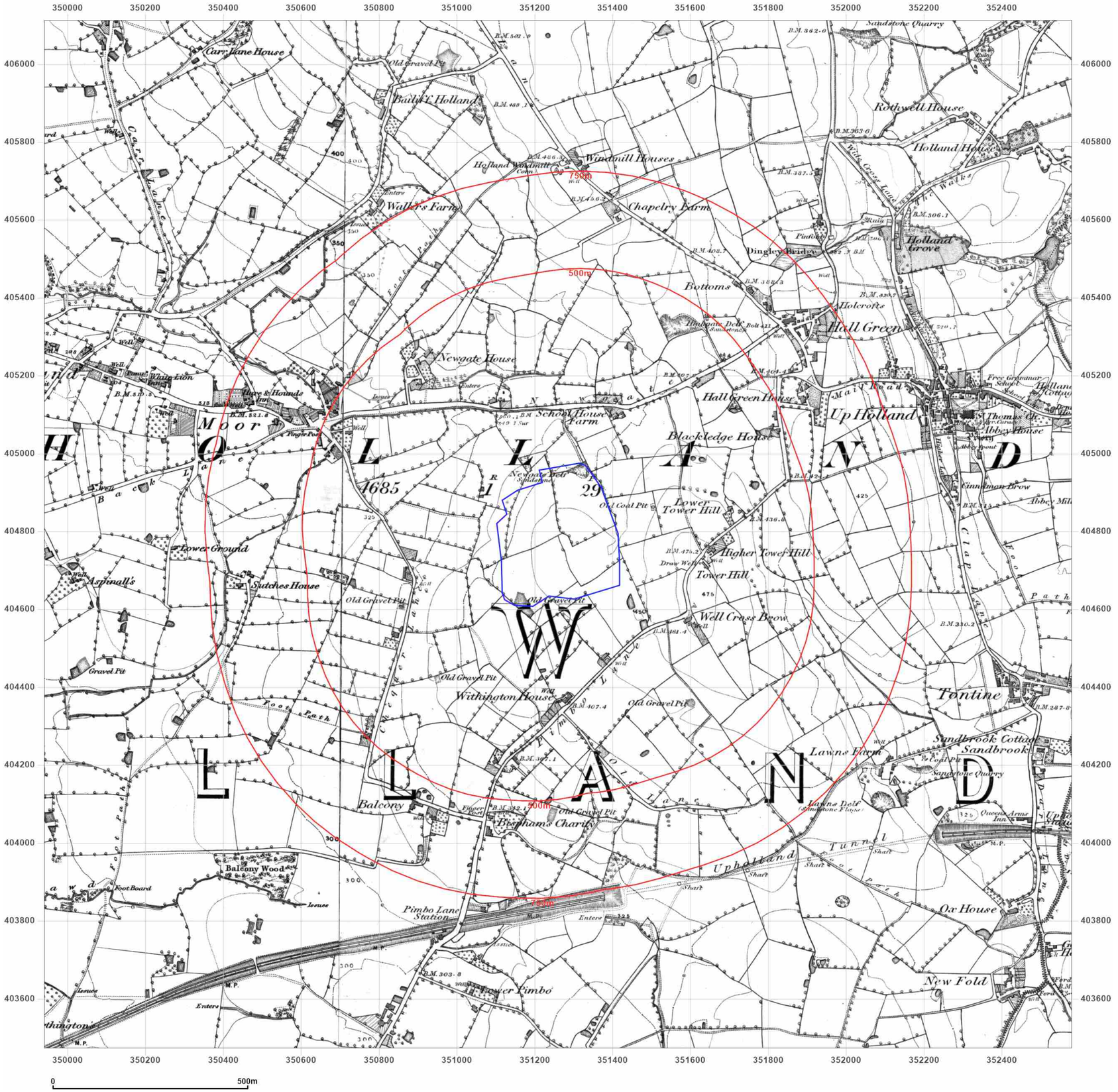

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1849**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1846
Revised N/A
Edition 1849
Copyright N/A
Levelled N/A

Surveyed 1846
Revised N/A
Edition 1849
Copyright N/A
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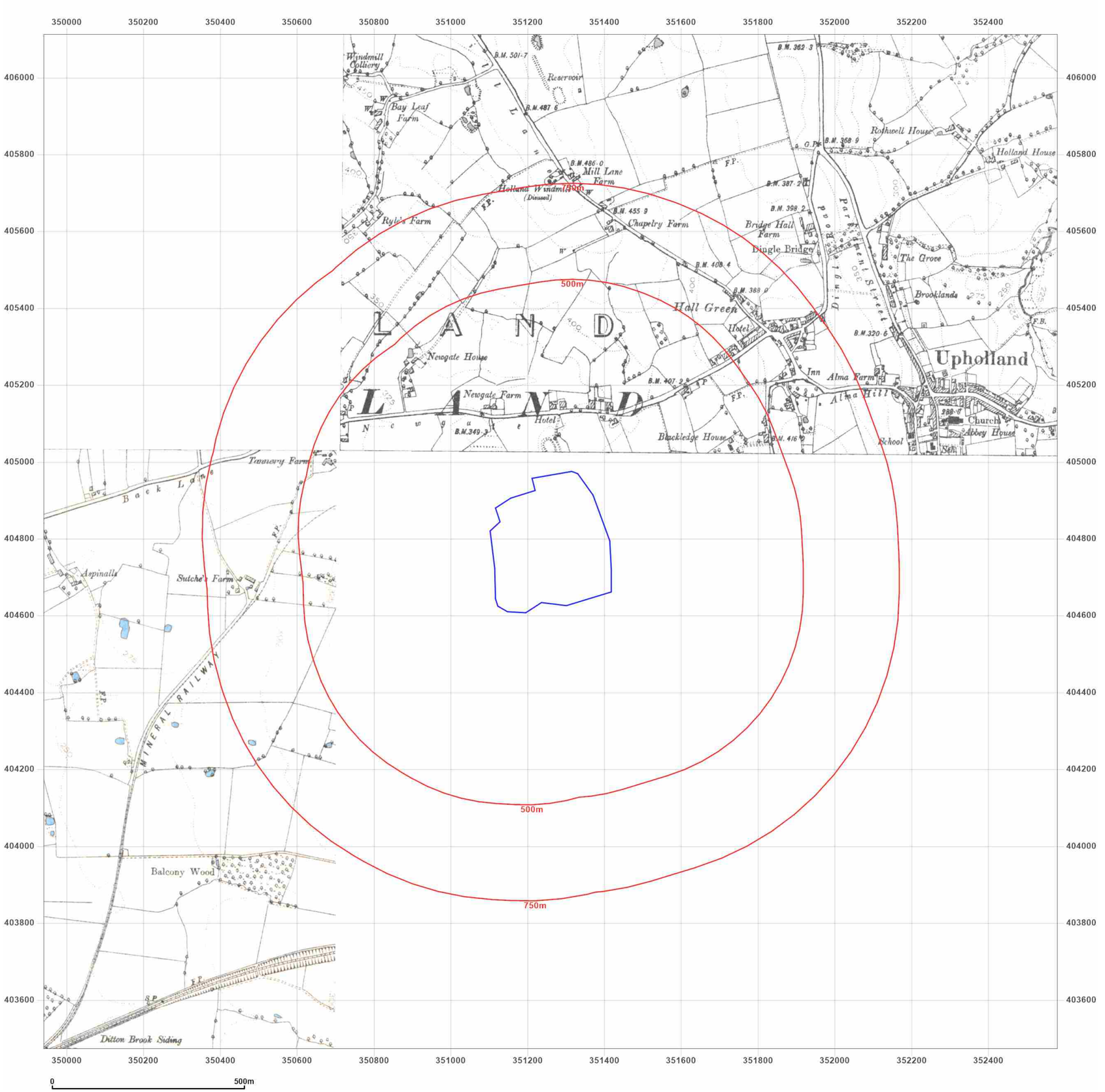

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1892**

Scale: 1:10,560

Printed at: 1:10,560

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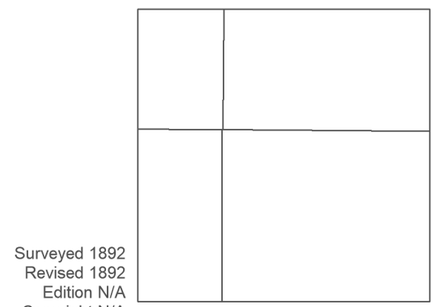
Surveyed 1892
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1892
Revised 1892
Edition N/A
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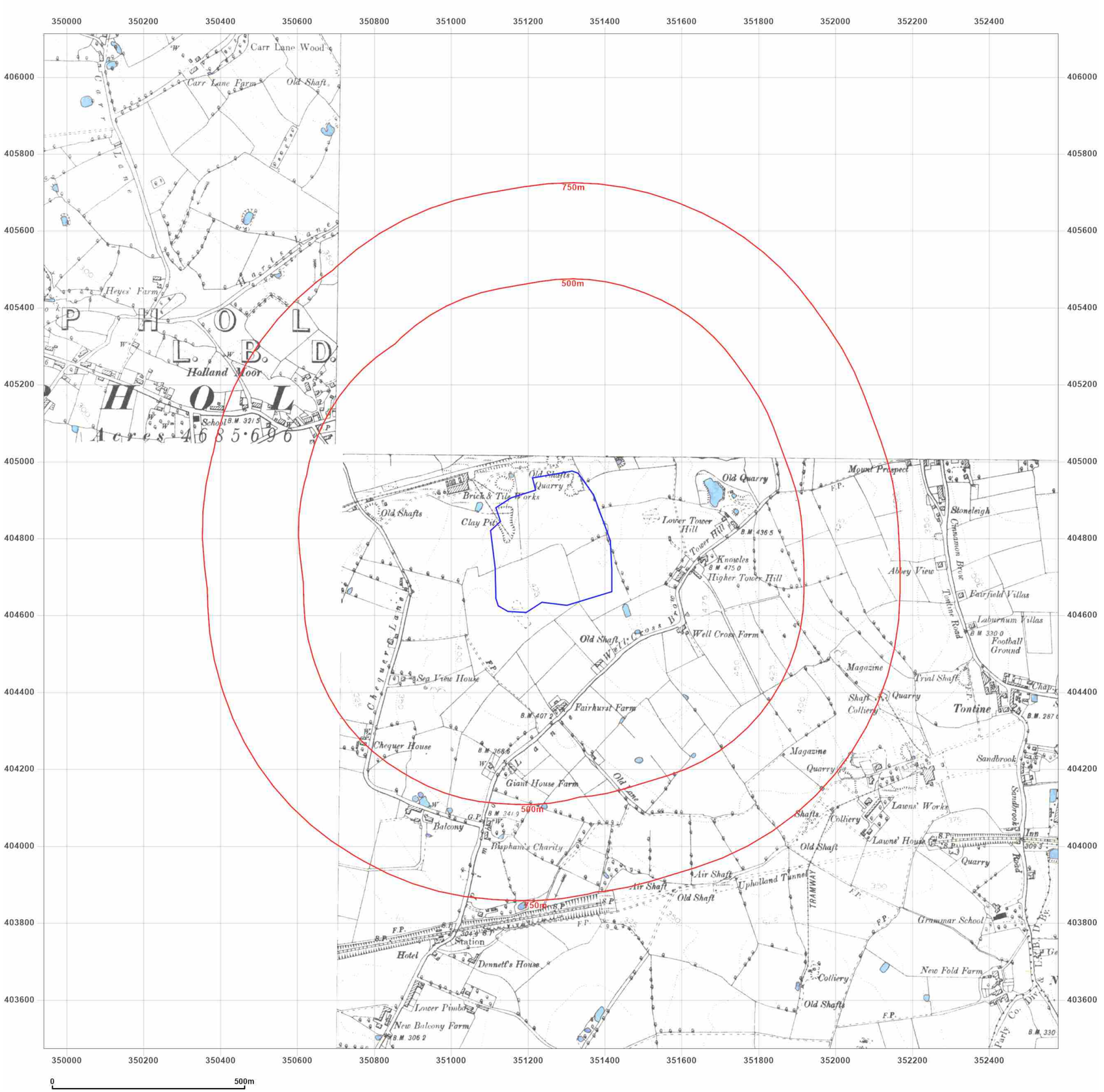

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1892**

Scale: 1:10,560

Printed at: 1:10,560

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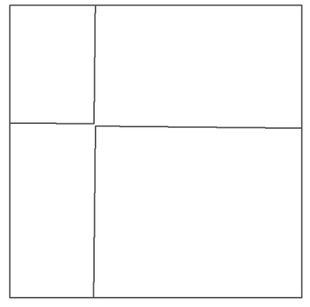
Surveyed 1892
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1892
Revised 1892
Edition N/A
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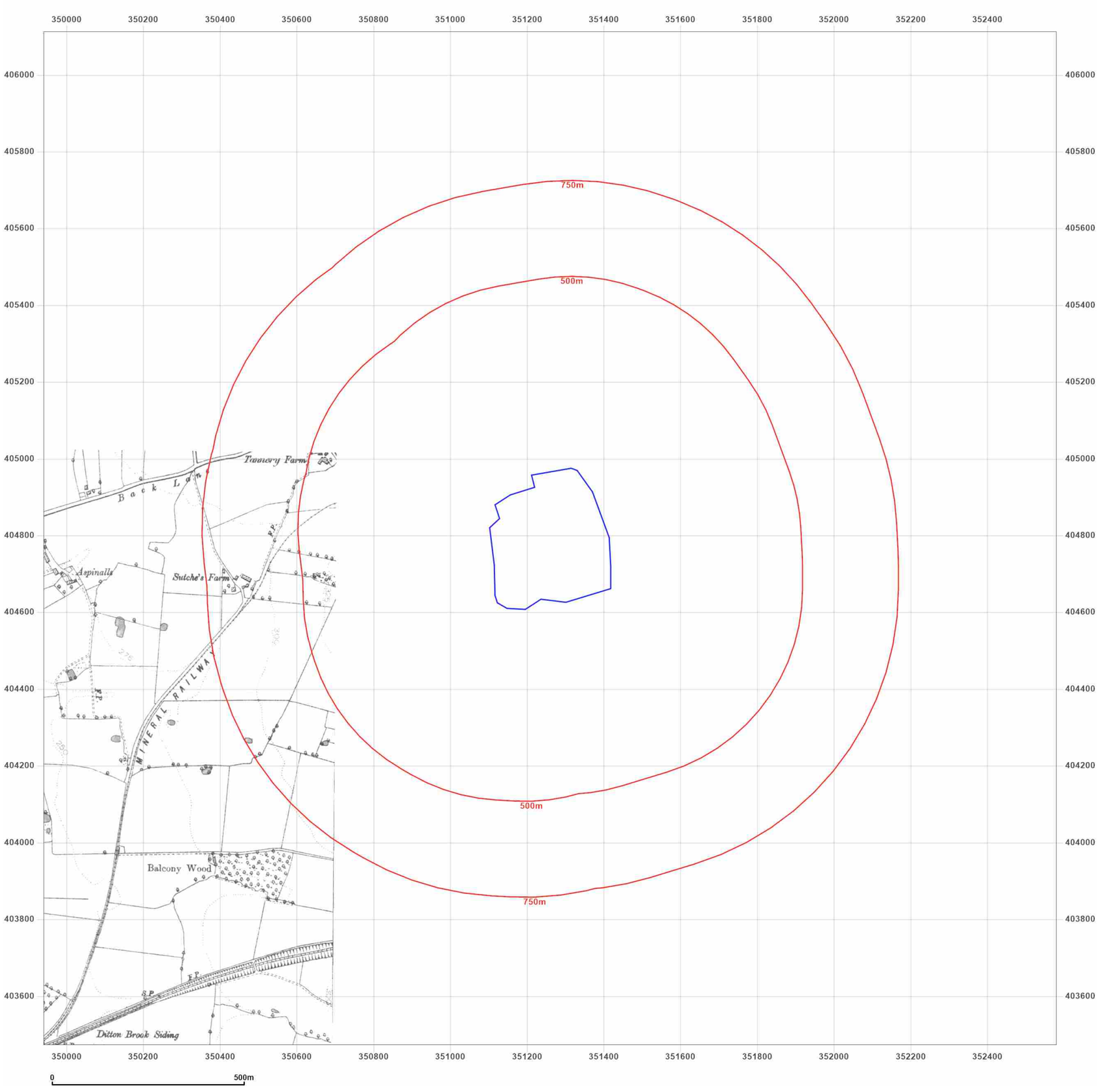

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1892**

Scale: 1:10,560

Printed at: 1:10,560

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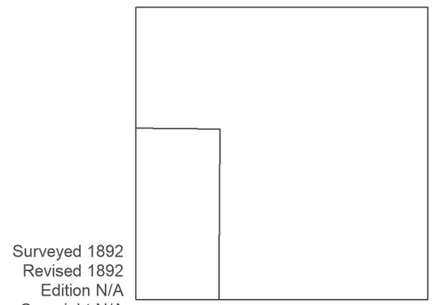

Surveyed 1892
Revised 1892
Edition N/A
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Levelled N/A

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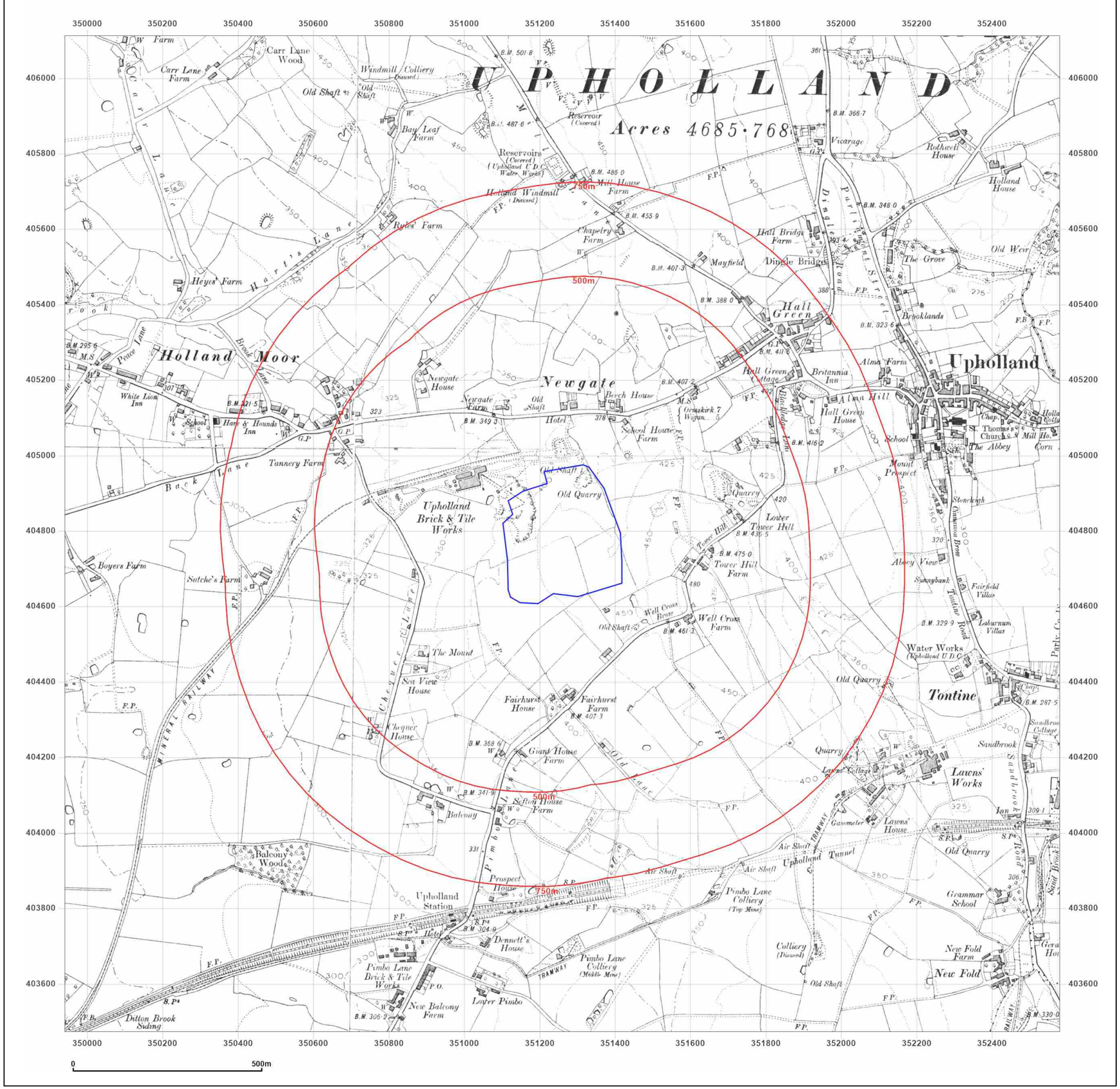

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1907**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised 1907
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1907
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1907
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Revised 1907
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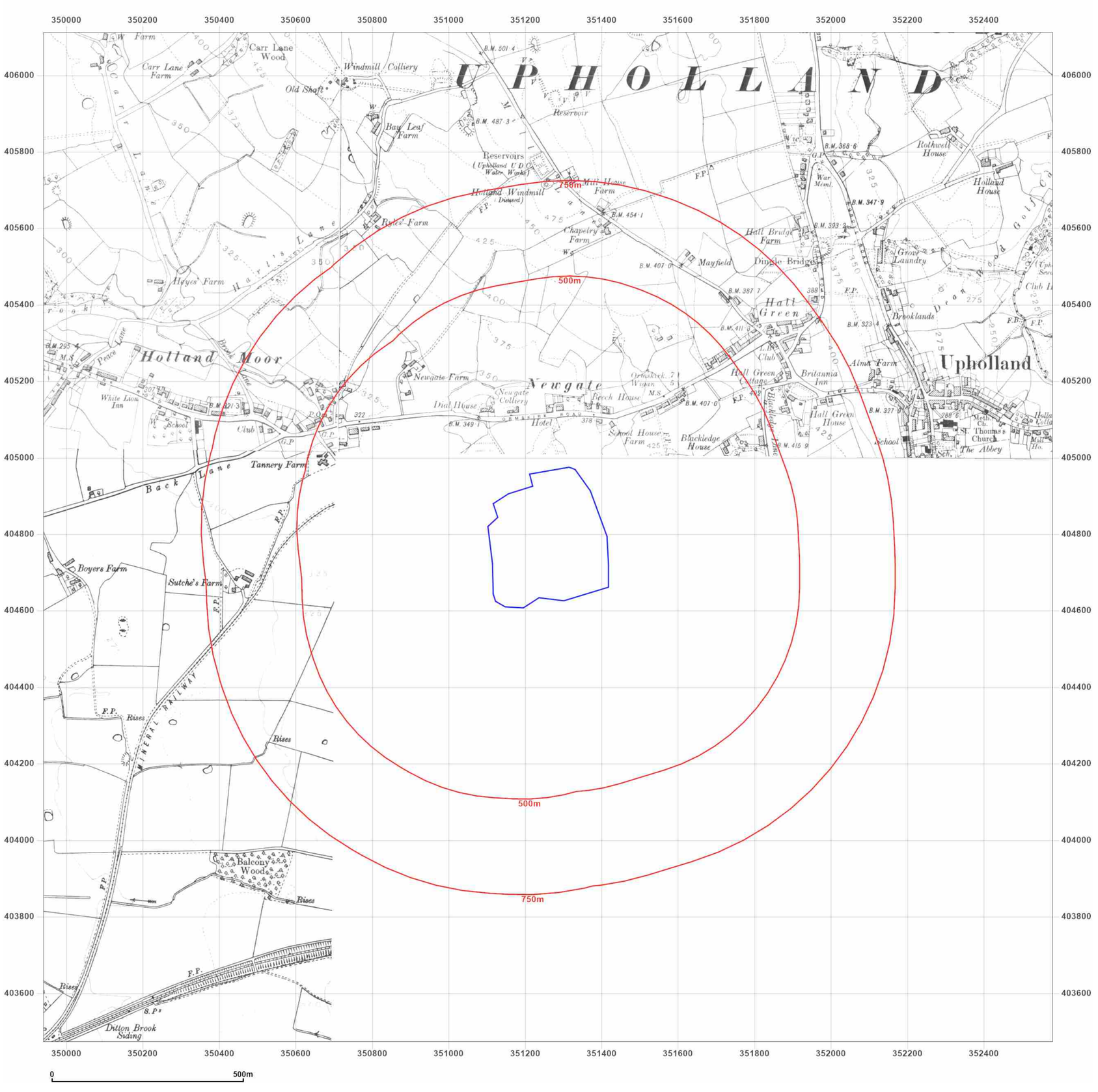

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1926-1927**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1927
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1846
Revised 1926
Edition N/A
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Levelled N/A

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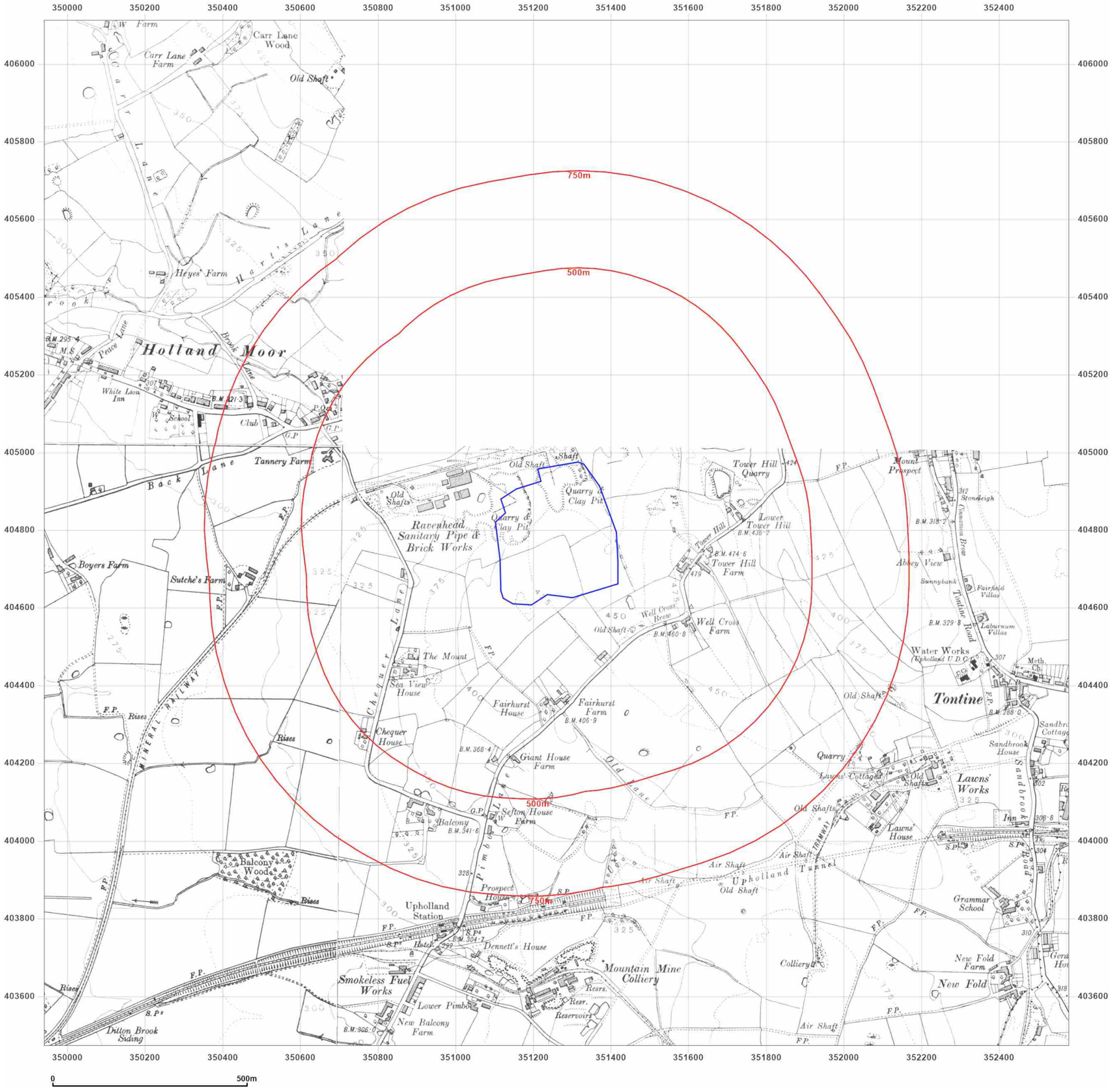

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1926-1927**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1845
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1846
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1846
Revised 1927
Edition N/A
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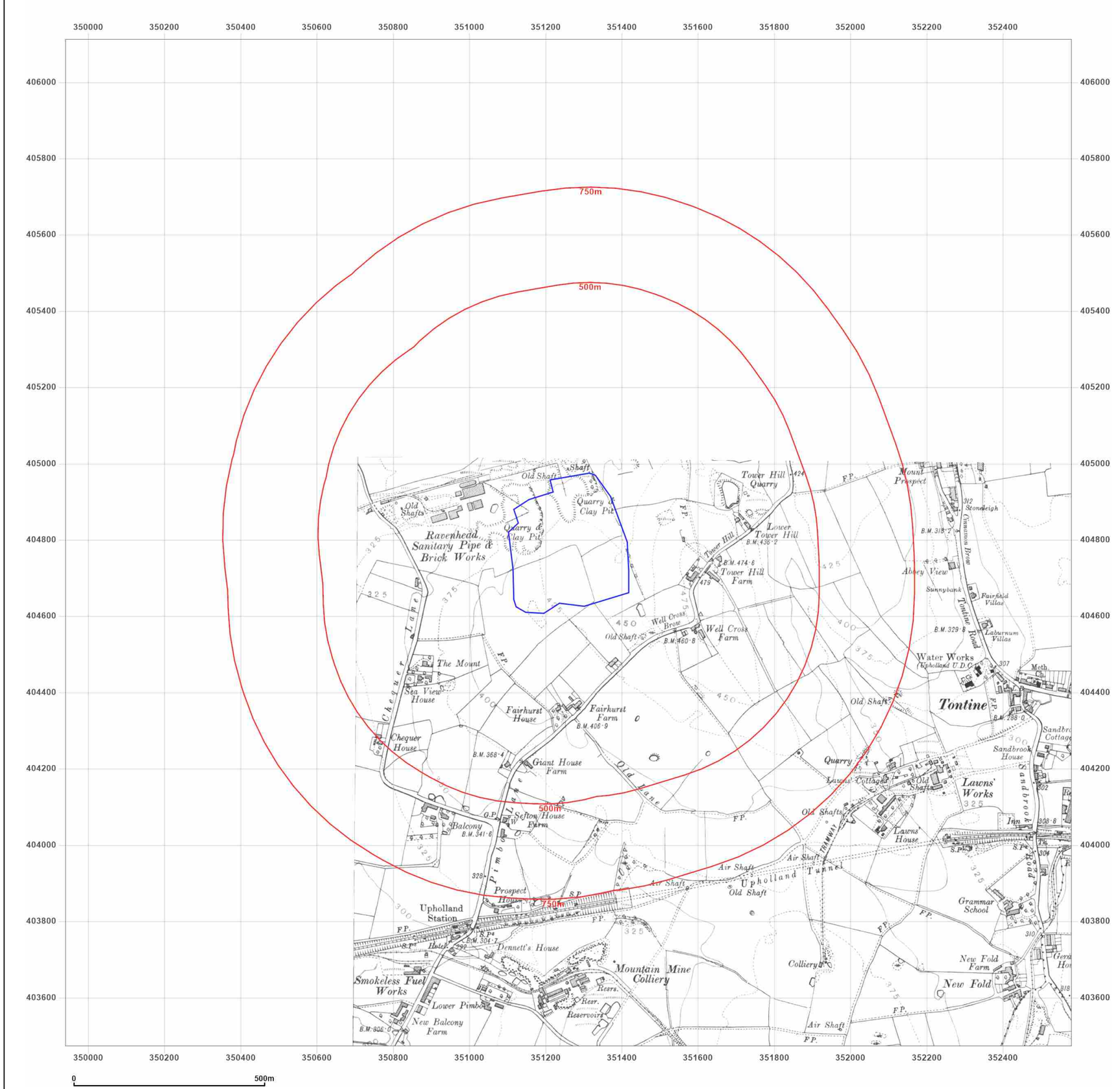

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1929**

Scale: 1:10,560

Printed at: 1:10,560

N
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Revised 1929
Edition 1929
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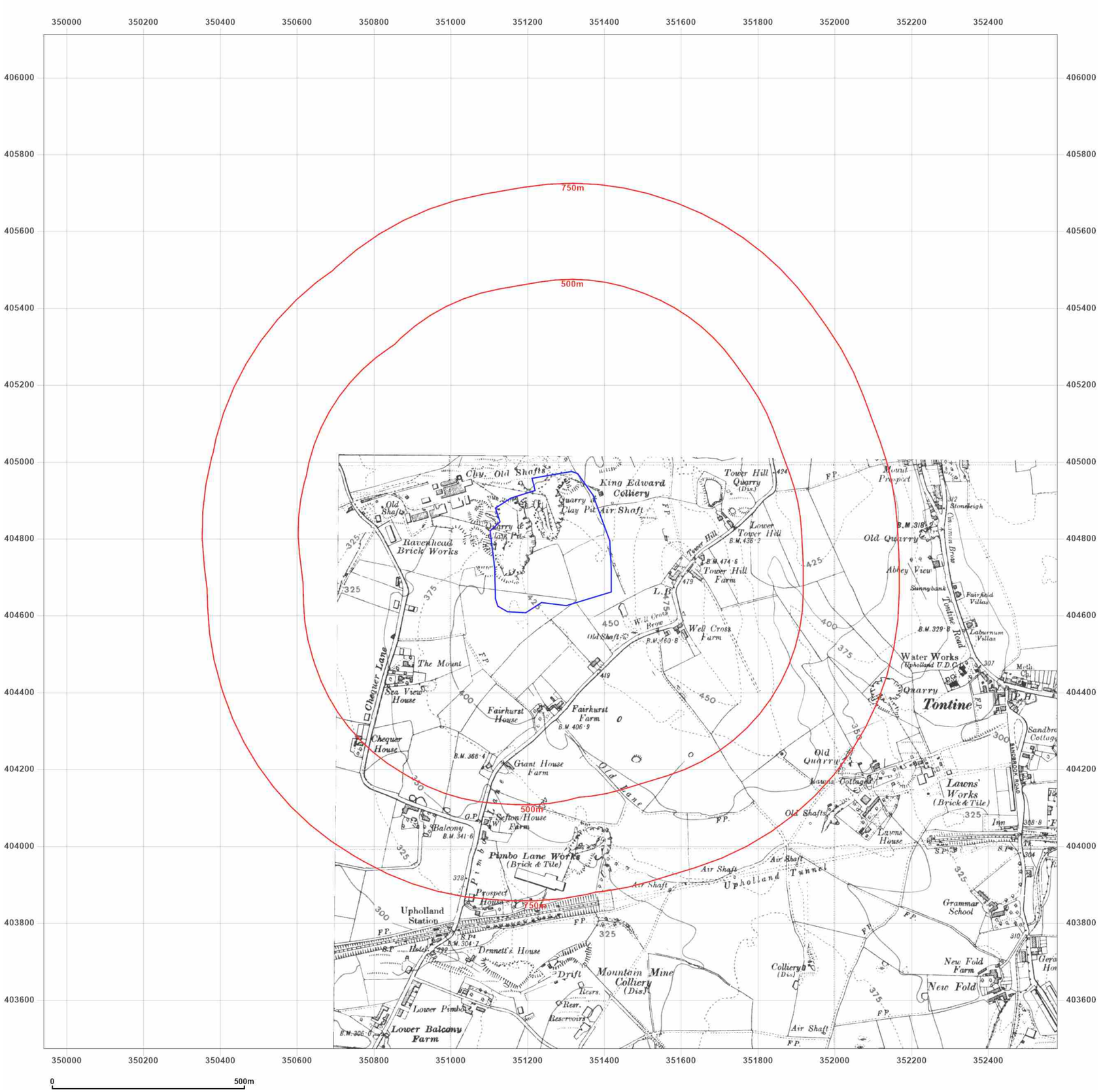

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1939**

Scale: 1:10,560

Printed at: 1:10,560

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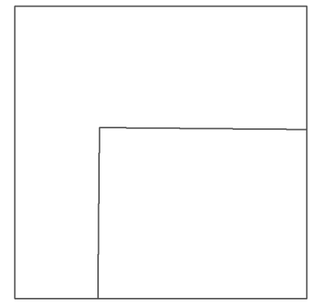

Surveyed 1846
Revised 1846
Edition N/A
Copyright N/A
Levelled N/A

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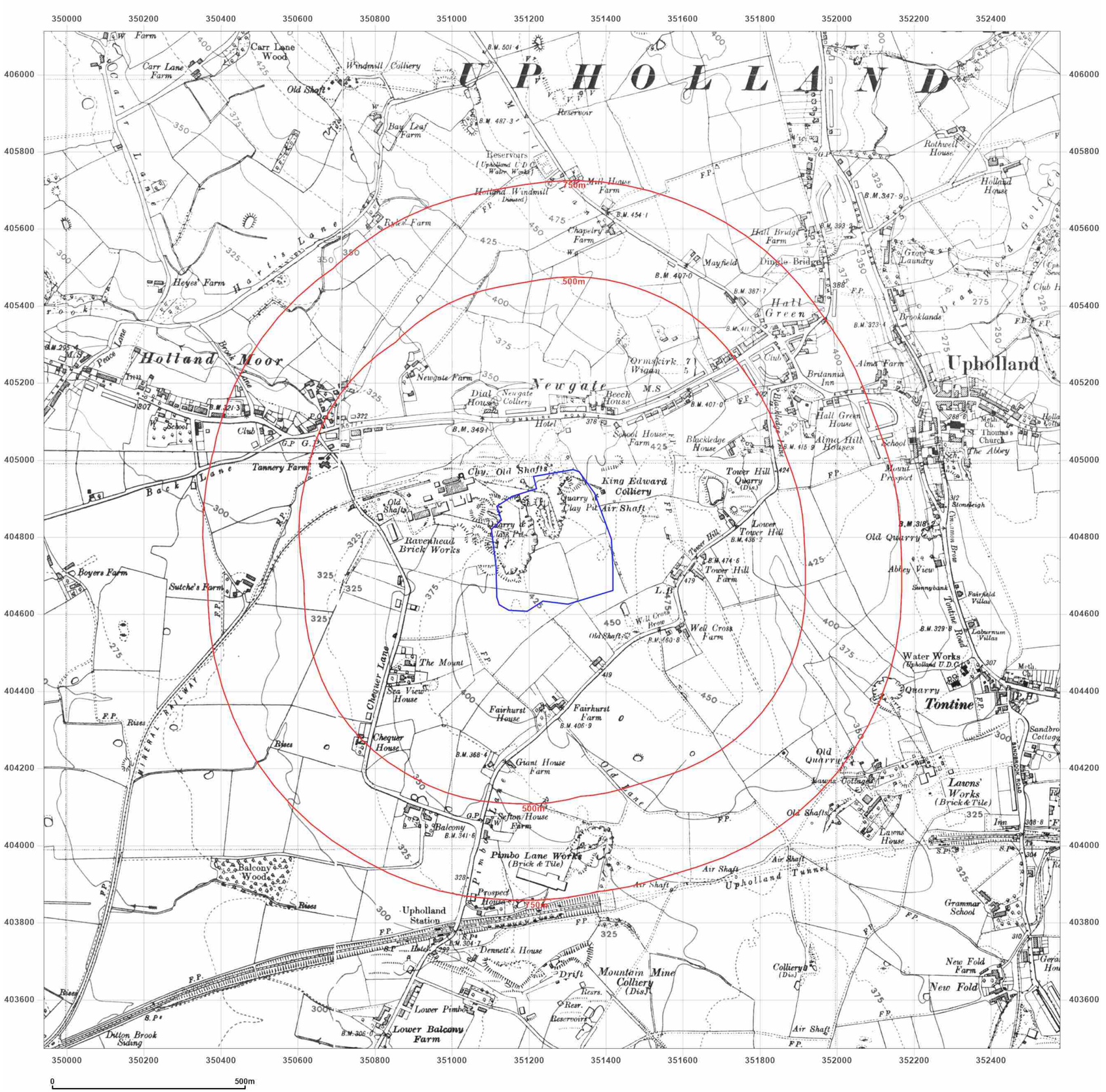

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1938-1939**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1845
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1938
Edition N/A
Copyright N/A
Levelled 1926

Surveyed 1846
Revised 1938
Edition 1938
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Revised 1939
Edition N/A
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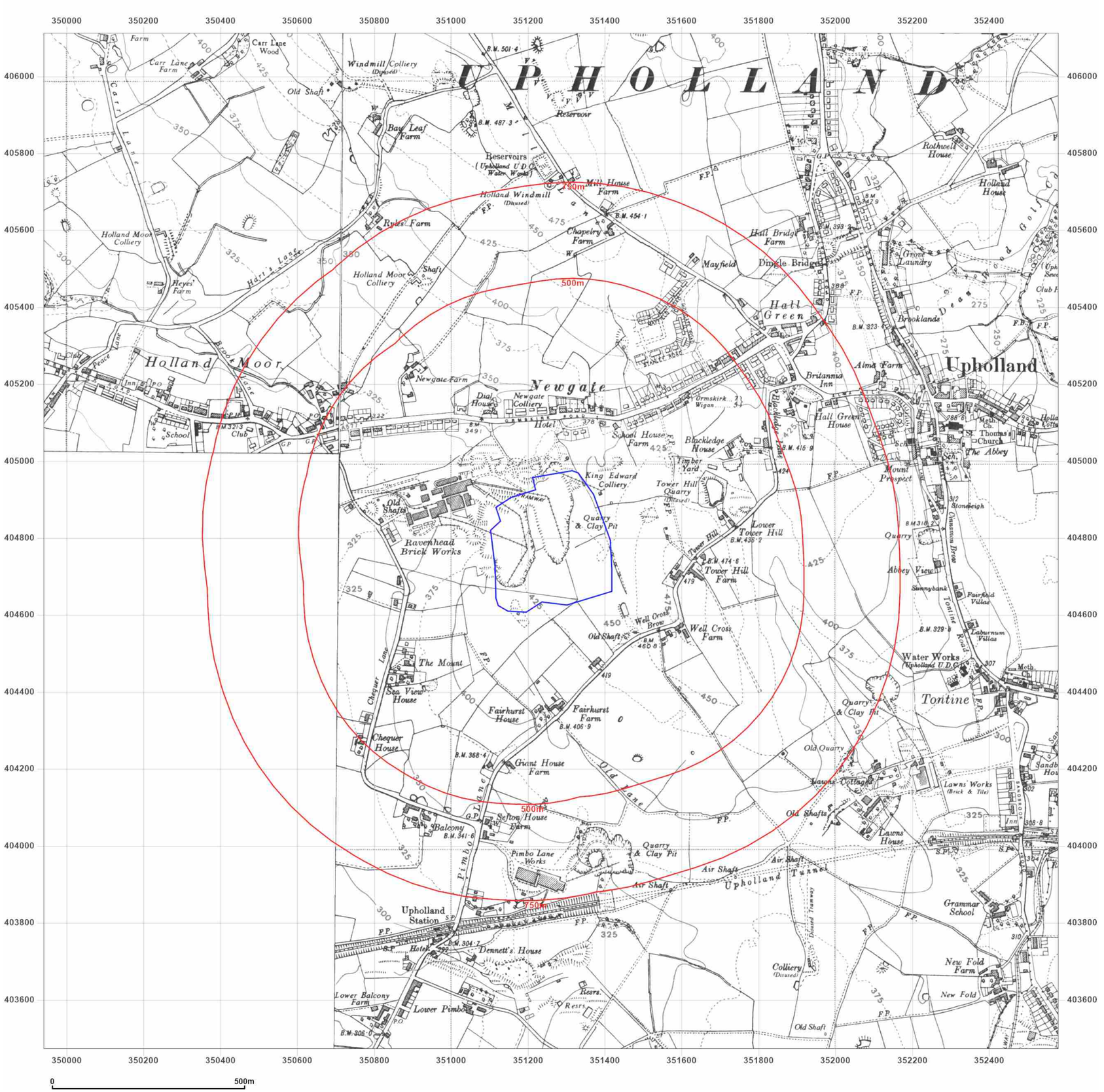

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1946-1948**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised 1947
Edition 1947
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1948
Edition 1948
Copyright N/A
Levelled N/A

Surveyed 1846
Revised 1846
Edition N/A
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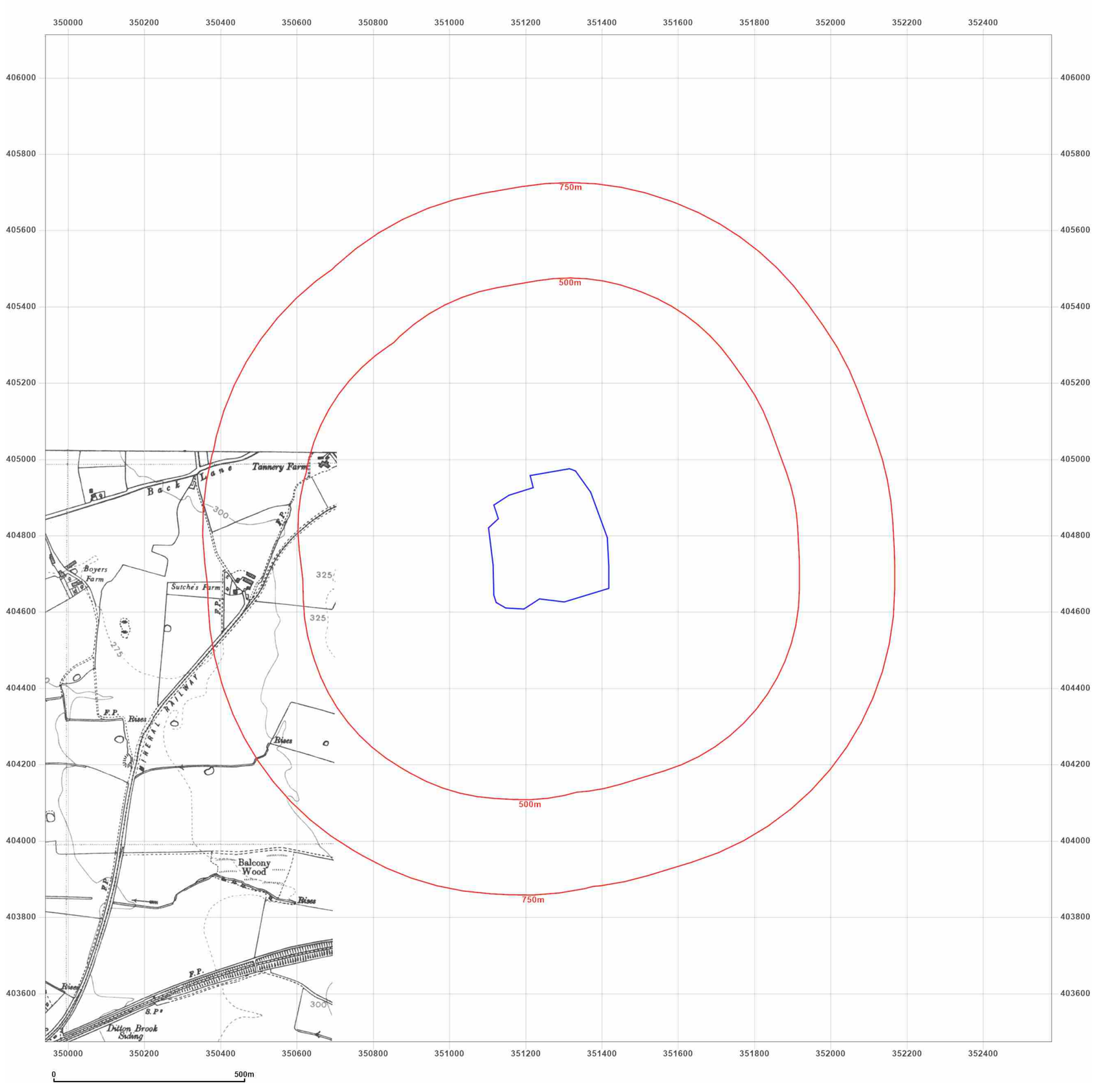

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: County Series

Map date: **1952**

Scale: 1:10,560

Printed at: 1:10,560

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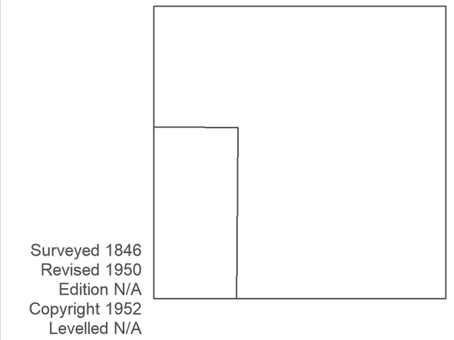

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Edition N/A
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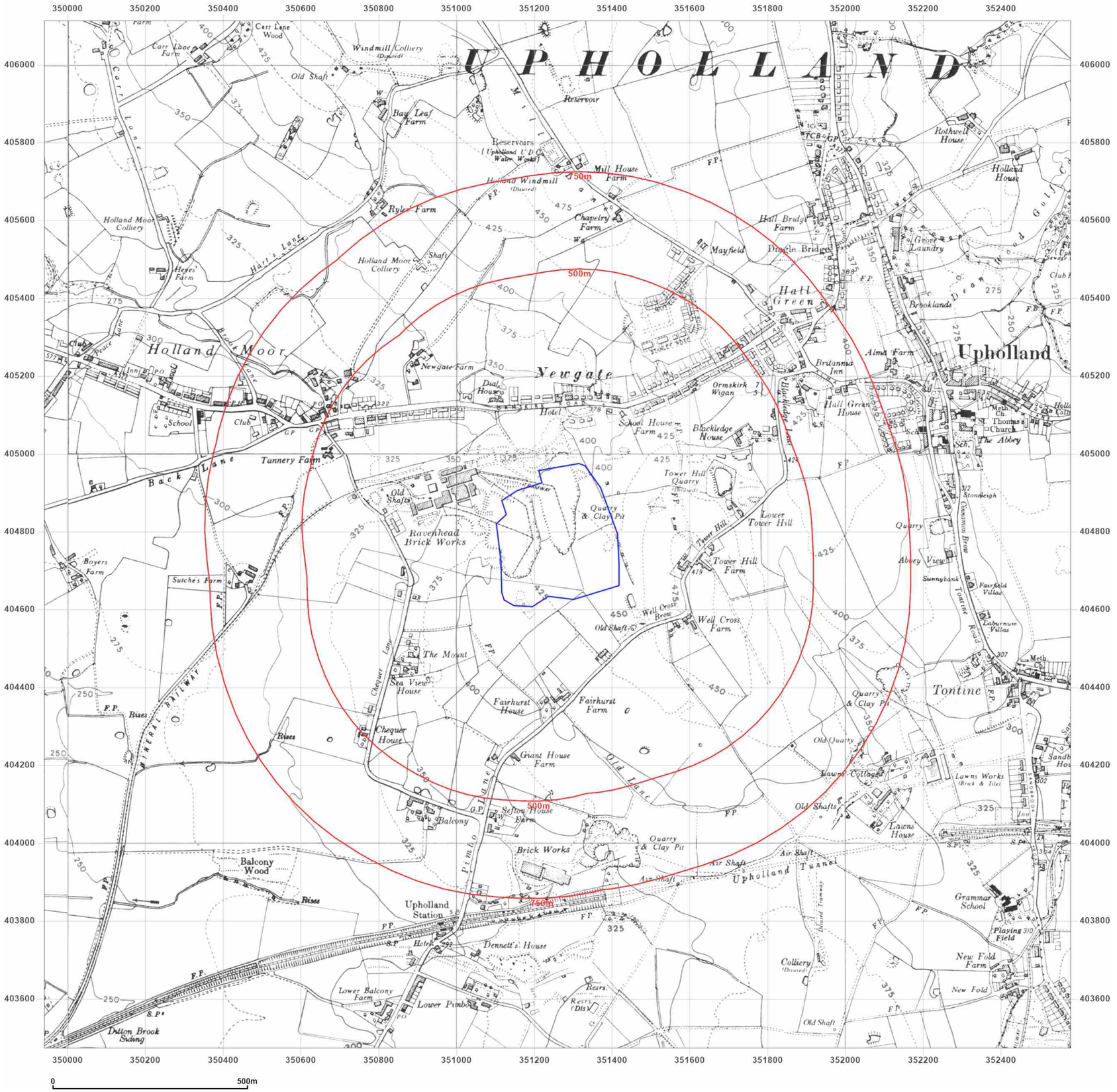

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: Provisional

Map date: **1955**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1949 Revised 1955 Edition 1955 Copyright N/A Levelled N/A	Surveyed N/A Revised 1955 Edition N/A Copyright N/A Levelled N/A
Surveyed 1949 Revised 1949 Edition 1955 Copyright N/A Levelled N/A	Surveyed N/A Revised 1955 Edition 1955 Copyright N/A Levelled N/A

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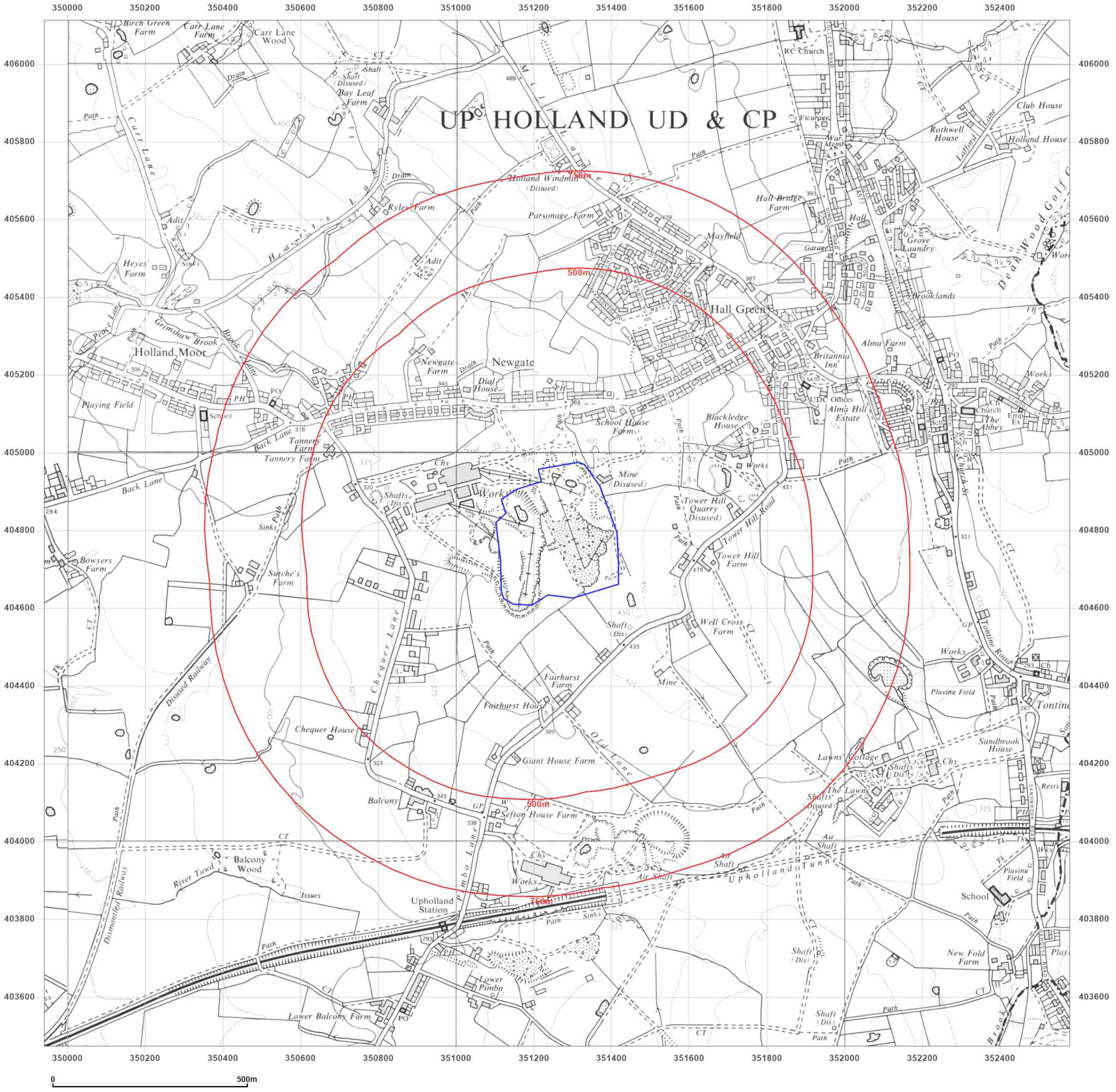

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: Provisional

Map date: **1967**

Scale: 1:10,560

Printed at: 1:10,560

N
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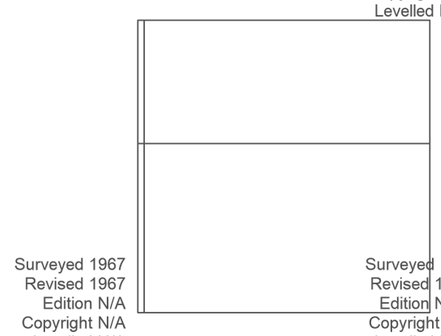
Surveyed 1967
Revised 1967
Edition N/A
Copyright N/A
Levelled N/A



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Edition N/A
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Levelled N/A

Surveyed 1967
Revised 1967
Edition N/A
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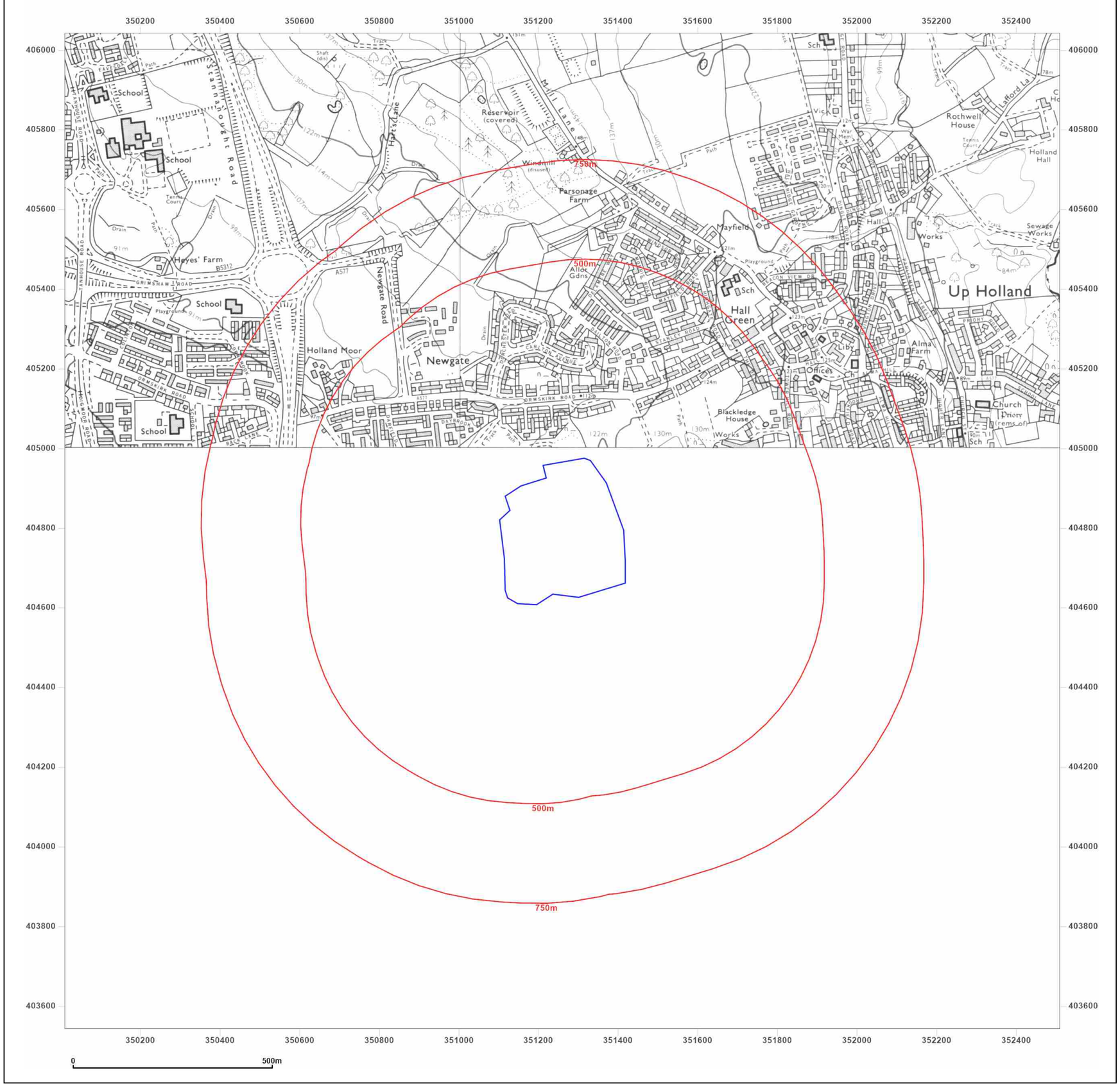

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: National Grid

Map date: **1975**

Scale: 1:10,000

Printed at: 1:10,000

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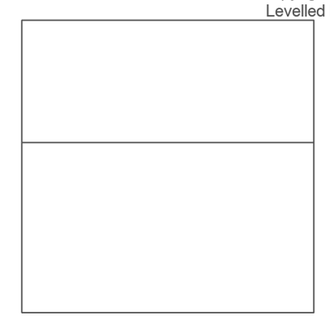
Surveyed 1975
Revised 1975
Edition N/A
Copyright N/A
Levelled N/A



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Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: National Grid

Map date: **1981-1983**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1979
Revised 1983
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1978
Revised 1981
Edition N/A
Copyright N/A
Levelled N/A

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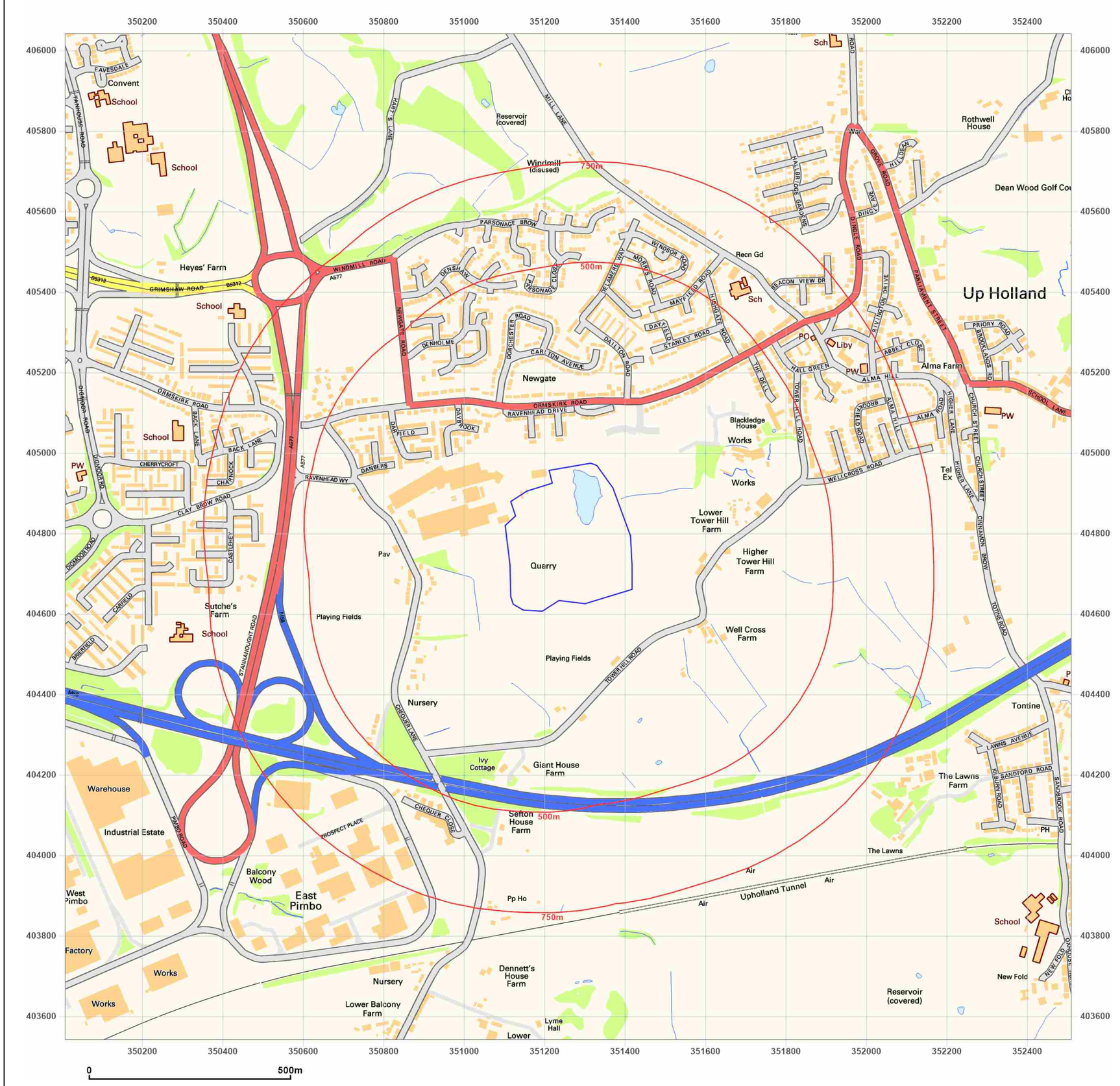

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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2001

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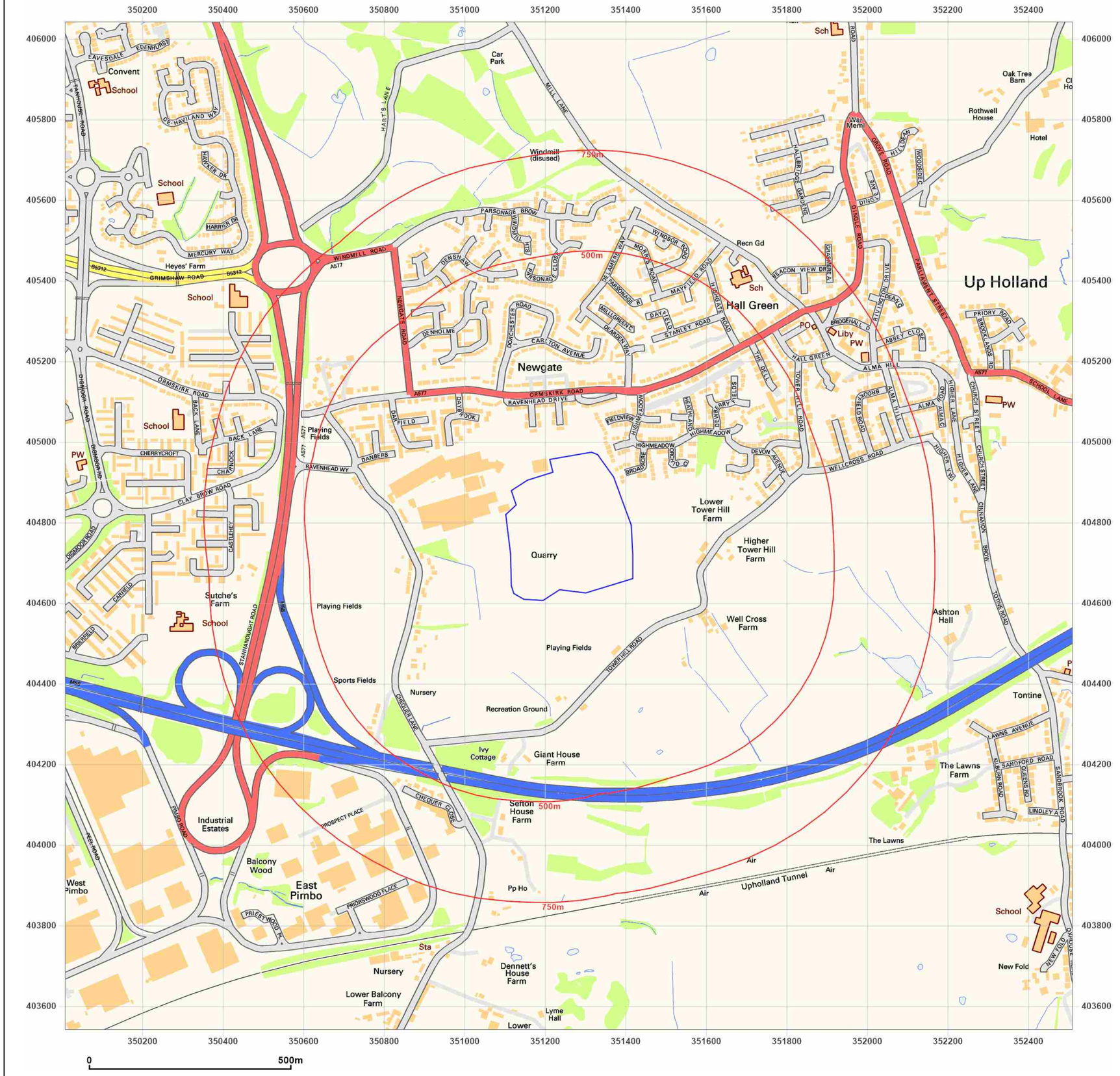

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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2010

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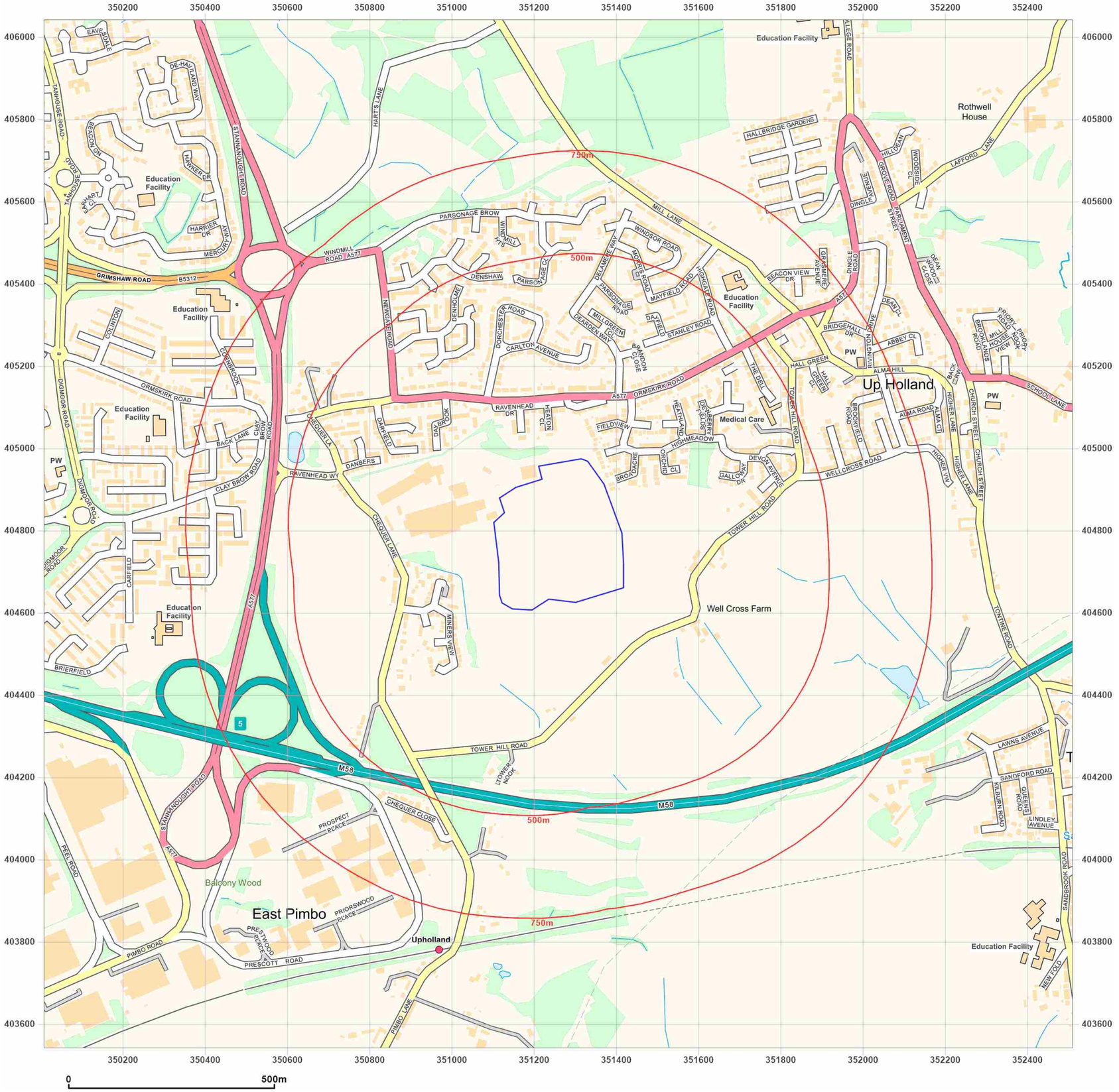

Groundsure INSIGHTS

Site Details:

351285 404782

Client Ref: K0158_Ravenhead_-_PO141043
Report Ref: GS-8507845
Grid Ref: 351259, 404792

Map Name: National Grid

Map date: **2022**

Scale: 1:10,000

Printed at: 1:10,000

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Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

351285 404782

Order Details

Date: 09/02/2022

Your ref: K0158_Ravenhead_-_PO141043

Our Ref: GS-8507846

Client: Byrne Looby Partners (UK) Limited

Site Details

Location: 351343 404792

Area: 8.96 ha

Authority: West Lancashire Borough Council

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
13	1.1	Historical industrial land uses	43	24	51	59	-
20	1.2	Historical tanks	2	2	25	8	-
22	1.3	Historical energy features	0	0	1	4	-
22	1.4	Historical petrol stations	0	0	0	0	-
22	1.5	Historical garages	0	0	0	0	-
23	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
24	2.1	Historical industrial land uses	52	29	67	84	-
33	2.2	Historical tanks	2	2	30	8	-
35	2.3	Historical energy features	0	0	1	6	-
35	2.4	Historical petrol stations	0	0	0	0	-
35	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
36	3.1	Active or recent landfill	0	0	0	0	-
36	3.2	Historical landfill (BGS records)	0	0	0	0	-
37	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
37	3.4	Historical landfill (EA/NRW records)	1	0	1	1	-
38	3.5	Historical waste sites	0	0	0	0	-
38	3.6	Licensed waste sites	1	0	0	0	-
38	3.7	Waste exemptions	0	0	1	2	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
40	4.1	Recent industrial land uses	2	1	14	-	-
41	4.2	Current or recent petrol stations	0	0	0	0	-
42	4.3	Electricity cables	0	0	0	0	-
42	4.4	Gas pipelines	0	0	0	0	-
42	4.5	Sites determined as Contaminated Land	0	0	0	0	-

42	4.6	Control of Major Accident Hazards (COMAH)	1	0	0	0	-
42	4.7	Regulated explosive sites	0	0	0	0	-
43	4.8	Hazardous substance storage/usage	0	0	1	0	-
43	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
43	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
43	4.11	Licensed pollutant release (Part A(2)/B)	0	0	1	2	-
44	4.12	Radioactive Substance Authorisations	0	0	0	0	-
44	4.13	Licensed Discharges to controlled waters	0	0	0	0	-
44	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
45	4.15	Pollutant release to public sewer	0	0	0	0	-
45	4.16	List 1 Dangerous Substances	0	0	0	0	-
45	4.17	List 2 Dangerous Substances	0	0	0	0	-
45	4.18	Pollution Incidents (EA/NRW)	0	0	0	2	-
46	4.19	Pollution inventory substances	0	0	0	0	-
46	4.20	Pollution inventory waste transfers	0	0	0	0	-
46	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
47	5.1	Superficial aquifer	Identified (within 500m)				
49	5.2	Bedrock aquifer	Identified (within 500m)				
51	5.3	Groundwater vulnerability	Identified (within 50m)				
53	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
53	5.5	Groundwater vulnerability- local information	None (within 0m)				
54	5.6	Groundwater abstractions	0	1	0	0	3
56	5.7	Surface water abstractions	0	0	0	0	0
56	5.8	Potable abstractions	0	0	0	0	0
56	5.9	Source Protection Zones	0	0	0	0	-
56	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
57	6.1	Water Network (OS MasterMap)	0	0	5	-	-

58	6.2	Surface water features	1	0	4	-	-
58	6.3	WFD Surface water body catchments	1	-	-	-	-
59	6.4	WFD Surface water bodies	0	0	0	-	-
59	6.5	WFD Groundwater bodies	1	-	-	-	-

Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
60	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
60	7.2	Historical Flood Events	0	0	0	-	-
60	7.3	Flood Defences	0	0	0	-	-
61	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
61	7.5	Flood Storage Areas	0	0	0	-	-
62	7.6	Flood Zone 2	None (within 50m)				
62	7.7	Flood Zone 3	None (within 50m)				

Page	Section	Surface water flooding	
63	8.1	Surface water flooding	1 in 30 year, 0.3m - 1.0m (within 50m)

Page	Section	Groundwater flooding	
65	9.1	Groundwater flooding	Low (within 50m)

Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
66	10.1	Sites of Special Scientific Interest (SSSI)	1	0	0	0	0
67	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
67	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
67	10.4	Special Protection Areas (SPA)	0	0	0	0	0
67	10.5	National Nature Reserves (NNR)	0	0	0	0	0
68	10.6	Local Nature Reserves (LNR)	0	0	0	0	1
68	10.7	Designated Ancient Woodland	0	0	0	0	1
68	10.8	Biosphere Reserves	0	0	0	0	0
69	10.9	Forest Parks	0	0	0	0	0
69	10.10	Marine Conservation Zones	0	0	0	0	0
69	10.11	Green Belt	1	0	0	0	4
69	10.12	Proposed Ramsar sites	0	0	0	0	0

70	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
70	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
70	10.15	Nitrate Sensitive Areas	0	0	0	0	0
70	**10.16**	**Nitrate Vulnerable Zones**	1	0	0	0	2
72	**10.17**	**SSSI Impact Risk Zones**	2	-	-	-	-
73	**10.18**	**SSSI Units**	1	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
74	11.1	World Heritage Sites	0	0	0	-	-
74	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
74	11.3	National Parks	0	0	0	-	-
74	11.4	Listed Buildings	0	0	0	-	-
75	11.5	Conservation Areas	0	0	0	-	-
75	11.6	Scheduled Ancient Monuments	0	0	0	-	-
75	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
76	**12.1**	**Agricultural Land Classification**	Grade 3b (within 250m)				
77	12.2	Open Access Land	0	0	0	-	-
77	12.3	Tree Felling Licences	0	0	0	-	-
78	12.4	Environmental Stewardship Schemes	0	0	0	-	-
78	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
79	13.1	Priority Habitat Inventory	0	0	0	-	-
79	13.2	Habitat Networks	0	0	0	-	-
80	**13.3**	**Open Mosaic Habitat**	1	0	0	-	-
80	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
81	**14.1**	**10k Availability**	Identified (within 500m)				
82	14.2	Artificial and made ground (10k)	0	0	0	0	-
83	14.3	Superficial geology (10k)	0	0	0	0	-

83	14.4	Landslip (10k)	0	0	0	0	-
84	14.5	Bedrock geology (10k)	0	0	0	0	-
84	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
85	15.1	50k Availability	Identified (within 500m)				
86	15.2	Artificial and made ground (50k)	1	0	1	1	-
87	15.3	Artificial ground permeability (50k)	1	1	-	-	-
88	15.4	Superficial geology (50k)	1	0	1	1	-
89	15.5	Superficial permeability (50k)	Identified (within 50m)				
89	15.6	Landslip (50k)	0	0	0	0	-
89	15.7	Landslip permeability (50k)	None (within 50m)				
90	15.8	Bedrock geology (50k)	3	0	8	4	-
91	15.9	Bedrock permeability (50k)	Identified (within 50m)				
92	15.10	Bedrock faults and other linear features (50k)	2	0	7	3	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
93	16.1	BGS Boreholes	0	8	36	-	-
Page	Section	Natural ground subsidence					
96	17.1	Shrink swell clays	Very low (within 50m)				
98	17.2	Running sands	Very low (within 50m)				
100	17.3	Compressible deposits	Moderate (within 50m)				
102	17.4	Collapsible deposits	Very low (within 50m)				
103	17.5	Landslides	Low (within 50m)				
105	17.6	Ground dissolution of soluble rocks	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
107	18.1	Natural cavities	0	0	0	0	-
108	18.2	BritPits	10	1	9	8	-
113	18.3	Surface ground workings	41	22	46	-	-
117	18.4	Underground workings	2	8	11	9	65
121	18.5	Historical Mineral Planning Areas	1	0	1	2	-

122	**18.6**	**Non-coal mining**	0	0	0	1	1
122	18.7	Mining cavities	0	0	0	0	0
122	**18.8**	**JPB mining areas**	Identified (within 0m)				
123	**18.9**	**Coal mining**	Identified (within 0m)				
123	18.10	Brine areas	None (within 0m)				
123	18.11	Gypsum areas	None (within 0m)				
123	18.12	Tin mining	None (within 0m)				
124	18.13	Clay mining	None (within 0m)				

Page	Section	Radon	
125	**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**	**BGS Estimated Background Soil Chemistry**	6	17	-	-	-
127	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
128	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
129	21.1	Underground railways (London)	0	0	0	-	-
129	21.2	Underground railways (Non-London)	0	0	0	-	-
130	21.3	Railway tunnels	0	0	0	-	-
130	**21.4**	**Historical railway and tunnel features**	14	0	9	-	-
131	21.5	Royal Mail tunnels	0	0	0	-	-
131	21.6	Historical railways	0	0	0	-	-
131	21.7	Railways	0	0	0	-	-
132	21.8	Crossrail 1	0	0	0	0	-
132	21.9	Crossrail 2	0	0	0	0	-
132	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 22/04/2019

Site Area: 8.96ha

Recent site history - 2015 aerial photograph

Capture Date: 11/06/2015

Site Area: 8.96ha

Recent site history - 2001 aerial photograph

Capture Date: 01/05/2001

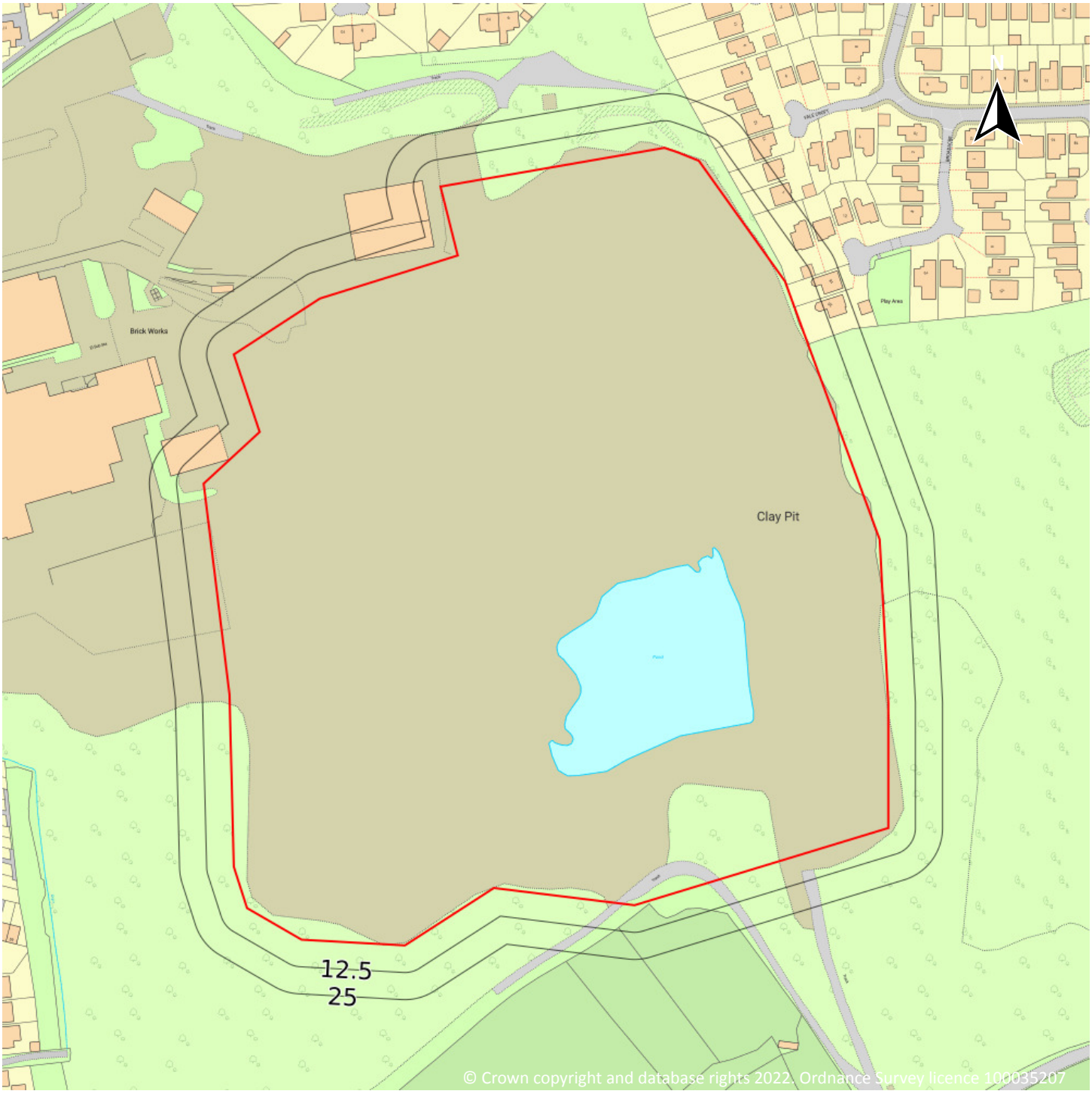
Site Area: 8.96ha

Recent site history - 2000 aerial photograph

Capture Date: 21/07/2000

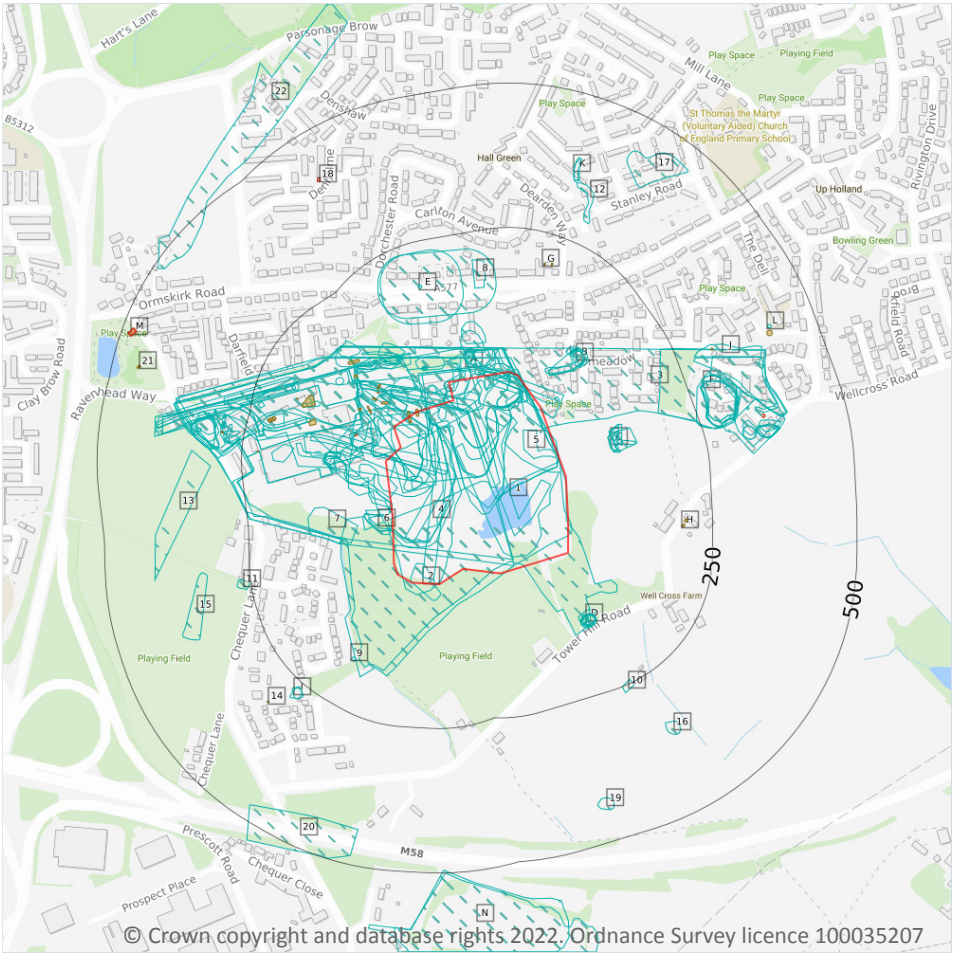
Site Area: 8.96ha

OS MasterMap site plan



Site Area: 8.96ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

1.1 Historical industrial land uses

Records within 500m	177

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 13**

ID	Location	Land use	Dates present	Group ID
1	**On site**	**Refuse Heap**	**1967**	**676496**

ID	Location	Land use	Dates present	Group ID
2	On site	Old Gravel Pit	1851	691590
3	On site	Colliery	1939 - 1946	733024
4	On site	Unspecified Quarry	1981	749105
5	On site	Unspecified Ground Workings	1967	645365
A	On site	Unspecified Ground Workings	1967	645364
A	On site	Unspecified Ground Workings	1967	645367
A	On site	Unspecified Heap	1967	648931
A	On site	Unspecified Disused Mine	1967	658321
A	On site	Sandstone Delf	1851	659761
A	On site	Clay Pit	1892	675960
A	On site	Refuse Heap	1981	676494
A	On site	Refuse Heap	1939	676495
A	On site	Refuse Heap	1939	676497
A	On site	Unspecified Old Quarry	1907	680484
A	On site	Unspecified Quarry and Clay Pit	1929	693994
A	On site	Tramway Sidings	1946 - 1955	699193
A	On site	Unspecified Quarry and Clay Pit	1955	700526
A	On site	Railway Sidings	1967	704742
A	On site	Mineral Railway Sidings	1892	712434
A	On site	Brick Works	1939 - 1946	721183
A	On site	Unspecified Ground Workings	1939	722432
A	On site	Unspecified Ground Workings	1907	728881
A	On site	Unspecified Quarry and Clay Pit	1946	731300
A	On site	Brick and Tile Works	1907	732502
A	On site	Mineral Railway Sidings	1927 - 1929	737681
A	On site	Railway Sidings	1939	740715
A	On site	Unspecified Quarry and Clay Pit	1939	741061
A	On site	Unspecified Quarry and Clay Pit	1955	747329

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Quarry and Clay Pit**	**1927**	**747463**
A	**On site**	**Mineral Railway Sidings**	**1907**	**749715**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**759853**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**759854**
A	**On site**	**Unspecified Quarry**	**1892**	**763471**
A	**On site**	**Railway Sidings**	**1967**	**765849**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**766845**
A	**On site**	**Railway Sidings**	**1939 - 1946**	**769360**
A	**On site**	**Mineral Railway Sidings**	**1939**	**769373**
A	**On site**	**Brick and Tile Works**	**1892**	**770744**
A	**On site**	**Unspecified Quarry**	**1907**	**771878**
A	**On site**	**Unspecified Ground Workings**	**1967**	**778902**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1927 - 1929**	**785659**
A	**On site**	**Sanitary Pipe and Brick Works**	**1927 - 1929**	**788352**
6	5m W	Unspecified Pit	1946	687817
A	15m N	Unspecified Heap	1892	648930
A	15m N	Unspecified Old Shaft	1907	651361
A	17m N	Unspecified Shaft	1929	695807
A	17m N	Unspecified Heap	1892 - 1907	698996
A	17m N	Unspecified Shaft	1927	760320
A	17m N	Unspecified Old Shafts	1939	760385
A	21m N	Unspecified Old Shafts	1892	640076
A	24m N	Unspecified Heap	1939	739507
A	26m NW	Unspecified Heap	1892 - 1907	785006
A	35m N	Unspecified Heap	1955	739661
A	37m N	Unspecified Ground Workings	1939	645368
A	38m NW	Unspecified Heap	1907	648920
A	38m NW	Unspecified Works	1981	723518

ID	Location	Land use	Dates present	Group ID
A	40m N	Unspecified Heap	1907	740690
A	42m N	Unspecified Tank	1907	672645
B	42m NE	Unspecified Ground Workings	1946	704190
A	45m NW	Unspecified Old Shafts	1939	729394
B	45m NE	Unspecified Ground Workings	1939	724888
A	45m NW	Unspecified Old Shaft	1929	709985
A	45m NW	Unspecified Old Shaft	1927	727895
A	45m NW	Unspecified Old Shafts	1892	739334
A	45m NW	Unspecified Old Shafts	1939	760887
B	46m NE	Unspecified Pit	1939	728392
A	57m N	Unspecified Heap	1892	732551
A	57m W	Unspecified Works	1967	733735
7	61m W	Unspecified Heap	1967	648906
A	74m NW	Cuttings	1907	641857
A	87m NW	Unspecified Ground Workings	1939	788555
A	89m N	Unspecified Ground Workings	1939	720913
A	89m N	Unspecified Ground Workings	1927	760028
C	90m E	Unspecified Ground Workings	1939 - 1946	781744
B	91m NE	Unspecified Pit	1927 - 1929	705561
C	91m E	Unspecified Ground Workings	1907 - 1927	708315
C	91m E	Unspecified Ground Workings	1939	713071
B	91m NE	Unspecified Pit	1955	704986
C	92m E	Unspecified Heap	1929	782927
A	92m NW	Unspecified Ground Workings	1967	765256
B	96m NE	Unspecified Pit	1892 - 1907	737482
C	96m E	Unspecified Ground Workings	1955	709244
C	97m E	Unspecified Heap	1981	758080
A	103m W	Railway Sidings	1939	641328

ID	Location	Land use	Dates present	Group ID
A	103m NW	Unspecified Ground Workings	1927	745110
A	104m NW	Unspecified Ground Workings	1939	743945
C	104m E	Old Coal Pit	1851	681913
D	104m S	Unspecified Heap	1946 - 1955	738860
E	106m N	Colliery	1927	764317
D	110m S	Unspecified Disused Shaft	1967	664008
D	111m S	Unspecified Heap	1929	695014
D	111m S	Unspecified Heap	1927	759032
D	111m S	Unspecified Heap	1939	759224
E	112m N	Colliery	1938	709144
D	113m S	Unspecified Heap	1907	776630
D	113m S	Unspecified Heap	1939	749439
D	116m S	Unspecified Old Shaft	1955	651366
A	117m NW	Chimney	1939	772355
D	121m S	Unspecified Old Shaft	1892 - 1939	694323
D	124m S	Unspecified Old Shaft	1946	750333
A	134m W	Unspecified Tanks	1892	665937
A	139m NW	Unspecified Heap	1967	648919
A	142m W	Unspecified Tank	1907	672644
A	143m W	Railway Sidings	1939	641327
A	147m W	Unspecified Tank	1907	672646
A	151m W	Mineral Railway Sidings	1946	728518
8	151m N	Colliery	1948	760184
A	155m W	Unspecified Tank	1907	672643
A	161m W	Refuse Heap	1967	676498
9	161m SW	Unspecified Disused Shaft	1981	664009
E	169m N	Unspecified Old Shaft	1907	651365
A	178m W	Chimney	1967	684265

ID	Location	Land use	Dates present	Group ID
A	186m W	Mineral Railway Sidings	1955	786372
F	188m E	Timber Yard	1946	642748
A	227m W	Unspecified Old Shafts	1955	640075
10	244m SE	Unspecified Mine	1967	691509
F	245m E	Unspecified Disused Quarry	1939 - 1946	698506
11	252m W	Old Gravel Pit	1851	691587
A	255m W	Unspecified Heap	1927	707548
A	256m W	Unspecified Ground Workings	1939	779856
I	258m SW	Old Gravel Pit	1851	691588
A	259m W	Unspecified Heap	1955	713642
I	260m SW	Unspecified Ground Workings	1907	645366
F	263m E	Unspecified Quarry	1929	760401
F	264m E	Unspecified Disused Quarry	1939	751086
F	264m E	Unspecified Disused Quarry	1927	754117
F	266m E	Unspecified Quarry	1907	756669
F	269m E	Unspecified Disused Quarry	1955	736643
F	269m E	Unspecified Disused Quarry	1967	770292
A	272m W	Unspecified Ground Workings	1907	759567
F	276m E	Unspecified Works	1967	771661
A	279m W	Unspecified Heap	1892 - 1907	737241
J	280m E	Unspecified Works	1975 - 1983	730096
A	282m W	Unspecified Old Shafts	1946	698312
A	283m W	Unspecified Old Shafts	1929 - 1939	731803
A	285m W	Unspecified Old Shafts	1939	699570
A	285m W	Unspecified Old Shafts	1927	721930
A	286m W	Unspecified Old Shafts	1955	714154
A	286m W	Unspecified Old Shafts	1892	763238
12	289m NE	Unspecified Ground Workings	1967	645363

ID	Location	Land use	Dates present	Group ID
A	290m W	Refuse Heap	1927	676499
A	291m W	Unspecified Heap	1929	702811
A	294m W	Unspecified Heap	1946	701645
F	295m E	Unspecified Works	1981	744806
A	298m W	Unspecified Heap	1939	769716
F	299m E	Unspecified Old Quarry	1892	680486
A	300m W	Unspecified Old Shafts	1927 - 1946	741826
A	300m W	Unspecified Heap	1955 - 1967	755067
13	304m W	Railway Sidings	1939	709186
A	306m W	Unspecified Old Shafts	1955	640072
A	306m W	Unspecified Disused Shafts	1967	683083
F	307m E	Unspecified Works	1981	778483
A	314m W	Railway Building	1892 - 1907	734959
F	316m E	Unspecified Pit	1927	732561
F	316m E	Unspecified Pit	1939	772635
F	318m E	Unspecified Pit	1955 - 1967	743069
15	324m W	Unspecified Heap	1981	648905
A	324m W	Unspecified Disused Shaft	1981	664007
A	329m W	Unspecified Old Shafts	1946	640071
F	334m E	Unspecified Tank	1907	672767
16	339m SE	Old Gravel Pit	1851	691591
F	340m E	Unspecified Heap	1939	721161
F	341m E	Unspecified Pit	1946	716169
F	341m E	Unspecified Heap	1927 - 1939	711228
F	345m E	Unspecified Heap	1907	770608
F	345m E	Unspecified Heap	1955 - 1967	723019
F	349m E	Unspecified Ground Workings	1892	645361
K	349m N	Unspecified Ground Workings	1948	790613

ID	Location	Land use	Dates present	Group ID
K	350m N	Unspecified Ground Workings	1907 - 1938	732418
17	388m NE	Sandstone Delf	1851	659760
L	417m E	Unspecified Tank	1955	672766
19	424m S	Unspecified Pit	1927	687810
20	436m S	Cuttings	1981	641868
22	469m NW	Colliery	1948	742708
N	495m S	Brick and Tile Works	1939	748411
N	500m S	Unspecified Works	1946	763943

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**37**

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 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 13**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Tank**	**1992**	**78551**
A	**On site**	**Unspecified Tank**	**1992**	**78552**
A	39m NW	Unspecified Tank	1992	78547
A	45m NW	Unspecified Tank	1992	78553
A	54m NW	Tanks	1973	86056
A	63m NW	Unspecified Tank	1959	78554
A	64m NW	Unspecified Tank	1973	78545
A	69m NW	Unspecified Tank	1973	78546
A	107m NW	Unspecified Tank	1959	78544
A	128m NW	Unspecified Tank	1973	78560

ID	Location	Land use	Dates present	Group ID
A	135m W	Tanks	1991 - 1992	89436
A	141m W	Tanks	1893 - 1908	102486
A	173m W	Unspecified Tank	1973	78559
G	195m N	Unspecified Tank	1995	89253
G	195m N	Unspecified Tank	1994	89766
G	195m N	Unspecified Tank	1996	99473
G	195m N	Unspecified Tank	1992	101007
G	196m N	Unspecified Tank	1973	98090
H	196m E	Unspecified Tank	1939	78550
G	199m N	Unspecified Tank	1996	93963
G	199m N	Unspecified Tank	1992	96380
G	199m N	Unspecified Tank	1995	98498
G	199m N	Unspecified Tank	1994	98648
G	200m N	Unspecified Tank	1973	96601
H	201m E	Unspecified Tank	1959	78548
A	204m W	Tanks	1991 - 1992	99324
A	204m W	Tanks	1973	99195
A	210m W	Tanks	1973	95122
A	221m W	Unspecified Tank	1973	78556
A	286m W	Unspecified Tank	1992	95283
A	286m W	Unspecified Tank	1992	101745
A	286m W	Unspecified Tank	1991	101915
A	287m W	Unspecified Tank	1973	96085
J	311m E	Unspecified Tank	1973	78543
14	313m SW	Unspecified Tank	1990	78555
L	412m E	Unspecified Tank	1928	78542
21	451m W	Tanks	1973	86055

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	5

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 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 13**

ID	Location	Land use	Dates present	Group ID
A	65m W	Electricity Substation	1992	43913
F	354m E	Electricity Substation	1992	43912
18	413m NW	Electricity Substation	1985 - 1995	50844
M	475m W	Electricity Substation	1985	48880
M	475m W	Electricity Substation	1975 - 1995	53000

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 un-grouped 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	0

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 un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

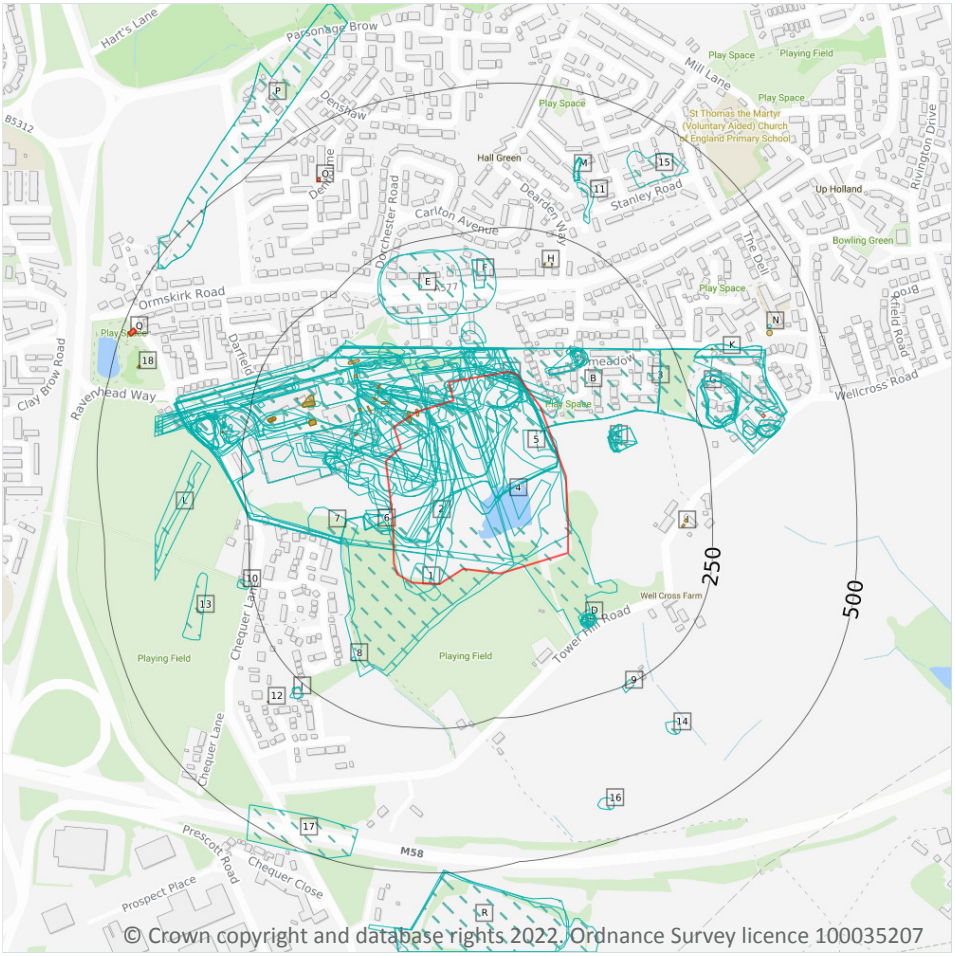
1.6 Historical military land

Records within 500m	0

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

2.1 Historical industrial land uses

Records within 500m	232

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 24**

ID	Location	Land Use	Date	Group ID
1	On site	Old Gravel Pit	1851	691590
2	On site	Unspecified Quarry	1981	749105
3	On site	Colliery	1939	733024

ID	Location	Land Use	Date	Group ID
4	On site	Refuse Heap	1967	676496
5	On site	Unspecified Ground Workings	1967	645365
A	On site	Unspecified Ground Workings	1939	722432
A	On site	Unspecified Ground Workings	1907	728881
A	On site	Refuse Heap	1939	676495
A	On site	Refuse Heap	1939	676497
A	On site	Brick and Tile Works	1907	732502
A	On site	Brick and Tile Works	1892	770744
A	On site	Brick Works	1939	721183
A	On site	Mineral Railway Sidings	1939	769373
A	On site	Mineral Railway Sidings	1927	737681
A	On site	Mineral Railway Sidings	1907	749715
A	On site	Mineral Railway Sidings	1892	712434
A	On site	Tramway Sidings	1955	699193
A	On site	Sanitary Pipe and Brick Works	1927	788352
A	On site	Unspecified Quarry and Clay Pit	1955	700526
A	On site	Unspecified Quarry and Clay Pit	1955	747329
A	On site	Sandstone Delf	1851	659761
A	On site	Railway Sidings	1939	740715
A	On site	Railway Sidings	1939	769360
A	On site	Unspecified Quarry and Clay Pit	1939	759854
A	On site	Unspecified Quarry and Clay Pit	1939	766845
A	On site	Brick Works	1939	721183
A	On site	Tramway Sidings	1946	699193
A	On site	Railway Sidings	1946	769360
A	On site	Unspecified Quarry and Clay Pit	1946	731300
A	On site	Brick Works	1946	721183
A	On site	Railway Sidings	1967	704742

ID	Location	Land Use	Date	Group ID
A	**On site**	**Railway Sidings**	**1967**	**765849**
A	**On site**	**Unspecified Disused Mine**	**1967**	**658321**
A	**On site**	**Unspecified Heap**	**1967**	**648931**
A	**On site**	**Unspecified Ground Workings**	**1967**	**645364**
A	**On site**	**Unspecified Ground Workings**	**1967**	**778902**
A	**On site**	**Unspecified Ground Workings**	**1967**	**645367**
A	**On site**	**Refuse Heap**	**1981**	**676494**
A	**On site**	**Sanitary Pipe and Brick Works**	**1929**	**788352**
A	**On site**	**Mineral Railway Sidings**	**1929**	**737681**
A	**On site**	**Unspecified Quarry**	**1907**	**771878**
A	**On site**	**Unspecified Old Quarry**	**1907**	**680484**
A	**On site**	**Clay Pit**	**1892**	**675960**
A	**On site**	**Unspecified Quarry**	**1892**	**763471**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**759853**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**741061**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1927**	**785659**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1927**	**747463**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1929**	**785659**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1929**	**693994**
B	**On site**	**Colliery**	**1939**	**733024**
B	**On site**	**Colliery**	**1946**	**733024**
6	5m W	Unspecified Pit	1946	687817
A	15m N	Unspecified Heap	1892	648930
A	15m N	Unspecified Old Shaft	1907	651361
A	17m N	Unspecified Shaft	1929	695807
A	17m N	Unspecified Shaft	1929	695807
A	17m N	Unspecified Heap	1907	698996
A	17m N	Unspecified Heap	1892	698996

ID	Location	Land Use	Date	Group ID
A	17m N	Unspecified Shaft	1927	760320
A	17m N	Unspecified Old Shafts	1939	760385
A	18m N	Unspecified Old Shafts	1939	760385
A	21m N	Unspecified Old Shafts	1892	640076
A	24m N	Unspecified Heap	1939	739507
A	26m NW	Unspecified Heap	1907	785006
A	26m NW	Unspecified Heap	1892	785006
A	35m N	Unspecified Heap	1955	739661
A	37m N	Unspecified Ground Workings	1939	645368
A	38m NW	Unspecified Heap	1907	648920
A	38m NW	Unspecified Works	1981	723518
A	40m N	Unspecified Heap	1907	740690
A	42m N	Unspecified Tank	1907	672645
B	42m NE	Unspecified Ground Workings	1946	704190
A	45m NW	Unspecified Old Shafts	1939	729394
B	45m NE	Unspecified Ground Workings	1939	724888
A	45m NW	Unspecified Old Shaft	1929	709985
A	45m NW	Unspecified Old Shaft	1929	709985
A	45m NW	Unspecified Old Shafts	1939	760887
A	45m NW	Unspecified Old Shaft	1927	727895
A	45m NW	Unspecified Old Shafts	1892	739334
B	46m NE	Unspecified Pit	1939	728392
A	57m W	Unspecified Works	1967	733735
A	57m N	Unspecified Heap	1892	732551
7	61m W	Unspecified Heap	1967	648906
A	74m NW	Cuttings	1907	641857
A	87m NW	Unspecified Ground Workings	1939	788555
A	89m N	Unspecified Ground Workings	1939	720913

ID	Location	Land Use	Date	Group ID
A	89m N	Unspecified Ground Workings	1927	760028
C	90m E	Unspecified Ground Workings	1946	781744
B	91m NE	Unspecified Pit	1929	705561
B	91m NE	Unspecified Pit	1929	705561
C	91m E	Unspecified Ground Workings	1939	713071
C	91m E	Unspecified Ground Workings	1927	708315
C	91m E	Unspecified Ground Workings	1939	781744
B	91m NE	Unspecified Pit	1955	704986
C	92m E	Unspecified Heap	1929	782927
C	92m E	Unspecified Heap	1929	782927
A	92m NW	Unspecified Ground Workings	1967	765256
C	93m E	Unspecified Ground Workings	1907	708315
B	94m NE	Unspecified Pit	1927	705561
B	96m NE	Unspecified Pit	1907	737482
B	96m NE	Unspecified Pit	1892	737482
C	96m E	Unspecified Ground Workings	1955	709244
C	97m E	Unspecified Heap	1981	758080
A	103m NW	Unspecified Ground Workings	1927	745110
A	103m W	Railway Sidings	1939	641328
A	104m NW	Unspecified Ground Workings	1939	743945
C	104m E	Old Coal Pit	1851	681913
D	104m S	Unspecified Heap	1955	738860
E	106m N	Colliery	1927	764317
D	110m S	Unspecified Disused Shaft	1967	664008
D	111m S	Unspecified Heap	1929	695014
D	111m S	Unspecified Heap	1929	695014
D	111m S	Unspecified Heap	1939	759224
D	111m S	Unspecified Heap	1927	759032

ID	Location	Land Use	Date	Group ID
E	112m N	Colliery	1938	709144
D	113m S	Unspecified Heap	1946	738860
D	113m S	Unspecified Heap	1907	776630
D	113m S	Unspecified Heap	1939	749439
D	116m S	Unspecified Old Shaft	1955	651366
A	117m NW	Chimney	1939	772355
A	117m NW	Chimney	1939	772355
D	121m S	Unspecified Old Shaft	1929	694323
D	121m S	Unspecified Old Shaft	1929	694323
D	122m S	Unspecified Old Shaft	1939	694323
D	122m S	Unspecified Old Shaft	1927	694323
D	122m S	Unspecified Old Shaft	1907	694323
D	122m S	Unspecified Old Shaft	1892	694323
D	123m S	Unspecified Old Shaft	1939	694323
D	124m S	Unspecified Old Shaft	1946	750333
A	134m W	Unspecified Tanks	1892	665937
A	139m NW	Unspecified Heap	1967	648919
A	142m W	Unspecified Tank	1907	672644
A	143m W	Railway Sidings	1939	641327
A	147m W	Unspecified Tank	1907	672646
A	151m W	Mineral Railway Sidings	1946	728518
F	151m N	Colliery	1948	760184
F	151m N	Colliery	1948	760184
A	155m W	Unspecified Tank	1907	672643
A	161m W	Refuse Heap	1967	676498
8	161m SW	Unspecified Disused Shaft	1981	664009
E	169m N	Unspecified Old Shaft	1907	651365
A	178m W	Chimney	1967	684265

ID	Location	Land Use	Date	Group ID
A	186m W	Mineral Railway Sidings	1955	786372
G	188m E	Timber Yard	1946	642748
A	227m W	Unspecified Old Shafts	1955	640075
9	244m SE	Unspecified Mine	1967	691509
G	245m E	Unspecified Disused Quarry	1939	698506
10	252m W	Old Gravel Pit	1851	691587
A	255m W	Unspecified Heap	1927	707548
A	256m W	Unspecified Ground Workings	1939	779856
J	258m SW	Old Gravel Pit	1851	691588
A	259m W	Unspecified Heap	1955	713642
J	260m SW	Unspecified Ground Workings	1907	645366
G	263m E	Unspecified Quarry	1929	760401
G	264m E	Unspecified Disused Quarry	1939	751086
G	264m E	Unspecified Disused Quarry	1927	754117
G	266m E	Unspecified Quarry	1907	756669
G	269m E	Unspecified Disused Quarry	1955	736643
G	269m E	Unspecified Disused Quarry	1967	770292
G	271m E	Unspecified Disused Quarry	1946	698506
A	272m W	Unspecified Ground Workings	1907	759567
G	276m E	Unspecified Works	1967	771661
A	279m W	Unspecified Heap	1907	737241
A	279m W	Unspecified Heap	1892	737241
K	280m E	Unspecified Works	1975	730096
K	280m E	Unspecified Works	1983	730096
A	282m W	Unspecified Old Shafts	1946	698312
A	283m W	Unspecified Old Shafts	1939	731803
A	284m W	Unspecified Old Shafts	1929	731803
A	284m W	Unspecified Old Shafts	1929	731803

ID	Location	Land Use	Date	Group ID
A	285m W	Unspecified Old Shafts	1939	699570
A	285m W	Unspecified Old Shafts	1927	721930
A	286m W	Unspecified Old Shafts	1955	714154
A	286m W	Unspecified Old Shafts	1892	763238
11	289m NE	Unspecified Ground Workings	1967	645363
A	290m W	Refuse Heap	1927	676499
A	291m W	Unspecified Heap	1929	702811
A	291m W	Unspecified Heap	1929	702811
A	294m W	Unspecified Heap	1946	701645
G	295m E	Unspecified Works	1981	744806
A	298m W	Unspecified Heap	1939	769716
G	299m E	Unspecified Old Quarry	1892	680486
A	300m W	Unspecified Heap	1939	769716
A	300m W	Unspecified Old Shafts	1939	741826
A	300m W	Unspecified Heap	1955	755067
A	300m W	Unspecified Heap	1967	755067
A	301m W	Unspecified Old Shafts	1946	741826
A	301m W	Unspecified Old Shafts	1929	741826
A	301m W	Unspecified Old Shafts	1929	741826
A	302m W	Unspecified Old Shafts	1939	741826
A	302m W	Unspecified Old Shafts	1927	741826
L	304m W	Railway Sidings	1939	709186
A	306m W	Unspecified Old Shafts	1955	640072
A	306m W	Unspecified Disused Shafts	1967	683083
G	307m E	Unspecified Works	1981	778483
A	314m W	Railway Building	1907	734959
A	314m W	Railway Building	1892	734959
G	316m E	Unspecified Pit	1939	772635

ID	Location	Land Use	Date	Group ID
G	316m E	Unspecified Pit	1927	732561
G	318m E	Unspecified Pit	1955	743069
G	318m E	Unspecified Pit	1967	743069
L	320m W	Railway Sidings	1939	709186
13	324m W	Unspecified Heap	1981	648905
A	324m W	Unspecified Disused Shaft	1981	664007
A	329m W	Unspecified Old Shafts	1946	640071
G	334m E	Unspecified Tank	1907	672767
14	339m SE	Old Gravel Pit	1851	691591
G	340m E	Unspecified Heap	1939	721161
G	341m E	Unspecified Pit	1946	716169
G	341m E	Unspecified Heap	1939	711228
G	341m E	Unspecified Heap	1927	711228
G	342m E	Unspecified Heap	1929	711228
G	342m E	Unspecified Heap	1929	711228
G	345m E	Unspecified Heap	1907	770608
G	345m E	Unspecified Heap	1955	723019
G	345m E	Unspecified Heap	1967	723019
G	349m E	Unspecified Ground Workings	1892	645361
M	349m N	Unspecified Ground Workings	1948	790613
M	349m N	Unspecified Ground Workings	1948	790613
M	350m N	Unspecified Ground Workings	1938	732418
M	350m N	Unspecified Ground Workings	1927	732418
M	350m N	Unspecified Ground Workings	1907	732418
15	388m NE	Sandstone Delf	1851	659760
N	417m E	Unspecified Tank	1955	672766
16	424m S	Unspecified Pit	1927	687810
17	436m S	Cuttings	1981	641868

ID	Location	Land Use	Date	Group ID
P	469m NW	Colliery	1948	742708
P	469m NW	Colliery	1948	742708
R	495m S	Brick and Tile Works	1939	748411
R	496m S	Brick and Tile Works	1939	748411
R	500m S	Unspecified Works	1946	763943

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**42**

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 24**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Tank**	**1992**	**78551**
A	**On site**	**Unspecified Tank**	**1992**	**78552**
A	39m NW	Unspecified Tank	1992	78547
A	45m NW	Unspecified Tank	1992	78553
A	54m NW	Tanks	1973	86056
A	63m NW	Unspecified Tank	1959	78554
A	64m NW	Unspecified Tank	1973	78545
A	69m NW	Unspecified Tank	1973	78546
A	107m NW	Unspecified Tank	1959	78544
A	128m NW	Unspecified Tank	1973	78560
A	135m W	Tanks	1991	89436
A	135m W	Tanks	1992	89436
A	135m W	Tanks	1992	89436
A	141m W	Tanks	1908	102486
A	143m W	Tanks	1893	102486

ID	Location	Land Use	Date	Group ID
A	173m W	Unspecified Tank	1973	78559
H	195m N	Unspecified Tank	1994	89766
H	195m N	Unspecified Tank	1992	101007
H	195m N	Unspecified Tank	1996	99473
H	195m N	Unspecified Tank	1995	89253
H	196m N	Unspecified Tank	1973	98090
I	196m E	Unspecified Tank	1939	78550
H	199m N	Unspecified Tank	1994	98648
H	199m N	Unspecified Tank	1992	96380
H	199m N	Unspecified Tank	1996	93963
H	199m N	Unspecified Tank	1995	98498
H	200m N	Unspecified Tank	1973	96601
I	201m E	Unspecified Tank	1959	78548
A	204m W	Tanks	1991	99324
A	204m W	Tanks	1992	99324
A	204m W	Tanks	1992	99324
A	204m W	Tanks	1973	99195
A	210m W	Tanks	1973	95122
A	221m W	Unspecified Tank	1973	78556
A	286m W	Unspecified Tank	1991	101915
A	286m W	Unspecified Tank	1992	95283
A	286m W	Unspecified Tank	1992	101745
A	287m W	Unspecified Tank	1973	96085
K	311m E	Unspecified Tank	1973	78543
12	313m SW	Unspecified Tank	1990	78555
N	412m E	Unspecified Tank	1928	78542
18	451m W	Tanks	1973	86055

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	7

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 24**

ID	Location	Land Use	Date	Group ID
A	65m W	Electricity Substation	1992	43913
G	354m E	Electricity Substation	1992	43912
O	413m NW	Electricity Substation	1995	50844
O	413m NW	Electricity Substation	1985	50844
Q	475m W	Electricity Substation	1985	48880
Q	475m W	Electricity Substation	1995	53000
Q	476m W	Electricity Substation	1975	53000

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	0

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'.

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill

Site Outline

Search buffers in metres (m)

Historical landfill (EA/NRW)

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	3

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 36**

ID	Location	Details		
A	**On site**	**Site Address: Ravenhead Works, Chequer Lane, Up Holland, Lancashire** **Licence Holder Address: -**	**Waste Licence: Yes** **Site Reference: Licence No 410, L1/08/477, K1/08/061** **Waste Type: Inert, Industrial** **Environmental Permitting Regulations (Waste) Reference: NS1/L/IBS001** **Licence Issue: 09/07/1992** **Licence Surrender: 14/08/2003**	**Operator: Ibstock Building Products Limited** **Licence Holder: Ibstock Building Products Limited** **First Recorded -** **Last Recorded: -**
2	247m E	Site Address: Tower Hill Quarry, Tower Hill Road, Upholland, West Lancashire Licence Holder Address: -	Waste Licence: - Site Reference: K1/08/086 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded 31/12/1930 Last Recorded: 31/12/1950
5	488m S	Site Address: Pimbo Landfill Site, Chequer Road, Upholland, Lancashire Licence Holder Address: -	Waste Licence: Yes Site Reference: WR/L1/8/1, RES NO 40, K1/08/069 Waste Type: Inert, Industrial, Commercial, Household, Special, Liquid sludge Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 29/08/1990 Licence Surrender: 31/12/1992	Operator: Skeimersdale and Holland Urban District Council Licence Holder: Lancashire County Council First Recorded 31/12/1960 Last Recorded: 31/12/1996

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

3.5 Historical waste sites

Records within 500m	0

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

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

3.6 Licensed waste sites

Records within 500m	1

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

Features are displayed on the Waste and landfill map on **page 36**

ID	Location	Details		
A	**On site**	**Site Name: Ibstock Site Address: Ravenhead Works, Chequer Lane, Upholland, Skelmersdale, Lancashire, WN8 0DD Correspondence Address: -**	**Type of Site: Landfill taking Non-Biodegradeable Wastes Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: IBS001 EPR reference: EA/EPR/EP3991CV/S002 Operator: Ibstock Building Products Ltd Waste Management licence No: 54071 Annual Tonnage: 576**	**Issue Date: 09/07/1992 Effective Date: - Modified: - Surrendered Date: Aug 14 2003 12:00AM Expiry Date: - Cancelled Date: - Status: Surrendered**

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

3.7 Waste exemptions

Records within 500m	3

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 36**

ID	Location	Site	Reference	Category	Sub-Category	Description
1	224m W	Former Glenburn High School and Sports College	WEX267749	Using waste exemption	Not on a farm	Use of waste in construction
3	273m NW	164, ORMSKIRK ROAD, UPHOLLAND, SKELMERSDALE, WN8 0AB	WEX003676	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal

ID	Location	Site	Reference	Category	Sub-Category	Description
4	315m NW	164 Ormskirk Road SKELMERSDALE Lancashire WN8 0AB	EPR/SH0013JD /A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting and de-naturing of controlled drugs for disposal

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

Control of Major Accident Hazards

Hazardous substance storage/usage

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

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	17

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 40**

ID	Location	Company	Address	Activity	Category
1	**On site**	**Tank**	**Lancashire, WN8**	**Tanks (Generic)**	**Industrial Features**
2	**On site**	**Clay Pit**	**Lancashire, WN8**	**Sand, Gravel and Clay Extraction and Merchants**	**Extractive Industries**
B	43m NW	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features

ID	Location	Company	Address	Activity	Category
B	51m NW	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features
B	65m W	Electricity Sub Station	Lancashire, WN8	Electrical Features	Infrastructure and Facilities
A	140m W	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features
4	190m W	Electricity Sub Station	Lancashire, WN8	Electrical Features	Infrastructure and Facilities
D	191m N	North West Turbo's	90, Ormskirk Road, Upholland, Skelmersdale, Lancashire, WN8 0AF	Engines	Industrial Products
D	198m N	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features
D	205m N	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features
C	207m W	Tank	Lancashire, WN8	Tanks (Generic)	Industrial Features
5	207m NE	Electricity Sub Station	Lancashire, WN8	Electrical Features	Infrastructure and Facilities
C	228m W	Ibstock Brick Ltd	Ravenhead Factory, Chequer Lane, Upholland, Skelmersdale, Lancashire, WN8 0DD	Bricks, Tiles, Clay and Ceramic Products	Industrial Products
6	230m SE	Mast	Lancashire, WN8	Telecommunications Features	Infrastructure and Facilities
7	232m NW	Electricity Sub Station	Lancashire, WN8	Electrical Features	Infrastructure and Facilities
8	245m E	Mast	Lancashire, WN8	Telecommunications Features	Infrastructure and Facilities
E	247m W	Gas Governor	Lancashire, WN8	Gas Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	0

Open, closed, under development and obsolete petrol stations.

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	1

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.

Features are displayed on the Current industrial land use map on **page 40**

ID	Location	Company	Address	Operational status	Tier
A	**On site**	**Steetley Brick Ltd**	**Steetley Brick Ltd, Ravenhead Works, Chequer Lane, Upholland, Skelmersdale**	**Historical NIHHS Site**	**-**

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	1

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.

Features are displayed on the Current industrial land use map on **page 40**

ID	Location	Details	
C	179m W	Application reference number: 92/1313 Application status: Approved Application date: 24/09/1992 Address: Ibstock Brick, Ravenhead Works, Chequer Lane, Upholland, Skelmersdale, West Lancashire District Council, England, WN8 0DD	Details: Claim For Deemed Hazardous Substances Consent Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

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	3

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 40**

ID	Location	Address	Details	
3	135m W	Ibstock Bricks, Ravenhead Works, Chequer Lane, Upholland, Skelmersdale, Lancashire, WN8 0DD	Process: Manufacture of Clay Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified. Date of enforcement: No Enforcement Notified. Comment: No Enforcement Notified.
E	288m W	Ibstock Brick Ltd, Chequer Lane, Upholland, Skelmersdalew, N8 0DD	Process: Manufacture of Clay Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified. Date of enforcement: No Enforcement Notified. Comment: No Enforcement Notified.
E	291m W	Ibstock Building Products Ltd, Chequer Lane, Upholland, Skelmersdale, WN8 0DD	Process: Manufacture of Clay Status: Current Permit Permit Type: Part A2	Enforcement: No Enforcement Notified. Date of enforcement: No Enforcement Notified. Comment: No Enforcement 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	**0**

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

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 40**

ID	Location	Details	
E	290m W	Incident Date: 25/06/2001 Incident Identification: 11289 Pollutant: Other Pollutant Pollutant Description: Other	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
9	455m E	Incident Date: 31/08/2001 Incident Identification: 28208 Pollutant: Specific Waste Materials Pollutant Description: Household Waste	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) 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.

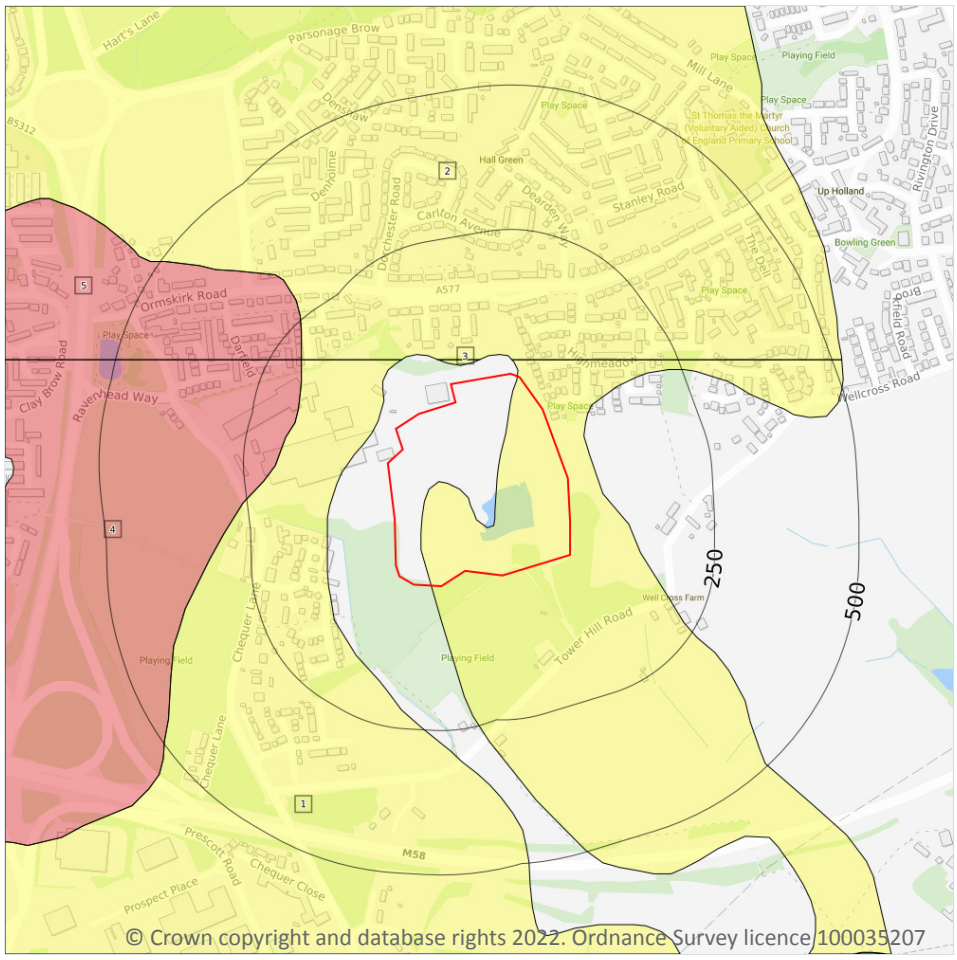
4.21 Pollution inventory radioactive waste

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	5

Aquifer status of groundwater held within superficial geology.

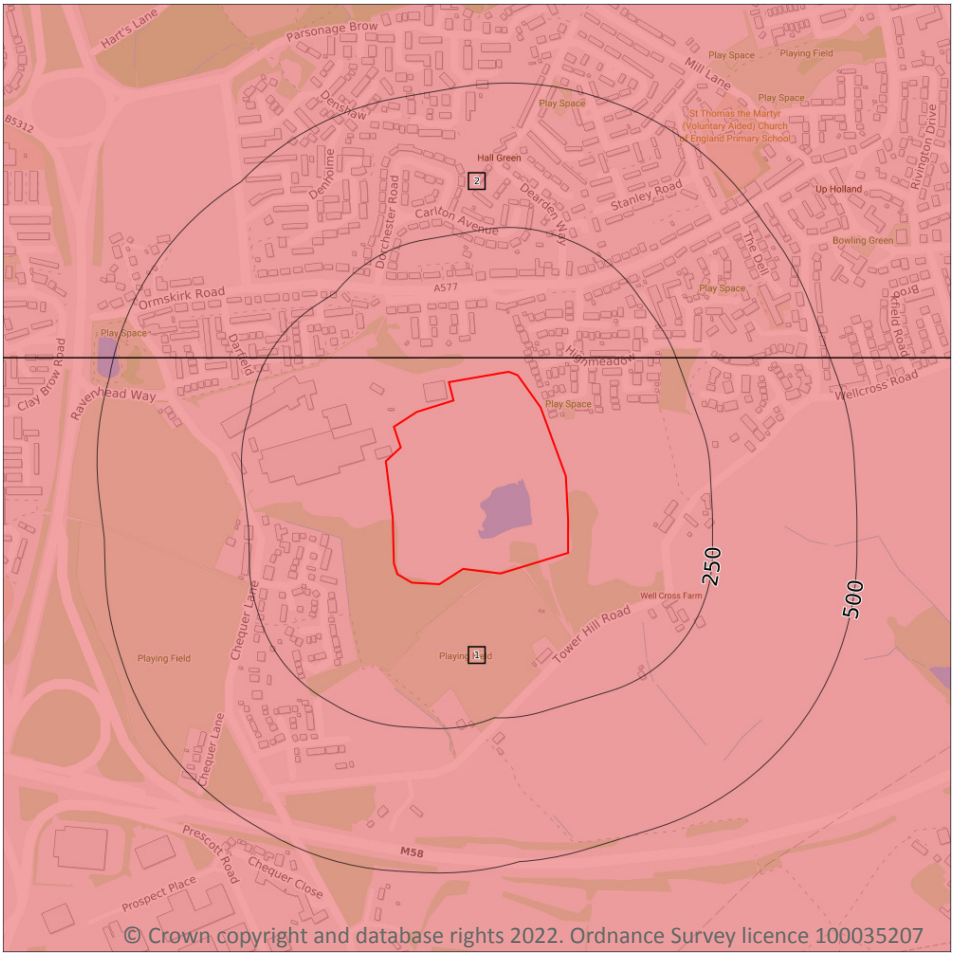
Features are displayed on the Hydrogeology map on **page 47**

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	25m N	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

ID	Location	Designation	Description
3	29m N	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	172m W	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	203m NW	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.

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

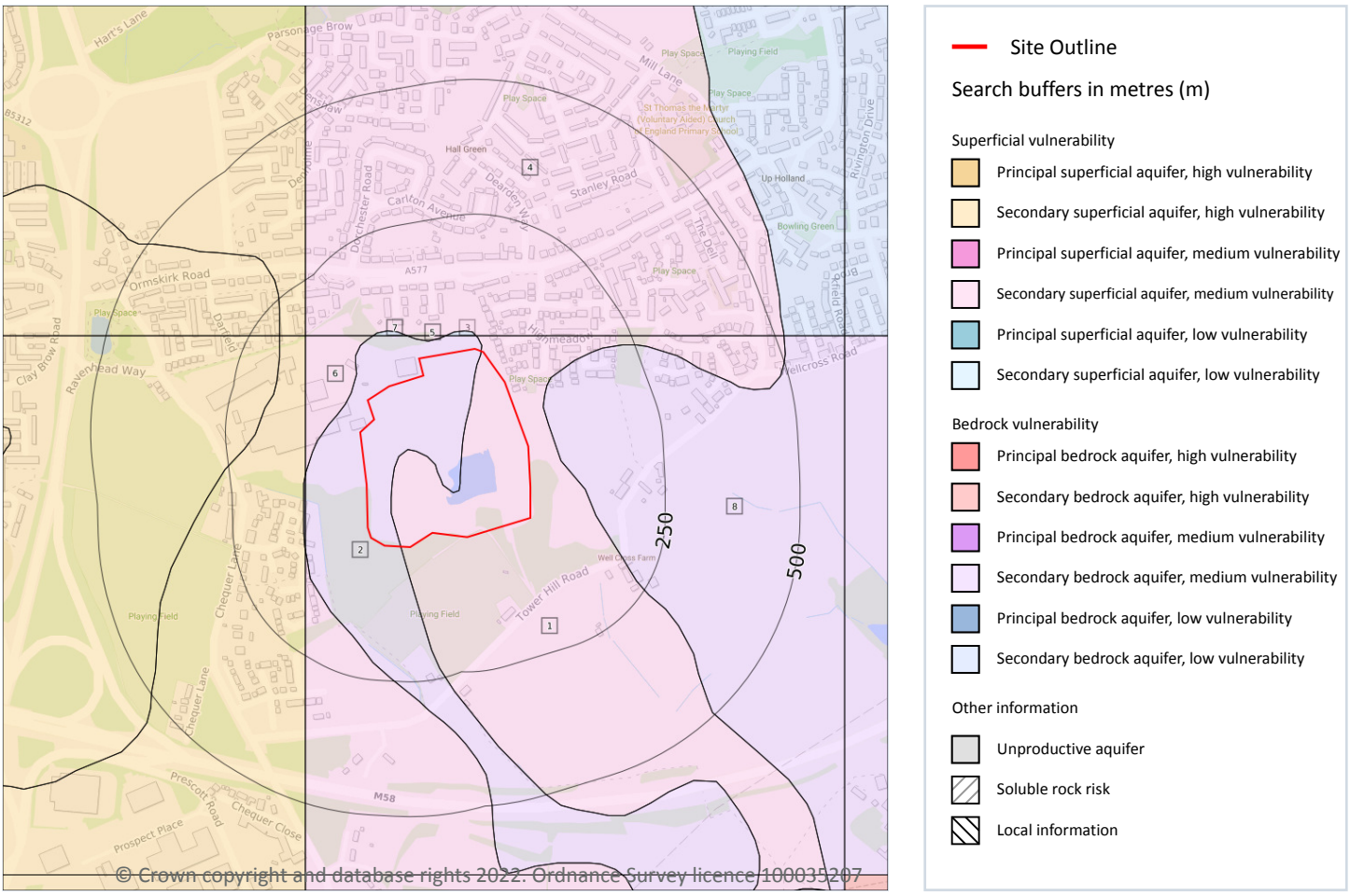
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 49**

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	24m N	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	8

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 51**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	**On site**	**Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year**	**Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: Low**	**Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures**
2	**On site**	**Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: Low**	**Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures**
3	24m N	Summary Classification: Secondary bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures
4	24m N	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures
5	28m N	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: Low	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures
6	33m NW	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: Low	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
7	47m NW	Summary Classification: Secondary bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures
8	48m E	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: Low	Vulnerability: Medium 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.

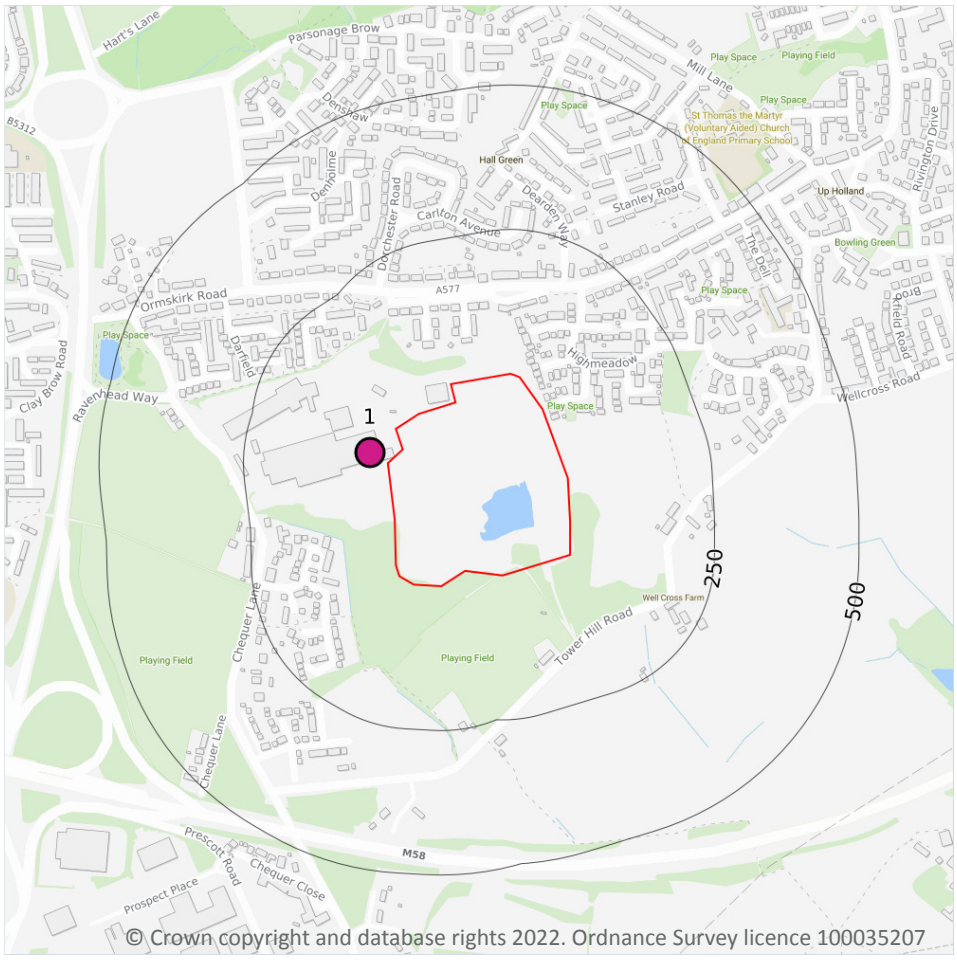
5.5 Groundwater vulnerability- local information

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
- 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	4

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 54**

ID	Location	Details	
1	37m NW	Status: Historical Licence No: 2670206019 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: LAND AT RAVENHEAD FACTORY Data Type: Point Name: IBSTOCK BRICK LTD (CO NO 00063230) Easting: 351070 Northing: 404840	Annual Volume (m^3): 21900 Max Daily Volume (m^3): 60 Original Application No: - Original Start Date: 19/03/2003 Expiry Date: 31/03/2016 Issue No: 1 Version Start Date: 19/03/2003 Version End Date: -
-	1523m NE	Status: Historical Licence No: 2670205034 Details: Spray Irrigation - Direct Direct Source: Ground Water - North West Region Point: UNDERGROUND STRATA IN UPHOLLAND WIGAN Data Type: Point Name: DEANWOOD GOLF CLUB Easting: 352520 Northing: 405920	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 06/09/1996 Expiry Date: - Issue No: 100 Version Start Date: 06/09/1996 Version End Date: -
-	1523m NE	Status: Active Licence No: 2670205034 Details: Spray Irrigation - Direct Direct Source: Ground Water - North West Region Point: UNDERGROUND STRATA IN UPHOLLAND WIGAN Data Type: Point Name: DEANWOOD GOLF CLUB Easting: 352520 Northing: 405920	Annual Volume (m^3): 10,000 Max Daily Volume (m^3): 92 Original Application No: - Original Start Date: 06/09/1996 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2008 Version End Date: -
-	1988m W	Status: Historical Licence No: 2670206018 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT SKELMERSDALE Data Type: Point Name: WALKERS SNACK FOODS LTD Easting: 349140 Northing: 404420	Annual Volume (m^3): 79636.36 Max Daily Volume (m^3): 218.18 Original Application No: - Original Start Date: 10/04/2001 Expiry Date: 09/04/2006 Issue No: 3 Version Start Date: 27/02/2004 Version End Date: -

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

5.7 Surface water abstractions

Records within 2000m	0

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.

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

5.8 Potable abstractions

Records within 2000m	0

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.

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	5

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

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

ID	Location	Type of water feature	Ground level	Permanence	Name
A	86m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

ID	Location	Type of water feature	Ground level	Permanence	Name
B	177m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	184m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
4	184m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	229m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	**5**

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.

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

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 57**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
2	**On site**	**River**	**Tawd**	**GB112070064790**	**Douglas OC**	**Douglas**

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 57**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
-	1876m SW	River	Tawd	GB112070064790	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 57**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	**On site**	**Douglas, Darwen and Calder Carboniferous Aquifers**	**GB41202G100300**	**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.

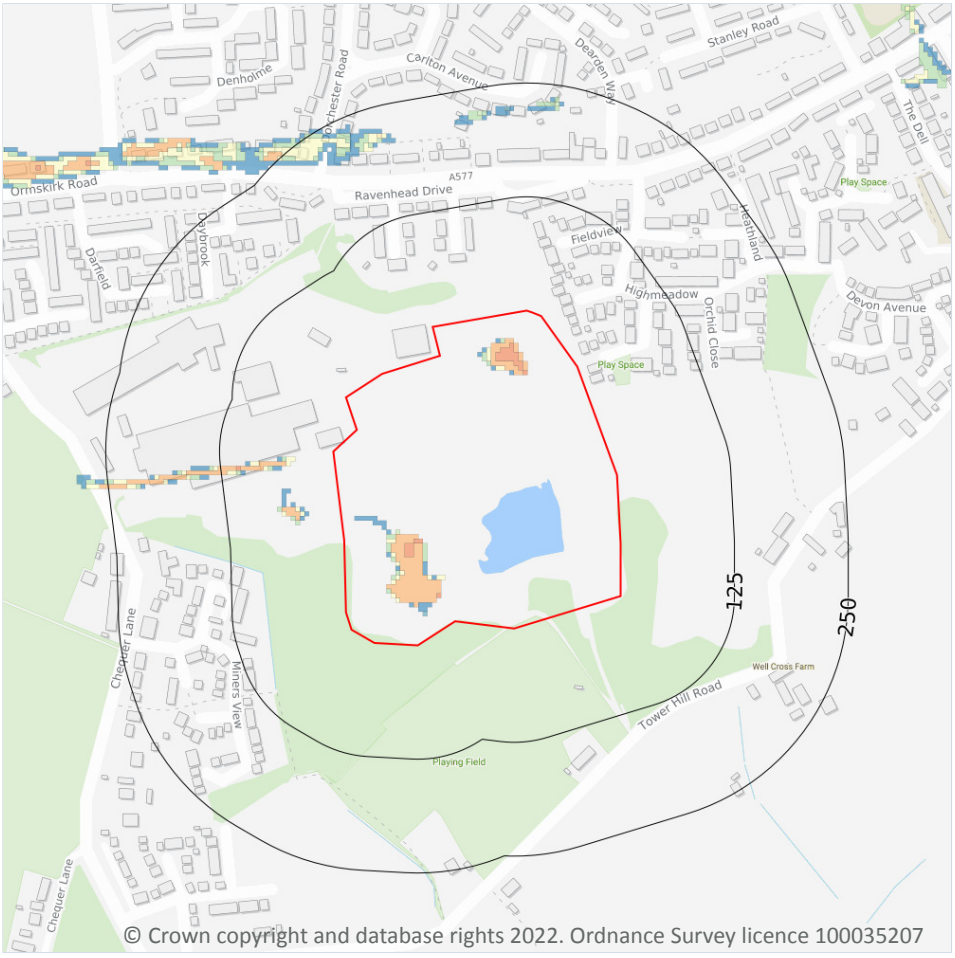
7.7 Flood Zone 3

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



Site Outline
Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.3m - 1.0m**
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 63**

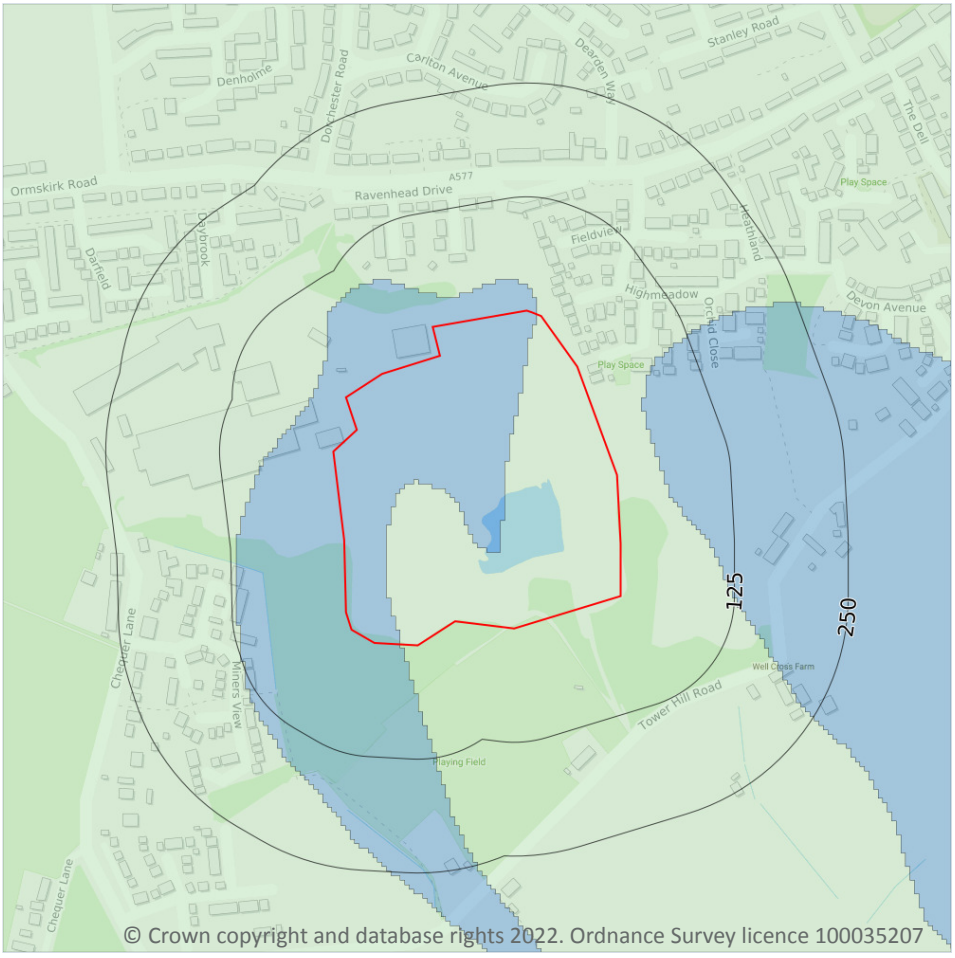
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on

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	Between 0.3m and 1.0m
1 in 250 year	Between 0.3m and 1.0m
1 in 100 year	Between 0.3m and 1.0m
1 in 30 year	Between 0.3m and 1.0m

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

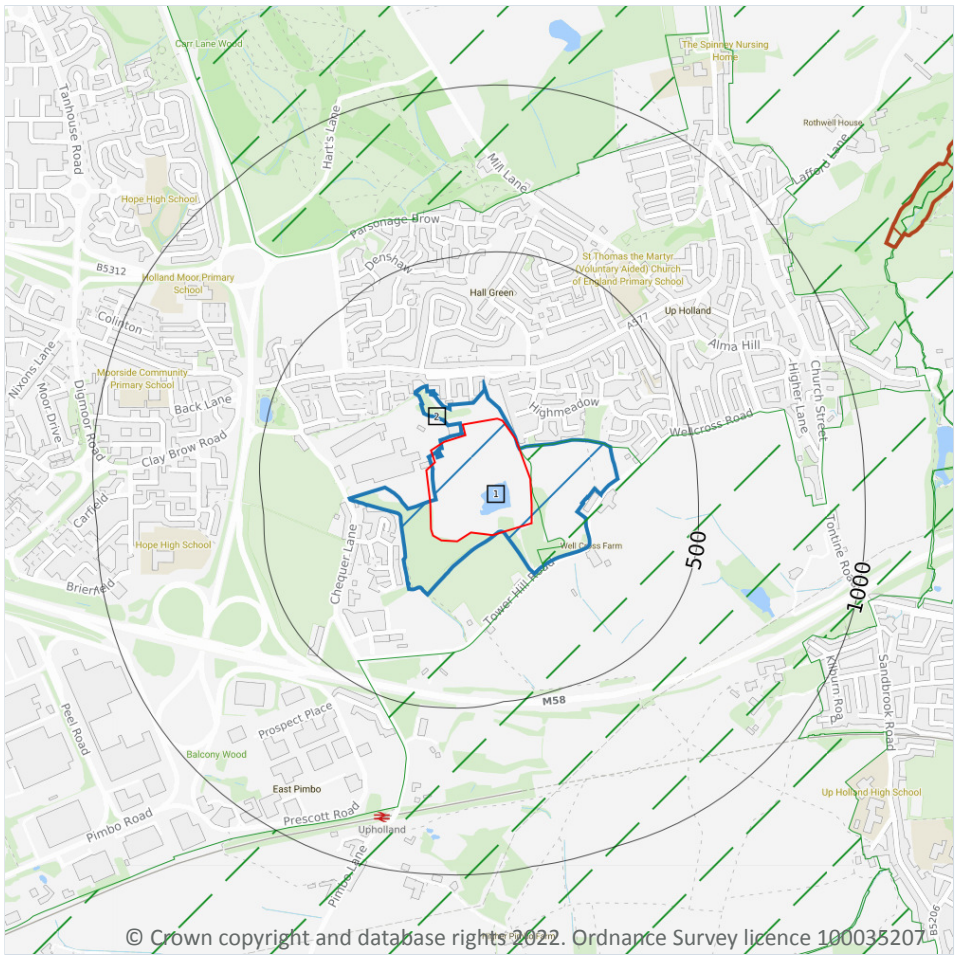
Highest risk on site	**Low**
Highest risk within 50m	**Low**

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 65**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations



Site Outline

Search buffers in metres (m)

Sites of Special Scientific Interest (SSSI)

Local Nature Reserves (LNR)

Designated Ancient Woodland

Green Belt

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	**1**

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 66**

ID	Location	Name	Data source
1	**On site**	**Ravenhead Brickworks**	**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	0

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.

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 66**

ID	Location	Name	Data source
-	1889m SE	Greenslate Water Meadows	Natural England

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

10.7 Designated Ancient Woodland

Records within 2000m	1

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 66**

ID	Location	Name	Woodland Type
4	1256m NE	Dean Wood	Ancient & Semi-Natural 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	5

Areas designated to prevent urban sprawl by keeping land permanently open.

Features are displayed on the Environmental designations map on **page 66**

ID	Location	Name	Local Authority name
2	**On site**	**Merseyside and Greater Manchester**	**West Lancashire**
3	1183m E	Merseyside and Greater Manchester	Wigan
5	1475m SE	Merseyside and Greater Manchester	Wigan
-	1766m S	Merseyside and Greater Manchester	St. Helens
-	1889m SE	Merseyside and Greater Manchester	Wigan

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	3

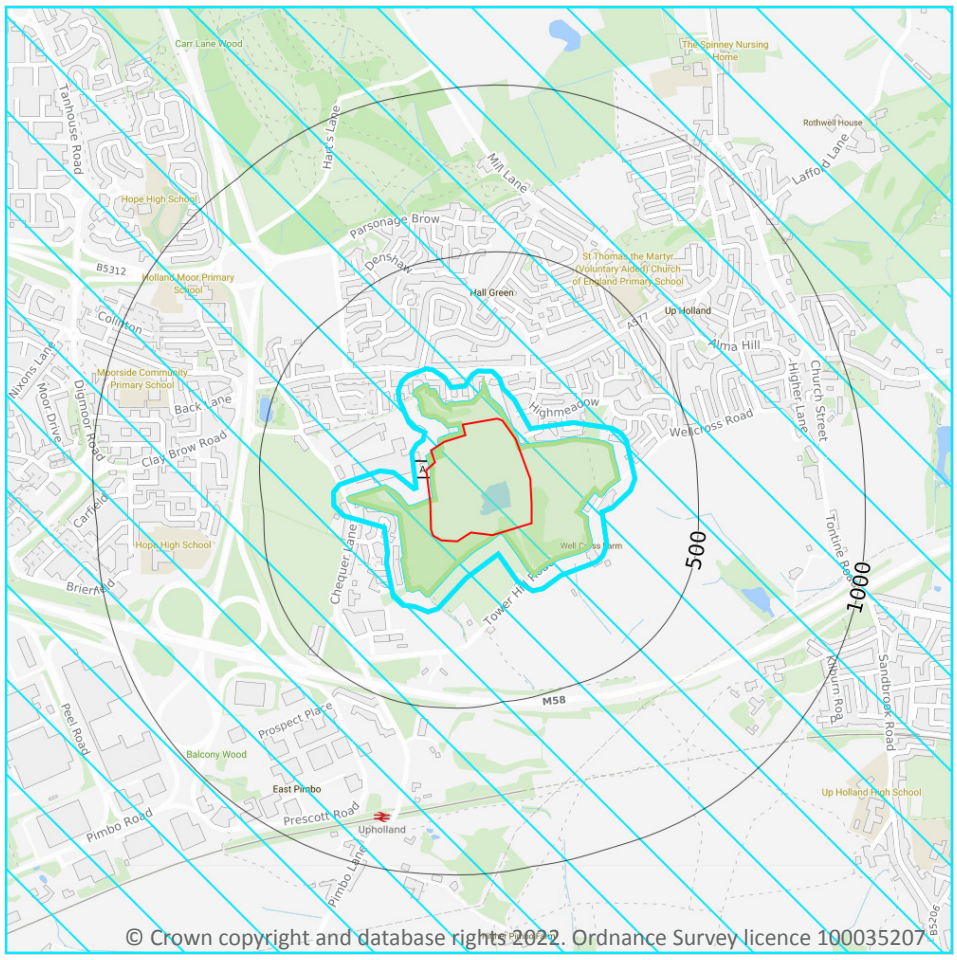
Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
On site	**River Douglas NVZ**	**Surface Water**	**644**	**Existing**

Location	Name	Type	NVZ ID	Status
1006m N	River Douglas NVZ	Surface Water	644	Existing
1117m S	Sankey Brook (Black Bk to Mersey) NVZ	Surface Water	639	Existing

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	2

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 72**

ID	Location	Type of developments requiring consultation
A	**On site**	**All applications - All planning applications - except householder applications.**
A	**On site**	**All applications - All planning applications.**

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	1

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 72**

ID: A
Location: On site
SSSI name: Ravenhead Brickworks
Unit name: Whole Site
Broad habitat: Earth Heritage
Condition: Favourable
Reportable features:

Feature name	Feature condition	Date of assessment
EA - Westphalian	Favourable	09/10/2013

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations

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	0

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.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	0

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.

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.

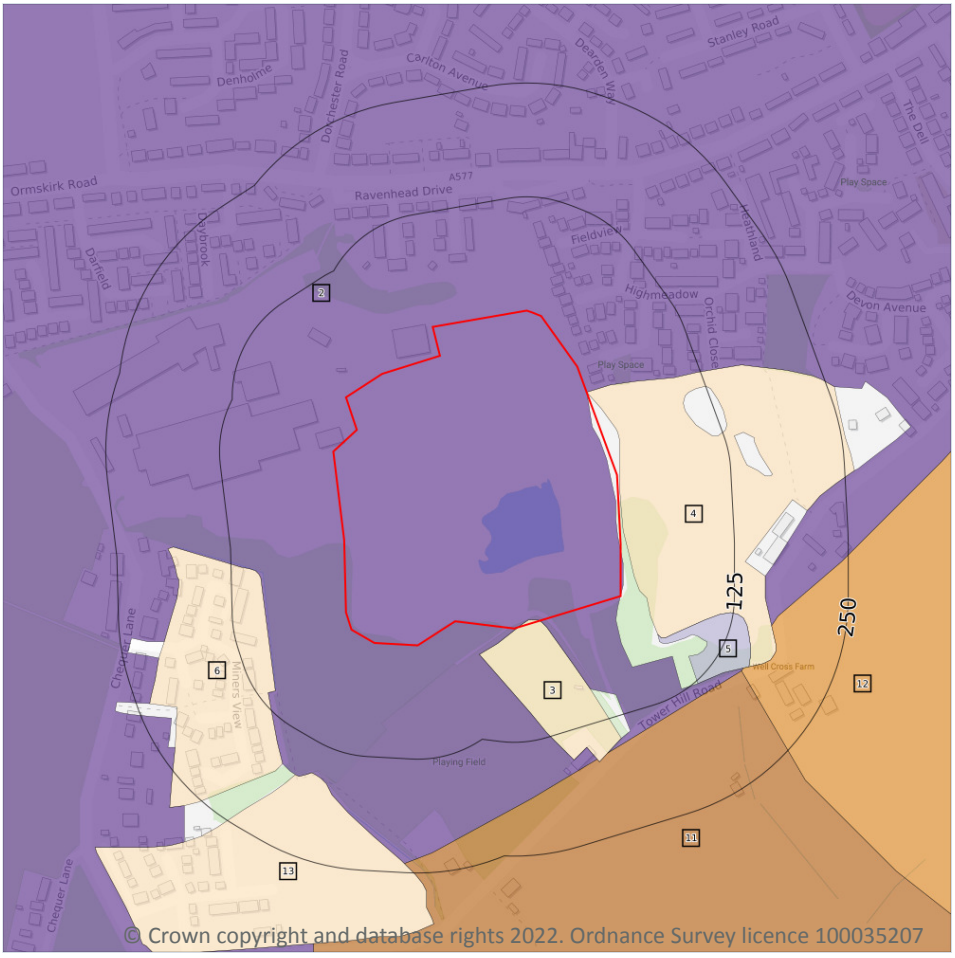
11.7 Registered Parks and Gardens

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	8

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 76**

ID	Location	Classification	Description
2	**On site**	**Urban**	**-**
3	**On site**	**Grade 3b**	**Moderate quality agricultural land. Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.**

ID	Location	Classification	Description
4	0m E	Grade 3b	Moderate quality agricultural land. Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.
5	59m SE	Grade 5	Very poor quality agricultural land. Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.
6	88m W	Grade 3b	Moderate quality agricultural land. Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.
11	140m SE	Grade 2	Very good quality agricultural land. Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.
12	156m SE	Grade 3	Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.
13	158m SW	Grade 3b	Moderate quality agricultural land. Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

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.

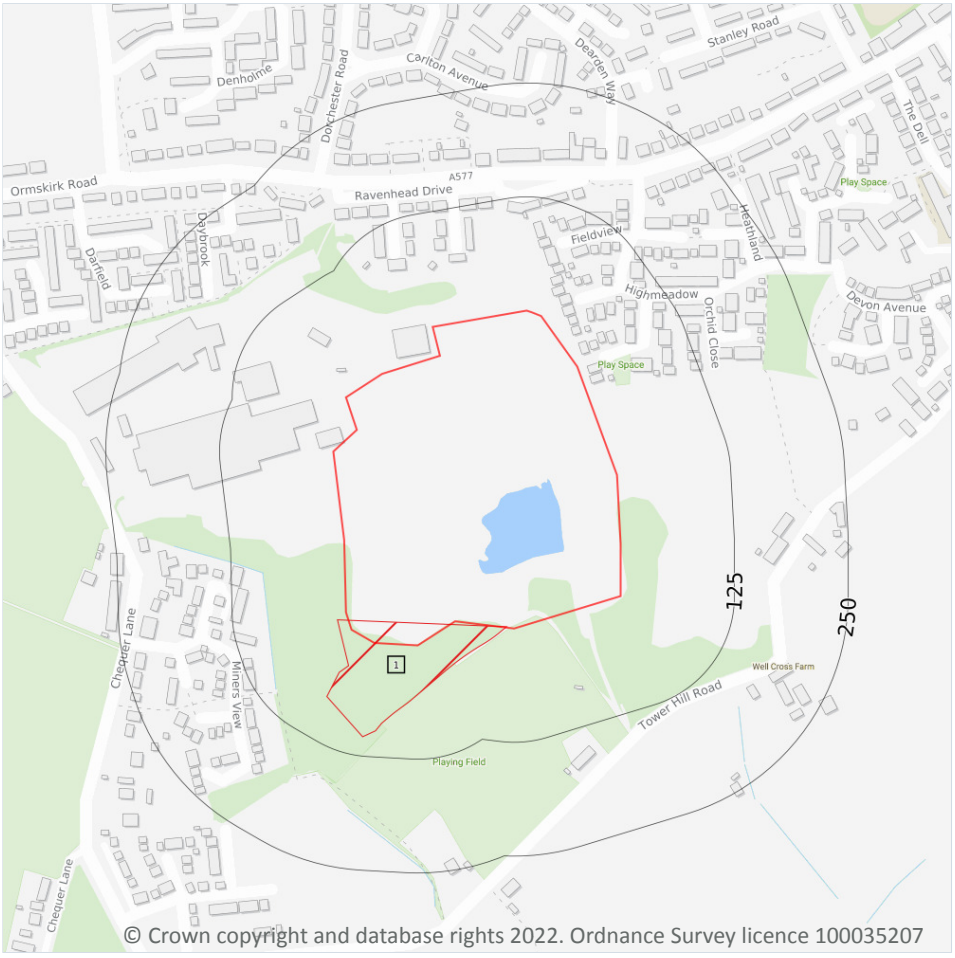
12.5 Countryside Stewardship Schemes

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 79**

ID	Location	Site reference	Identification confidence	Primary source	Secondary source	Tertiary source
1	**On site**	**BRITPITS ref: 96746**	**Low**	**British Geological Survey BRITPITS database**	**UK Perspectives Aerial Photography**	**-**

This data is sourced from Natural England.

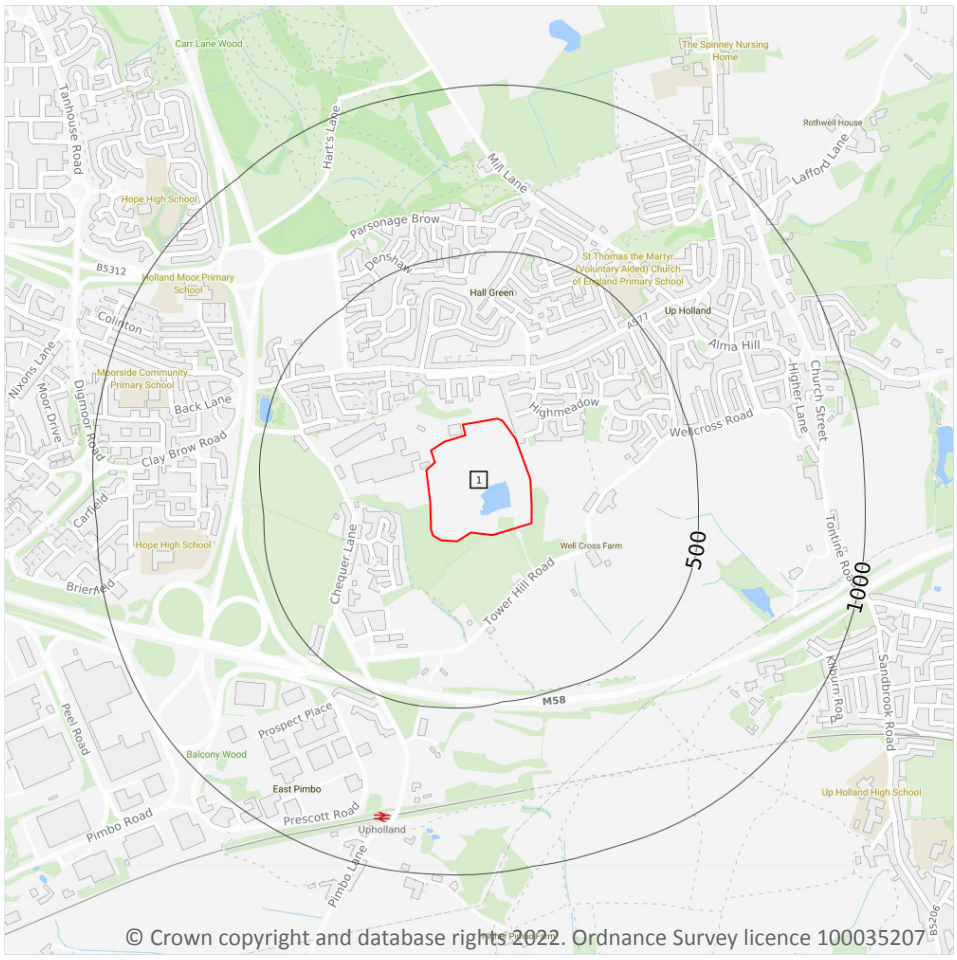
13.4 Limestone Pavement Orders

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	1

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 81**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**No coverage**	**No coverage**	**No coverage**	**NoCov**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground

14.2 Artificial and made ground (10k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial

14.3 Superficial geology (10k)

Records within 500m	0

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.

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

14.5 Bedrock geology (10k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

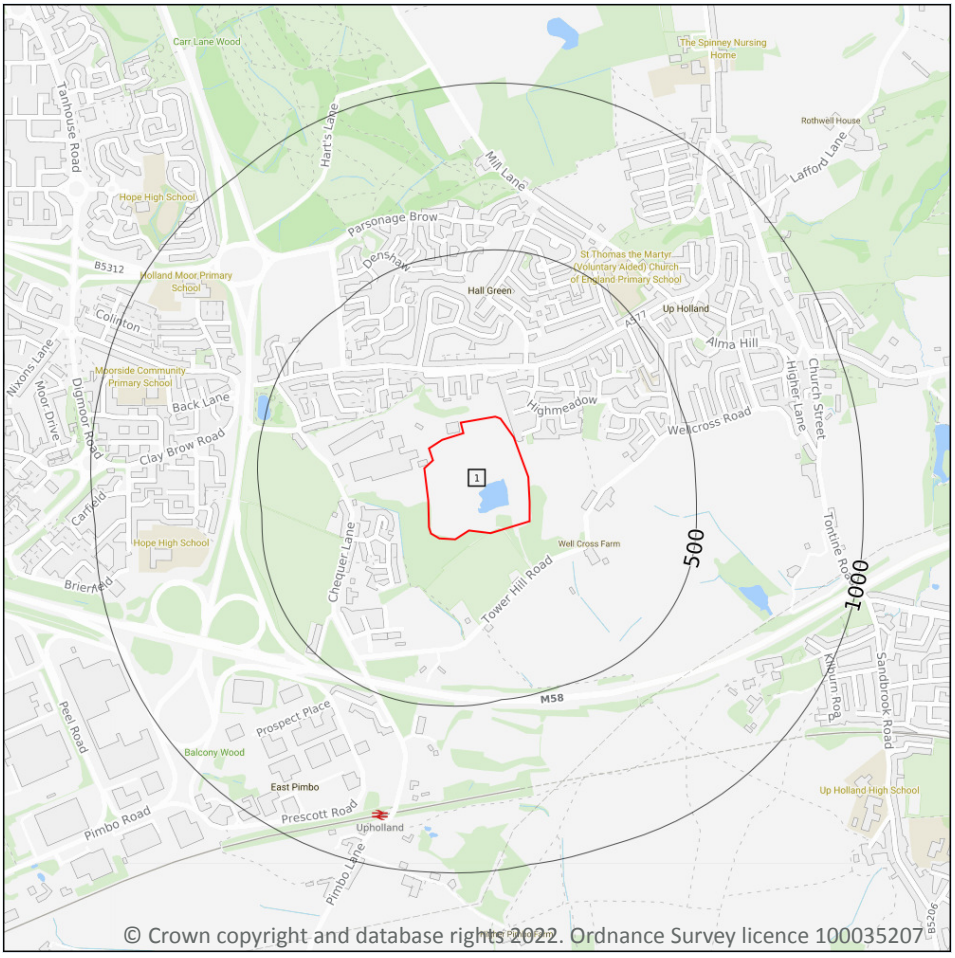
14.6 Bedrock faults and other linear features (10k)

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



Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	1

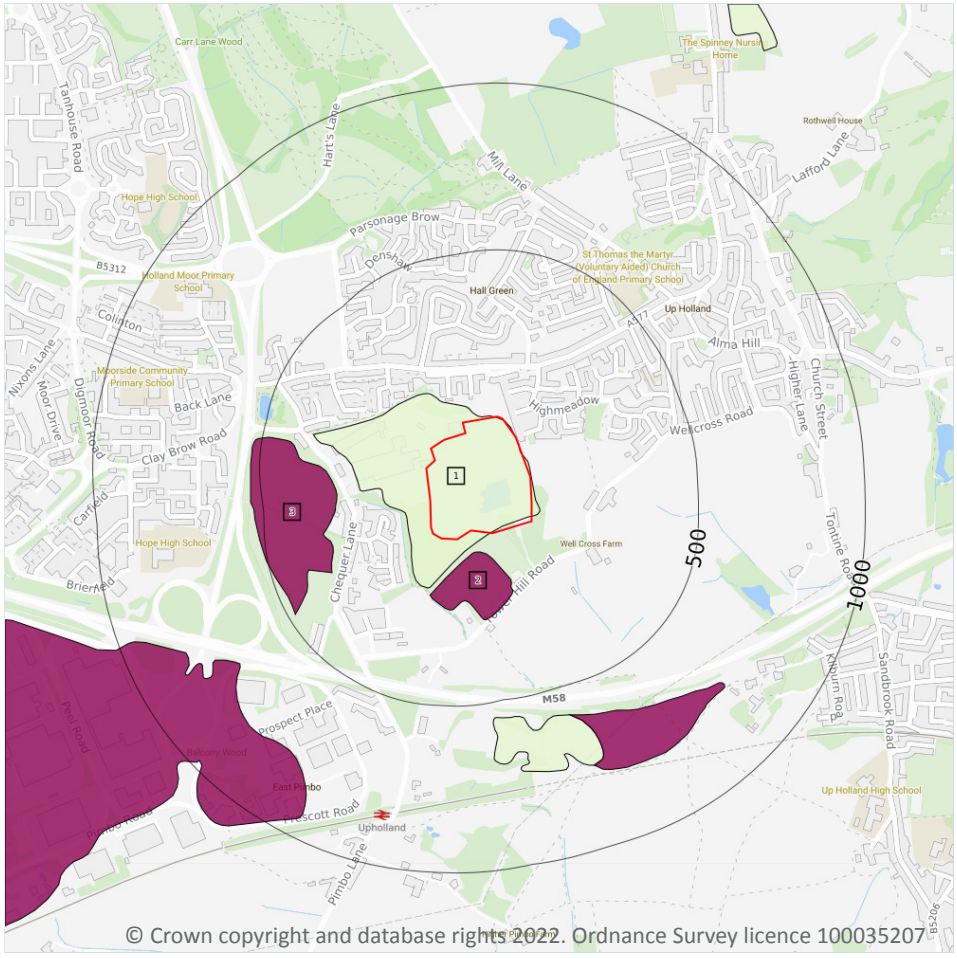
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 85**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**Full**	**Full**	**No coverage**	**EW084_wigan_v4**

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground



Site Outline

Search buffers in metres (m)

- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

15.2 Artificial and made ground (50k)

Records within 500m	3

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.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 86**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**WMGR-ARTDP**	**INFILLED GROUND**	**ARTIFICIAL DEPOSIT**
2	60m SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	275m W	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

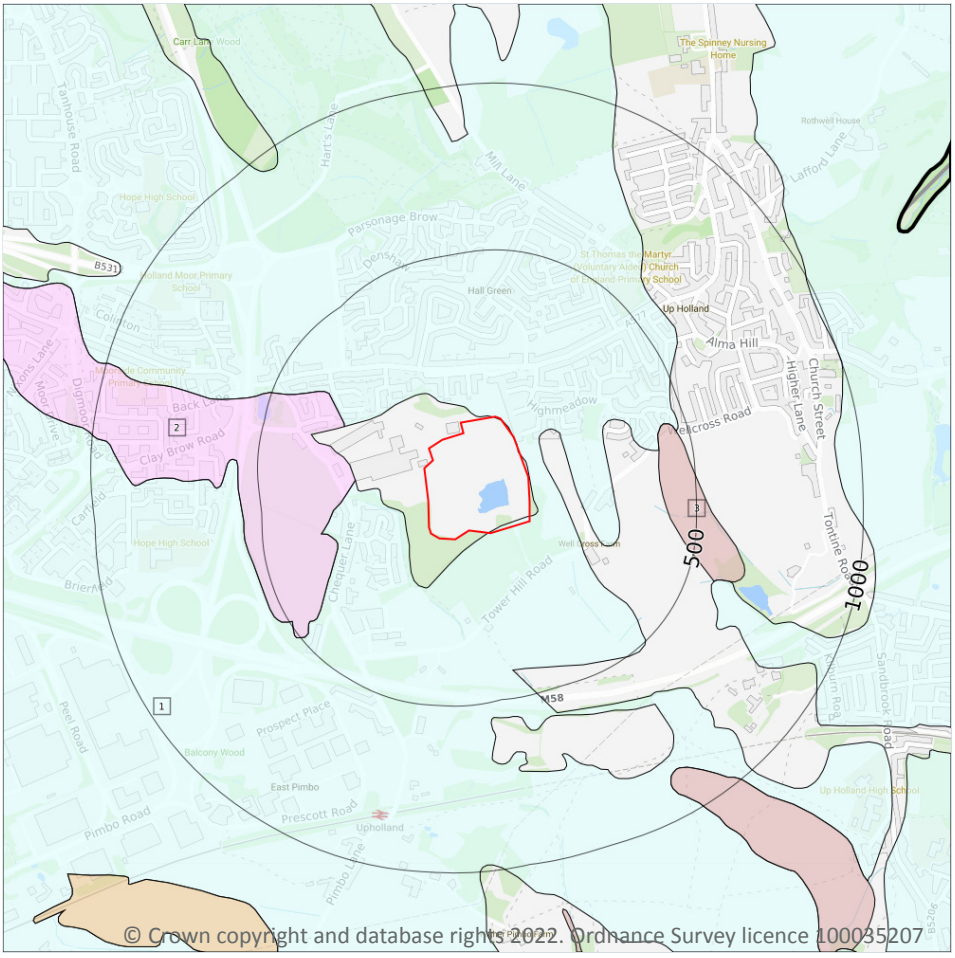
Records within 50m	2

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).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**Very High**	**Low**
39m NW	Mixed	Very High	Low

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 **3**

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 88**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
2	210m W	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	392m E	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	2

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**
24m NE	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.

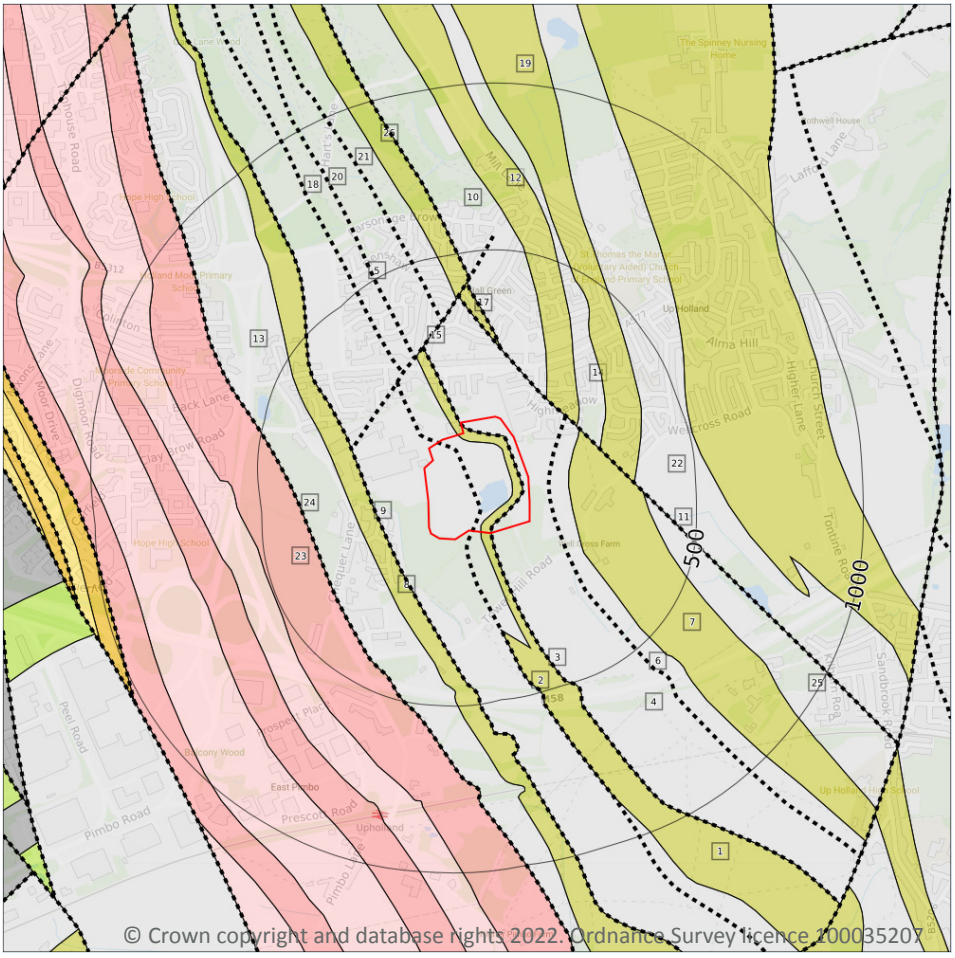
15.7 Landslip permeability (50k)

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	15

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 90**

ID	Location	LEX Code	Description	Rock age
1	On site	GAS-SDST	GREAT ARC SANDSTONE - SANDSTONE	WESTPHALIAN
4	On site	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
5	On site	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN

ID	Location	LEX Code	Description	Rock age
7	119m E	MLRS-SDST	MILNROW SANDSTONE - SANDSTONE	WESTPHALIAN
8	127m SW	WH-SDST	WOODHEAD HILL ROCK - SANDSTONE	WESTPHALIAN
10	140m NE	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
12	147m NE	OL-SDST	OLD LAWRENCE ROCK - SANDSTONE	WESTPHALIAN
13	185m SW	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
14	188m E	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
17	205m N	MLRS-SDST	MILNROW SANDSTONE - SANDSTONE	WESTPHALIAN
19	230m E	OL-SDST	OLD LAWRENCE ROCK - SANDSTONE	WESTPHALIAN
22	316m E	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
23	336m W	RR-SDST	ROUGH ROCK - SANDSTONE	NAMURIAN
25	341m E	PLCM-MDST	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE	WESTPHALIAN
26	367m N	MLRS-SDST	MILNROW SANDSTONE - SANDSTONE	WESTPHALIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	**4**

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**
On site	**Fracture**	**Low**	**Low**
24m N	Fracture	Low	Low
48m NW	Fracture	High	Moderate

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	12

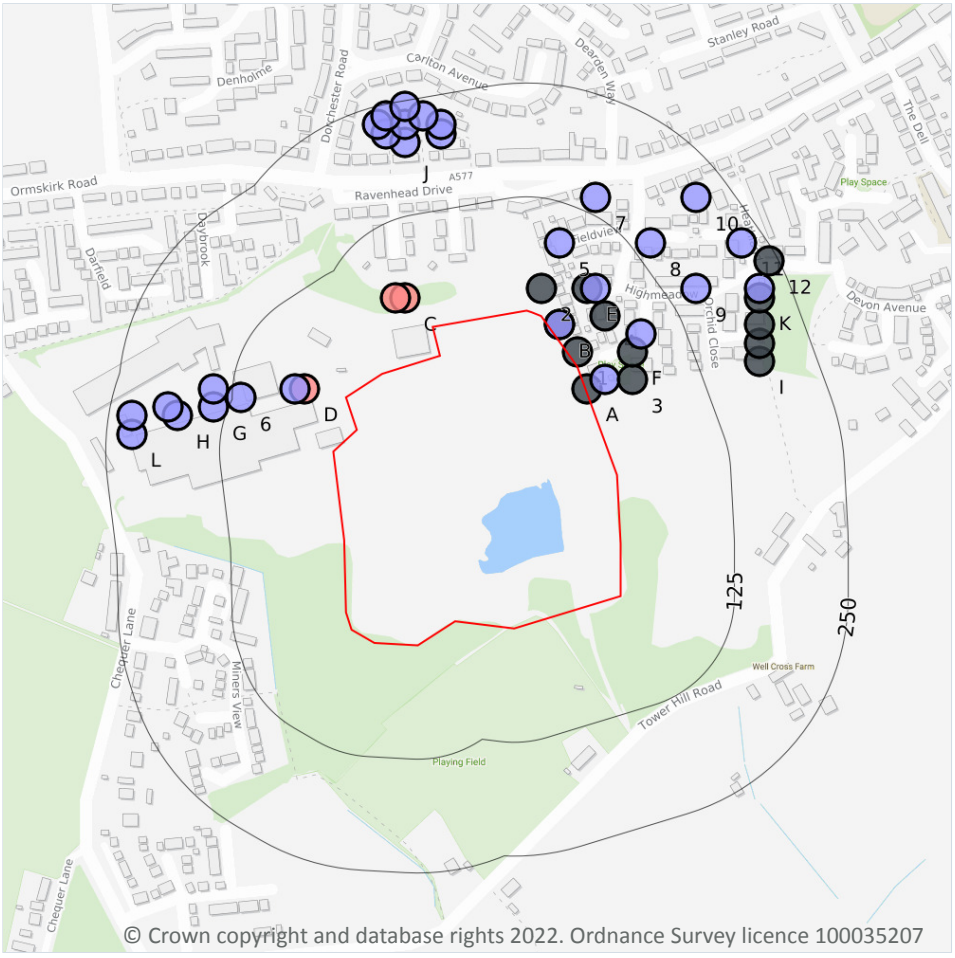
Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 90**

ID	Location	Category	Description
2	**On site**	**ROCK**	**Coal seam, inferred**
3	**On site**	**FOSSIL_HORIZON**	**Marine band**
6	59m E	FOSSIL_HORIZON	Marine band
9	127m SW	ROCK	Coal seam, inferred
11	140m NE	FAULT	Fault, inferred
15	191m NW	FAULT	Fault, inferred
16	205m N	ROCK	Coal seam, inferred
18	228m NW	FOSSIL_HORIZON	Marine band
20	237m NW	ROCK	Coal seam, inferred
21	307m N	FOSSIL_HORIZON	Marine band
24	336m W	FOSSIL_HORIZON	Marine band
27	422m N	ROCK	Coal seam, inferred

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

16.1 BGS Boreholes

Records within 250m	44

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 93**

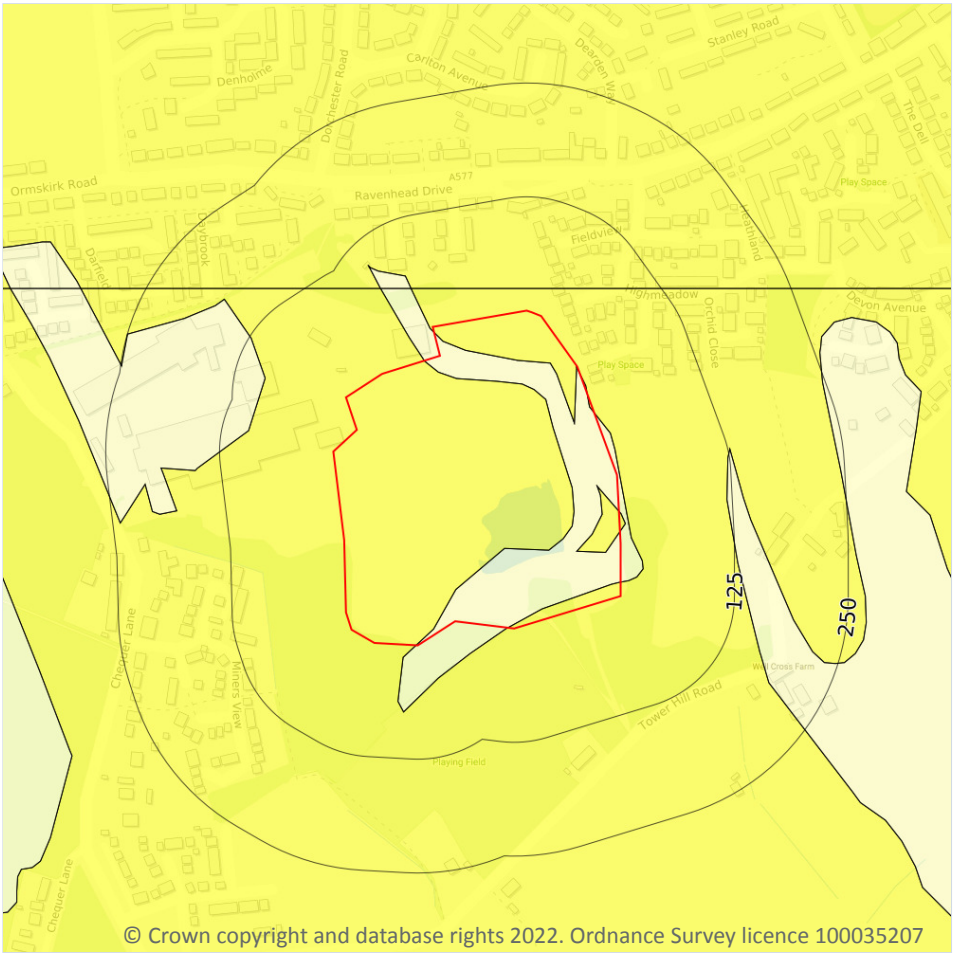
ID	Location	Grid reference	Name	Length	Confidential	Web link
A	2m E	351380 404890	SCHOOLHOUSE FARM SKELMERSDALE 1A	-	Y	N/A
1	10m NE	351370 404930	SCHOOLHOUSE FARM SKELMERSDALE 3	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
B	11m NE	351350 404960	SCHOOLHOUSE FARM SKELMERSDALE 5	-	Y	N/A
B	11m NE	351350 404960	SCHOOLHOUSE & BLACKLEDGE FARM 14	3.4	N	17517211
A	24m E	351400 404900	SCHOOLHOUSE & BLACKLEDGE FARM 17	4.7	N	17517213
2	28m N	351330 405000	SCHOOLHOUSE FARM SKELMERSDALE 7	-	Y	N/A
C	45m NW	351180 404990	DITTON BROOK COLLIERY PIT NO.3	92.26	N	9213
D	47m W	351070 404890	RAVENHEAD FACTORY, SKELMERSDALE	75.0	N	12083875
3	52m E	351430 404900	SCHOOLHOUSE FARM SKELMERSDALE 2	-	Y	N/A
C	52m NW	351170 404990	SKELMERSDALE DEVELOPMENT CORPORATION SHEET SD5104 1	45.31	N	18135623
D	56m W	351060 404890	RAVENSHEAD BRICK WORKS 2	4.57	N	9445
4	57m NE	351400 404970	SCHOOLHOUSE FARM SKELMERSDALE 6	-	Y	N/A
E	58m NE	351380 405000	SCHOOLHOUSE FARM SKELMERSDALE 8	-	Y	N/A
F	62m E	351430 404930	SCHOOLHOUSE FARM SKELMERSDALE 4	-	Y	N/A
E	67m NE	351390 405000	SCHOOLHOUSE & BLACKLEDGE FARM 11	6.6	N	17517208
F	79m NE	351440 404950	SCHOOLHOUSE & BLACKLEDGE FARM 15	3.8	N	17517212
5	82m N	351350 405050	SCHOOLHOUSE & BLACKLEDGE FARM 7	5.4	N	17517203
6	116m W	351000 404880	RAVENSHEAD BRICK WORKS 7	4.57	N	9450
G	141m W	350970 404870	RAVENSHEAD BRICK WORKS 6	7.46	N	9449
7	144m NE	351390 405100	SCHOOLHOUSE & BLACKLEDGE FARM 1	6.6	N	17517197
8	144m NE	351450 405050	SCHOOLHOUSE & BLACKLEDGE FARM 8	5.0	N	17517205
G	146m W	350970 404890	RAVENSHEAD BRICK WORKS 5	6.1	N	9448
9	156m NE	351500 405000	SCHOOLHOUSE & BLACKLEDGE FARM 12	4.7	N	17517209
H	176m W	350930 404860	RAVENSHEAD BRICK WORKS 4	6.1	N	9447
H	188m W	350920 404870	RAVENSHEAD BRICK WORKS 3	6.24	N	9446
I	190m E	351570 404920	SCHOOLHOUSE FARM SKELMERSDALE 10	-	Y	N/A
I	197m E	351570 404940	SCHOOLHOUSE FARM SKELMERSDALE 9	-	Y	N/A
I	204m E	351570 404960	SCHOOLHOUSE FARM SKELMERSDALE 12	-	Y	N/A
J	205m N	351180 405160	CORONA PROPERTIES - SKELMERSDALE 1	6.1	N	17622118
J	208m N	351220 405170	ORMSKIRK ROAD UPHOLLAND TH 5	2.5	N	17636350

ID	Location	Grid reference	Name	Length	Confidential	Web link
10	214m NE	351500 405100	SCHOOLHOUSE & BLACKLEDGE FARM 2	6.1	N	17517198
K	214m E	351570 404990	SCHOOLHOUSE FARM SKELMERSDALE 11	-	Y	N/A
J	217m N	351220 405180	CORONA PROPERTIES - SKELMERSDALE 4	6.0	N	17622121
K	218m NE	351570 405000	SCHOOLHOUSE & BLACKLEDGE FARM 13	3.8	N	17517210
J	218m N	351160 405170	ORMSKIRK ROAD UPHOLLAND TH 3	2.5	N	17636348
L	223m W	350880 404840	RAVENSHEAD BRICK WORKS 8	4.57	N	9451
J	224m N	351180 405180	ORMSKIRK ROAD UPHOLLAND TH 4	2.5	N	17636349
L	225m W	350880 404860	RAVENSHEAD BRICK WORKS 1	4.57	N	9444
11	226m NE	351550 405050	SCHOOLHOUSE & BLACKLEDGE FARM 9	5.8	N	17517206
J	230m N	351150 405180	CORONA PROPERTIES - SKELMERSDALE 2	6.3	N	17622119
J	231m N	351200 405190	ORMSKIRK ROAD UPHOLLAND TH 2	2.5	N	17636347
J	238m N	351160 405190	ORMSKIRK ROAD UPHOLLAND TH 1	2.0	N	17636346
12	240m NE	351580 405030	SCHOOLHOUSE FARM SKELMERSDALE 14	-	Y	N/A
J	244m N	351180 405200	CORONA PROPERTIES - SKELMERSDALE 3	6.1	N	17622120

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	4

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).

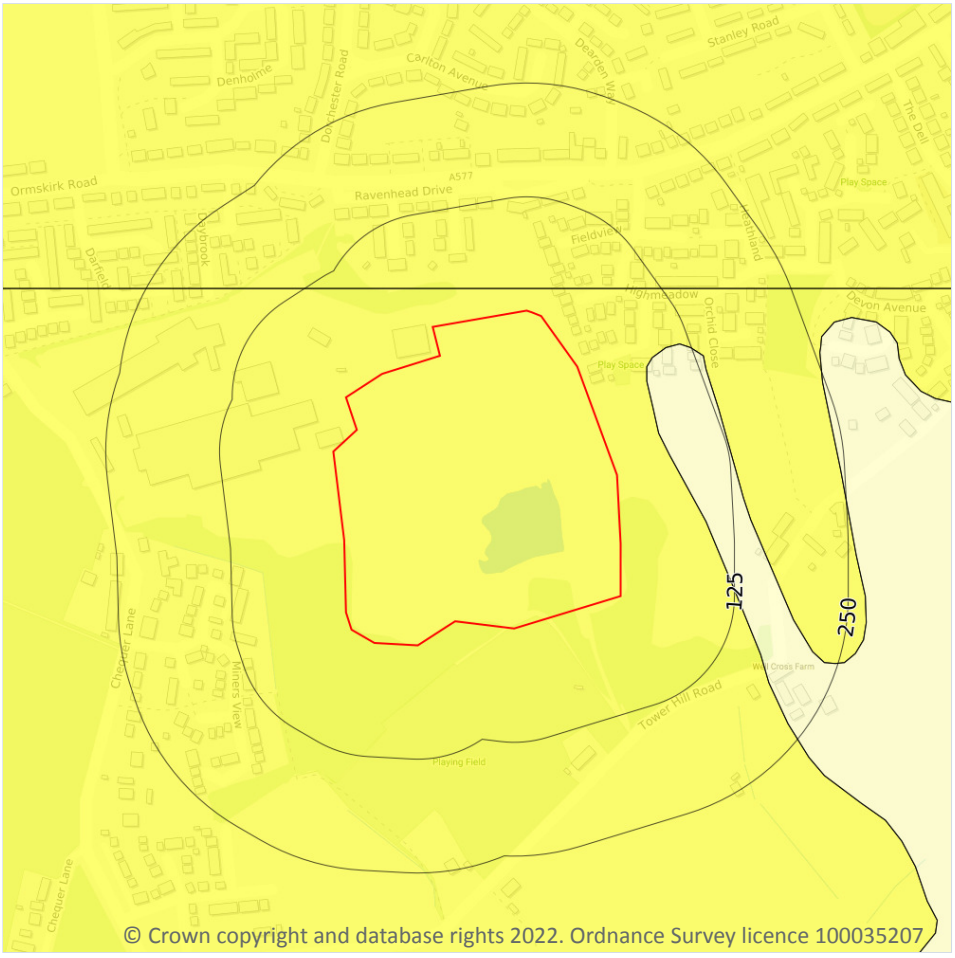
Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 96**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
On site	**Very low**	**Ground conditions predominantly low plasticity.**
24m N	Very low	Ground conditions predominantly low plasticity.

Location	Hazard rating	Details
49m NW	Negligible	Ground conditions predominantly non-plastic.

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

17.2 Running sands

Records within 50m	2

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.

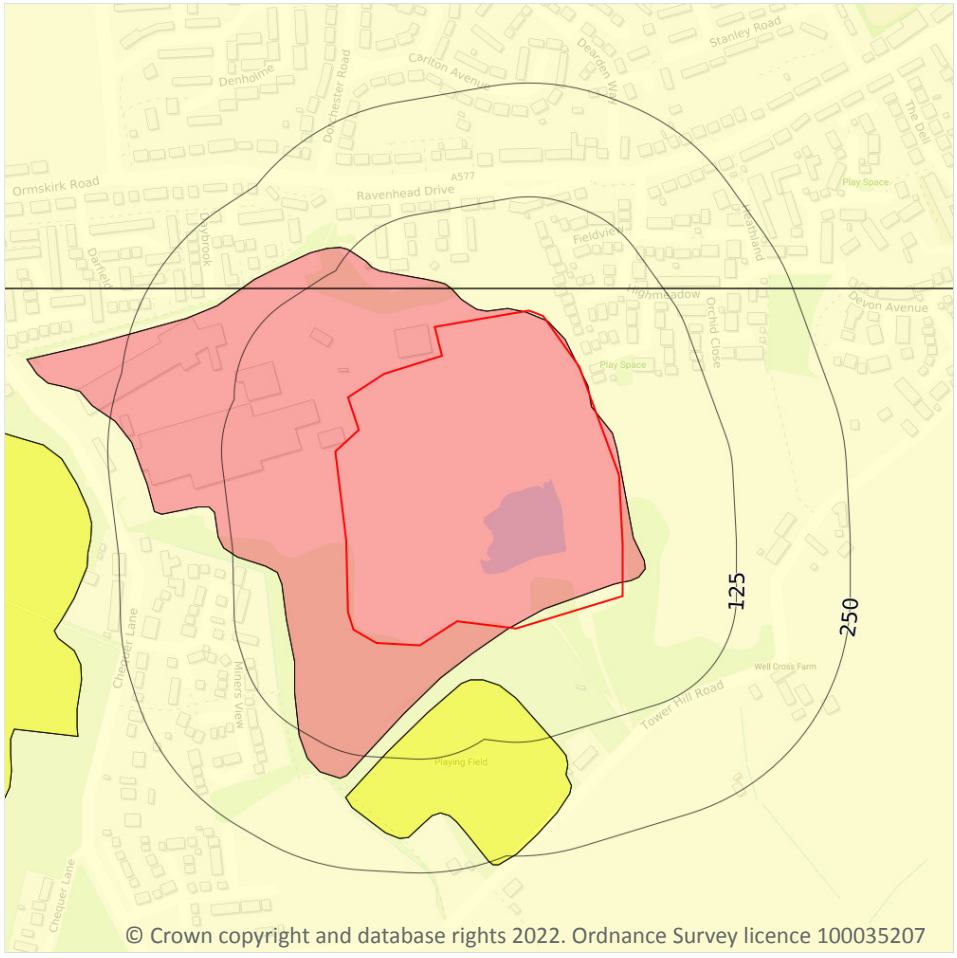
Features are displayed on the Natural ground subsidence - Running sands map on **page 98**

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.**

Location	Hazard rating	Details
24m N	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



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	4

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.

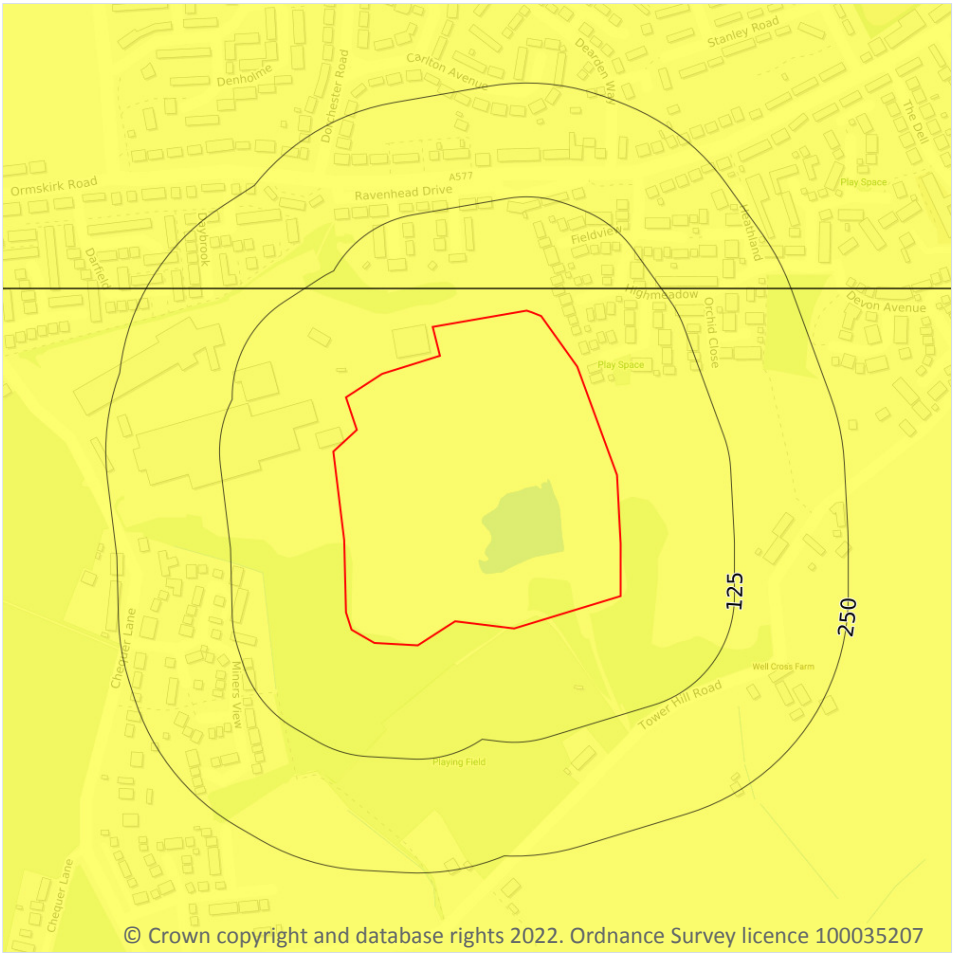
Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 100**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**
On site	**Moderate**	**Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.**

Location	Hazard rating	Details
24m N	Negligible	Compressible strata are not thought to occur.
39m N	Moderate	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.

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	**2**

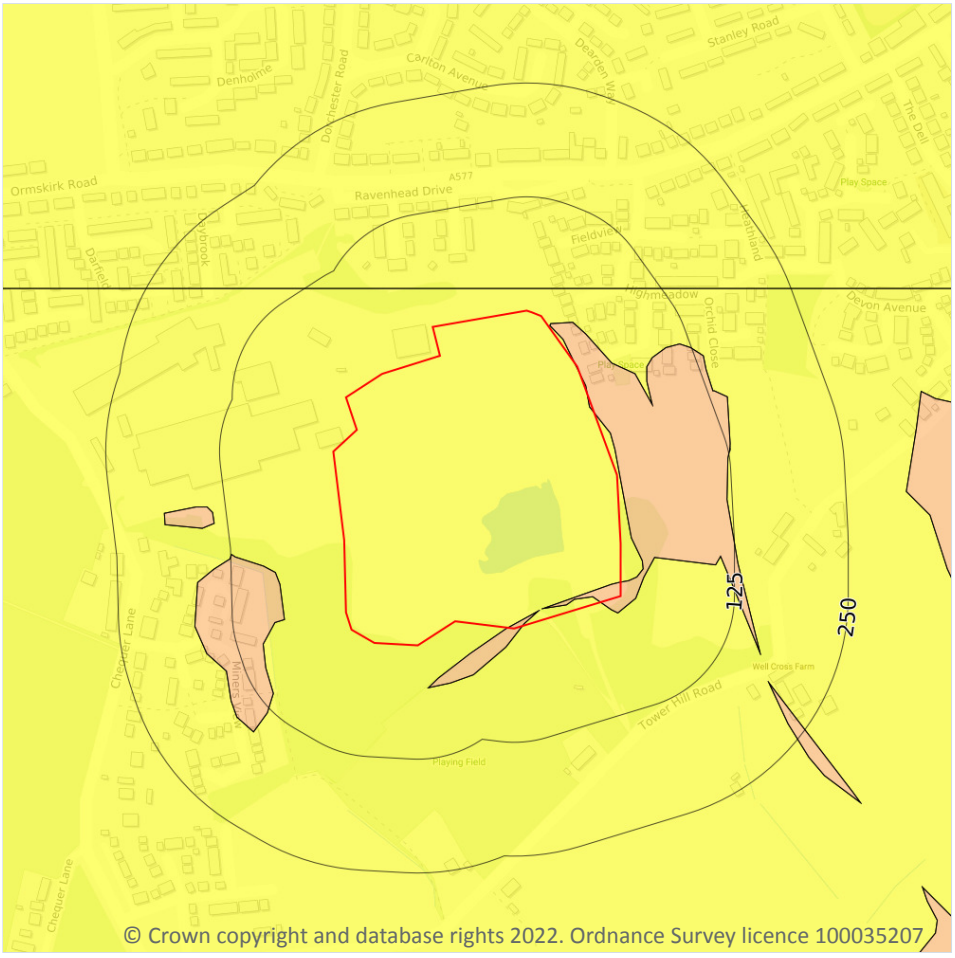
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 102**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**
24m N	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	3

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.

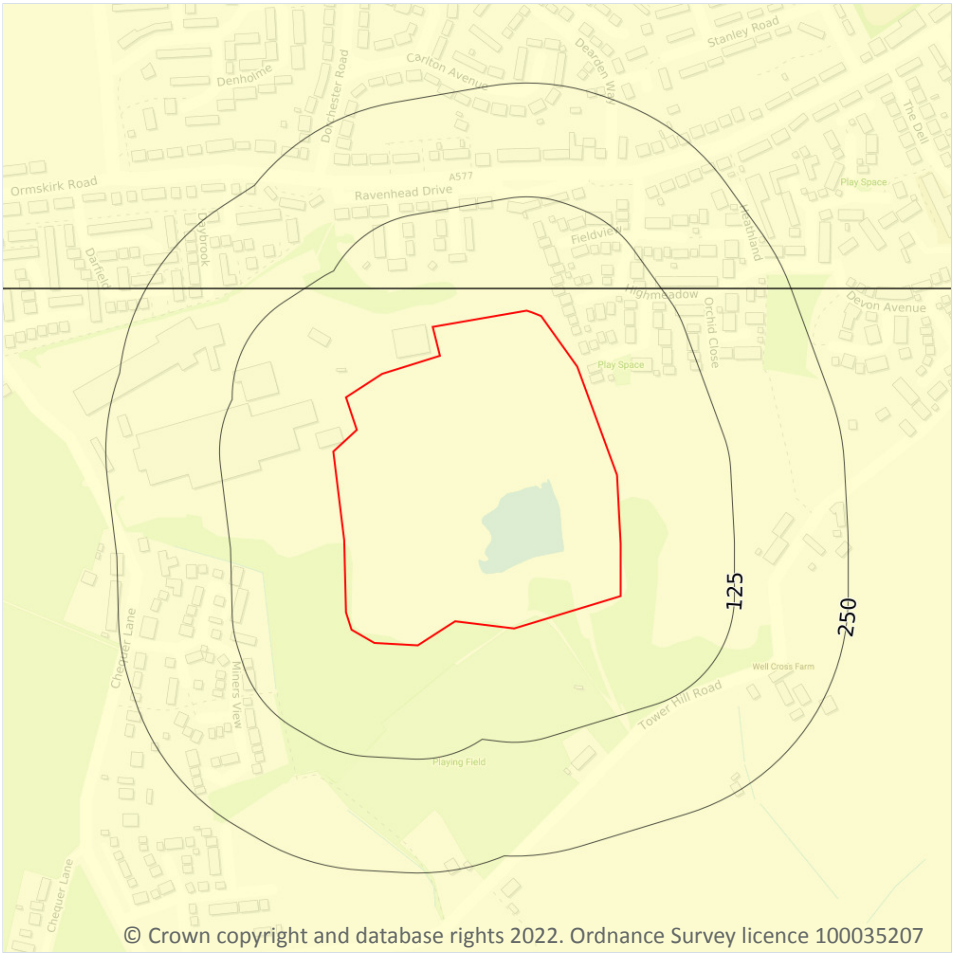
Features are displayed on the Natural ground subsidence - Landslides map on **page 103**

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.**

Location	Hazard rating	Details
On site	**Low**	**Slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site.**
24m N	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



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	2

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.

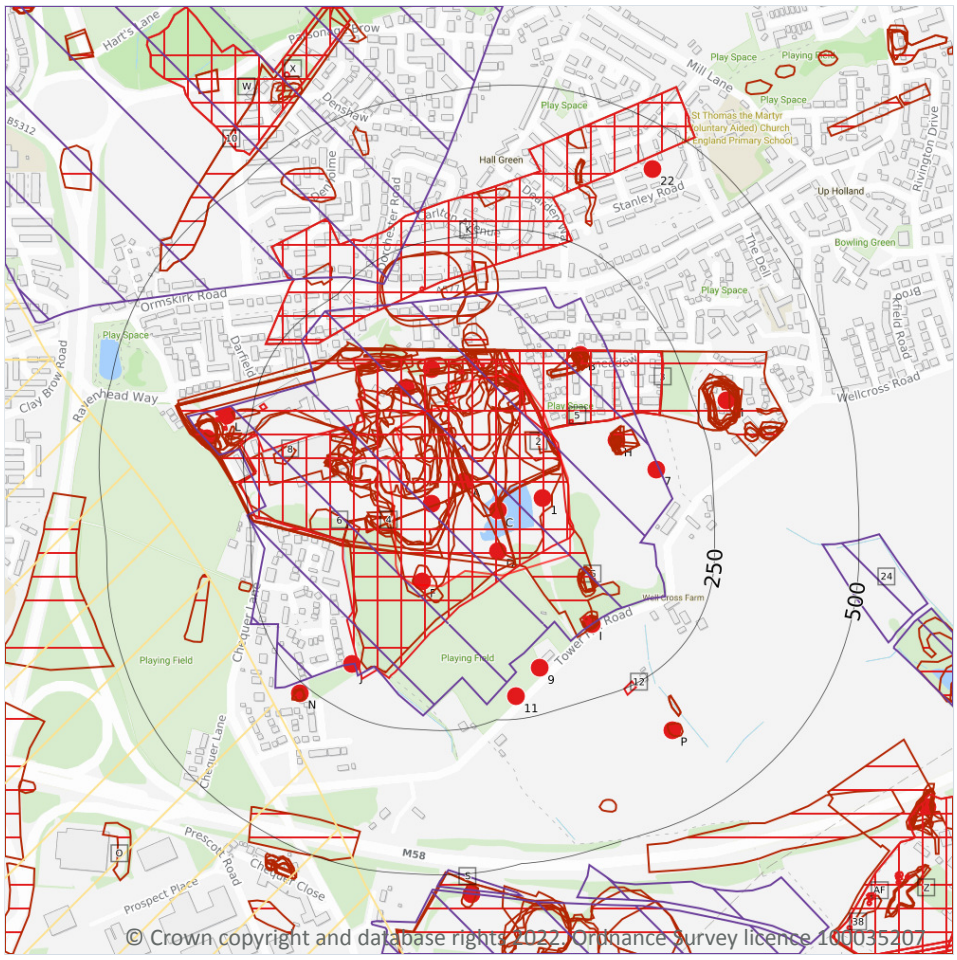
Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 105**

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.**

Location	Hazard rating	Details
24m N	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	28

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 107**

ID	Location	Details	Description
1	On site	Name: Ravenhead Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Clay & Shale Status: Inactive	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, is not extracting minerals, but which still has a valid planning permission to do so, and can restart at any time. May be considered Mothballed by operator.May be considered to have Active or Dormant planning permission
A	On site	Name: Ravenhead Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Clay & Shale Status: Inactive	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, is not extracting minerals, but which still has a valid planning permission to do so, and can restart at any time. May be considered Mothballed by operator.May be considered to have Active or Dormant planning permission
A	On site	Name: Newgate Colliery Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
C	On site	Name: Tower Hill Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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

ID	Location	Details	Description
D	On site	Name: Newgate Colliery Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
D	On site	Name: Ravenhead Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Secondary Status: Active	Type: Recycled material, construction and demolition materials recovered for use as secondary aggregates Status description: Site which is actively extracting mineral products, or in the case of wharfs and rail depots, is actively handing minerals
D	On site	Name: Ravenhead Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Clay & Shale Status: Active	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which is actively extracting mineral products, or in the case of wharfs and rail depots, is actively handing minerals
D	On site	Name: Ravenhead Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sandstone Status: Active	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which is actively extracting mineral products, or in the case of wharfs and rail depots, is actively handing minerals
E	On site	Name: Newgate Delf Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sandstone 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
F	On site	Name: Withington House Gravel Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sand & Gravel 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

ID	Location	Details	Description
E	42m NW	Name: Ditton Brook Colliery, No. 3 Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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	50m NW	Name: Ditton Brook Colliery Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
H	101m E	Name: Tower Hill Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
H	103m E	Name: Tower Hill Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
B	108m NE	Name: Walk Down Mine Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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

ID	Location	Details	Description
I	125m S	Name: Well Cross Brow Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
7	154m E	Name: Tower Hill Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
9	171m S	Name: Fairhurst Farm Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
J	171m SW	Name: The Mount Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
11	210m S	Name: Fairhurst Farm Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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

ID	Location	Details	Description
N	265m SW	Name: Withington House Gravel Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sand & Gravel 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
L	290m W	Name: Brick Works Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
L	290m W	Name: Brick Works Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Fireclay Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
M	304m E	Name: Tower Hill Quarry Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sandstone 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
L	315m W	Name: Brick Works Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Coal, Deep Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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

ID	Location	Details	Description
L	315m W	Name: Brick Works Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Fireclay Status: Ceased	Type: Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots) 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
P	351m SE	Name: Withington House Gravel Pit Address: Up Holland, SKELMERSDALE, Lancashire Commodity: Sand & Gravel 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
22	427m NE	Name: Highgate Delf Address: Hall Green, Up Holland, ORRELL, Lancashire Commodity: Sandstone 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 **109**

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 107**

ID	Location	Land Use	Year of mapping	Mapping scale
2	**On site**	**Unspecified Ground Workings**	**1967**	**1:10560**
3	**On site**	**Colliery**	**1939**	**1:10560**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1955**	**1:10560**
A	**On site**	**Unspecified Quarry and Clay Pit**	**1955**	**1:10560**
A	**On site**	**Refuse Heap**	**1939**	**1:10560**
A	**On site**	**Sanitary Pipe and Brick Works**	**1929**	**1:10560**

ID	Location	Land Use	Year of mapping	Mapping scale
A	On site	Brick Works	1939	1:10560
A	On site	Unspecified Quarry	1907	1:10560
A	On site	Clay Pit	1892	1:10560
A	On site	Sanitary Pipe and Brick Works	1927	1:10560
A	On site	Unspecified Quarry and Clay Pit	1939	1:10560
A	On site	Unspecified Quarry and Clay Pit	1927	1:10560
A	On site	Pond	1967	1:10560
A	On site	Pond	1981	1:10000
A	On site	Unspecified Quarry	1981	1:10000
A	On site	Unspecified Quarry and Clay Pit	1929	1:10560
A	On site	Unspecified Quarry and Clay Pit	1939	1:10560
A	On site	Brick Works	1939	1:10560
A	On site	Unspecified Heap	1967	1:10560
A	On site	Unspecified Ground Workings	1967	1:10560
A	On site	Unspecified Quarry and Clay Pit	1946	1:10560
A	On site	Brick Works	1946	1:10560
B	On site	Colliery	1939	1:10560
B	On site	Colliery	1946	1:10560
C	On site	Refuse Heap	1967	1:10560
E	On site	Unspecified Ground Workings	1939	1:10560
E	On site	Unspecified Ground Workings	1907	1:10560
E	On site	Refuse Heap	1939	1:10560
E	On site	Brick and Tile Works	1907	1:10560
E	On site	Brick and Tile Works	1892	1:10560
E	On site	Unspecified Old Quarry	1907	1:10560
E	On site	Unspecified Quarry	1892	1:10560
E	On site	Unspecified Quarry and Clay Pit	1939	1:10560
E	On site	Unspecified Quarry and Clay Pit	1927	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
E	**On site**	**Pond**	**1981**	**1:10000**
E	**On site**	**Unspecified Quarry and Clay Pit**	**1929**	**1:10560**
E	**On site**	**Unspecified Quarry and Clay Pit**	**1939**	**1:10560**
E	**On site**	**Unspecified Ground Workings**	**1967**	**1:10560**
E	**On site**	**Unspecified Ground Workings**	**1967**	**1:10560**
E	**On site**	**Refuse Heap**	**1981**	**1:10000**
F	**On site**	**Old Gravel Pit**	**1851**	**1:10560**
4	5m W	Unspecified Pit	1946	1:10560
E	15m N	Unspecified Heap	1892	1:10560
E	17m N	Unspecified Heap	1907	1:10560
E	17m N	Unspecified Heap	1892	1:10560
E	24m N	Unspecified Heap	1939	1:10560
E	26m NW	Unspecified Heap	1907	1:10560
E	26m NW	Unspecified Heap	1892	1:10560
G	30m SE	Pond	1955	1:10560
G	32m SE	Pond	1851	1:10560
E	35m N	Unspecified Heap	1955	1:10560
E	37m N	Unspecified Ground Workings	1939	1:10560
G	37m SE	Pond	1946	1:10560
G	37m SE	Pond	1967	1:10560
E	38m NW	Unspecified Heap	1907	1:10560
E	40m N	Unspecified Heap	1907	1:10560
G	41m SE	Pond	1939	1:10560
G	41m SE	Pond	1927	1:10560
G	41m SE	Pond	1907	1:10560
G	41m SE	Pond	1892	1:10560
B	42m NE	Unspecified Ground Workings	1946	1:10560
B	45m NE	Unspecified Ground Workings	1939	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
B	46m NE	Unspecified Pit	1939	1:10560
E	57m N	Unspecified Heap	1892	1:10560
6	61m W	Unspecified Heap	1967	1:10560
E	69m NW	Pond	1946	1:10560
E	74m NW	Cuttings	1907	1:10560
E	75m NW	Pond	1955	1:10560
E	87m NW	Unspecified Ground Workings	1939	1:10560
E	89m N	Unspecified Ground Workings	1939	1:10560
E	89m N	Unspecified Ground Workings	1927	1:10560
H	90m E	Unspecified Ground Workings	1946	1:10560
B	91m NE	Unspecified Pit	1929	1:10560
B	91m NE	Unspecified Pit	1929	1:10560
H	91m E	Unspecified Ground Workings	1939	1:10560
H	91m E	Unspecified Ground Workings	1927	1:10560
H	91m E	Unspecified Ground Workings	1939	1:10560
B	91m NE	Unspecified Pit	1955	1:10560
H	92m E	Unspecified Heap	1929	1:10560
H	92m E	Unspecified Heap	1929	1:10560
E	92m NW	Unspecified Ground Workings	1967	1:10560
H	93m E	Unspecified Ground Workings	1907	1:10560
B	94m NE	Unspecified Pit	1927	1:10560
B	96m NE	Unspecified Pit	1907	1:10560
B	96m NE	Unspecified Pit	1892	1:10560
H	96m E	Unspecified Ground Workings	1955	1:10560
H	97m E	Unspecified Heap	1981	1:10000
E	100m N	Ponds	1892	1:10560
E	103m NW	Unspecified Ground Workings	1927	1:10560
E	104m NW	Unspecified Ground Workings	1939	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
H	104m E	Old Coal Pit	1851	1:10560
I	104m S	Unspecified Heap	1955	1:10560
E	106m N	Colliery	1927	1:10560
I	111m S	Unspecified Heap	1929	1:10560
I	111m S	Unspecified Heap	1929	1:10560
I	111m S	Unspecified Heap	1939	1:10560
I	111m S	Unspecified Heap	1927	1:10560
E	112m N	Colliery	1938	1:10560
I	113m S	Unspecified Heap	1946	1:10560
I	113m S	Unspecified Heap	1907	1:10560
I	113m S	Unspecified Heap	1939	1:10560
E	139m NW	Unspecified Heap	1967	1:10560
E	146m N	Pond	1892	1:10560
E	151m N	Colliery	1948	1:10560
E	151m N	Colliery	1948	1:10560
8	161m W	Refuse Heap	1967	1:10560
K	168m NW	Collieries	1892	1:10560
L	238m W	Pond	1907	1:10560
M	245m E	Unspecified Disused Quarry	1939	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	**95**

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 107**

ID	Location	Land Use	Year of mapping	Mapping scale
A	**On site**	**Unspecified Disused Mine**	**1967**	**1:10560**

ID	Location	Land Use	Year of mapping	Mapping scale
B	**On site**	**Colliery**	**1846**	**1:10560**
E	15m N	Unspecified Old Shaft	1907	1:10560
E	17m N	Unspecified Shaft	1927	1:10560
E	17m N	Unspecified Old Shafts	1846	1:10560
E	21m N	Unspecified Old Shafts	1892	1:10560
5	36m E	Air Shaft	1846	1:10560
E	45m NW	Unspecified Old Shafts	1846	1:10560
E	45m NW	Unspecified Old Shaft	1927	1:10560
E	45m NW	Unspecified Old Shafts	1892	1:10560
I	110m S	Unspecified Disused Shaft	1967	1:10560
I	116m S	Unspecified Old Shaft	1949	1:10560
I	122m S	unspecified Old Shaft	1846	1:10560
I	122m S	unspecified Old Shaft	1927	1:10560
I	122m S	unspecified Old Shaft	1907	1:10560
I	122m S	unspecified Old Shaft	1892	1:10560
J	161m SW	Unspecified Disused Shaft	1981	1:10000
K	168m NW	Collieries	1892	1:10560
E	169m N	Unspecified Old Shaft	1907	1:10560
L	227m W	Unspecified Old Shafts	1949	1:10560
12	244m SE	Unspecified Mine	1967	1:10560
L	285m W	Unspecified Old Shafts	1846	1:10560
L	285m W	Unspecified Old Shafts	1927	1:10560
L	286m W	Unspecified Old Shafts	1949	1:10560
L	286m W	Unspecified Old Shafts	1892	1:10560
L	302m W	Unspecified Old Shafts	1846	1:10560
L	302m W	Unspecified Old Shafts	1927	1:10560
L	306m W	Unspecified Old Shafts	1949	1:10560
L	306m W	Unspecified Disused Shafts	1967	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
L	324m W	Unspecified Disused Shaft	1981	1:10000
W	528m NW	Colliery	1949	1:10560
X	602m NW	Unspecified Shaft	1949	1:10560
-	730m SE	Colliery	1892	1:10560
-	737m E	Unspecified Old Shaft	1927	1:10560
Z	743m SE	Colliery	1892	1:10560
-	744m E	Unspecified Shaft	1892	1:10560
-	756m E	Unspecified Shaft	1892	1:10560
AD	763m S	Tunnel	1949	1:10560
AD	763m S	Tunnel	1967	1:10560
AD	763m S	Tunnel	1981	1:10000
-	766m S	Mine Colliery	1907	1:10560
AD	772m S	Tunnel	1846	1:10560
AD	772m S	Tunnel	1927	1:10560
AD	772m S	Tunnel	1907	1:10560
AD	772m S	Tunnel	1892	1:10560
-	774m S	Air Shaft	1949	1:10560
-	774m S	Air Shaft	1967	1:10560
-	774m S	Air Shaft	1981	1:10000
AF	782m SE	Unspecified Disused Shafts	1967	1:10560
-	782m S	Air Shaft	1846	1:10560
-	782m S	Air Shaft	1927	1:10560
-	782m S	Air Shaft	1907	1:10560
-	782m S	Air Shaft	1892	1:10560
AF	783m SE	Unspecified Disused Shafts	1981	1:10000
AF	788m SE	Unspecified Old Shafts	1949	1:10560
Z	790m SE	Unspecified Disused Shafts	1967	1:10560
Z	791m SE	Unspecified Disused Shafts	1981	1:10000

ID	Location	Land Use	Year of mapping	Mapping scale
AF	792m SE	Unspecified Shafts	1892	1:10560
AF	792m SE	Unspecified Old Shafts	1846	1:10560
AF	792m SE	Unspecified Old Shafts	1927	1:10560
Z	794m SE	Unspecified Old Shafts	1949	1:10560
Z	800m SE	Unspecified Old Shafts	1846	1:10560
Z	800m SE	Unspecified Old Shafts	1927	1:10560
-	800m SE	Air Shaft	1949	1:10560
-	800m SE	Air Shaft	1967	1:10560
-	800m SE	Air Shaft	1981	1:10000
38	803m SE	Unspecified Old Shaft	1892	1:10560
Z	805m SE	Unspecified Shafts	1892	1:10560
Z	805m SE	Unspecified Old Shafts	1846	1:10560
Z	805m SE	Unspecified Old Shafts	1927	1:10560
-	806m SE	Air Shaft	1846	1:10560
-	806m SE	Air Shaft	1927	1:10560
-	806m SE	Air Shaft	1907	1:10560
-	806m SE	Air Shaft	1892	1:10560
-	816m S	Unspecified Old Shaft	1927	1:10560
-	820m S	Unspecified Old Shaft	1892	1:10560
-	853m SE	Air Shaft	1949	1:10560
-	853m SE	Air Shaft	1967	1:10560
-	853m SE	Air Shaft	1981	1:10000
-	857m SE	Air Shaft	1846	1:10560
-	857m SE	Air Shaft	1927	1:10560
-	857m SE	Air Shaft	1907	1:10560
-	857m SE	Air Shaft	1892	1:10560
-	868m S	Disused Mine Colliery	1846	1:10560
-	868m S	Disused Mine Colliery	1927	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
-	883m S	Mine Colliery	1907	1:10560
-	892m SE	Unspecified Disused Shafts	1967	1:10560
-	894m SE	Unspecified Old Shafts	1927	1:10560
-	895m SE	Unspecified Disused Shafts	1967	1:10560
-	919m E	Trial Shaft	1892	1:10560
-	960m S	Drift	1846	1:10560
-	981m SE	Disused Colliery	1846	1:10560
-	981m SE	Colliery	1927	1:10560
-	981m SE	Disused Colliery	1907	1:10560
-	981m SE	Colliery	1892	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m **4**

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.

Features are displayed on the Mining, ground workings and natural cavities map on **page 107**

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
A	**On site**	**Upholland**	**Marl, sandstone, bricks**	**Surface mineral working**	**Valid**	**15/12/49**
10	209m NW	Holland Moor	Fireclay	Working is wholly underground	Valid	Not available
24	437m E	Sandbrook Road	Shale	Surface mineral working	Application	Not available
S	492m S	Pimbo Lane	Shale, clay	Surface mineral working	Application	26/9/52

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	2

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).

Features are displayed on the Mining, ground workings and natural cavities map on **page 107**

ID	Location	Name	Commodity	Class	Likelihood
O	294m SW	Not available	Vein Mineral	A	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
29	608m W	Not available	Vein Mineral	A	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

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	1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk.**

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.

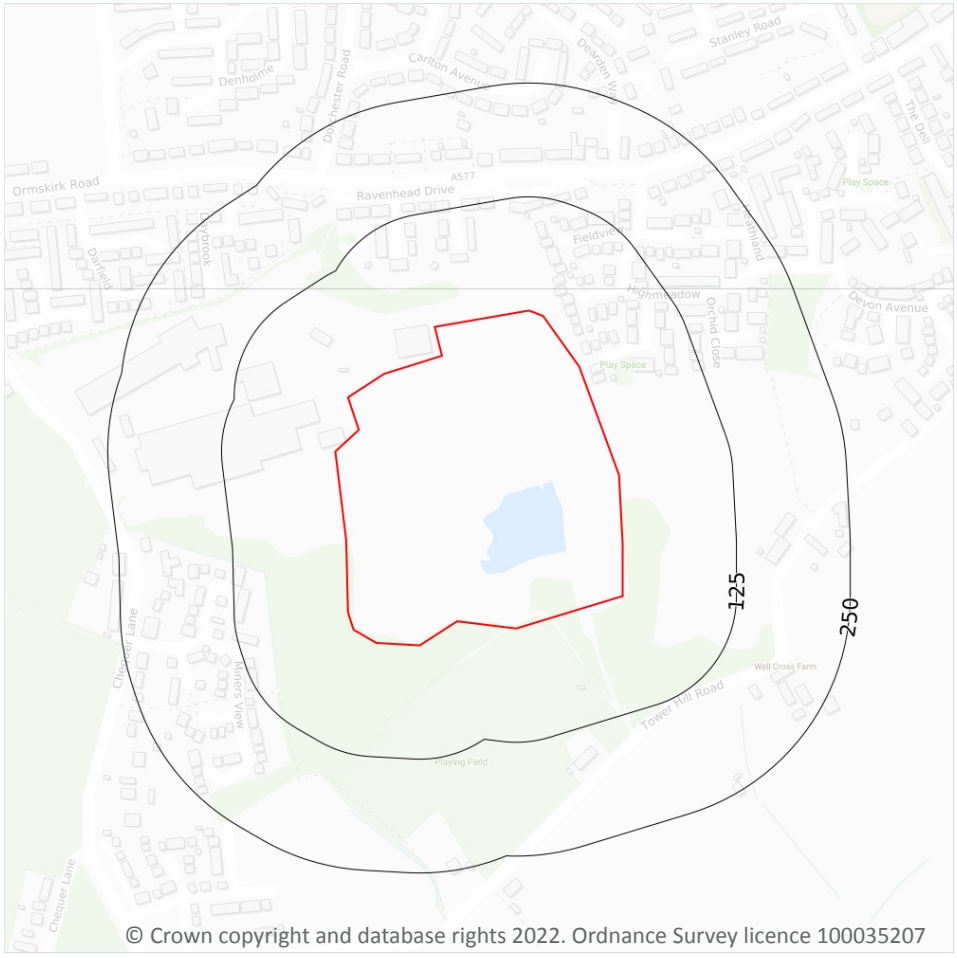
18.13 Clay mining

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



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 125**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m	23

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 km^2. 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 km^2; 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**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 - 30 mg/kg**
24m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
24m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
25m NE	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
25m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
28m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
28m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
29m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
33m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
33m NW	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
33m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
35m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
42m N	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
42m NW	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
48m NW	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
48m NW	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
49m E	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
49m E	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 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 km^2).

This data is sourced from the British Geological Survey.

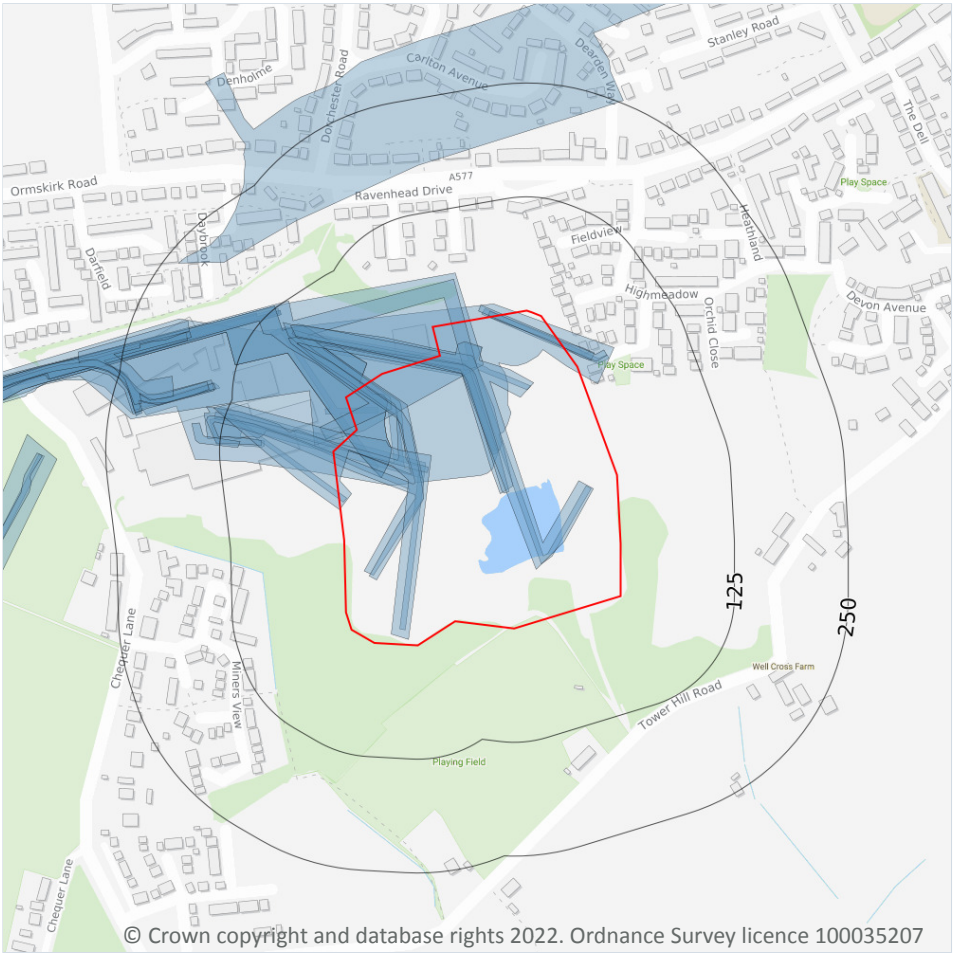
20.3 BGS Measured Urban Soil Chemistry

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 km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects



Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 1 Worksites
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

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	23

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.

Features are displayed on the Railway infrastructure and projects map on **page 129**

Location	Land Use	Year of mapping	Mapping scale
On site	**Railway Sidings**	**1939**	**2500**
On site	**Tramway Sidings**	**1893**	**2500**
On site	**Tramway Sidings**	**1939**	**2500**
On site	**Tramway Sidings**	**1959**	**2500**
On site	**Mineral Railway Sidings**	**1939**	**10560**
On site	**Mineral Railway Sidings**	**1927**	**10560**
On site	**Mineral Railway Sidings**	**1907**	**10560**
On site	**Mineral Railway Sidings**	**1892**	**10560**
On site	**Mineral Railway Sidings**	**1929**	**10560**
On site	**Railway Sidings**	**1939**	**10560**
On site	**Railway Sidings**	**1946**	**10560**
On site	**Tramway Sidings**	**1955**	**10560**
On site	**Tramway Sidings**	**1946**	**10560**
On site	**Railway Sidings**	**1967**	**10560**
103m W	Railway Sidings	1939	10560
116m NW	Mineral Railway Sidings	1908	2500
116m NW	Mineral Railway Sidings	1928	2500

Location	Land Use	Year of mapping	Mapping scale
118m NW	Mineral Railway Sidings	1893	2500
143m W	Railway Sidings	1939	10560
148m W	Mineral Railway Sidings	1939	2500
151m W	Mineral Railway Sidings	1946	10560
168m NW	Railway Sidings	1892	10560
186m W	Mineral Railway Sidings	1955	10560

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

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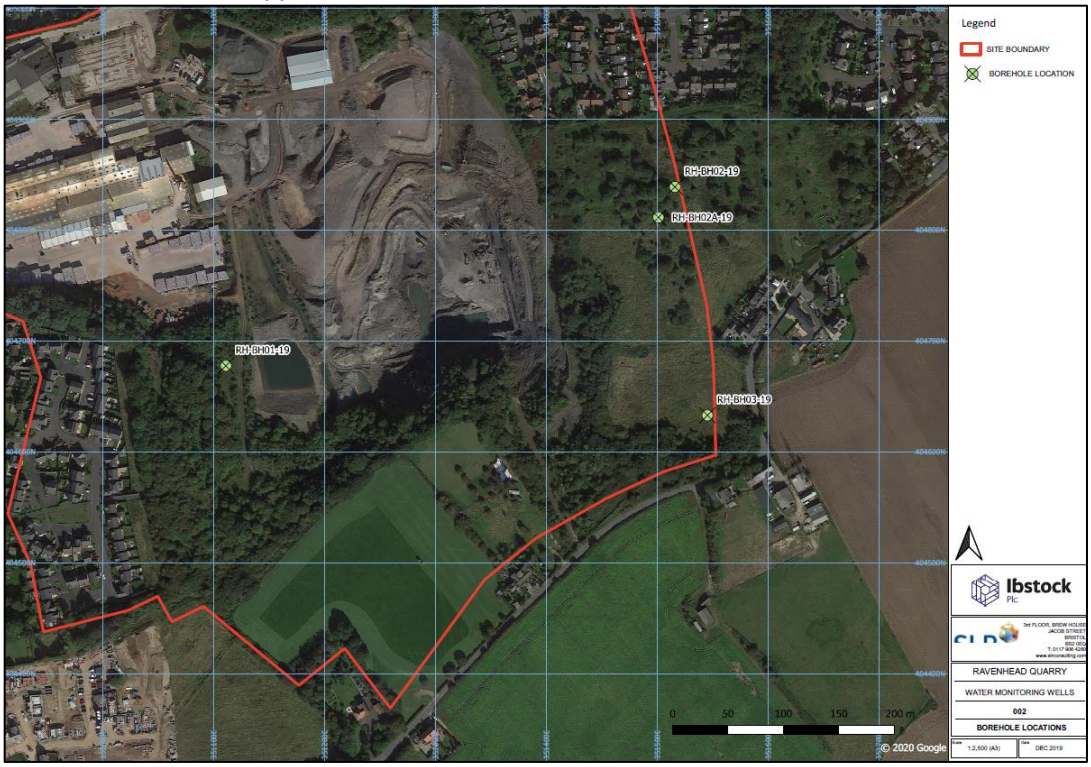
ByrneLooby		Analyte	Mecoprop	Arsenic as As	Cadmium as Cd	Copper as Cu	Lead as Pb	Mercury as Hg	Nickel as Ni	Total Chromium as Cr	Zinc as Zn	Calcium as Ca	Magnesium as Mg	Potassium as K	Sodium as Na	Total Sulphur as SO4	Ammoniacal Nitrogen as N	Chloride as Cl	Conductivity at 25°C	pH	Total Alkalinity
Customer Reference:	Sampling Date:	Units	µg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µS/cm	pH units	mg/l
BH 19-01	22/04/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.004	173	29	11	32	17	0.8	121	1090	6.9	384
BH 19-2A	22/04/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002	93	24	5	21	62	0.3	30	683	7.1	260
BH 19-03	22/04/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.002	95	26	4	19	81	<0.01	33	718	7	262
BH1-19	24/05/2022		<0.02	0.002	<0.00002	<0.001	<0.001	<0.00003	<0.001	0.002	0.007	148	24	9	34	18	1	90	1060	7.1	402
BH2A-19	24/05/2022		<0.02	0.002	<0.00002	<0.001	<0.001	<0.00003	<0.001	0.001	0.008	94	24	4	21	62	0.2	29	622	7.3	263
BH3-19	24/05/2022		<0.02	0.002	<0.00002	<0.001	<0.001	<0.00003	<0.001	0.001	0.004	91	25	4	19	64	0.04	32	658	7.1	250
02A-19 BP	17/06/2022		<0.02	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	0.022	94	24	4	21	63	0.2	28	689	7.2	253
02A-19 AP	17/06/2022		<0.02	<0.001	0.00004	<0.001	<0.001	<0.00003	<0.001	<0.001	0.007	94	23	4	21	59	0.2	28	699	7.2	269
03-19 BP	17/06/2022		<2.00	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	0.003	93	25	5	20	66	0.06	32	707	7	241
01-19 AP	17/06/2022		<0.02	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	0.004	143	23	9	30	18	0.9	76	965	7.1	365
01-19 BP	17/06/2022		<0.02	<0.001	0.00005	<0.001	<0.001	<0.00003	<0.001	<0.001	0.004	143	23	9	31	18	0.8	87	1000	7.3	353
bh1-19	14/07/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.024	143	23	14	23	44	0.3	30	854	7.3	341
bh2A-19	14/07/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.015	74	28	5	23	77	0.2	29	704	7.3	258
BH3-19 (AP)	14/07/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.008	95	24	5	21	62	0.3	29	705	7.2	259
bh1-19	11/08/2022		<0.02	<0.001	0.00005	<0.001	<0.001	<0.00003	<0.001	0.001	<0.002	145	23	9	30	19	0.15	73	910	7.3	290
bh2A-19	11/08/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002	99	24	5	21	66	0.16	29	667	7.3	261
bh3-19(AP)	11/08/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002	75	23	9	14	5	0.02	29	575	7.4	254
BH1-19	22/09/2022		<10.0	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.015	154	25	10	31	20	0.2	71	875	7.4	368
BH2A-19	22/09/2022		<10.0	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.004	104	26	4	21	73	0.2	28	645	7.2	262
BH3-19	22/09/2022		<10.0	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.006	79	24	9	14	4	<0.01	27	550	7.2	246
BH01/19	23/11/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.003	148	22	9	29	20	0.7	60	940	7.1	376
BH02A/19	23/11/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.003	98	23	4	21	69	0.2	27	681	7	241
BH03/19	23/11/2022		<0.02	<0.001	<0.00002	<0.001	<0.001	<0.00003	<0.001	<0.001	0.003	86	24	6	16	56	0.17	24	636	6.9	227

Borehole Condition – Site Visit Report

Client	Booth Ventures	**Site**	**Ravenhead Quarry, Upholland**
Staff Member	A Crawford	**Day/Date**	11th March 2022
Weather	Overcast 9°c	**Time on site**	09.30 – 12.30
Details of ByrneLooby works:	To locate and record the conditions of and access to 3No Perimeter Boreholes that are require sampling and testing of the Groundwater. BH01-19 can be located in the Southwest corner of Ravenhead Quarry. Access is via the Booths compound along the Western Haul Road to the South of the Brickworks. Both BH02A-19 and BH03-19 can be accessed via the open field off Tower Hill Road. Each installation consists of 115mm DI PVC Well Screen. This is protected by a raised cover that is secured with an 8mm security bolt. All Borehole IDs are marked on the protective cover. All 3 Boreholes are to be purged using a Geosub pump on a later date before Groundwater samples are taken. Borehole details can be found below in Appendix 'A' Photographic record of Borehole Locations and Condition, also in Appendix 'B' Borehole Condition Table. 		

APPENDIX A

Photographic record of Borehole Locations and Condition

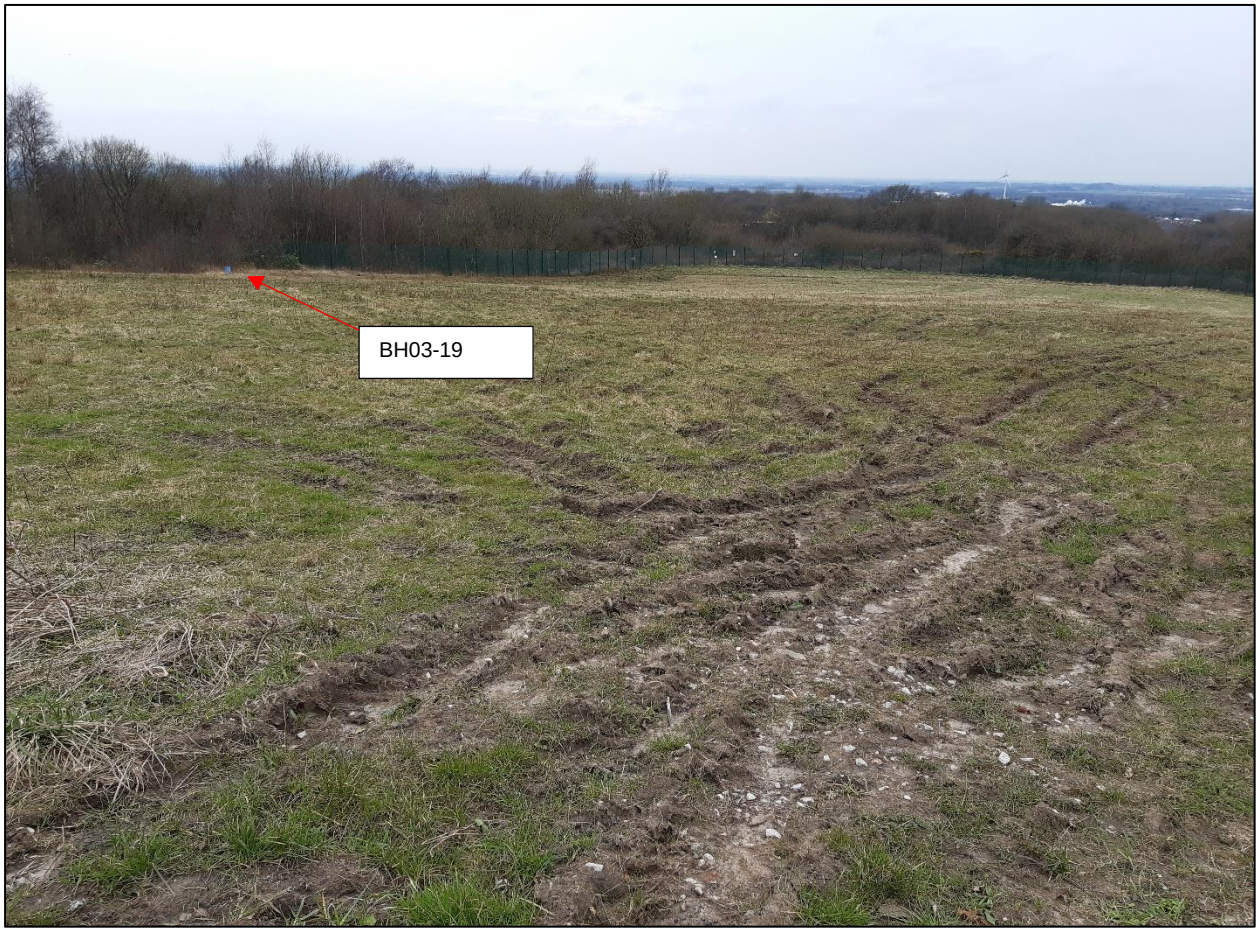
P1 – Access to BH01-19 Via Western Haul Road

P2 – BH01-19 Location Looking North

P3 - BH01-19 Location Looking East

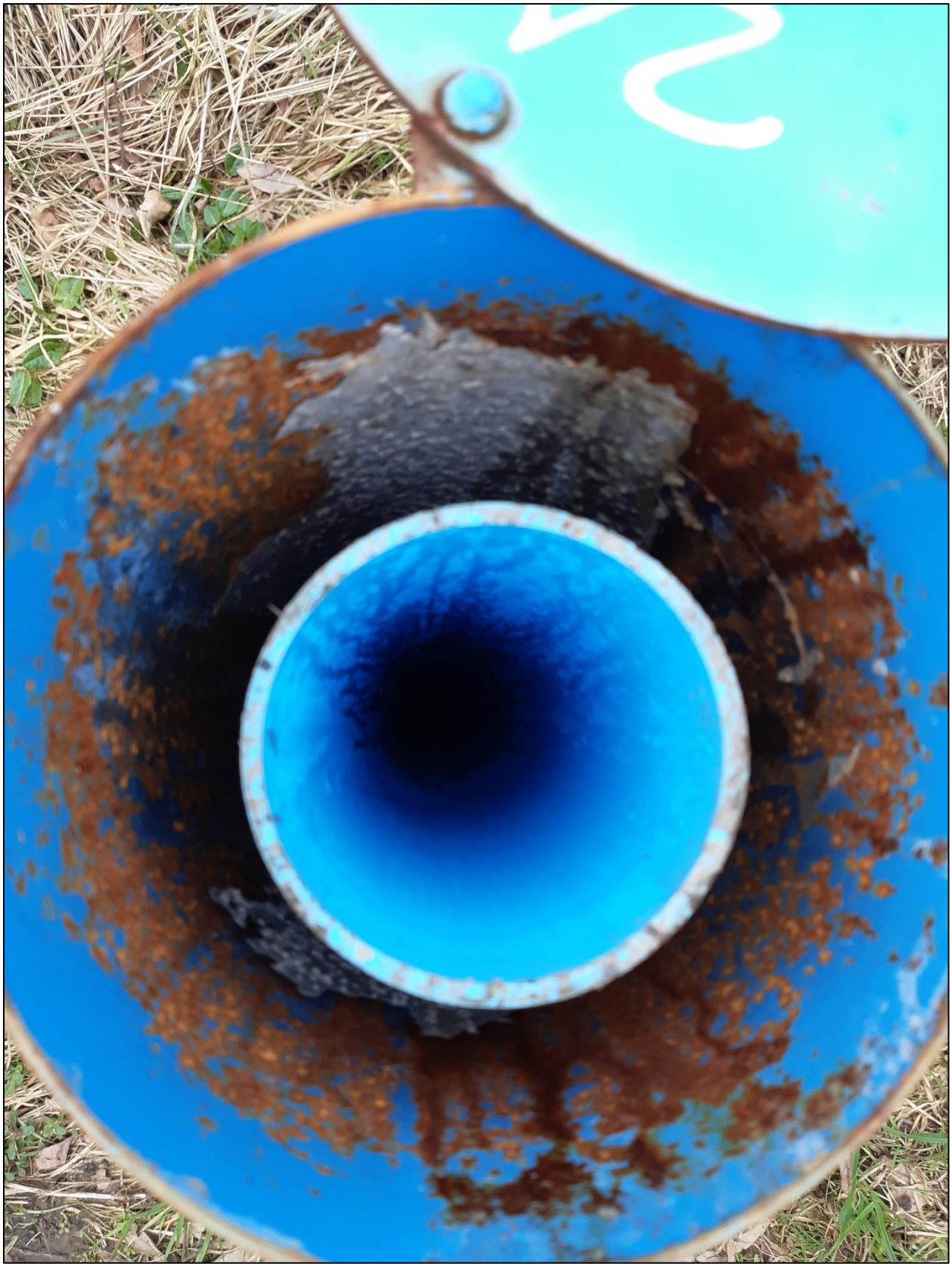
P4 – BH01-19 Installation

P5 – Access to BH03-19 and BH02A-19 off Town Hill Lane



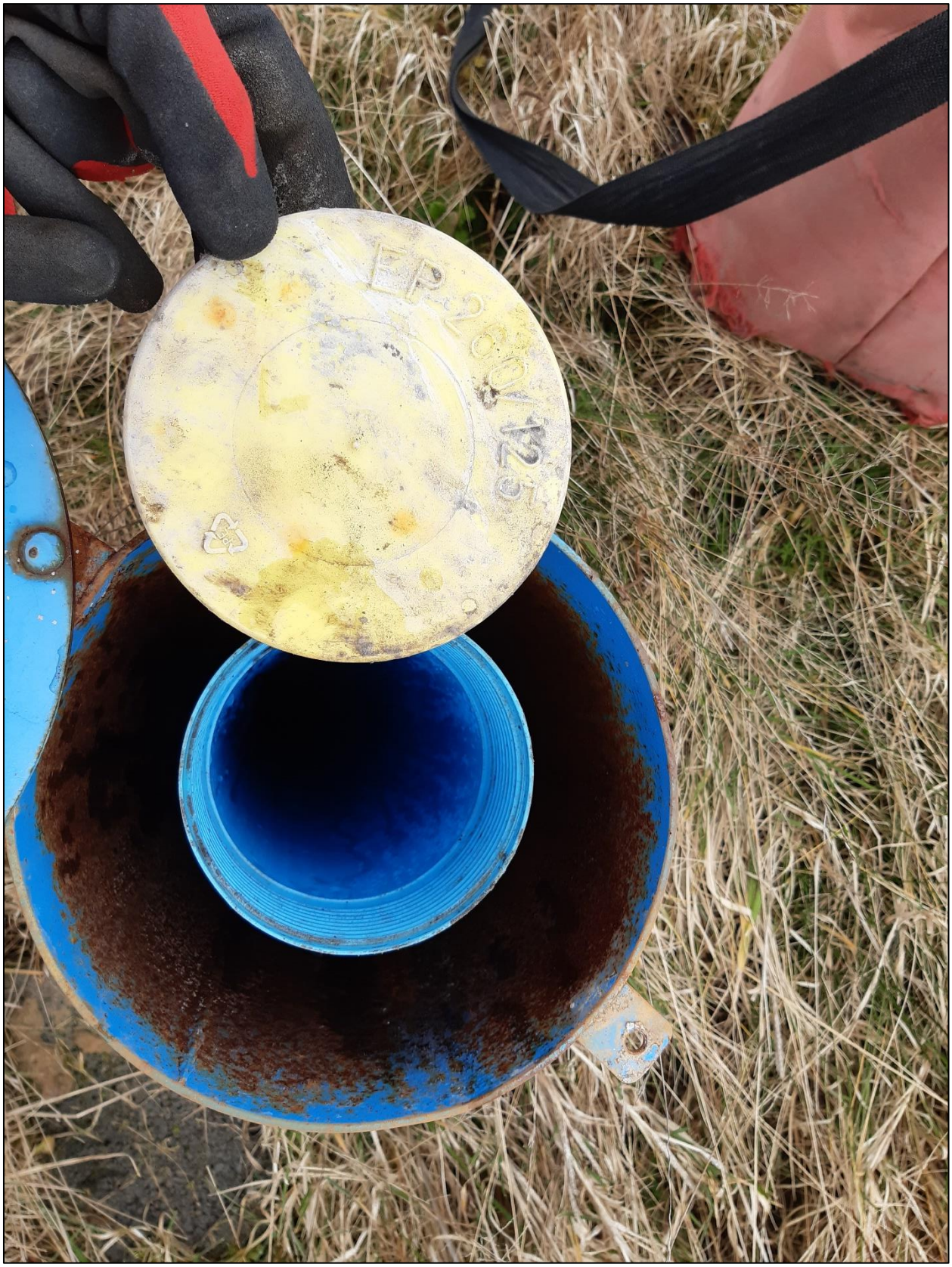
P6 – Access to BH03-19 and BH02A-19 off Town Hill Lane

P7 – BH02A-19 Location Looking North towards Ravenhead Quarry



P8 – BH02A-19 Installation

P9 – BH03-19 Location Looking Southeast towards Tower Hill Lane



P10 – BH03-19 Installation

P11 – BH03-19 Oxidisation in Ground Water.

Borehole Condition – Site Visit Report

APPENDIX B

Borehole Condition Table

BH Ref.	Photo Ref Nos.	Functioning Cover Y/N inc. lock or bolt	Damaged Casing Y/N	Damaged, Falty or Missing Bung Y/N	Blocked or Damaged Pipe	Depth to Water (m)	Depth to Base (m)	Access Information	Action Required	WTW Location
BH01-19	P1 to 4	Y	N	125mm OD Cap	N	15.87	66.47	Via Brick Works, through Booths Site	Purge 3x well volume using GEOSUB pumping system	smirking-dolls-snowballs
BH02A-19	P5 to 8	Y	N	125mm OD Cap	N	32.79	91.60	Open field situated between Upholland Boarding Kennels and Highview on Tower Hill Road	Purge 3x well volume using GEOSUB pumping system	forces-excellent-depravity
BH03-19	P9 to 11	Y	N	125mm OD Cap	N	36.31	85.23	Open field situated between Upholland Boarding Kennels and Highview on Tower Hill Road	Purge 3x well volume using GEOSUB pumping system	replying-hydration-showering

RAVENHEAD QUARRY GROUNDWATER WELLS

Factual Investigation Report

Prepared for: Ibstock Brick Limited

Client Ref:

SLR Ref: 416.00461.00048
Version No: DRAFT
November 2019

BASIS OF REPORT

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DOCUMENT REFERENCES

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APPENDICES

DRAWINGS

1.0 Introduction

SLR Consulting Limited (SLR) was commissioned by Ibstock Brick Limited (Ibstock) to undertake intrusive works to allow for the installation of 3No. groundwater wells at their Ravenhead site located off Chequers Lane, Up Holland, Lancashire; hereafter referred to as the Site (Drawing 001).

This report describes the detail of the intrusive investigation which was undertaken between 7th – 24th October 2019, comprising the construction and installation of 3No. monitoring wells.

A groundwater monitoring programme is required to discharge Condition 5 of the Planning Permission granted by Lancashire County Council under application LCC/2014.0008[1].

1.1 Site History

The Site currently extracts Carboniferous clay and shale for the manufacture of bricks and siltstone and shales for general purposes. The resource is extracted through surface mining methods. The maximum permitted depth of the existing quarry operations is 60mAOD; the groundwater wells were proposed to extend 10m beyond this depth to 50mAOD.

1.2 Scope of Work

The scope of work for this investigation was devised by SLR and included:

- utilities service search;
- preparation of a detailed Health and Safety Plan;
- clearance of borehole locations using a Cable Avoidance Tool (C.A.T) and Genny;
- boring and installation of 3No. rotary open-hole boreholes to a maximum of 92.1mbgl; and
- production of a factual report to include ground and hydrogeological conditions.

[1] Lancashire County Council (10 January 2014) Application under the Environment Act 1995 for the review working and restoration conditions of an old mining permission at Ravenhead quarry, Ibstock Brick, Chequer Land, Up Holland. Application No. LCC/2014/0008.

2.0 Intrusive Works

2.1 Scope of Works

The intrusive investigation comprised:

- clearance of borehole locations using a Cable Avoidance Tool (C.A.T) and Genny;
- excavation of hand-dug pits to 1.2m below ground level (bgl) to prove the absence of underground services at borehole locations;
- boring 4No. rotary open-hole boreholes to a maximum of 92.1mbgl;
- installation of 3No. 125mm outer diameter (OD) groundwater wells;
- supervision and logging of all boring in accordance with BS5930:2015 by a suitably qualified engineer.

Whilst boring RH-BH02-19, coal workings were encountered; the borehole was grouted to surface and an alterative location was found for completion of the groundwater monitoring well (RH-BH02A-19).

All borehole locations were surveyed using a handheld GPS receiver (+/- 5m accuracy) and their respective locations are presented on Drawing 002.

2.2 Utilities

No utilities were identified to be near the proposed locations during the desk-based search. Despite this, all intrusive locations were scanned using a C.A.T and Genny and inspection pits were excavated to 1.2m bgl to further prove the absence of any services.

2.3 Summary of Ground Conditions

The drilling methodology does not provide samples adequate for detailed logging, however notes have been made on ground conditions encountered during the investigation. These are shown on the borehole logs in Appendix 01.

A review of the BGS geological mapping[2] shows no Superficial Deposits are present beneath the Site itself, however areas of Till, comprising Diamicton, are recorded to be present overlying the bedrock geology surrounding the main quarry area. The Site is shown to be underlain by solid geology of the Pennine Lower Coal Measures Formation of the Upper Carboniferous Pennine Coal Measures Group (PCM), typically comprising interbedded mudstone, siltstone and sandstone.

Four rotary boreholes were excavated at peripheral locations of the Site, using open-hole techniques. Made Ground was encountered in three of the four boreholes (RH-BH01-19, RH-BH02-19 and RH-BH02A-19), comprising clay with some silt, sand and gravel content. Gravel was of brick, coal, sandstone and mudstone.

No Superficial Deposits were recorded during the intrusive works; Made Ground, where present, was directly underlain by solid geology. Bedrock comprising interbedded mudstone and sandstone was encountered in all boreholes.

Whilst progressing RH-BH02-19, coal workings were noted to be present from 34.0m bgl. The arisings included wood chippings and mudstone, indicating that the workings had been backfilled. Between 35.5 – 37.0m bgl, there was little-to-no recovery and the drilling operative recorded a 50% loss of flush. The borehole was

[2] http://mapapps.bgs.ac.uk/geologyofbritain/home.html?. Accessed 8th November 2019.

terminated at 37.0m bgl and backfilled to surface with a bentonite-cement grout. No settlement was noted at ground level following the backfilling.

No visual or olfactory evidence of contamination was observed within the boreholes.

2.4 Groundwater

Groundwater was encountered in all boreholes. Table 2-1, below, details the strike recordings. All boreholes were flushed until the groundwater ran clear prior to installation of each monitoring well.

Table 2-1
Groundwater Details

Location	Depth of Strike (m bgl)	Depth of Strike (mAOD)
RH-BH01-19	35.0	79.0
	40.0	74.0
RH-BH02-19	30.5	107.5
RH-BH02A-19	47.0	91.0
RH-BH03-19	18.0	124.0
	43.0	99.0

2.5 Monitoring Wells

Standpipe piezometers were installed upon completion of three of the boreholes to allow for subsequent groundwater monitoring.

Each completed well comprised 120mm OD pipework, with the slotted section surrounded by a gravel filter pack, extending at least 1500mm above the response zone. A minimum 500mm of sand was installed above the gravel, with a bentonite seal of at least 1000mm thickness. The wells were completed with a bentonite-cement grout to just below ground level to allow for installation of the steel headworks.

Resting levels were established once the boreholes were completed and the final headworks installed. The findings are presented within Table 2-2.

Table 2-2
Post-Installation Groundwater Details

Location	Depth (m bgl)	Depth (m below cover top)	Depth (mAOD)
RH-BH01-19	13.52	14.02	100.48
RH-BH02A-19	32.65	33.20	105.85
RH-BH03-19	36.36	36.86	105.64

APPENDIX 1

BOREHOLE LOGS

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

Sheet
1 of 7

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
						113.90		0.10	TOPSOIL : Very soft brown slightly sandy CLAY with frequent rootlets. MADE GROUND : Firm red mottled greyish brown sandy very gravelly CLAY. Sand is medium to coarse. Gravel is subangular fine to coarse of brick, sandstone and mudstone.	
								(5.60)		
						108.30		5.70	Dark grey MUDSTONE. *5.70 - 7.50 : Weathered. Recovered as dark grey gravelly CLAY. Gravel is subangular fine to medium of mudstone.*	
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
11									Dark grey MUDSTONE.	
12										
13										
14										
15										
16										
17										
18										
19									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
21									Dark grey MUDSTONE.	
22										
23										
24										
25								(35.30)		
26										
27										
28										
29										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
31									Dark grey MUDSTONE.	
32										
33										
34										
35					▼					
36										
37										
38										
39					▽				Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

Sheet
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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
						73.00		41.00		
41						72.80		41.20	Light grey SANDSTONE.	
									Dark grey MUDSTONE.	
42										
43										
44										
45										
46										
47										
48										
49										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
51									Dark grey MUDSTONE.	
52										
53										
54										
55								(22.80)		
56										
57										
58										
59										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH01-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	22/10/2019	114.00m	E351111 N404678

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
61									Dark grey MUDSTONE.	
62										
63										
64						50.00		64.00	Borehole Complete at 64.00m	
65										
66										
67										
68										
69										

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	14/10/2019	138.00m	E351519 N404838

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
						137.75		0.25	TOPSOIL : Very soft brown slightly sandy CLAY with frequent rootlets. Occasional angular fine gravel of brick and sandstone.	
								(2.45)	MADE GROUND : Stiff brown mottled grey slightly silty sandy CLAY with frequent angular fine gravel of sandstone. *0.80 - 1.10 : Subangular cobbles of yellowish brown sandstone and dark grey mudstone.*	
						135.30		2.70		
								(1.10)	Dark grey MUDSTONE.	
						134.20		3.80		
						133.80		4.20	Black COAL.	
								(1.80)	Dark grey MUDSTONE.	
						132.00		6.00		
						131.50		(0.50) 6.50	Black COAL.	
								(0.80)	Dark grey MUDSTONE.	
						130.70		7.30		
						130.40		7.60	Black COAL.	
									Dark grey MUDSTONE.	

Borehole Continued on Next Page

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated due to presence of coal workings 34.0-37.0m bgl.
3. Backfilled with bentonite grout.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 200mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	14/10/2019	138.00m	E351519 N404838

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
11									Dark grey MUDSTONE.	
12										
13										
14										
15								(22.50)		
16										
17										
18										
19										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated due to presence of coal workings 34.0-37.0m bgl.
3. Backfilled with bentonite grout.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 200mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	14/10/2019	138.00m	E351519 N404838

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
21									Dark grey MUDSTONE.	
22					▼					
23										
24										
25										
26										
27										
28										
29										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated due to presence of coal workings 34.0-37.0m bgl.
3. Backfilled with bentonite grout.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 200mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	14/10/2019	138.00m	E351519 N404838

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
						~~107.90~~		~~30.10~~	Dark grey MUDSTONE.	
					▽	107.50		30.50	Black COAL.	
31									Dark grey MUDSTONE.	
32								(3.50)		
33										
34						104.00		34.00		
								(1.50)	MADE GROUND : Grey MUDSTONE with occasional gravel of coal. *34.00 : Wood.*	
35						102.50		35.50		
36								(1.50)	NO RECOVERY.	
37						101.00		37.00		
38									Borehole Complete at 37.00m	
39										

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated due to presence of coal workings 34.0-37.0m bgl.
3. Backfilled with bentonite grout.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 200mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
						138.20		0.30	TOPSOIL : Brown slightly sandy CLAY with frequent rootlets.	
								(2.50)	MADE GROUND : Firm reddish brown mottled grey slightly gravelly silty CLAY. Gravel is angular fine to medium of coal, sandstone and mudstone.	
						135.70		2.80	Dark grey MUDSTONE.	
									Borehole Continued on Next Page	

1
2
3
4
5
6
7
8
9

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
11									Dark grey MUDSTONE.	
12										
13										
14										
15								(29.70)		
16										
17										
18										
19										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

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SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
21									Dark grey MUDSTONE.	
22										
23										
24										
25										
26										
27										
28										
29									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
4 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
						106.00		32.50		
						105.70		32.80	Black COAL.	
								(1.20)	Dark grey MUDSTONE.	
						104.50		34.00		
								(5.40)	Light grey fine to medium grained SANDSTONE.	
						99.10		39.40		
									Dark grey MUDSTONE.	
									Borehole Continued on Next Page	

31 32 33 34 35 36 37 38 39

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
5 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
41									Dark grey MUDSTONE.	
42										
43										
44										
45								(11.40)		
46										
47					▼					
48										
49										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
6 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
						87.70		50.80		
51									Light grey fine to medium grained micaceous SANDSTONE.	
52										
53										
54								(6.70)		
55										
56										
57										
						81.00		57.50		
58									Dark grey MUDSTONE.	
59										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
7 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
61									Dark grey MUDSTONE.	
62										
63										
64										
65								(17.10)		
66										
67										
68										
69										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
8 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
71									Dark grey MUDSTONE.	
72										
73										
74						63.90		74.60		
75									Light grey fine to medium grained SANDSTONE.	
76										
77										
78										
79										

Borehole Continued on Next Page

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH02A-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	16/10/2019	138.50m	E351501 N404812

Project:
Ravenhead Site Investigation

Sheet
9 of 9

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Light grey fine to medium grained SANDSTONE.	
81										
82										
83										
84								(13.90)		
85										
86										
87										
88						50.00		88.50		
89									Borehole Complete at 88.50m	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
1 of 10

SAMPLES & TESTS					Water	STRATA				Instrument
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Backfill
								(0.70)	Firm reddish brown slightly gravelly silty CLAY. Gravel is angular fine of mudstone and siltstone.	
						141.30		0.70	Dark grey MUDSTONE. *0.70 - 2.00 : Weathered. Recovered as dark grey gravelly CLAY. Gravel is subangular fine to medium of mudstone.*	
								(11.00)		
									Borehole Continued on Next Page	

1
2
3
4
5
6
7
8
9

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
2 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
						130.30		11.70		
								(0.50)	Light grey fine to medium grained SANDSTONE.	
						129.80		12.20		
									Dark grey MUDSTONE.	
								(5.80)		
					▼	124.00		18.00		
						123.70		18.30	Black COAL.	
									Dark grey MUDSTONE.	
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
3 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
21										
22								(5.90)		
23										
24						117.80		24.20		
						117.50		24.50	Black COAL.	
									Dark grey MUDSTONE.	
25										
26										
27										
28										
29										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
4 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
31										
32										
33										
34										
35								(20.50)		
36										
37										
38										
39										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
5 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Dark grey MUDSTONE.	
41										
42										
43					▼					
44										
45						97.00		45.00	Light grey fine to medium grained micaceous SANDSTONE.	
46										
47									*47.00 - 50.00 : Recovered as angular coarse GRAVEL.*	
48								(8.10)		
49										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
6 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Light grey fine to medium grained micaceous SANDSTONE.	
						88.90		53.10		
									Dark grey MUDSTONE.	
								(8.90)		
									Borehole Continued on Next Page	

51 52 53 54 55 56 57 58 59

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
7 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
						80.00		62.00	Dark grey MUDSTONE.	
						79.40		(0.60) 62.60	Black COAL.	
						79.00		63.00	Dark grey MUDSTONE.	
						78.50		(0.50) 63.50	Black COAL.	
						76.80		(1.70) 65.20	Dark grey MUDSTONE.	
						76.00		(0.80) 66.00	Black COAL.	
									Dark grey MUDSTONE.	
									Borehole Continued on Next Page	

61 62 63 64 65 66 67 68 69

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
8 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
71									Dark grey MUDSTONE.	
72										
73										
74										
75								(26.10)		
76										
77										
78										
79										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
9 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
81									Dark grey MUDSTONE.	
82										
83										
84										
85										
86										
87										
88										
89										
									Borehole Continued on Next Page	

General Remarks

1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added

From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

BOREHOLE LOG

BOREHOLE No
RH-BH03-19

Client:
Ibstick Brick

Project No:	Date:	Ground Level:	Co-ordinates:
416.00461.00048	08/10/2019	142.00m	E351545 N404633

Project:
Ravenhead Site Investigation

Sheet
10 of 10

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	SPT N Value 10 20 30 40		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
91									Dark grey MUDSTONE.	
92						49.90		92.10	Borehole Complete at 92.10m	
93										
94										
95										
96										
97										
98										
99										

General Remarks

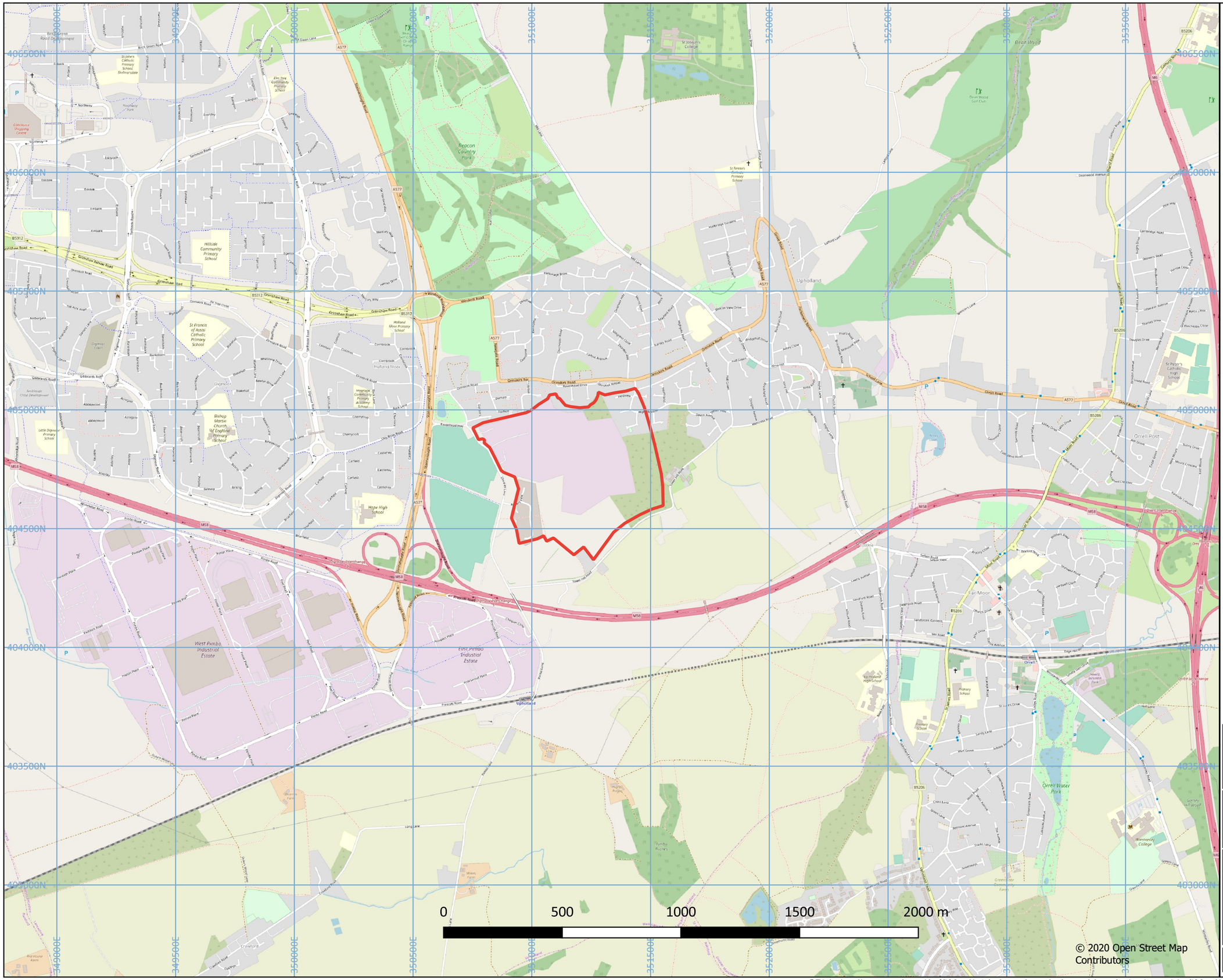
1. Scanned with C.A.T. and hand-dug inspection pit to 1.2m bgl prior to drilling.
2. Terminated at target depth.
3. Completed with 125mm OD groundwater well.

Water Added	
From	To

All dimensions in metres	Contractor: Apex Drilling Services	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Fraste	Hole Size: 165mm	SW	BM

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015

DRAWINGS



Ibstock Plc

SLR
3rd FLOOR, BREW HOUSE
JACOB STREET
BRISTOL
BS2 0EQ
T: 0117 906 4280
www.slrconsulting.com

RAVENHEAD QUARRY

WATER MONITORING WELLS

001

SITE LOCATION

Scale	Date
1:15,000 (A3)	DEC 2019

Legend

SITE BOUNDARY

BOREHOLE LOCATION

Ibstock Plc

SLR
3rd FLOOR, BREW HOUSE
JACOB STREET
BRISTOL
BS2 0EQ
T: 0117 906 4280
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RAVENHEAD QUARRY

WATER MONITORING WELLS

002

BOREHOLE LOCATIONS

Scale	Date
1:2,500 (A3)	DEC 2019

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
belfast@slrconsulting.com

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
T: +44 (0)141 353 5037

GUILDFORD
T: +44 (0)1483 889800

LONDON
T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14

Nature and Heritage Conservation

Screening Report: Bespoke Waste

Reference	**EPR/LB3107GH/A001**
NGR	**SD 51260 04790**
Buffer (m)	**150**
Date report produced	**11/01/2023**
Number of maps enclosed	**2**

The nature and heritage conservation sites and/or protected species and habitats identified in the table below must be considered in your application.

Nature and heritage conservation sites	Screening distance (m)	Further Information
Sites of Special Scientific Interest (SSSI)	1000	Natural England
Ravenhead Brickworks		
Local Wildlife Sites (LWS)	200	Appropriate Local Record Centre (LRC)
Pimbo Lane Pit		

The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

Please note we have screened this application for protected and priority sites, habitats and species for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

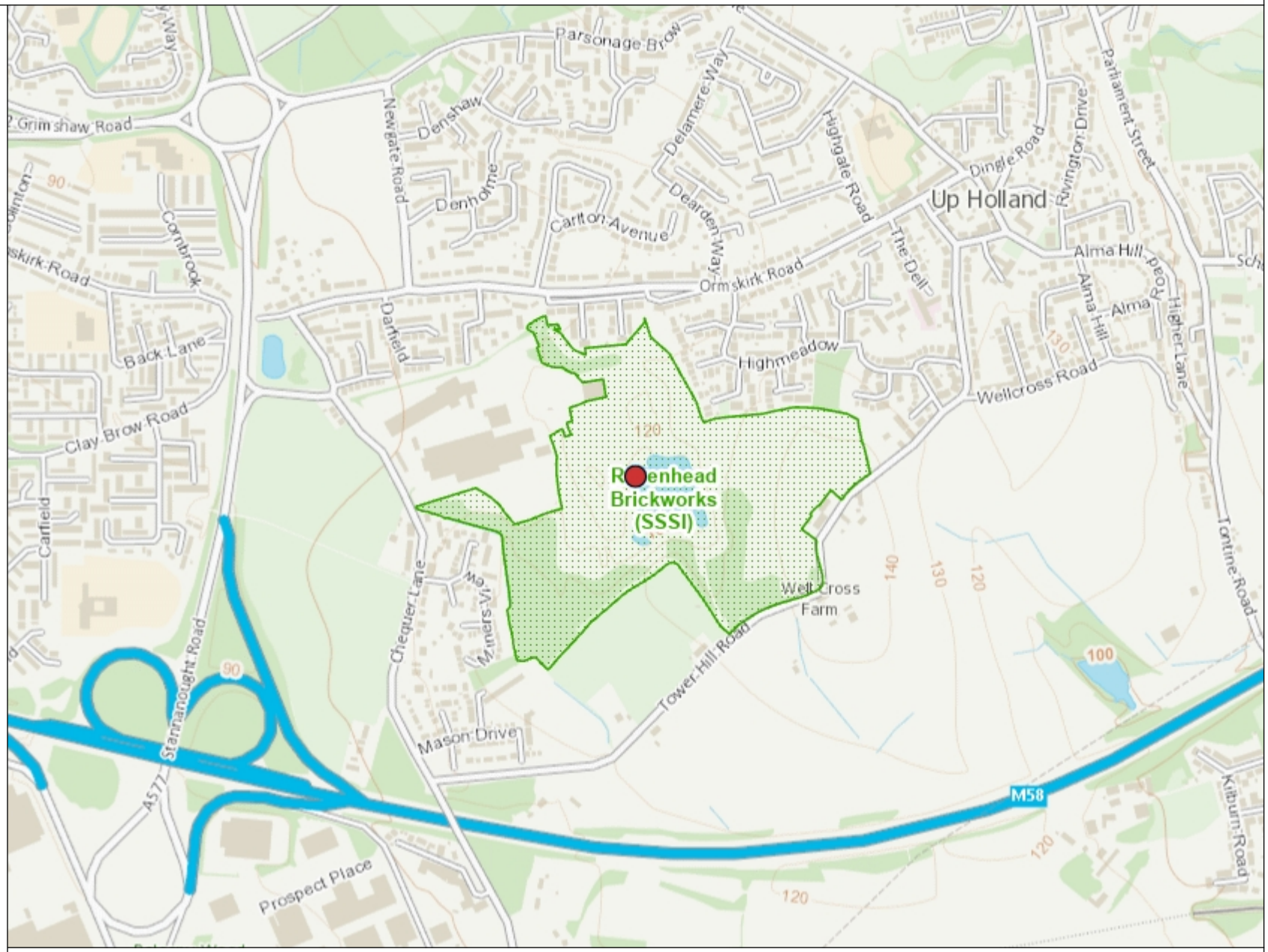
Please note the nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information.

Sites of Special Scientific Interest

Environment Agency

Legend

SSSI (England)



1: 10,000

0 250

Metres

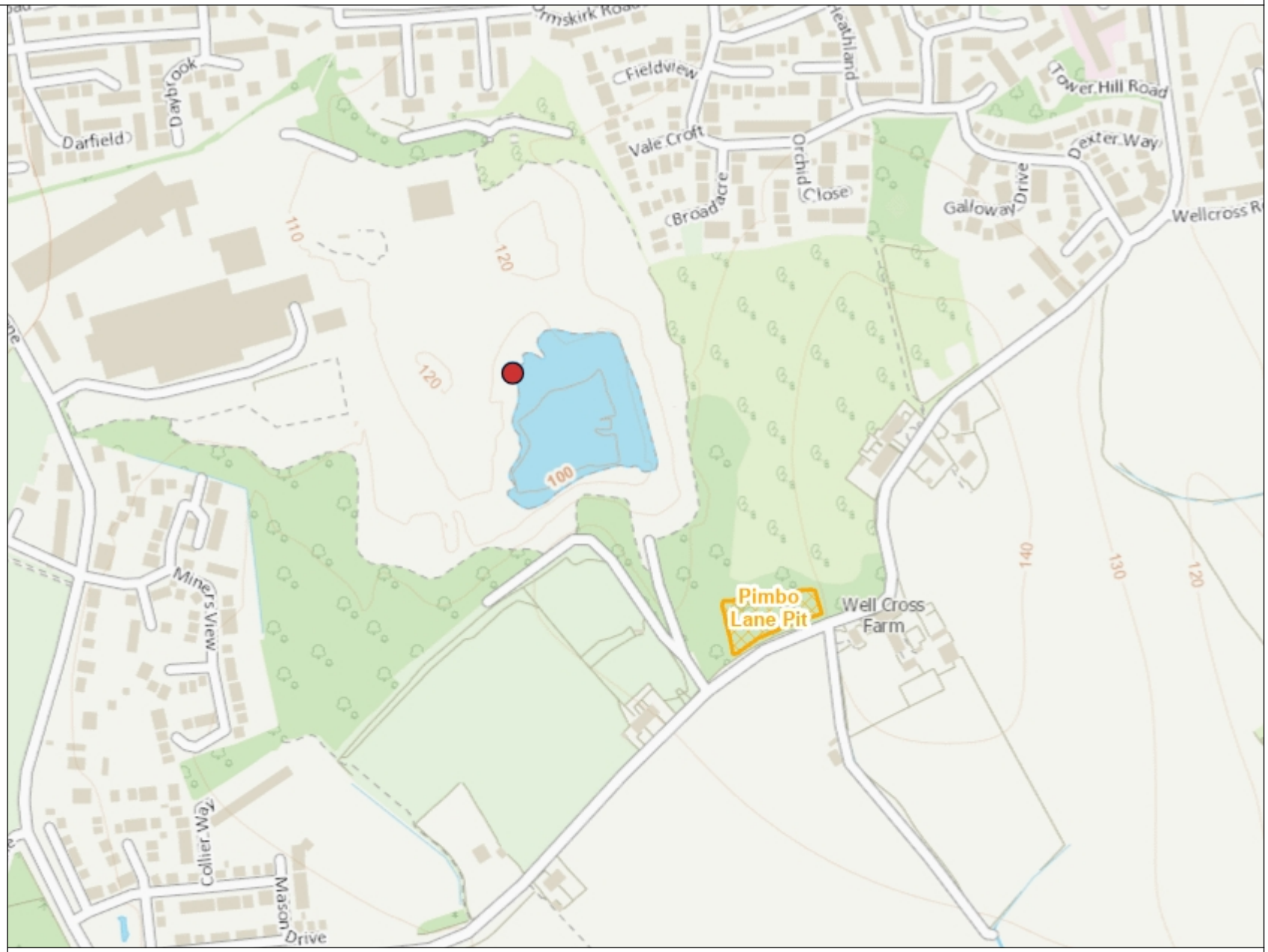
N W E S

Local Wildlife Sites

Environment Agency

Legend

Local Wildlife Sites



1: 5,000

0 125

Metres

N

W E

S

A1

N
W E
S

River Tawd

Stannanought Road
A577
Houghtons Road
Glenburn Road
Fosters Green
Beacon House Farm
Stopforths Farm
Beacon Lane
Rogers Cottages
Crow Lane
Chisnall's Farm
Farley Lane
Roby Mill
Roby Mill
School La
Walthew Green
Stoney Brow
Johnson's Farm
Pearson's Farm
Lafford Lane
Jollies Dean Farm
College Farm
College Road
Rothwell House
Mill Lane
Dean Wood
Dean Brook
Gathurst
Gathurst
Gathurst Road
Rickath Farm
B5206
Ackhurst Brook
Spring Road
Latham Lane
Prescott Lane
Ball Lane
The Bell
Orrell
Stand House Farm
Dingle Road
School Lane
Orrell Road
Orrell Post
Fleet Street
City
Redwood
Captain's Clough
Tontine
Tontine Road
Sefton Road
Church Street
Moor Road
Sandbrook Road
Sand Brook
Far Moor
St James Road
Orrell
Tueson House
Wood Cottage
Higher End
Greenslate Road
Lodge
Tracks Lane
Winstanley
Winstanley Park
Gorsey Hill Wood
Swift Gate Farm
Moss House
New House Farm
Longshaw
Longshaw Bottom
Park Road
Camp Hill
110
A571
M6
26
Hill Ho
Upholland
Brownlow
Mill House
170
Promised Land Farm
Maddocks
Strawberry Cottage
Mountains Farm
Heaton House
Captain Leigh's Farm
Higher Pimbo Farm
Long Lane
Crawford Road
Crawford
Billinge Bounty Farm
Maggots Nook Farm
Rainford Junction
Rainford
News Lane
Scythe Stone Delph Farm
The Coach House
Moss House
Moss House Farm
Reeds Brow
Randle Brook
Pimbo Road
Pimbo
West Pimbo
East Pimbo
Upholland
Ferny Knoll Cottages
Holland Moss
Ferny Knoll Road
Mole Hall
Nipe Lane
Moss Side Farm
Digmoor Road
Digmoor
M58
5
Stannanought Road
Chequer Lane
Well Cross Farm
Up Holland
Ormskirk Road
Hall Green
Hall Gn
Alma Hill
Higher Lane
A577
Grimshaw Road
B5312
East Gillibrands
Gillibrands Road
Whiteledge Road
4
SKELMERSDALE
Town Centre
Tanhouse Road
Tanhouse
A5068
Glenburn Road
Church Road
Northway
Skelmersdale Hall Clough
Birch Green
Elmers Green
Elmers Clough
Northway
Fosters Green Road
Stannanought Road
A577
Chisnall's Farm
Roby Mill
Walthew Green
House
Gathurst
Gathurst Road
B5206
Rickath Farm
Dean Wood
Ackhurst Brook
Dean Brook
Spring Road
Latham Lane
Ball Lane
Prescott Lane
The Bell
Orrell
Stand House Farm
Dingle Road
School Lane
Orrell Road
Orrell Post
Fleet Street
City
Redwood
Captain's Clough
Tontine
Tontine Road
Sefton Road
Church Street
Moor Road
Sandbrook Road
Sand Brook
Far Moor
St James Road
Orrell
Tueson House
Wood Cottage
Higher End
Greenslate Road
Lodge
Tracks Lane
Winstanley
Winstanley Park
Gorsey Hill Wood
Swift Gate Farm
Moss House
New House Farm
Longshaw
Longshaw Bottom
Park Road
Camp Hill
110
A571
M6
26
Hill Ho
Upholland
Brownlow
Mill House
170
Promised Land Farm
Maddocks
Strawberry Cottage
Mountains Farm
Heaton House
Captain Leigh's Farm
Higher Pimbo Farm
Long Lane
Crawford Road
Crawford
Billinge Bounty Farm
Maggots Nook Farm
Rainford Junction
Rainford
News Lane
Scythe Stone Delph Farm
The Coach House
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Moss House Farm
Reeds Brow
Randle Brook
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Pimbo
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SKELMERSDALE
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Tanhouse
A5068
Glenburn Road
Church Road
Northway
Skelmersdale Hall Clough
Birch Green
Elmers Green
Elmers Clough
Northway
Fosters Green Road

GENERAL NOTES

A.01 - ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
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KEY

SITE LOCATION

Rev.	Date	Description	By	Chk.	App.

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CLIENT
BOOTH VENTURES

PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
SITE LOCATION
ESID 1

STATUS

Date: 30/01/23	Scale: 1:10,000	Drawn: JM	Chk: PS	App: JB

Project No:	Org. No:	Rev:
K0158	K0158-4-001	00

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GENERAL NOTES

A.01 - ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
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KEY

SITE LOCATION / BOUNDARY

11 SITE RECEPTOR

Rev	Date	Description	By	Chk	App

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CLIENT
BOOTH VENTURES

PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
ENVIRONMENTAL SITE SETTING
ESID 2

STATUS

Date: 31/02/23	Scale: 1:1000	Drawn: JM	Chk: PS	App: JB
Project No: K0158	Drg. No: K0158-4-002	Rev: 00		

A1

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GENERAL NOTES

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KEY

SITE LOCATION / BOUNDARY

11 SITE RECEPTOR

Rev	Date	Description	By	Chk	App

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CLIENT
BOOTH VENTURES

PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

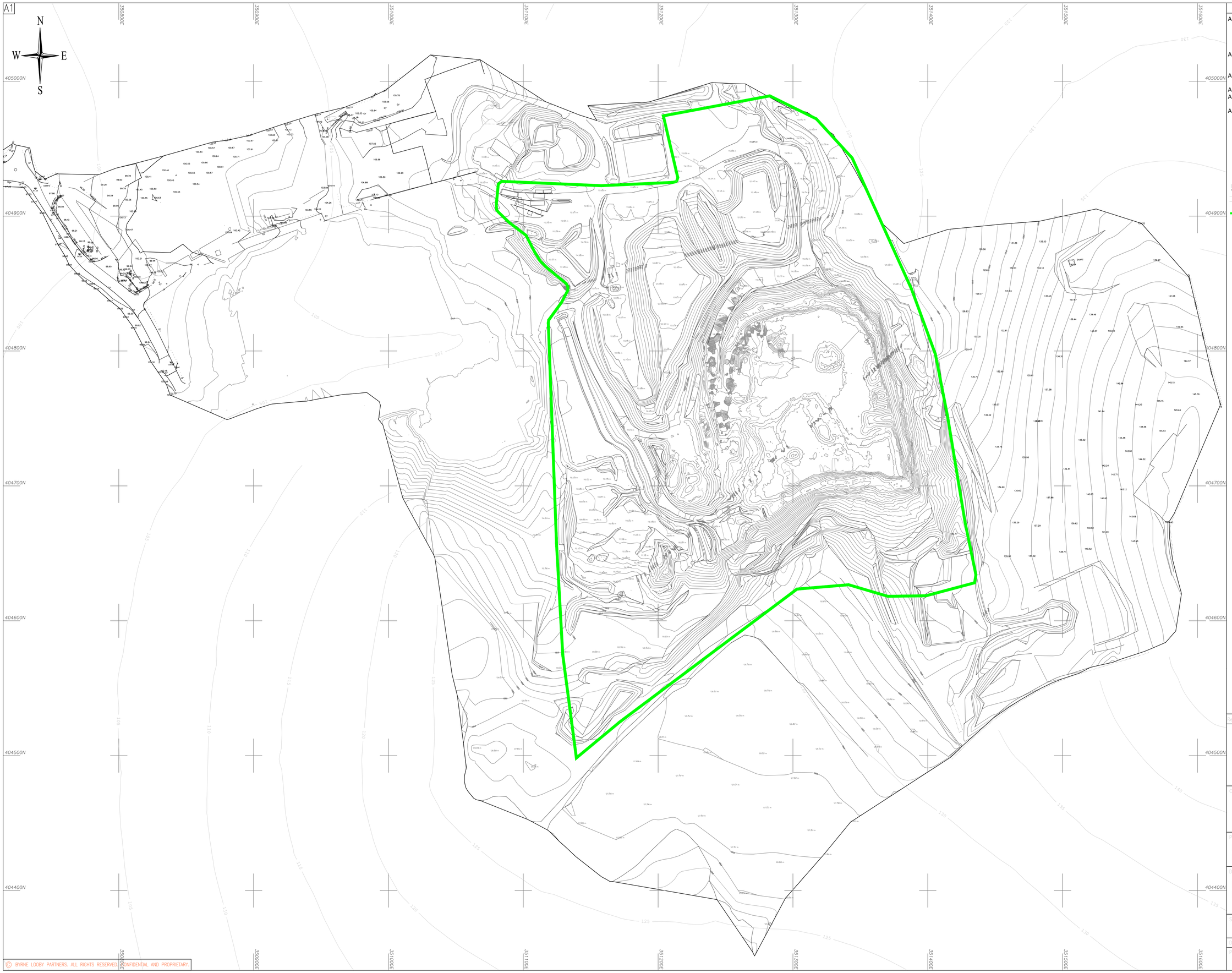
DRAWING TITLE
CULTURAL AND NATURAL HERITAGE
ESID 3

STATUS

Date: 31/02/23	Scale: 1:10000	Drawn: JM	Chc: PS	App: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-003	00

A1



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KEY

120.0 / 119.0 — EXISTING GROUND CONTOURS

PERMIT INSTALLATION BOUNDARY

Rev	Date	Description	By	Chk	App

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CLIENT:

BOOTH VENTURES

PROJECT:

RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE:

EXISTING SITE LAYOUT
ESID 4

STATUS

Date: 30/01/23	Scale: 1:1,250	Drawn: JM	Chk: PS	App: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-004	00

A1

GENERAL NOTES

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KEY

FINAL EXTRACTION CONTOURS

Rev	Date	Description	By	Chk	App

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CLIENT:

BOOTH VENTURES

PROJECT:

RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE:

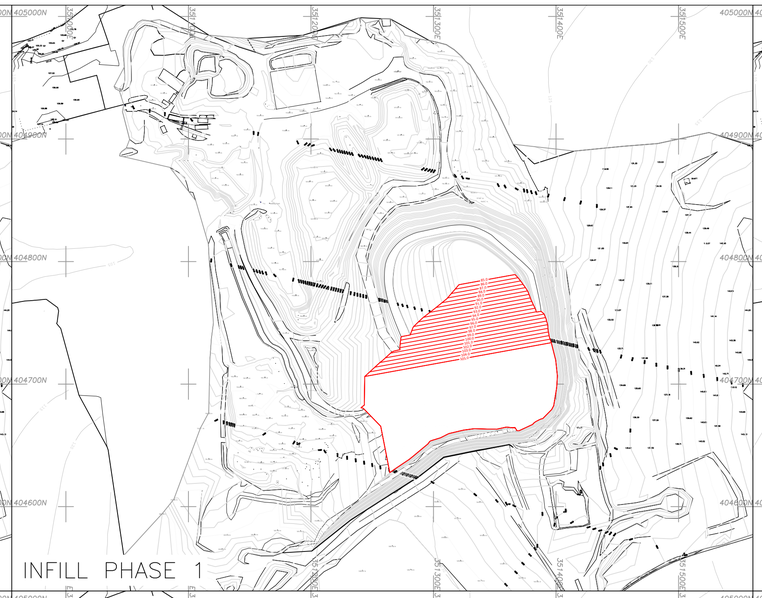
INFILL PHASING PLAN
ESID 5A

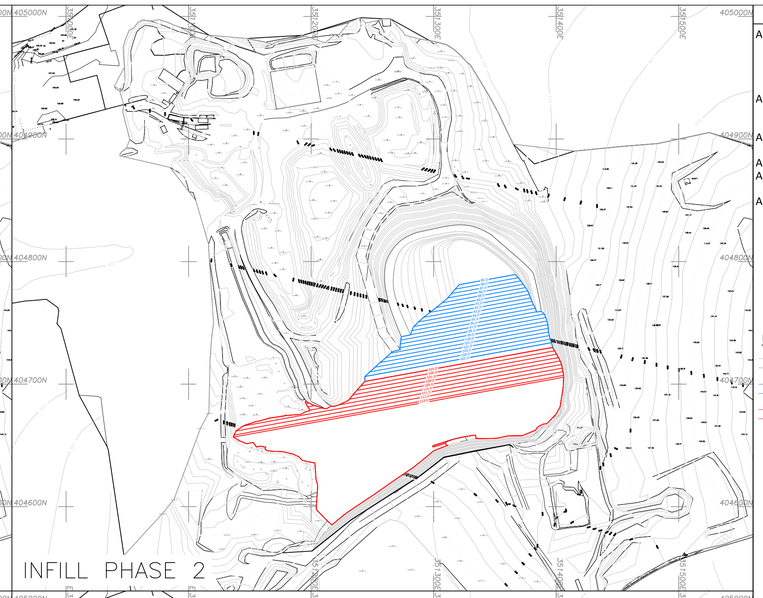
STATUS:

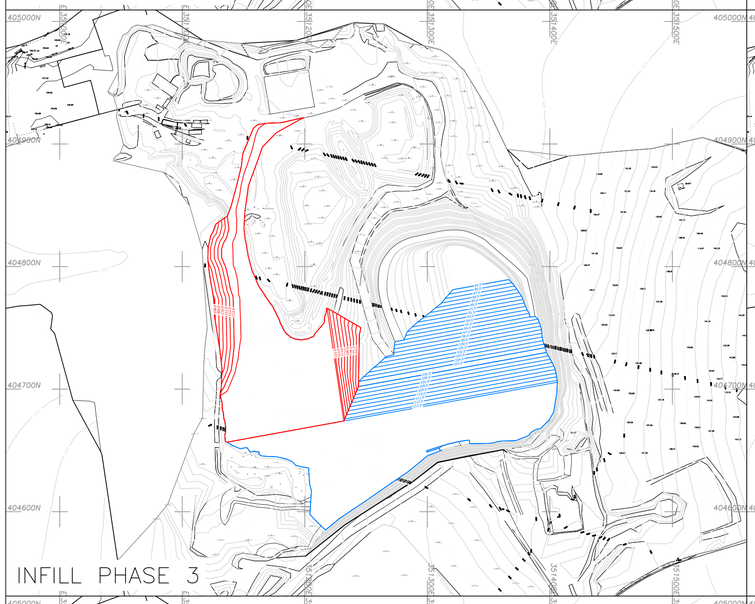
Date: 30/01/23	Scale: 1:1000	Drawn: JM	Chk: PS	App: JB

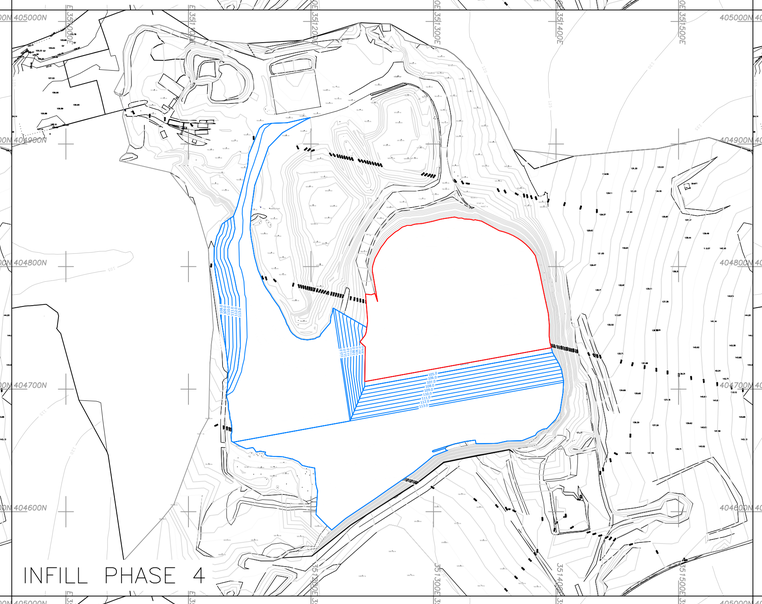
Project No:	Drg. No:	Rev:
K0158	K0158-4-005A	00

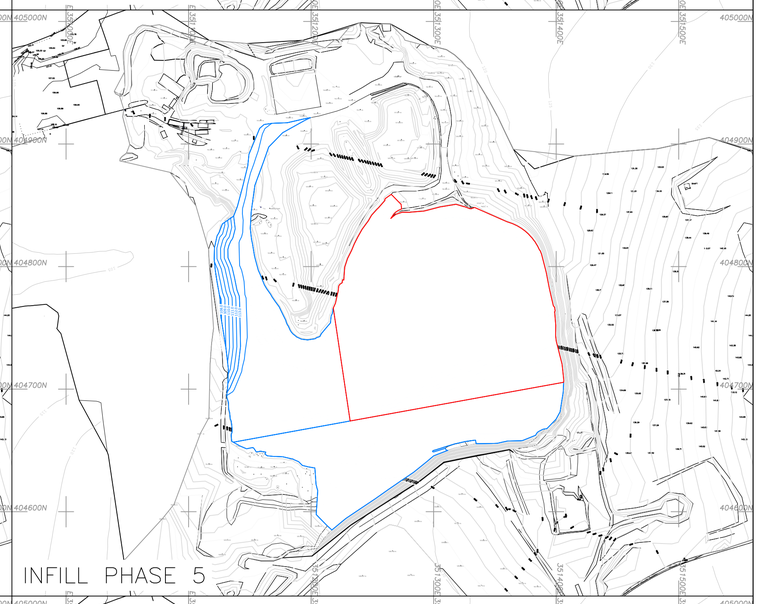
A1

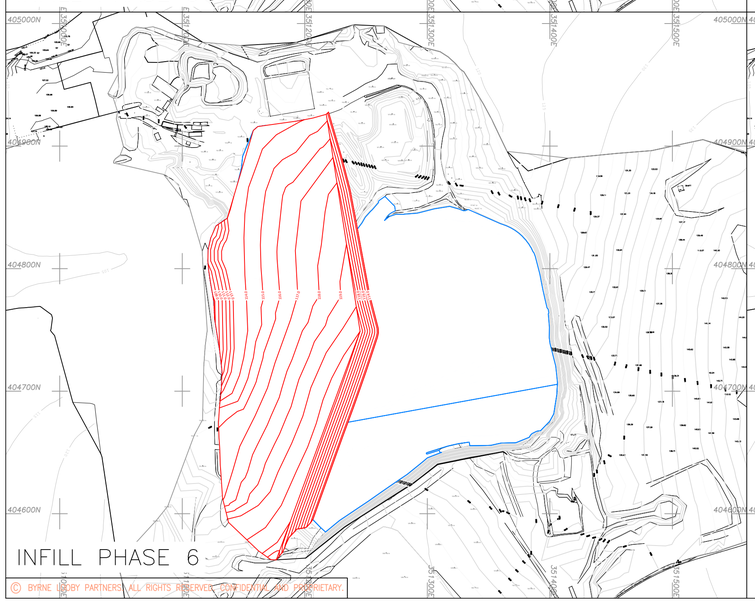


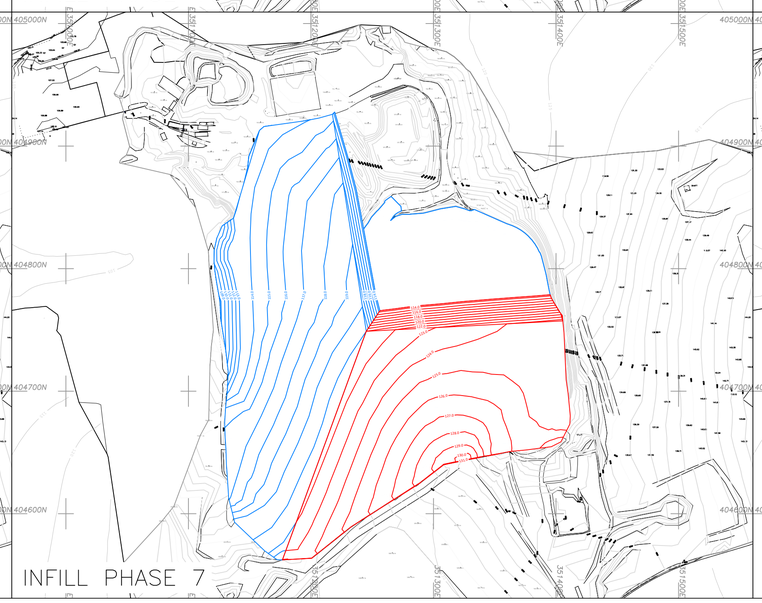


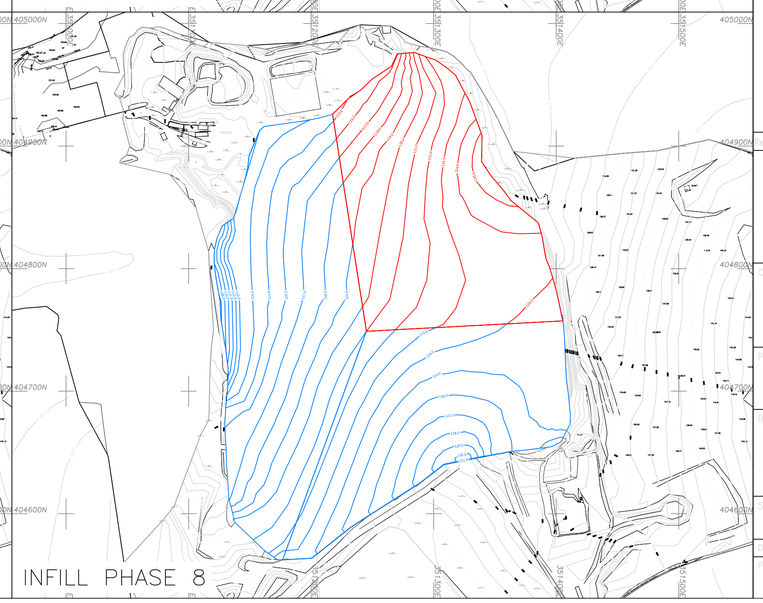












GENERAL NOTES

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KEY

FINAL EXTRACTION CONTOURS

COMPLETED INFILL PHASE CONTOURS

ACTIVE INFILL PHASE CONTOURS

Rev.	Date	Description	By	Chk	App.

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CLIENT

BOOTH VENTURES

PROJECT

RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE

INFILL PHASING PLAN
ESID 5B

STATUS

Date: 30/01/23	Scale: 1:2,500	Drawn: JM	Chk: PS	Appr: JB
Project No: K0158	Drg. No: K0158-4-005B			Rev: 00

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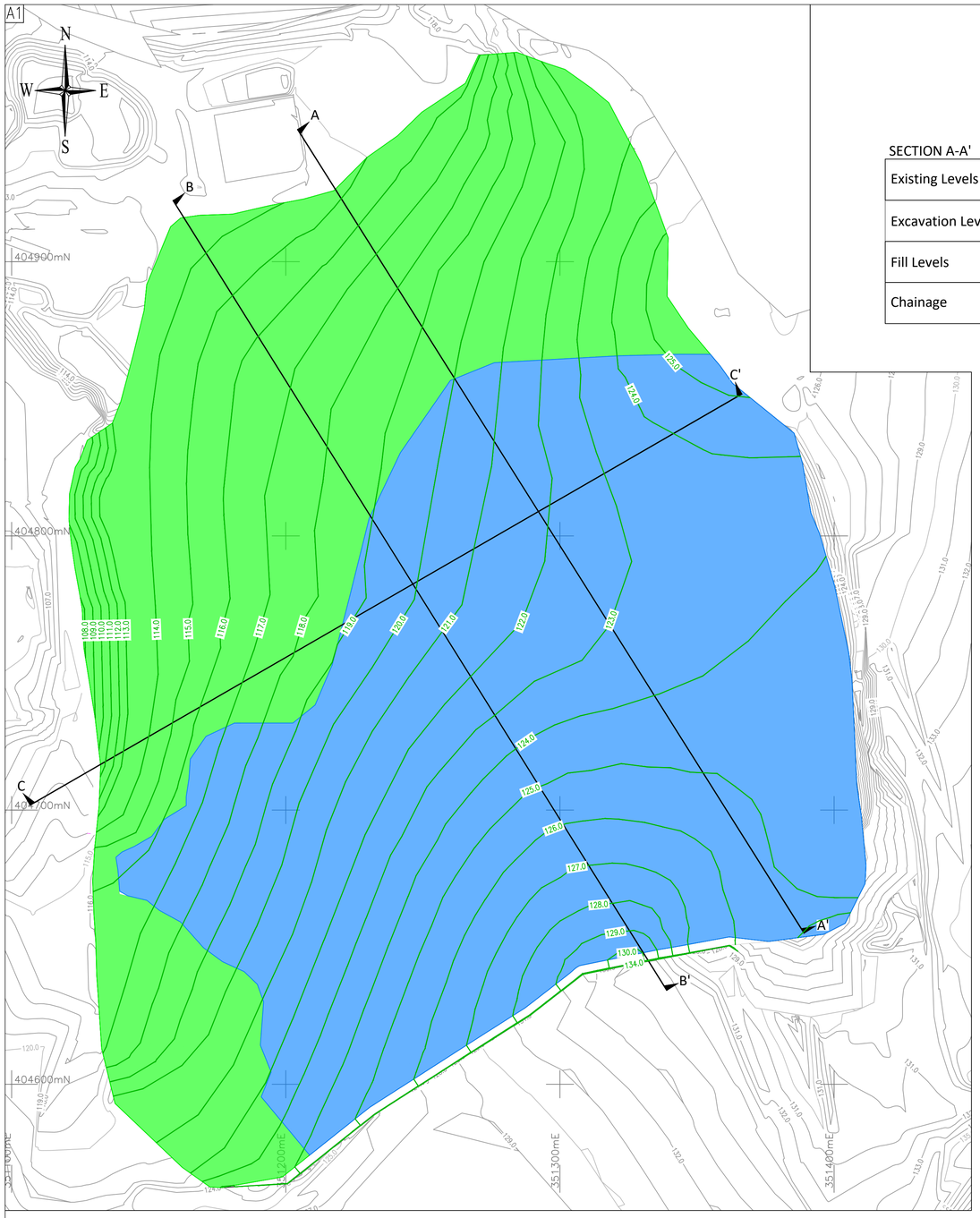
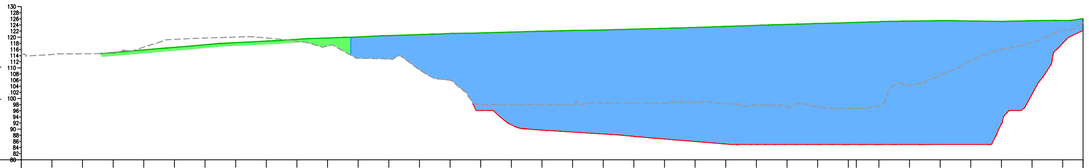
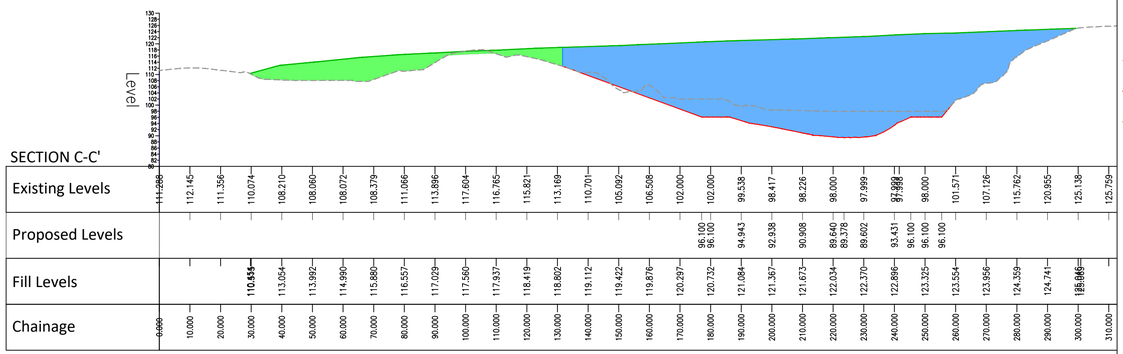


SECTION A-A'



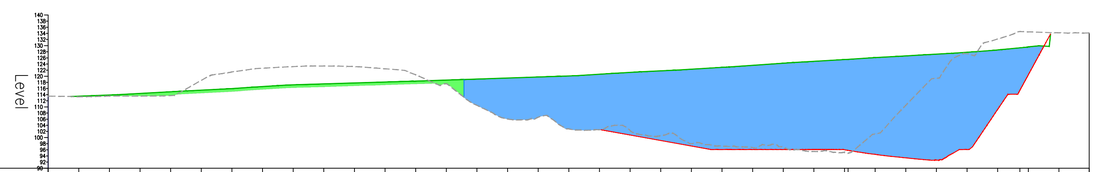
Chainage	Existing Levels	Excavation Levels	Fill Levels
0.000	114.491		
10.000	114.388		
20.000	114.609		
30.000	114.766		114.658
40.000	116.772		115.008
50.000	119.305		115.866
60.000	119.742		116.706
70.000	120.059		117.548
80.000	119.765		118.235
90.000	118.691		118.732
100.000	117.133		119.324
110.000	113.144		119.765
120.000	112.893		120.122
130.000	109.356		120.540
140.000	105.983		120.858
150.000	98.000	96.100	121.220
160.000	98.043	96.100	121.425
170.000	98.001	91.452	121.695
180.000	98.000	89.699	121.966
190.000	98.484	89.053	122.218
200.000	98.499	88.431	122.385
210.000	98.500	87.650	122.646
220.000	98.985	86.787	122.908
230.000	98.273	85.982	123.202
240.000	97.583	85.000	123.533
250.000	97.507	85.000	123.863
260.000	97.814	85.000	124.184
270.000	96.724	85.000	124.478
280.000	97.499	85.000	124.771
290.000	104.304	85.000	125.078
300.000	107.604	85.000	125.279
310.000	112.487	85.000	125.404
320.000	116.024	85.000	125.319
330.000	118.284	91.657	125.184
340.000	122.276	101.389	125.387
346.656	124.787	118.007	125.461
		122.250	126.084

SECTION C-C'



Chainage	Existing Levels	Proposed Levels	Fill Levels
0.000	111.288		
10.000	112.145		
20.000	111.356		
30.000	110.074		110.555
40.000	108.210		113.054
50.000	108.060		113.992
60.000	108.072		114.990
70.000	108.379		115.880
80.000	111.066		116.557
90.000	113.896		117.029
100.000	117.604		117.560
110.000	116.765		117.937
120.000	115.821		118.419
130.000	113.189		118.802
140.000	110.701		119.112
150.000	105.092		119.422
160.000	106.508		119.876
170.000	102.000		120.297
180.000	102.000	96.100	120.732
190.000	99.538	96.100	121.084
200.000	98.417	94.943	121.367
210.000	98.226	92.938	121.673
220.000	98.000	90.908	122.034
230.000	97.999	89.640	122.370
240.000	97.388	89.378	122.896
250.000	98.000	89.602	123.325
260.000	101.571	93.431	123.554
270.000	107.126	96.100	123.956
280.000	115.762	96.100	124.359
290.000	120.955	96.100	124.741
300.000	125.138		125.065
310.000	125.759		

SECTION B-B'



Chainage	Existing Levels	Excavation Levels	Fill Levels
0.000	113.543		
10.000	113.303		113.411
20.000	113.535		113.503
30.000	113.534		113.888
40.000	113.700		114.400
50.000	118.678		114.948
60.000	121.428		115.470
70.000	122.632		115.974
80.000	123.154		116.648
90.000	123.339		117.211
100.000	123.171		117.518
110.000	122.454		117.821
120.000	120.475		118.124
130.000	117.522		118.429
140.000	110.507		118.761
150.000	106.080		119.093
160.000	106.634		119.425
170.000	102.841		119.758
180.000	102.528		120.104
190.000	102.304		120.668
200.000	100.578		121.259
210.000	97.999		121.769
220.000	97.229	96.100	122.312
230.000	96.747	96.100	122.915
240.000	96.756	96.100	123.578
250.000	95.458	96.100	124.264
260.000	95.458	96.023	124.872
270.000	101.181	94.506	125.457
280.000	110.532	93.375	126.092
290.000	119.361	92.288	126.646
300.000	127.397	96.100	127.219
310.000	132.158	109.192	127.838
320.000	134.588	120.463	128.596
330.000	134.200	133.830	129.590
339.893	134.150		133.830

GENERAL NOTES

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KEY

- 120.0 / 119.0 — EXISTING GROUND CONTOURS
- 110.0 / 109.0 — PROPOSED RESTORATION CONTOURS
- CROSS SECTION LOCATION
- APPROXIMATE EXTENT OF LINED LANDFILL AREA
- APPROXIMATE EXTENT OF RESTORATION ONLY AREA

SECTION KEY

- EXISTING GROUND PROFILE
- APPROVED EXCAVATION PROFILE
- PROPOSED RESTORATION PROFILE
- APPROXIMATE EXTENT OF LINED LANDFILL AREA
- APPROXIMATE EXTENT OF RESTORATION ONLY AREA

Rev	Date	Description	By	Chk	App

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CLIENT: BOOTH VENTURES

PROJECT: RAVENHEAD QUARRY LANDFILL RESTORATION SCHEME

DRAWING TITLE: PROPOSED RESTORATION AND CROSS SECTIONS ESID 6

STATUS:

Date: 30/01/23	Scale: 1:1,000	Drawn: JM	Chk: PS	Appr: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-006	00

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Rodding Point

SHAFT

GENERAL NOTES

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KEY

FINAL EXTRACTION CONTOURS

LEACHATE WELL

SPINE DRAIN

Rev.	Date	Description	By	Chk	Apr.

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BOOTH VENTURES

PROJECT

RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE

LEACHATE MANAGEMENT
ESID 7A

STATUS

Date: 31/01/23	Scale: 1:500	Drawn: JM	Chk: PS	Apr: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-007A	00

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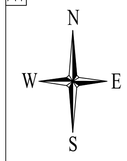

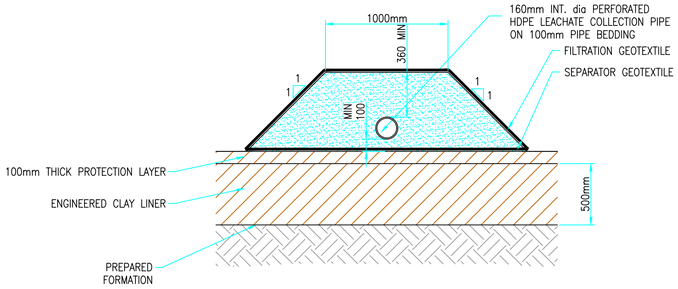

SECTION A–A: LEACHATE COLLECTION PIPE

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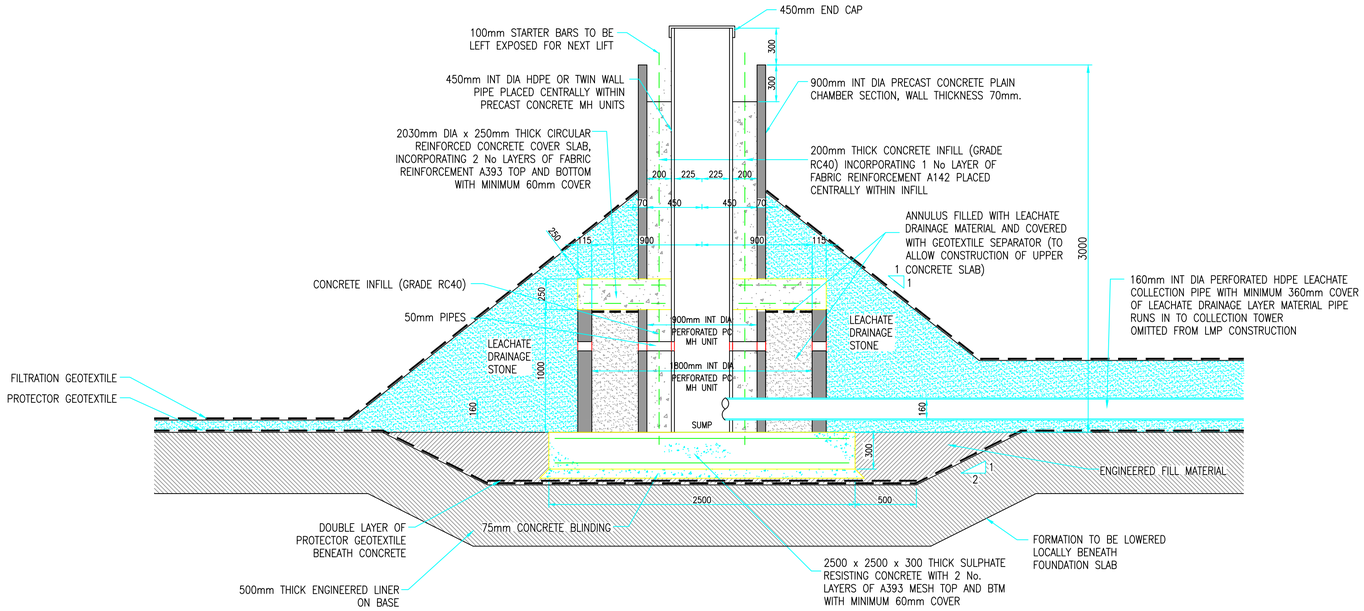
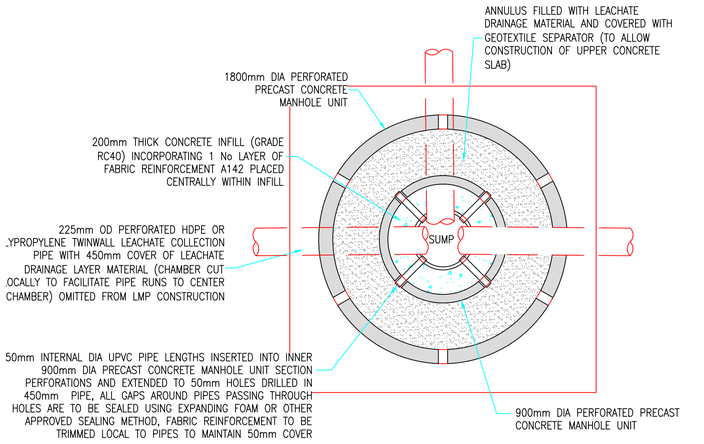


LEACHATE COLLECTION POINT AND LEACHATE MONITORING POINT CONSTRUCTION DETAIL

SCALE 1:25



PLAN OF LEACHATE COLLECTION POINT AND LEACHATE MONITORING POINT CONSTRUCTION DETAIL

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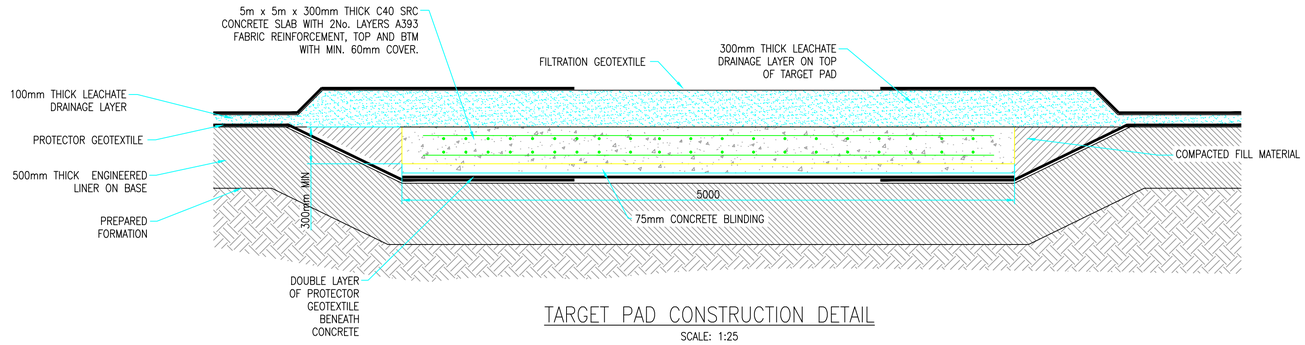

TARGET PAD CONSTRUCTION DETAIL

SCALE: 1:25

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PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
INSTALLATION ENGINEERING DETAILS
ESID 7B

STATUS

Date: 07.03.23	Scale: N/A	Drawn: JM	Chk: PS	App: JB

Project No:	Drg. No:	Rev:
K0158	K0158–4–007B	00

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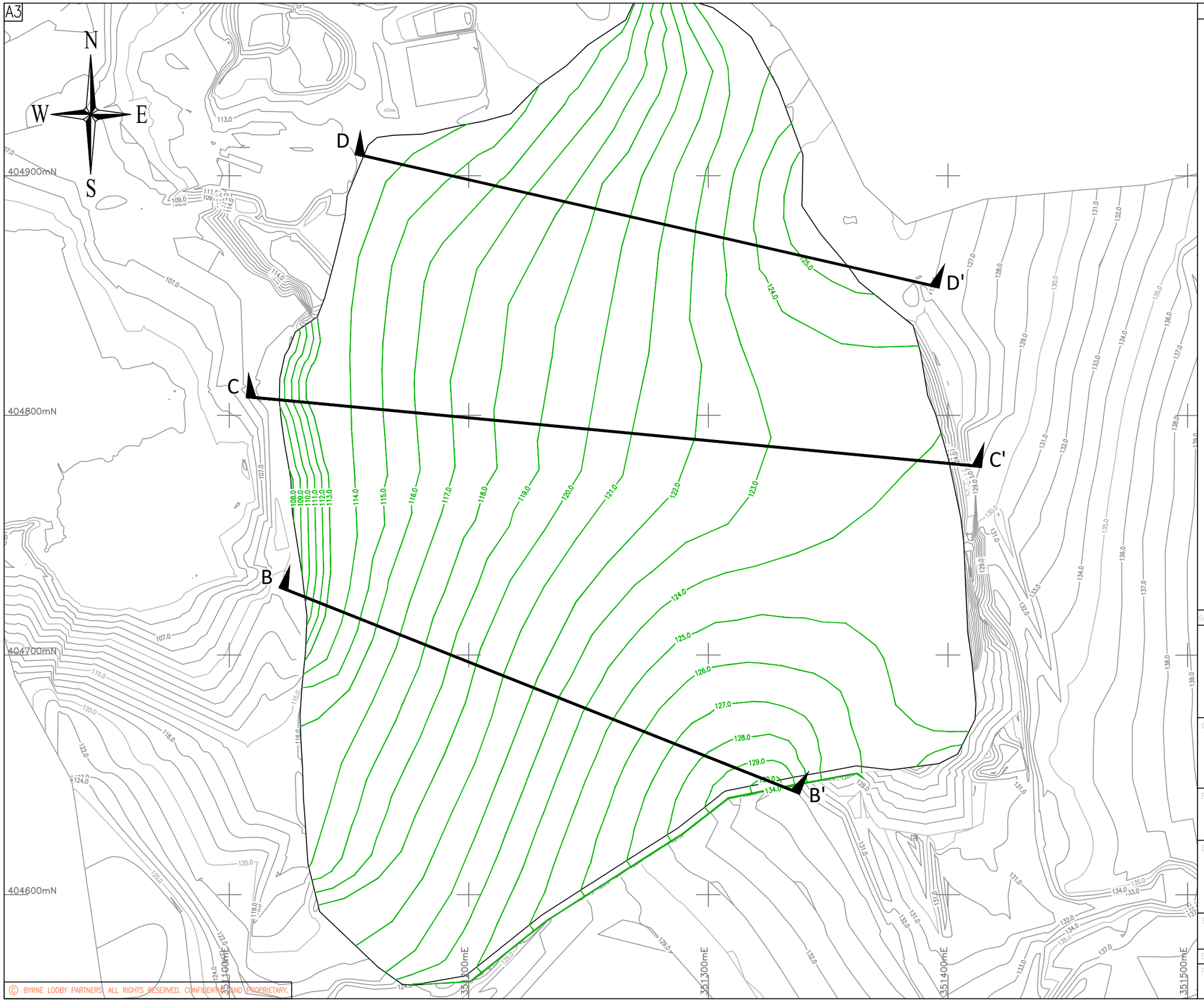

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A.07 - CROSS SECTIONS SEE DRAWING K0158-4-008 ESID 8B

KEY

120.0 / 119.0 — EXISTING GROUND CONTOURS

110.0 / 109.0 — PROPOSED RESTORATION CONTOURS

CROSS SECTION LOCATION

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PROJECT

RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE

PROPOSED RESTORATION
ESID 8

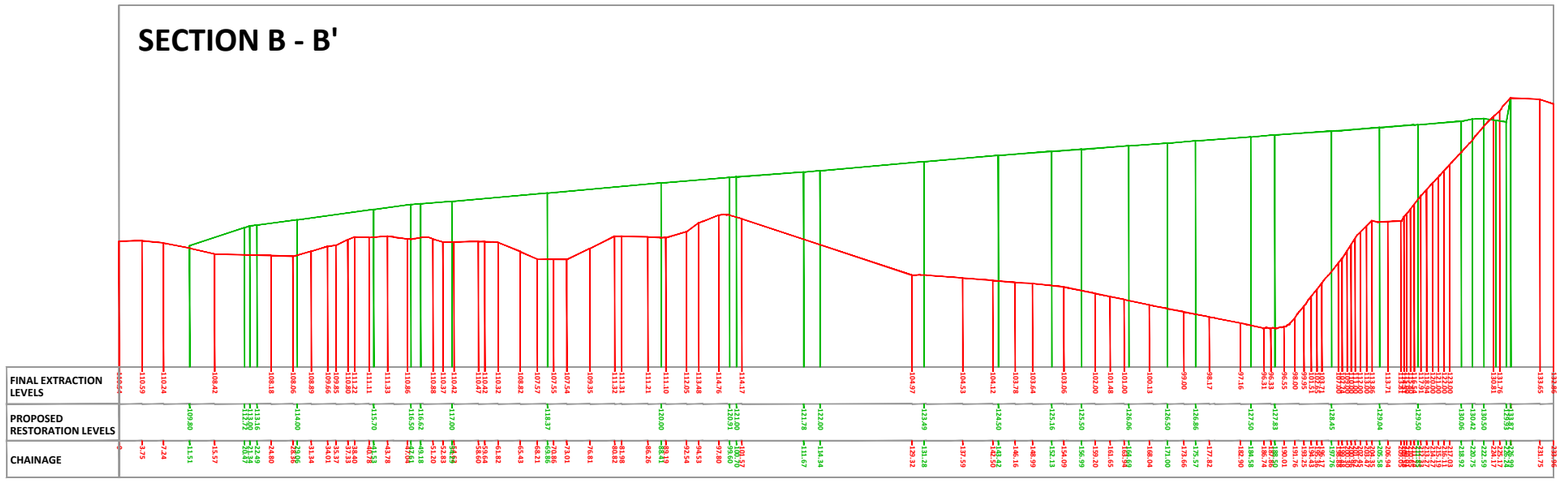
STATUS

Date: 03/2023	Scale: 1:1500	Drawn: PP	Chk: AB	App: PS

Project No:	Org. No:	Rev:
K0158	K0158-4-008 ESID 8A	

A3

SECTION B - B'



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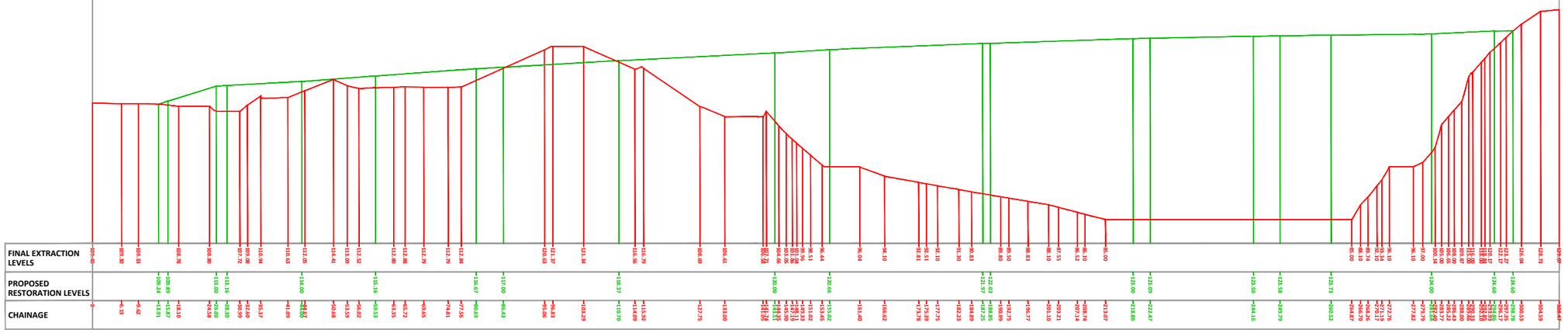

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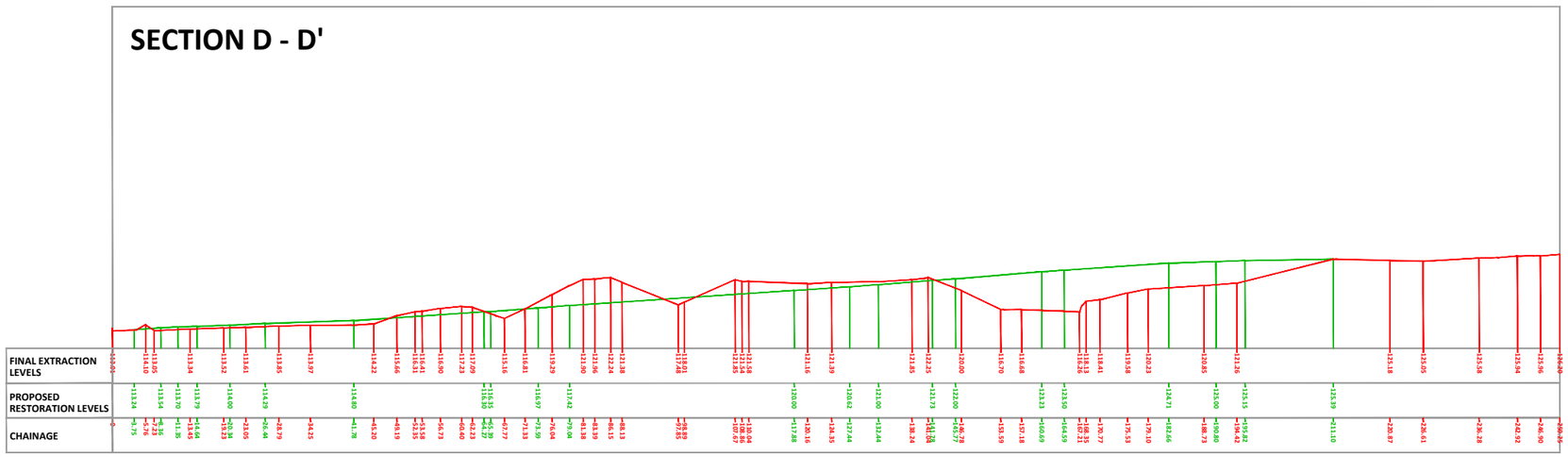

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A.07 - CROSS SECTIONS LOCATIONS SEE DRAWINGS K0158-4-008 ESID 8A

KEY

FINAL EXTRACTION PROFILE

PROPOSED RESTORATION PROFILE

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RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE

CROSS SECTIONS
ESID 8

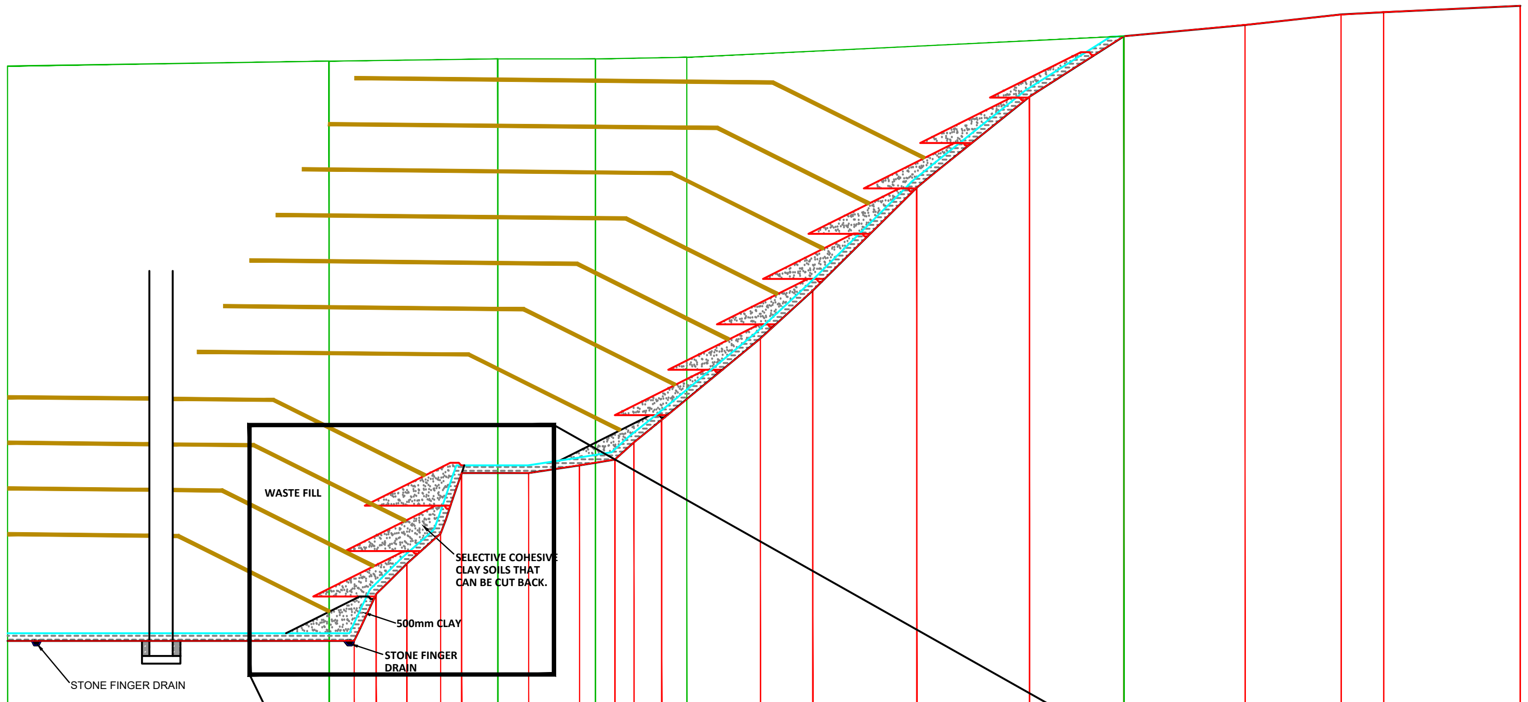
STATUS

Date: 03/2023	Scale: 1:1000	Drawn: PP	Chk: AB	App: PS

Project No:	Drg. No:	Rev:
K0158	K0158-4-008 ESID 8B	

A3

SECTION A - A'



CHAINAGE	FINAL EXTRACTION LEVELS	PROPOSED RESTORATION LEVELS
0	85.00	123.03
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22.91	85.00	
24.37	88.10	
26.39	90.10	
28.64	92.10	
30.02	96.10	
32.41		123.50
34.45	96.10	
37.82	96.62	
38.86		123.50
40.15	97.00	
41.41	98.14	
43.24	99.61	
44.91		123.60
49.77	105.00	
53.23	108.18	
60.11	115.00	
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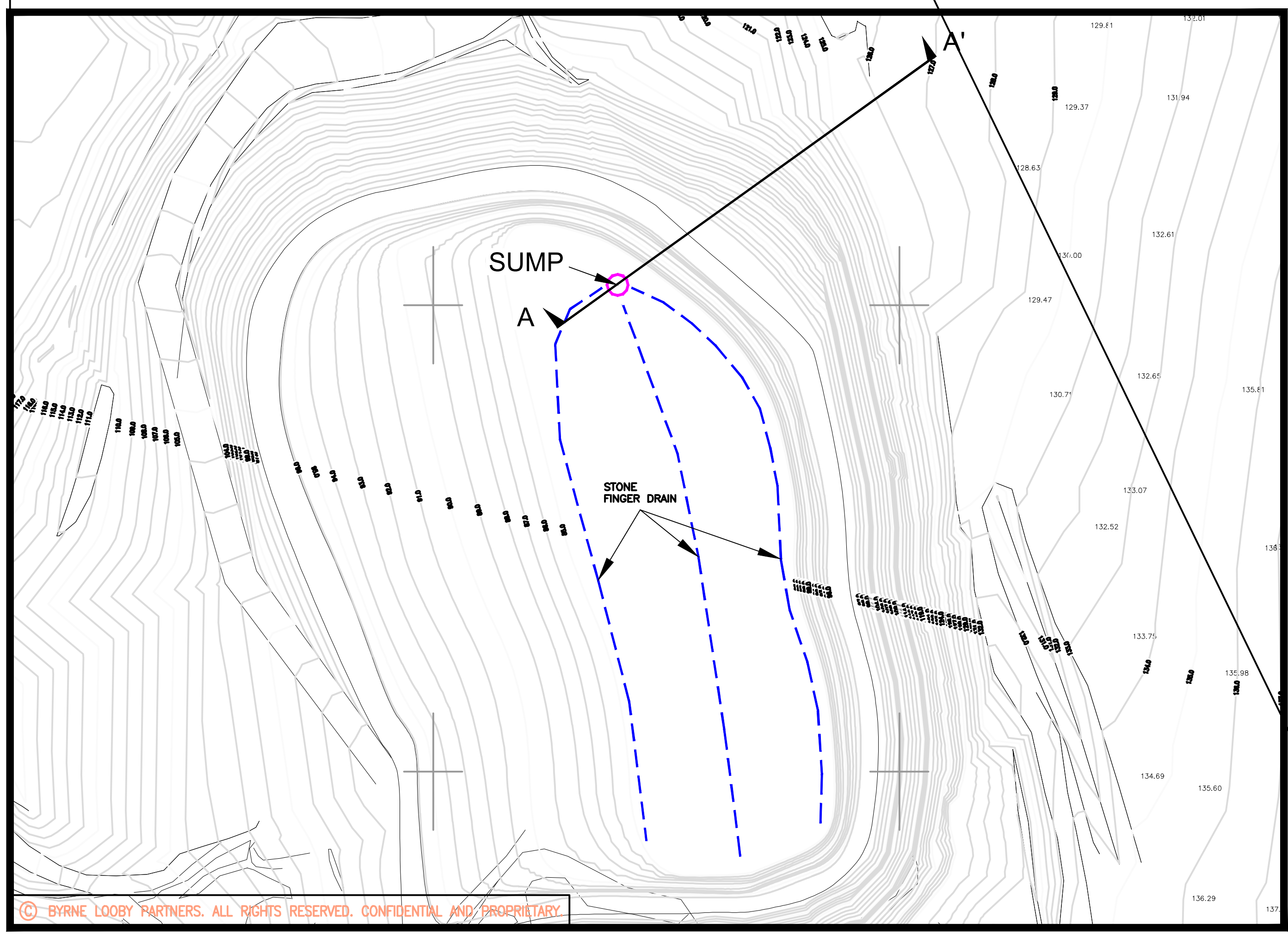

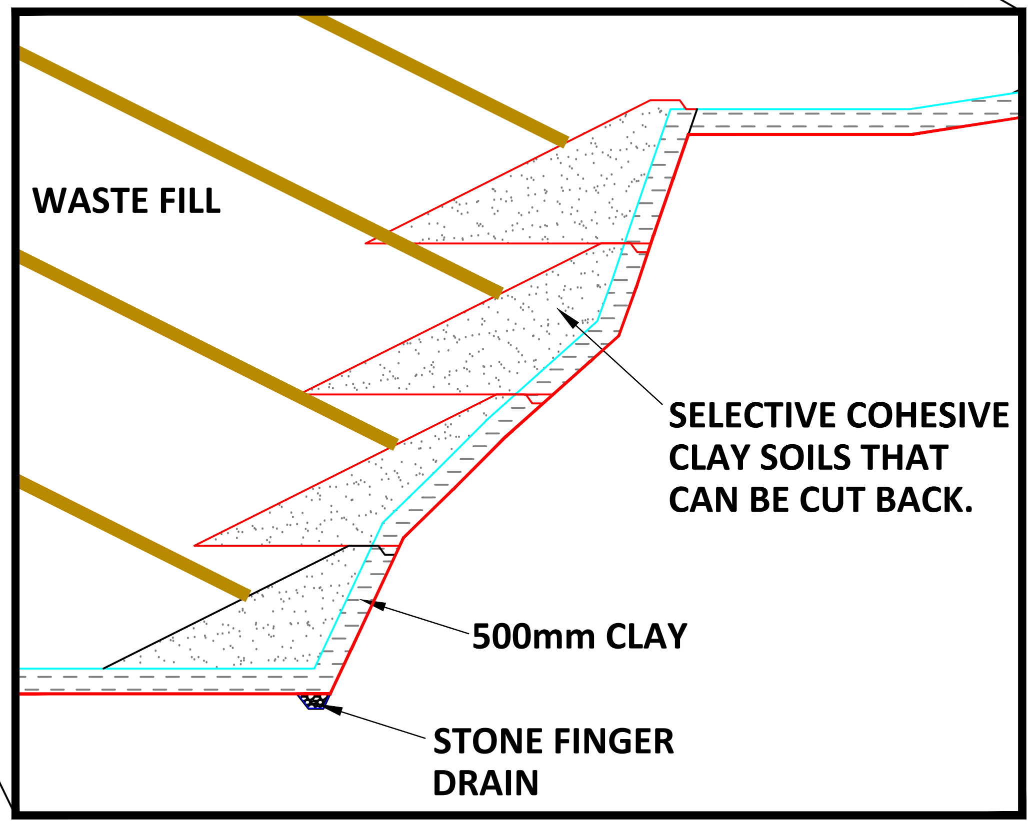

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KEY

FINAL EXTRACTION PROFILE

PROPOSED RESTORATION PROFILE

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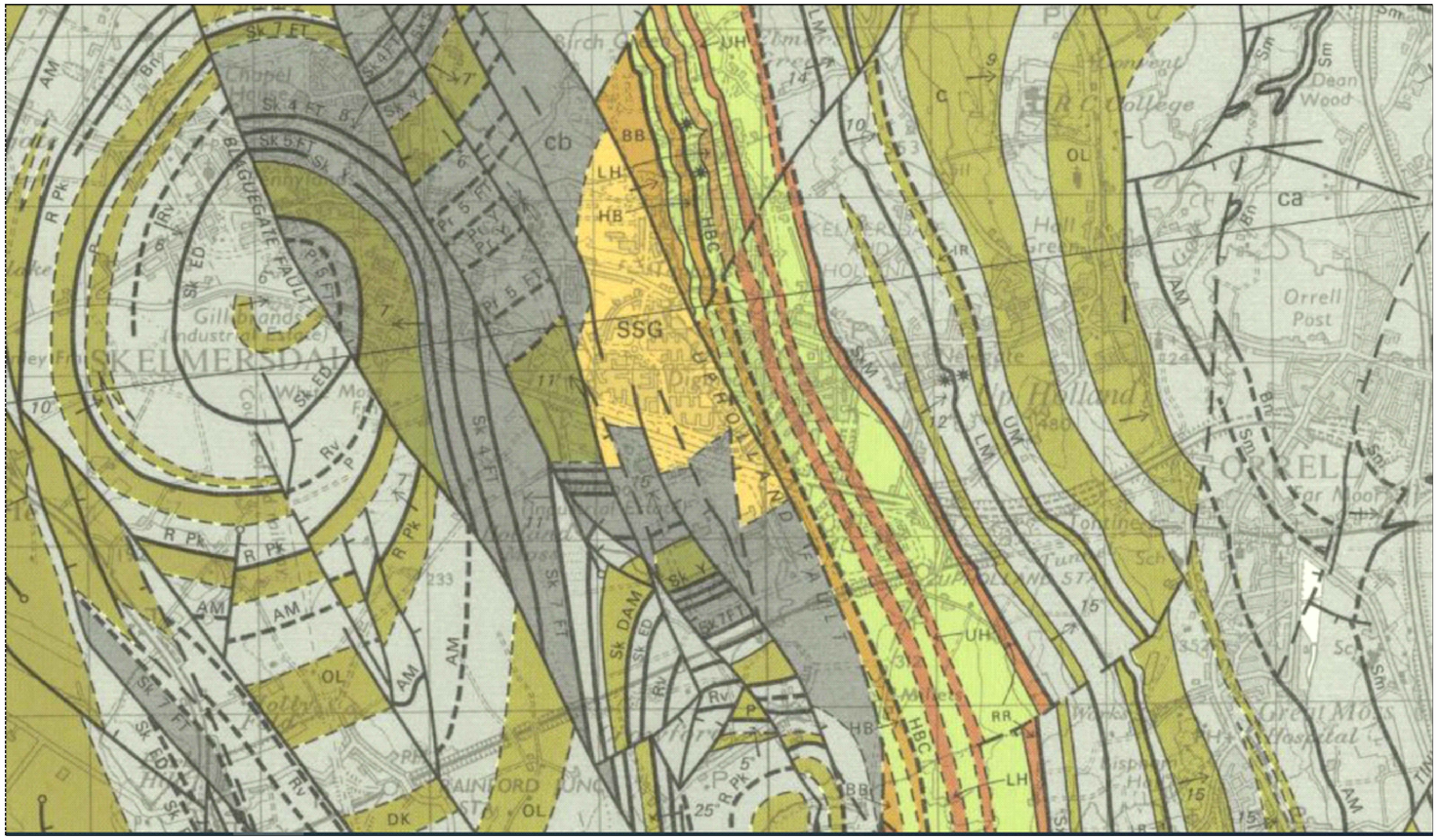
PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

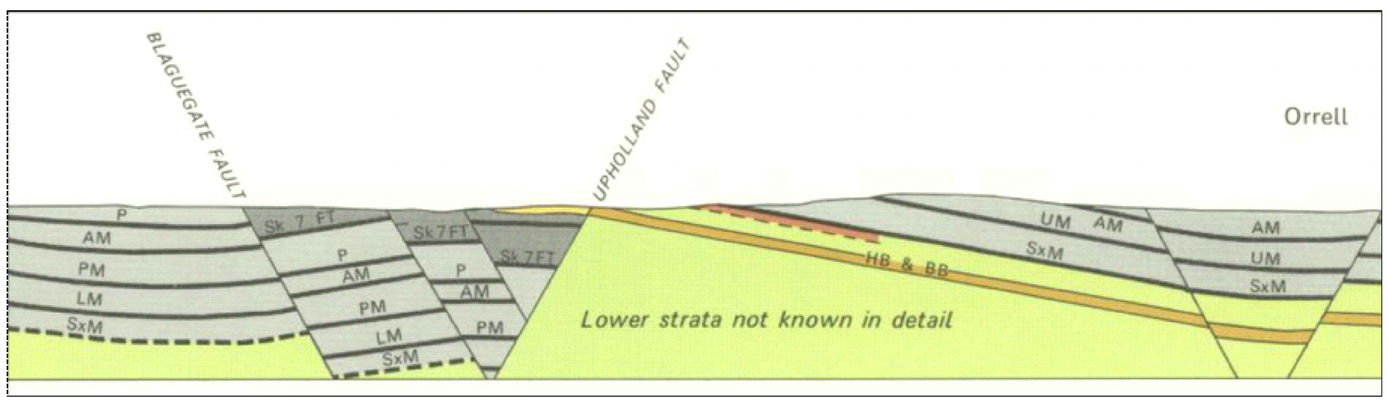
DRAWING TITLE
SCHEMATIC ENGINEERING DETAILS
ESID 8

STATUS

Date: 03/2023	Scale: 1:1000	Drawn: PP	Chk: AB	App: PS
Project No: K0158	Drg. No: K0158-4-008 ESID 8C			Rev:

A1





PERMIAN AND TRIASSIC

MMG	Mercia Mudstones ('Keuper Marl')	
OmS	Ormskirk Sandstone (= 'Keuper' Sandstone)	Sherwood Sandstones
SSG / PB	'Bunter' Sandstone including Pebble Beds	Sherwood Sandstones
MM	Manchester Marl †	
CS	Collyhurst Sandstone	

CARBONIFEROUS

AG	Red beds in Westphalian D (Ardwick Group, upper part)
cc	Westphalian C, undifferentiated
AG	Red beds in Westphalian C (Ardwick Group, lower part)
S	Sandstones in Westphalian C
cb	Westphalian B, undifferentiated
S	Sandstones in Westphalian B
ca	Westphalian A, undifferentiated
S	Sandstones in Westphalian A
cn	Namurian, undifferentiated
RR,UH,LH	Sandstones in Yeadonian
HB,BB	Sandstones in Marsdenian

GENERAL NOTES

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A.07- REPRODUCED UNDER BGS LICENCE NUMBER C08/053.

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BOOTH VENTURES

PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
REGIONAL GEOLOGY
ESID 9

STATUS

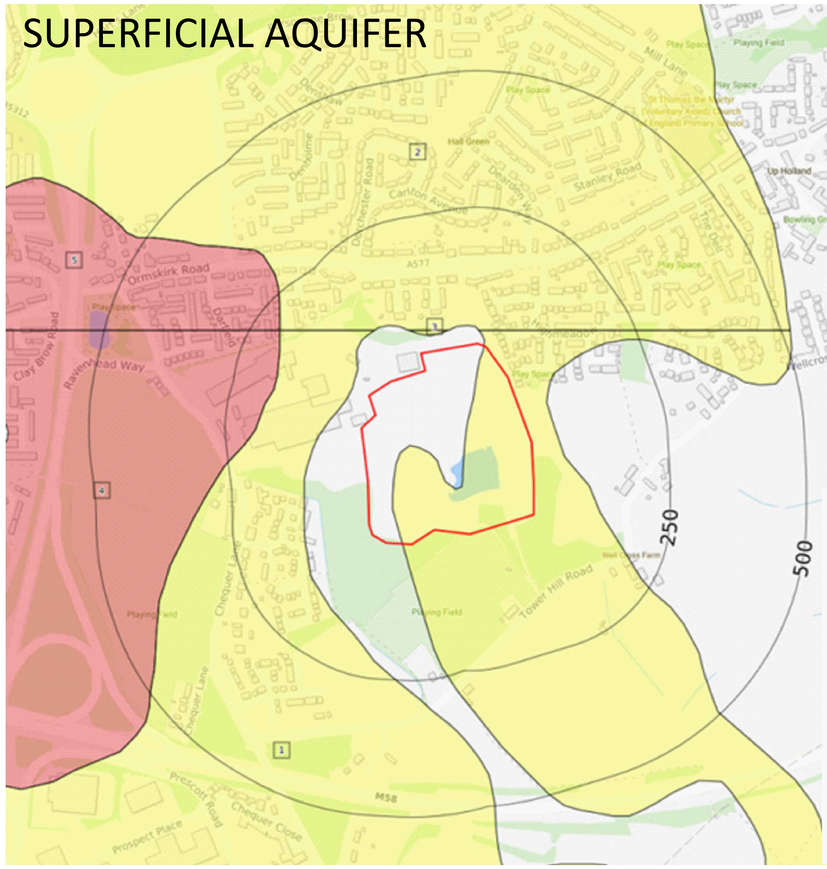
Date: 31/02/23	Scale: N/A	Drawn: JM	Chk: PS	App: JB

Project No:	Drg. No:	Rev.
K0158	K0158-4-009	00

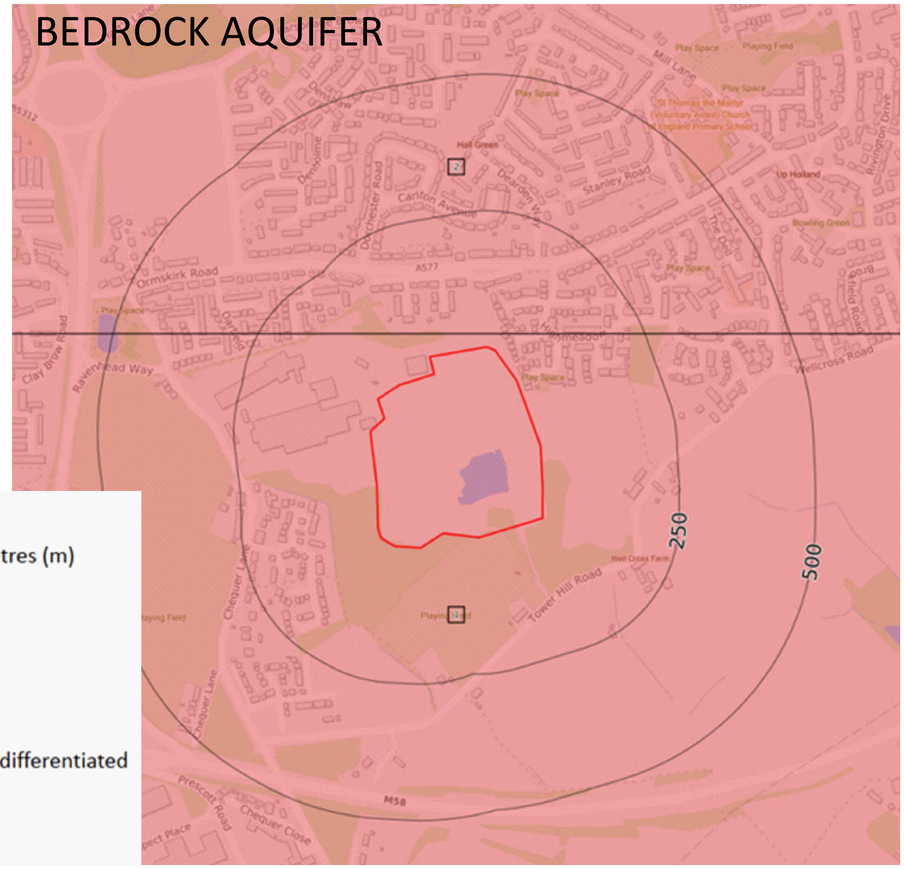
A1

N
W E
S

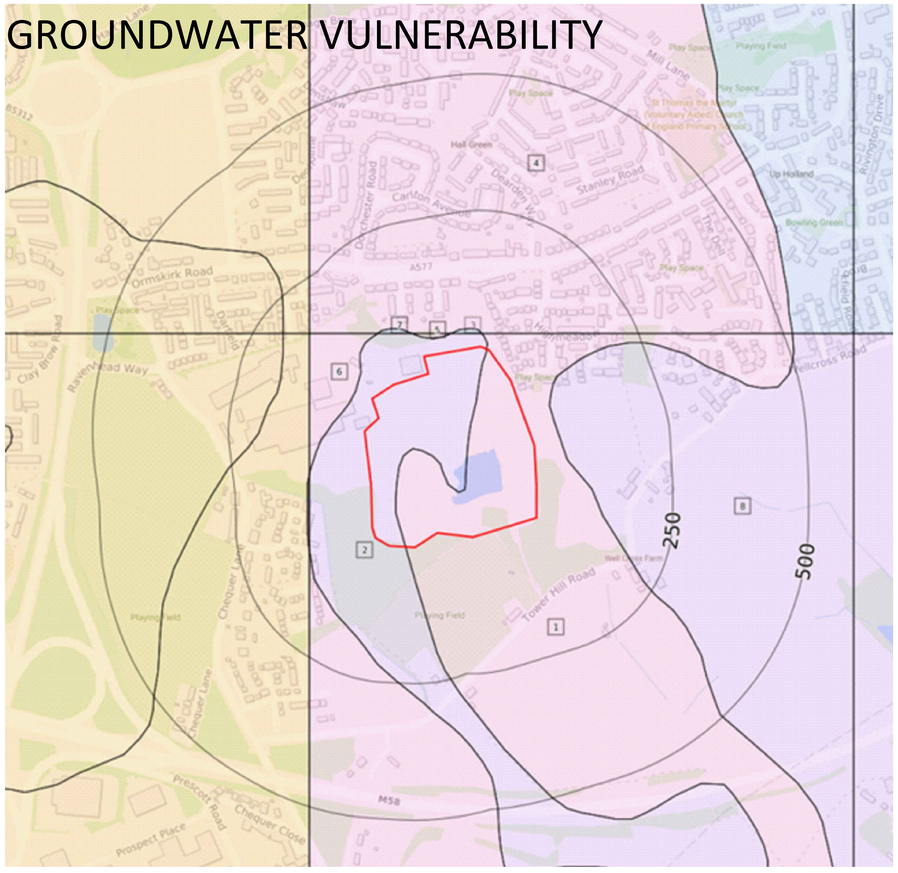
SUPERFICIAL AQUIFER



BEDROCK AQUIFER



GROUNDWATER VULNERABILITY



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PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
HYDROGEOLOGY
ESID 10

STATUS

Date: 31/02/23	Scale: N/A	Drawn: JM	Chk: PS	App: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-010	00

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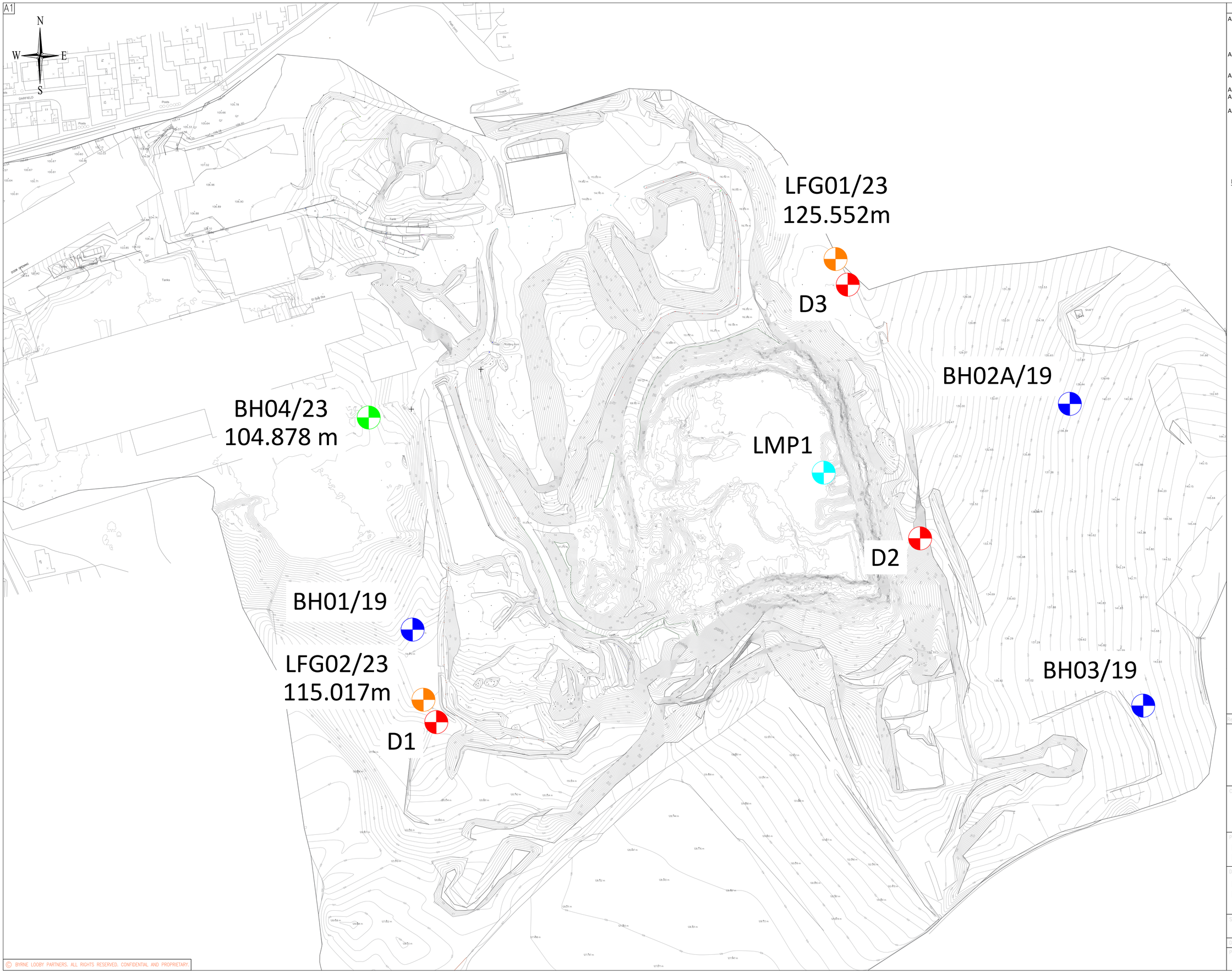

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KEY

- PROPOSED DUST MONITORING LOCATION
- EXISTING GROUNDWATER MONITORING BOREHOLES
- PROPOSED LEACHATE MONITORING CHAMBER
- PROPOSED GAS MONITORING BOREHOLES
- PROPOSED COMBINED GAS AND GROUNDWATER MONITORING BOREHOLES

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PROJECT
RAVENHEAD QUARRY
LANDFILL RESTORATION SCHEME

DRAWING TITLE
MONITORING PLAN
ESID 12

STATUS

Date: 09/03/23	Scale: 1:1000	Drawn: JM	Chk: PS	App: JB

Project No:	Drg. No:	Rev:
K0158	K0158-4-012	00

Ravenhead Quarry Landfill

ESID / Technical Standards

Booth Ventures Waste (North West) Limited

Report No. K0158-BLP-R-ENV-03-02
March 2023
Revision 02

BOOTH VENTURES

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Document Control

Document: ESID / Technical Standards

Project: Ravenhead Quarry Landfill

Client: Booth Ventures Waste (North West) Limited

Report Number: K0158-BLP-R-ENV-03-02

Document Checking:

Revision	Revision/ Review Date	Details of Issue	Authorised		
			Prepared By	Checked By	Approved By
02	March 2023	Final	Dan King	Phil Scotney	John Baxter
01	February 2022	Final	Dan King	Phil Scotney	John Baxter
00	December 2022	Draft	Dan King	Phil Scotney	John Baxter
Disclaimer: Please note that this report is based on specific information, instructions and information from our Client and should not be relied upon by third parties.					

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Contents

FIGURES

TABLES

1 Introduction

1.1 Report Context

This report outlines the Environmental Setting and Installation Design (ESID) for the proposed landfill at Ravenhead Quarry site (operator Booth Ventures Waste (North West) Limited) and defines the technical standards to be employed at the facility.

This ESID supports the environmental permit application for the site and summarises the proposed engineering for the associated void infill and associated ancillary activity (processing). In addition, the report details the proposed measures to be employed to ensure the filling of the void does not have a detrimental impact on the surrounding environment including mitigation measures where they are considered necessary.

The information provides a basis for relevant risk assessment and established baseline conditions. This ESID report develops the Conceptual Site Model (CSM) for the site, and hence characterises the source term, potential pathways and receptors for the subsequent environmental risk assessments and follows the appropriate Environment Agency template[1].

There are two defined aspects associated with the environmental permit application:

1. infilling the quarried void with low-polluting potential wastes to achieve a suitable, stable, manageable long-term restoration scheme and associated landform, with
2. on-site processing (screening and crushing) of suitable construction and demolition wastes.

1.2 Quarry Restoration Rationale

The currently approved scheme for the site (as defined by Planning Permission LCC/2022/0016) is not considered desirable on the grounds of Health and Safety and long-term water management.

The current approved scheme retains significant “sheer” vertical rock faces that are a danger to life with risk of falling and death. To the east, a rock face of ~30m in height is within 70m of the “Play Space” defined area of the Up Holland residential development (within 70m of Broadacre and Orchid Close). To the south, a rock face of ~30m in height is within 20m of the “Playing Field” defined area north of Tower Hill Road.

Additionally, the current approved scheme retains a significant “water body” with long-term danger to life with risk of drowning and death. This scheme will require water pumping in perpetuity to maintain the defined water level of 97mAOD which is not sustainable (as depicted on drawing 3151-01-03, Appendix A).

Based on the hydrogeological information contained herein, there is an expectation that post cessation of quarry dewatering, the groundwater will rebound to a level of ~105mAOD. Although this eventuality will reduce the height of the sheer rock faces noted above, this will result in a water depth of 30m (relative to base excavation level of 85mAOD).

[1] https://www.gov.uk/government/publications/esid-report-template

Flooded quarries in recent years have become attractive to trespassing and swimming with devastating consequences[2,3] with almost two in every three fatalities happening at inland waters that includes quarries[4].

The revised restoration proposals contained herein (including mitigation as required), will allow for Ravenhead Quarry to be infilled, and subsequently restored in an environmentally safe and effective manner that will not result in the abandonment of a worked-out quarry with the associated long-term health and safety risks to the local residents of Up Holland, Skelmersdale and beyond.

The currently approved restoration scheme is considered to present an unacceptable risk to life and potential for uncontrolled water management issues.

1.3 Summarised Proposed Development

Infilling / Landfill

The volume of the infilling scheme is calculated at 1,060,000m^3 with a final surface area coverage of 4.7Ha (47,000m^2) applicable to the engineered capped area of site. The total restored area for the quarry is 86,300m^2, 8.63Ha.

It is proposed to utilise a supply of waste materials associated with excavation and construction works for the infilling of the proposed landfill. These wastes are of lower polluting potential than those infilled at typical non-hazardous waste landfill sites.

It is proposed to infill the existing quarry void as a restoration activity. The infill material comprising only of wastes which are considered suitable, and which are specified by His Majesty's Revenue and Customs (HMRC) in The Landfill Tax (Qualifying Material) Order 2011 (as amended)[5] (i.e. Qualifying Materials (QMs). The site benefits from a historic planning consent for infilling subject to submission of a scheme of restoration. A planning submission addressing the condition requirement and a scheme for restoration is to be submitted to Lancashire County Council Planning Authority imminently.

The infilling of the current void will be completed to a level coincident with surrounding / perimeter ground and shaped to facilitate drainage.

The proposals are as follows:

- installation of a suitable engineered barrier;
- landfilling using low pollution potential material (Qualifying Materials);
- restoration to similar levels to the surrounding ground levels, with a gentle slope for surface water management;
- preservation of and provision of access to the on-site geological SSSI; and
- landscaping of the site to a suitable restored surface.

[2] https://www.theguardian.com/uk-news/2022/jul/11/boy-16-drowns-dawber-delph-appley-bridge-lancashire-quarry
[3] https://www.lancs.live/news/lancashire-news/kids-still-flocking-lethal-quarry-24458574
[4] National Water Safety Forum (2015) A future without drowning: The UK National Drowning Prevention Strategy 2016-2026.
[5] The Landfill Tax (Qualifying Material) Order 2011 (as amended) - https://www.legislation.gov.uk/uksi/2011/1017/contents/made

On Site Processing

In support of the restoration operations and to support sustainability, imported wastes with a recoverable component will be processed to recover aggregates in accordance with the quality protocol approved by the Environment Agency[6]. It is anticipated that approximately 5% of the wastes imported will be suitable for processing (crushing and/or screening).

Suitable wastes, selected from the imported wastes, will be stockpiled on a hardstanding pad (aggregate over lower permeability soil) located on the southwestern site boundary prior to treatment. When sufficient recoverable wastes have been stockpiled treatment will be undertaken periodically for short periods utilising mobile plant. Recovered aggregate will either be used on site (e.g. for creation of roads and hardstanding areas) or exported and used in accordance with quality protocol (e.g. pipe bedding and highway sub base). The recovery of aggregates from imported wastes will cease when the final restoration of the quarry void is completed. Residual material from the crushing and/or screening activity will be deposited within the landfill void.

1.4 Supporting Documentation

Drawings

A number of drawings illustrate relevant aspects of the application that accord with Environment Agency Guidance, these drawings are numbered as:

- ESID1 Site Location
- ESID2 Environmental Site Setting
- ESID3 Cultural and Natural Heritage
- ESID4 Existing Site Layout (Permit Boundary)
- ESID5A Installation Phasing Plan – Final Extraction
- ESID5B Installation Phasing – Infill Phasing Plan
- ESID6 Proposed Restoration & Cross Sections (including extent of landfill area)
- ESID7A Leachate Management (location of spine drains)
- ESID7B Installation Engineering Details (leachate monitoring chamber / target pad design)
- ESID8A Section line locations B-B', C-C' & D-D'
- ESID8B Section lines B-B', C-C' & D-D' (for Stability assessment)
- ESID8C Schematic Engineering Details (stone finger drain, groundwater chamber and sidewall liner) including section line location A-A'
- ESID8D Schematic Engineering Details (groundwater dewatering chamber).
- ESID9 Regional Geology
- ESID10 Regional Hydrogeology
- ESID11 Geological / Hydrogeological Cross Sections
- ESID12 Monitoring Plan

[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296499/LIT_8709_c60600.pdf

- ESID13 Surface Water Management

The drawings above will be cross-referenced throughout the application where relevant, additional drawings are provided at Appendix A where required.

Assessment

This Environmental Setting and Installation Design report provides supporting information for the following and associated assessments:

- K0158-BLP-R-ENV-04-02 Environmental Risk Assessment (H1)
- K0158-BLP-R-ENV-05-02 Waste Acceptance Criteria (WAC)
- K0158-BLP-R-ENV-06-02 Hydrogeological Risk Assessment (HRA)
- K0158-BLP-R-ENV-07-02 Gas Risk Assessment (GRA)
- K0158-BLP-R-ENV-08-02 Stability Assessment (SRA)
- K0158-BLP-R-ENV-09-02 Emissions Monitoring and Financial Provision Report

A GroundSure report is provided at Appendix B that includes historic mapping, monitoring data is provided at Appendix C and site investigations / drilling logs are provided at Appendix D.

1.5 Site Location and Surrounding Land Use

Ravenhead Quarry is located approximately 500m to the north of the M58 motorway, on the southwest boundary of Upholland, and is approximately 2.5 kilometres to the east of Skelmersdale at National Grid Reference (NGR) SD 5126 0479 (Figure 1, see also Drawing ESID 1).

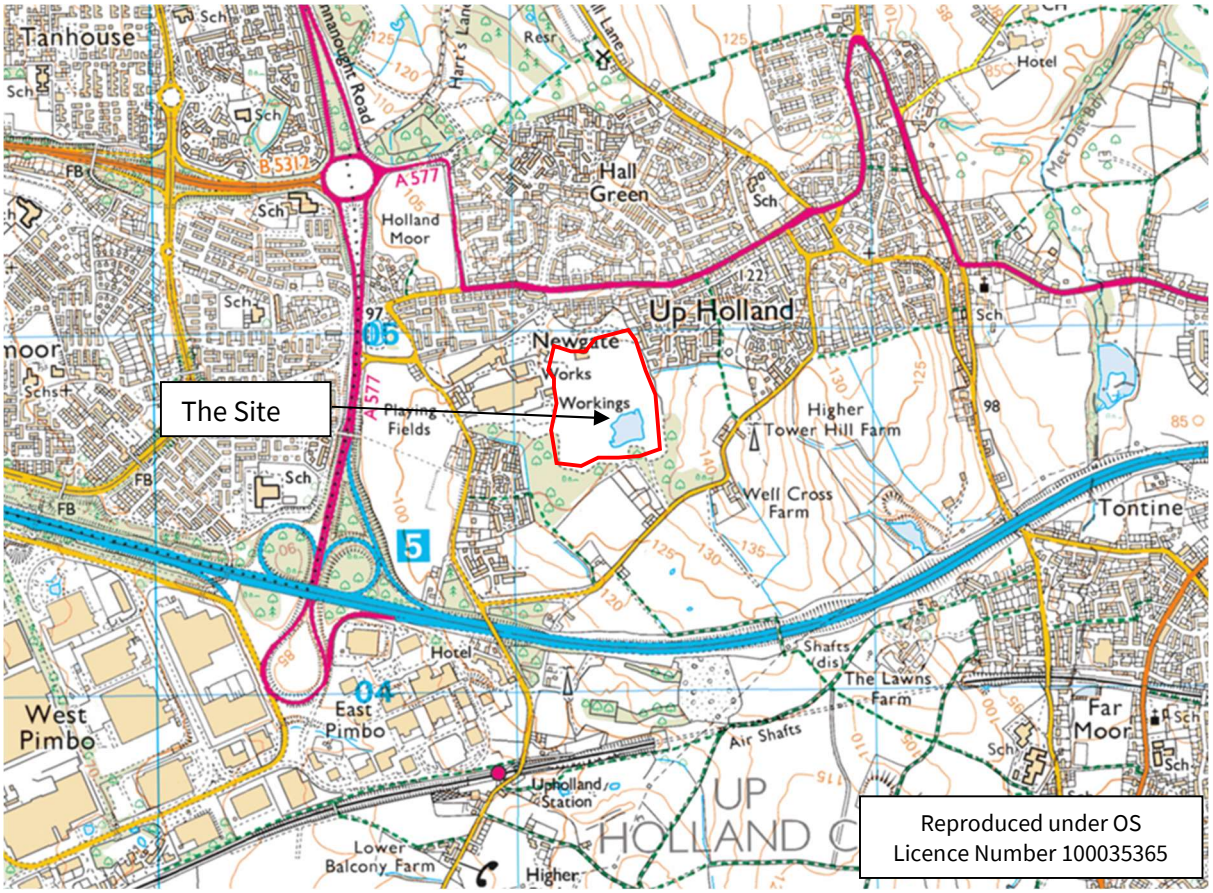
The site is currently an active quarry, operated by Booth Ventures Waste (North West) Limited, excavating aggregate for the construction industry. The quarrying operations currently occupy the southern end of the quarry, and the mineral processing operations occupy the northern end of the quarry. The whole site is part of the larger Ibstock Brick Works site, which is owned by Ibstock Brick Ltd.

Up Holland is located to the north and northeast and is the closest urban area. The town of Skelmersdale is located to the west, the M58 motorway to the south with the West and East Pimbo industrial estates to the southwest. The village of Orrell is located to the east of Up Holland and east-southeast of Site. South of the M58 is a railway and local Up Holland Station.

An indicative representation of the proposed permit boundary is provided in Figure 1, the permit / installation boundary is defined on Drawing ESID 4 (edged green).

The shaded relief topography map (Figure 2) illustrates that the site is located in an area of high ground, with river valleys located to the northeast, northwest and southwest. The ridge that the high ground demarcates (associated with Carboniferous bedrock strata, e.g. Rough Rock to Old Lawrence Rock sandstone) is orientated roughly north-northwest/south-southeast (i.e. between Dalton and Longshaw).

Figure 1 Site Location



The perimeter of the site is at ~130mAOD in the east and southeast, 120mAOD on the south and northwest boundaries falling to a low point of ~107mAOD near the northwest corner of the brickworks. Current excavation depths within the quarry are estimated to be at ~90mAOD, in the southeast portion of the extraction area.

Locally, the highest ground is at ~145mAOD, approximately 180m to the east on Tower Hill, with the topography sloping gently to the west-northwest, and at a larger scale to the southwest.

As part of a comprehensive review of local receptors, an Environment Agency 'Nature and Heritage Conservation Screening Report' (ref: EPR/LB3107GH/A001) was requested and received in January 2023 which identified a Local Wildlife Site (LWS) at Pimbo Lane Pit to the south-southeast (~60m).

The Screening Report also highlighted that there are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), or RAMSAR sites located within 2km (confirmed through a review of the on-line www.magic.gov.uk website portal). The Screening Report is attached as Appendix E and as Appendix C within the associated H1 Environmental Risk Assessment (Report K0158-BLP-R-ENV-04-02).

There is one SSSI within 2km of the Site, the Ravenhead Brickwork SSSI, which is a geological SSSI based upon the exposure of the lower Carboniferous, further detail is provided in Section 1.6.

A review of receptors within 1.5 km of the Site are summarised and listed in Table 1, the locations are depicted on Drawing ESID 2 and ESID 3.

Figure 2 Regional Topography (Shaded Relief Map)

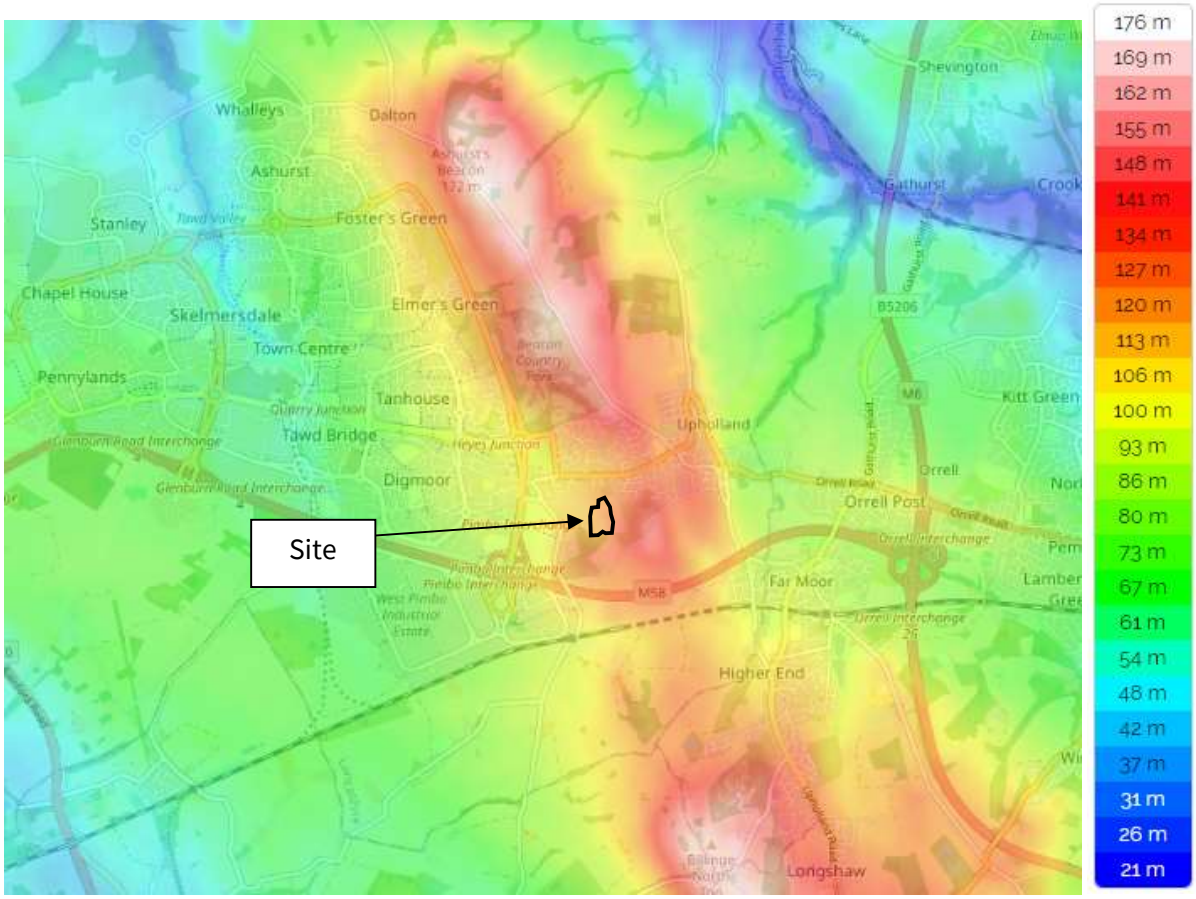


Table 1 Nearby Receptors to Ravenhead Quarry

Receptor No.	Receptor	Receptor Type	Approx. Distance from Site Boundary (m)	Direction from Site
1	Residential properties on Miners View	Residential	120	W
2	Residential properties on Broadacre & Play Space	Residential	10	ENE
3	Residential properties on Vale Croft	Residential	10	NE
4	Residential properties on Fieldview	Residential	25	NNE
5	Residential properties on Ravenhead Drive	Residential	35	N
6	Residential properties on Daybrook	Residential	200	NNW
7	Residential properties on Darfield	Residential	260	NW
8	Residential properties on Danbers	Residential	340	WNW
9	Residential properties on Tower Hill Road	Residential	150	S
10	Residential properties on Galloway Drive	Residential	270	E
11	Well Cross Farm (and kennels)	Residential / Farm	200	SE
12	Highview Pre-school	School	170	E
13	Playing Field	Recreation	45	S
14	Playing Field	Recreation	300	W
15	Chequer Lane Playing Fields	Recreation	460	WNW
16	Beacon Country Park	Recreation	740	NNW
17	Hope High School	School	700	WSW
18	Moorside Primary School	School	850	WNW
19	Holland Moor Primary School	School	840	NW
20	St Thomas the Martyr CoE Primary School	School	530	NE

Receptor No.	Receptor	Receptor Type	Approx. Distance from Site Boundary (m)	Direction from Site
21	Up Holland High School	School	1240	SE
22	Ibstock Brick Works	Industry	<10	NW
23	East Pimbo Industrial Estate	Industry	570	SW
24	Best Western Lancashire Manor Hotel	Hotel	500	SW
25	Up Holland Benedictine Priory	Scheduled Monument	920	ENE
26	Upholland station	Station	870	SSW
27	Train line	Train line	800	S
28	Tower Hill Road	Road	135	SSE
29	Miners View	Road	150	W
30	Broadacre	Road	40	ENE
31	Vale Croft	Road	35	NE
32	Fieldview	Road	55	NNE
33	Ravenhead Drive	Road	55	N
34	Daybrook	Road	240	NW
35	Darfield	Road	300	NW
36	Danbers	Road	360	WNW
37	Chequer Lane	Road	270	W
38	M58 Motorway	Road	480	S
39	Public Footpath	Footpath	180	E
40	Public Footpath	Footpath	140	SW
41	Issues	Water	590	ESE
42	Issues	Water	960	E
43	Issues	Water	1050	NE
44	Issues	Water	830	NNW
45	Unnamed Pond	Pond	700	ESE
46	Unnamed Pond	Pond	510	WNW
47	Abbey Lakes	Lakes	1200	E
48	Dean Brook	Stream	1250	ENE
49	Unnamed drain	Drain	100	W
50	Unnamed drain	Drain	115	SSW
51	Unnamed drain	Drain	170	ESE
52	Unnamed drain	Drain	370	E
53	Unnamed drain	Drain	670	N
54	Ravenhead Quarry geological SSSI	SSSI	0	At Site
55	Pimbo Lane Pit	LWS	60	SE
56	A577	Road	570	W

1.6 Environmental Designations

Ramsar Site / SAC / SPA / NNR[7]

None Located within 2km.

LNR

Greenslate Water Meadows (Local Nature Reserve) is located 1.8km to the southeast.

[7] Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. Special Areas of Conservation (**SAC**). Special Protection Areas (**SPA**). National Nature Reserves (**NNR**). Local Nature Reserves (**LNR**). Local Wildlife Site (**LWS**). Sites of Special Scientific Interest (**SSSI**).

LWS

The Pimbo Lane Pit Local Wildlife Site is located ~60m to the southeast adjacent to Well Cross Farm.

Designated Ancient Woodland

Dean Wood (ancient and semi-natural woodland) is located 1.2km to the northeast.

SSSI

Ravenhead Brickworks Site of Special Scientific Interest is located at Site.

Citation – Reason for Notification

"*Ravenhead Brickworks is a nationally important geological site for the exposures of the Late Carboniferous, Westphalian succession within this part of the Pennine Basin; lying between the Honley and Parkhouse Marine Bands. The sequence includes both marine and non-marine strata and demonstrates the patterns of deposition in a lower delta-plain setting at this time*".

General Description

"The site shows much of the characteristic sedimentology of the lower part of the Langsettian Stage in the Productive Coal Formation within the south-western part of the Pennine Basin. At least 90 metres of sediments, consisting of shales, siltstones, sandstones and thin coals are present. These form several coarsening-upward sequences but also include a succession of laminated sandstone/mudstone couplets, interpreted as crevasse splay deposits. The latter are of particular interest as they contain the moulds of bivalves as well as the traces of their burrows, some of which provide evidence for the swift escape of the bivalves under conditions where the sand was being rapidly deposited and the organisms threatened with suffocation. Each couplet has been interpreted as representing a year's deposition under seasonal conditions in a lacustrine setting. The coarsening-upward sequences show evidence that the environment of deposition changed from brackish at the base to non-marine at the top, whilst the upper parts of these sequences are capped by sandstones that sometimes show the development of seat-earths and thin coals above. These sequences are generally succeeded by a marine band.

All of the important marine bands of this part of the succession are represented here and both the Lower Foot Mine Marine Band and the Bullion Mine Marine Band have yielded faunas belonging to the Gastrioceras/Pectinoid Facies. The Bullion Mine Marine Band is particularly important for yielding well-preserved, three dimensional ammonoids from carbonate concretions. Non-marine bivalves form a sequence of assemblages in the basal 7 metres of the succession and again occur in the sandstone/mudstone couplets toward the middle of the succession.

The successions at Ravenhead Brickworks are of vital importance for the understanding of the environment and the deposition of the Productive Coal Formation, not only within the Pennine Basin, but also within the UK as a whole".

This citation has been taken from the reference "British Upper Carboniferous Stratigraphy (Cleal and Thomas, Chapter 10, Coal Measures of the Pennine Basin, 1996)[8].

[8] British Upper Carboniferous Stratigraphy (Cleal and Thomas, Chapter 10, Coal Measures of the Pennine Basin, 1996

As part of the ongoing discussion with Natural England regarding revision of the current SSSI boundary, a revision to the SSSI Management Scheme has been agreed, a copy of this document is provided for reference at Appendix E.

2 Source Term Characterisation

2.1 The Development of the Installation – Outline

The proposed non-hazardous site is not located below water table (where the strata provide an important contribution to river flow or sensitive surface water receptors), within or on a major aquifer or within a Source Protection Zone (SPZ), zone I, II or III [9,10]. Further details are provided in Section 3.4.

The landfill will be developed on the principle of containment, Site access is restricted, and the Site is fully fenced with lockable gates. As stated in Environment Agency document, Regulatory Guidance Series No LFD1[10], containment engineering for the purposes of groundwater protection cannot be undertaken in isolation from gas management. Gas generation potential is therefore, addressed further in report K0158-BLP-R-ENV-07-02.

LFD1 goes on to state that in assessing the landfill engineering proposals, there must be:

- compliance with the Landfill Directive (LFD), Annex 1 engineering requirements;
- no likelihood of unacceptable discharge / emission over the entire lifecycle of the landfill (i.e. Landfill Directive and Groundwater Directive compliant); and,
- structural / physical stability over the entire lifecycle of the landfill.

Stability aspects are addressed in report K0158-BLP-R-ENV-08-02.

As such, the landfill at Ravenhead will be developed on the principle of containment by the provision of:

- An "artificial" geological barrier of low permeability site derived material, or alternatively imported material which will meet the requirements for a geological barrier are set out in paragraph 3.2 of Annex I to the Directive.
- Use of inert wastes for Site restoration outside of the main areas of fill Emplacement of engineered site-won mudstone / clay, or imported material liner (in areas with a waste thickness exceeding 4m).
- The Hydrogeological Risk Assessment (K0158-BLP-R-ENV-06-02) has indicated there is no requirement for leachate collection;

The proposed engineered "artificial" geological barrier (base and sidewall liner) will form a low permeability seal of 500mm minimum thickness, at a permeability no greater than $1x10^{-8}$ m/s in areas of site where the Coal Measures Strata is exposed in the final quarry exposure (base and sidewall). The thickness accords with the minimum requirement outlined in the DEFRA guidance

[9] Environmental Permitting Guidance, The Landfill Directive. For the Environmental Permitting (England and Wales) Regulations 2010, Updated March 2010. Version 3.1, DEFRA

[10] Environmental Permitting Regulations (England and Wales) 2010. Regulatory Guidance Series, No LFD 1 Understanding the Landfill Directive. Environment Agency

document[9] and paragraph 3.2 of Annex I to the Directive (landfill for non-hazardous wastes). The geological barrier in these areas is referred to as an artificial geological barrier.

The waste infill will be composed solely of Qualifying Materials, which will have low leachate and landfill gas producing capacity and are essentially inert. These materials, which by their very nature once compacted, capped and restored will not require active management. The surrounding geological and hydrogeological systems are not considered at risk based on the information reviewed to date (further details provided in report reference K0158-BLP-R-ENV-06-02).

The void space will be filled to existing ground levels on all sides with the exception of the uppermost part of the south-eastern corner and southern boundary where the SSSI will be preserved and retained where possible (Report K0158-BLP-R-ENV-11-02). There will be a gentle gradient to the west and northwest to facilitate surface water management. Surface water control is discussed separately.

The environmental protection measures included within the design of the landfill e.g. cell lining systems, leachate management (although not required based on risk assessment) and capping systems will be designed in accordance with the Landfill Directive and as such are considered to represent best practice environmental protection.

On completion of the filling a cap will be placed to the same standard as the basal engineering (i.e. a minimum 500m thickness with a permeability no greater than $1x10^{-8}$ m/s). Restoration soils will provide a cover for the uppermost 1m. Restoration to similar levels to the surrounding ground levels, with a gentle slope for surface water management.

Preservation of, and provision of access to the on-site geological SSSI (where retained) will be agreed through the associated twin-tracked Planning Application and agreement with Natural England.

In tandem with infilling some select wastes will be processed for recovery. The crushing and screening process of imported construction and demolition waste is discussed further in Section 2.15.

2.2 Site History & Local Historical Development

A Groundsure Enviro-Geo Insight report[11] is included at Appendix B. The historical maps show that in 1849 the land was entirely agricultural. By 1892 quarrying had started occupying the land in the northwest corner of the current Site. Between 1892 and 1929 there was little change in the quarry extent, however the Ravenhead brick works at that time increased in size. Between 1938 and 1955 the quarry extended southwards and eastwards towards the centre of the present extraction area, with little change locally. By 1967 the quarry had extended into a significant portion of the present-day quarry, and by 1981 the quarry filled the full lateral extent of the current quarry.

Shafts have been recorded near the Site since 1926, with King Edward Colliery being recorded in 1939 beside the north-eastern boundary of the Site (Figure 3). The colliery was present in 1948, however by 1955 there is no record of the colliery or colliery buildings being present, although in 1967 a disused mine is recorded at the location of the colliery.

[11] Groundsure (February 2022) Enviro+Geo Insight – Ravenhead Quarry. Report reference GS-8507846

There is little residential development in the local area until 1967, when a series of properties were recorded along Ormskirk Road north of Site, as well as an increase in the number of properties around the Hall Green area of Up Holland northeast of Site. By 1975 there were many new houses built on side-streets of Ormskirk Road, as well as the construction of the town of Skelmersdale to the west and northwest. At some time between 2001 and 2010 the properties on Highmeadow and its associated side streets were constructed on the site of the old King Edward Colliery, and by 2022 the Miners View road and homes had been built to the west-southwest of Site (Figure 4).

As such the local Site area has undergone extensive industrial development over the past 130 years, including significant mineral railway development historically for coal and clay reserve extraction, these are classified as *"potentially contaminative historic land use features"*. There are 232 records of this nature within 500m of the Site.

42 records of "historical tanks" are reported within 500m, two of which were located on site (dated 1992). Additionally, the Groundsure report at Appendix B identifies that there are 3 "historic waste sites" within 500m (EA records).

- On-site (Site Reference: Licence No 410, L1/08/477, K1/08/061 Waste Type: Inert)
- Tower Hill Quarry, 247m east (Site Reference: K1/08/086 Waste Type: Inert, Industrial (1930-1950)
- Pimbo Landfill, 488m south (Site Reference: WR/L1/8/1, RES NO40, K1/08/069 Waste Type: Inert, Industrial, Commercial, Household, Special, Liquid sludge (1960-196).

The presence of historical waste on site has been verified by recent trial pitting associated with "soakaway testing" and has identified the inert, rubble, brick, concrete nature of these deposits. These observations are consistent with the records identified in Appendix B.

There are 17 reported "current potentially contaminative industrial sites" within 250m, two of which are on reported on-site, "tank" and "clay pit".

Two records of pollution are noted since 2006 within 500m, both referenced as "minor land impact" at locations 290m west and 455m east of Site (see further details at Appendix B).

2.3 Proposed Development

Infilling / Landfill

Ravenhead Quarry is currently an active quarry, quarrying the Pennine Lower Coal Measures for aggregate for the construction industry. The Site is currently excavating workable mineral reserves beneath the water table, this involves dewatering the aquifer/ groundwater locally to achieve dry working of the mineral. This achieved within the constraints of the current to discharge the water to foul sewer at 5l/s.

As a consequence, the area of proposed infilling is also within the Pennine Lower Coal Measure, the proposed permit / installation boundary detailed on Drawing ESID 4. The edges of the current voids are variably covered by trees, vegetation and rock to the north, east, south and southwest. To the northwest is the Ibstock Brick Works brick factory and stockpiles of brick clay. An overview of the current dewatering is provided in Section 3.

Figure 3 Site Context 1938-1939[11]

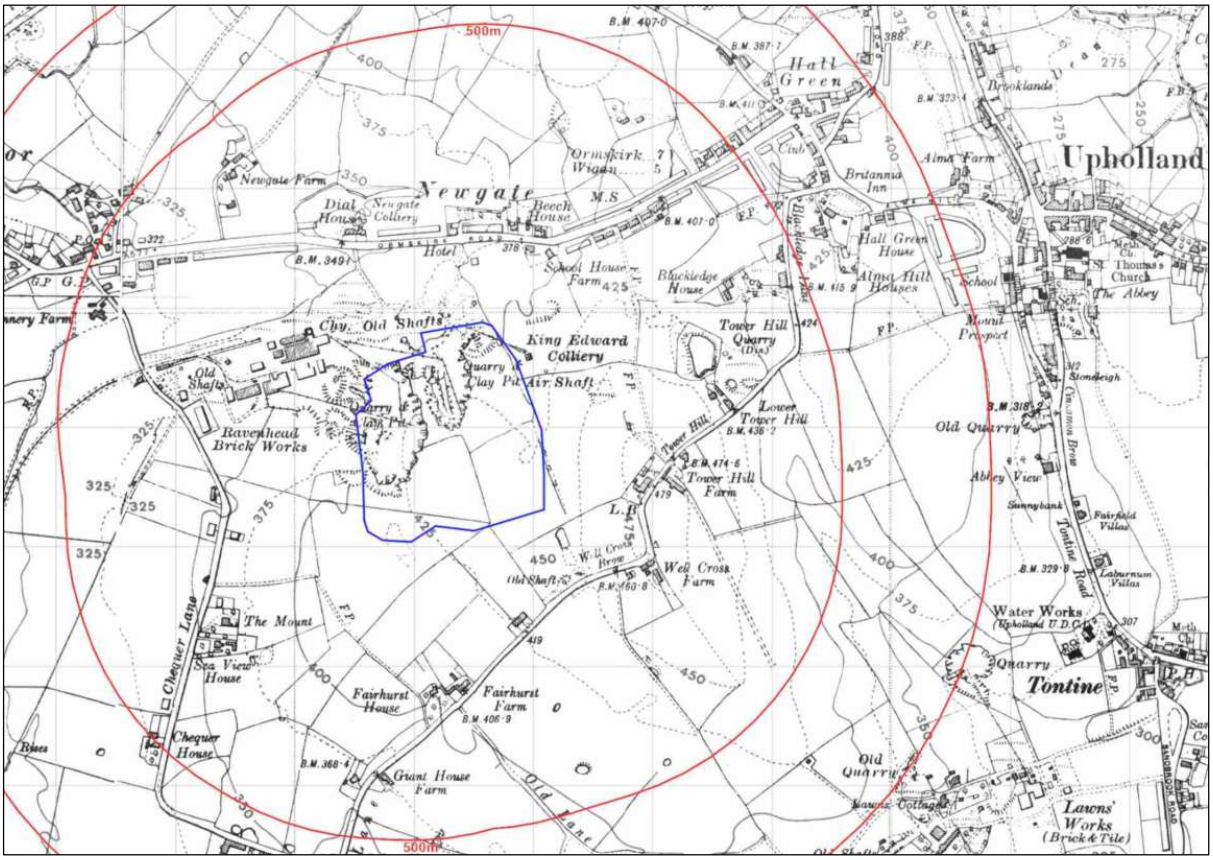
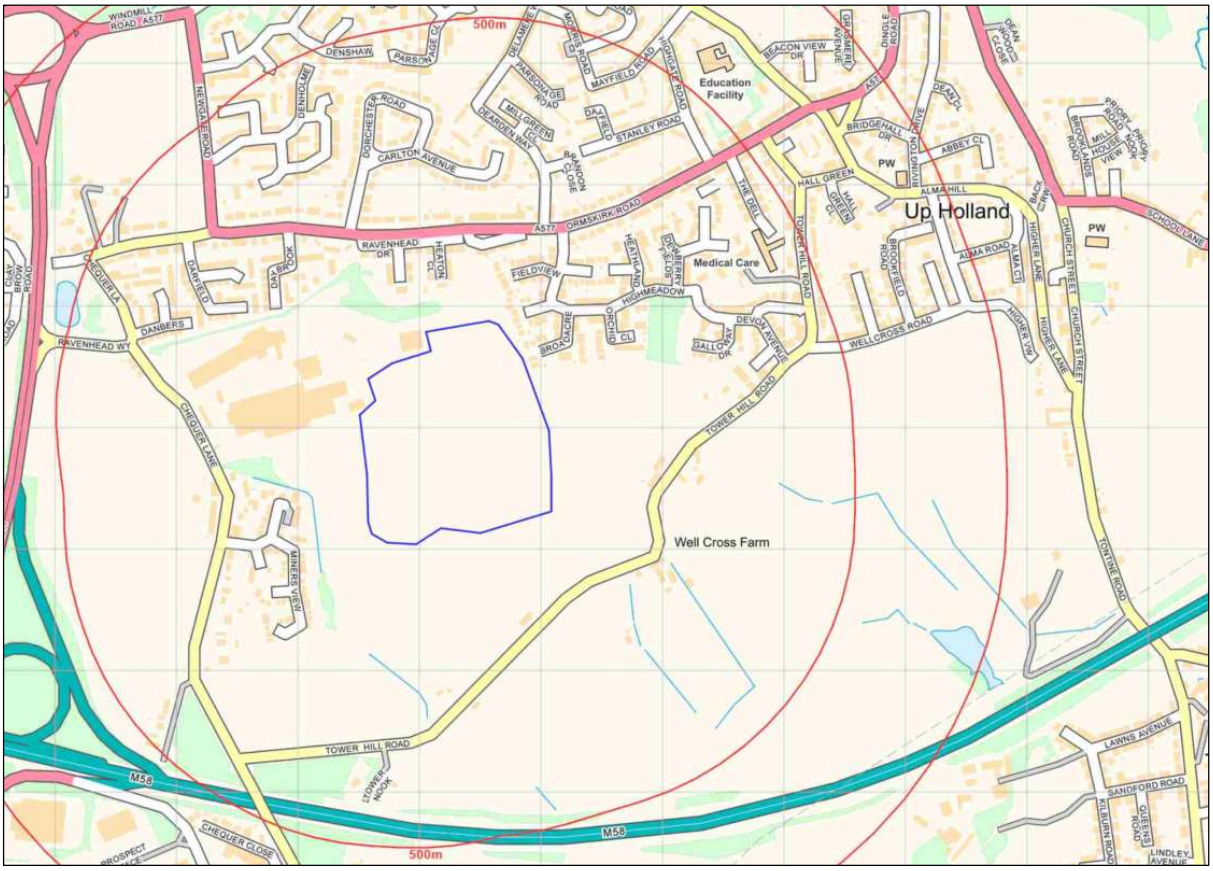
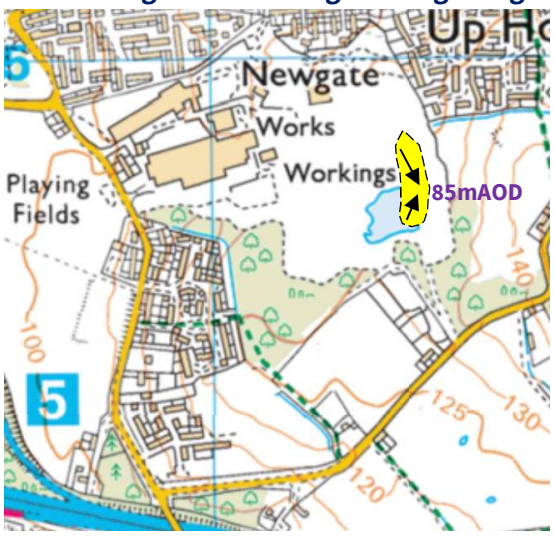


Figure 4 Site Context 2022[11]

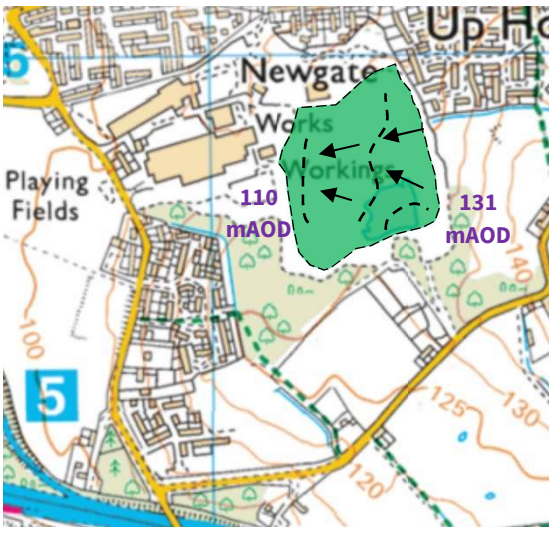


The basal engineering will utilise re-worked site-won clay and mudstone or (alternatively imported clay if required) to the specification of 500 mm with a maximum permeability of $1x10^{-8}$ m/s. The application stability Report (K0158-BLP-R-ENV-08-02) confirms that based on the expected geometry of the voids that construction of the proposed landfill will be stable and the groundwater that may be present can be successfully managed (relevant aspects include basal heave appraisal). The excavation of the brick marl reserve will continue down to a terminal depth of 85mAOD (Figure 5, drawing ESID 5A).

Figure 5 Engineering Design Schematic



Base (mAOD) & direction of fall



Restoration Surface (mAOD) & direction of fall

The restoration surface will fall from ~131mAOD to 110mAOD, ESID 6), the scheme provides consideration of surface water control accordingly (further detail in Section 2.13).

The site will only allow for wastes considered suitable for quarry restoration. HM Revenue and Customs (HMRC) made specific allowance for quarry restoration identifying a very limited list of suitable wastes in accordance with The Landfill Tax (Qualifying Material) Order 2011 (as amended)[5]. These Qualifying Material (QM) wastes are primarily inert and non-hazardous waste with low pollution potential.

Nature of Qualifying Materials

The proposed wastes will consist of excavation, construction/demolition wastes and similar industrial wastes that have a low-level pollution potential.

The qualifying materials include wastes in the following groups:

- Group 1 Rocks and soils
- Group 2 Ceramics or concrete materials
- Group 3 Minerals, processed or prepared
- Group 4 Furnace slags
- Group 5 Ash

Of these the majority of the materials to be landfilled are expected to be:

- Soil (including mixed clays, silts and sands);
- Stones; and
- Concrete based construction materials from development schemes

Therefore, it is not expected that the waste will generate landfill gas or that active management of landfill gas will be required. Such a restriction will also prevent the generation of the primary soluble landfill leachate pollutant (i.e. ammonium) as well as the organic degradation by-products, namely hydrolysis products such as the phenols and the hazardous substances such as BTEX compounds.

The proposed wastes will have a negligible pollution potential; thus, the voids are highly likely to rapidly stabilise to a state where the permitted area could be surrendered upon or shortly after cessation of disposal activities. Gas is considered within report K0158-BLP-R-ENV-07-02.

Waste Characterisation

The infill material may be sourced from excavated mineral and aggregates or similar suitable excavated waste materials and recovered aggregates. This will be enforced by rigorous waste pre-acceptance procedures ensuring only suitable wastes as listed in the European Waste Catalogue (EWC) may be used.

Only wastes that meet the requirements of the Landfill Tax (Qualifying Material) Order 2011 (as amended) (QMO) will be accepted for disposal with due regard to the advice concerning incidental amounts of standard rated wastes given in HMRC Notice LFT1. During the Level 1 characterisation check all waste proposed to be accepted will be compared to the EWC code for the permitted wastes above and to the appropriate description given in the QMO. Waste will only be accepted if it appears in both lists.

During Level 1 characterisation all available data will be assessed to confirm that the correct non-hazardous EWC code has been allocated by the waste producer. Comparison will be made with limiting factors specified in Environment Agency guidance WM3.

Only wastes confirmed as non-hazardous in accordance with the WM3 guidance and that meet the requirements of QMO and that achieve acceptance criteria imposed by paragraph 2.1.1 of the Annex to Council Decision 2003/33/EC will be accepted without the need to review supporting analytical data. All other wastes will only be accepted following comparison of the analytical composition data against the limits imposed by WM3 and this document. All such records will be retained in accordance with the obligations imposed by the Duty of Care and for auditing purposes by HMRC for the operational life of the site. Waste acceptance is detailed in report K0158-BLP-R-ENV-05-02.

Waste Inputs

The void has a calculated capacity of ~1.06Mm^3 (~2.1M tonnes) and comprises an area of approximately 6,000m^2, 0.6ha (base), 47,000m^2, 4.7ha (cap above the engineered site) and 86,300m^2, 8.63ha for the area of restoration. The infilling is anticipated to have a duration of 7 years although material availability may alter the initial assumptions. Input rates averaged over the expected infilling period would equate to 152,000t/y, however, to account for any surplus or additional waste

infill availability and only 260 working days in a calendar year, a permitted maximum of 300,000t/y is proposed within the application.

The waste material is considered to be of a low polluting potential.

2.4 Installation Engineering

Paragraph 1.2 of Annex I to the Landfill Directive states that a landfill can only be authorised if it does not pose serious environmental risk. Paragraph 3.1 provides that a combination of either geological barrier and a bottom liner or a geological barrier and top liner must always be in place in order to protect soil, groundwater and surface water. Paragraphs 3.2 and 3.3 provide technical detail on what these requirements entail, whilst paragraph 3.4 allows for a reduction in what is required under paragraph 3.2 and 3.3.

Paragraph 2 states that appropriate measures for water control and leachate management shall be taken with respect to the collection of leachate. However, the third point in this paragraph says that if an assessment of the location of the landfill and the waste to be accepted shows that the landfill poses no potential hazard to the environment, the measures to collect contaminated water and leachate may be dis-applied. Paragraph 2 therefore indicates that in addition to landfills for inert waste, leachate collection may not be required at landfills for selected non-hazardous waste.

The Environment Agency provides guidance[10] on 'Understanding the Landfill Directive Version 2 (March 2010)'. The guidance indicates that the design of a landfill site should be based on site specific risk assessments. It indicates that a particular element of design criteria of the Annex I may be removed where demonstrated as unnecessary by appropriate risk assessment.

The conceptual site design within this document conform to the requirements of the following:

- Landfill Directive (99/31/EC);
- The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (2016 Regulations)[12];
- The Environment Agency's Landfill Engineering guidance documents – Sector Technical Guidance (LFE series)[13];

Infilling will be undertaken in accordance with Section 5.2, Part A(1) (a) of The Environmental Permitting (England and Wales) Regulations 2016 "Disposal of waste in a Landfill".

Annex 1 of the Landfill Directive outlines the design requirements needed to achieve a successful permit application. The Landfill Directive requires all landfills to have a geological barrier and the Environment Agency have further qualified the directive such that a geological barrier must:

- Extend across the entirety of the base and side walls of the landfill;
- Provide a barrier to contaminant emissions; and

[12] SI 2016 No. 1154 - The Environmental Permitting (England and Wales) Regulations 2016
NOTE: The Environmental Permitting (England and Wales) Regulations 2016 ("the 2016 Regulations") consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010 (S.I. 2010/675) ("the 2010 Regulations"), which have been amended 15 times to date. The 2016 Regulations set out an environmental permitting and compliance regime that applies to various activities and industries

[13] https://www.gov.uk/government/collections/environmental-permitting-landfill-sector-technical-guidance

- Provide sufficient attenuation to prevent pollution to soil and groundwater.

Drawing ESID 6 shows the extend of the engineered landfill on Site. The area highlighted blue will be engineered with an artificial geological barrier and capped with a mineral cap as detailed below. The areas highlighted green are areas that require re-profiling outside of the engineered landfill. The re-profiling will involve the use of on-site quarry mineral waste or imported inert fill. The restored surface area of 8.36 ha will be made up of 4.7ha (cap above the engineered site) and an area of re-profiling restoration of 3.93ha.

2.4.1 Basal / Side Slope Lining System

The Site will be developed as an engineered containment landfill site and will be engineered accordingly.

The site does not have the benefit of an 'in-situ natural geological barrier'. As such a re-engineered Coal Measures strata (appropriate mudstone / clay from the geological succession) 'artificial' geological barrier (AGB) will be placed across the sidewalls and landfill base (ESID 6). See additional discussion in the supporting Hydrogeological Risk Assessment. The Directive states that the artificially established geological barrier should be no less than 0.5 m thick (Annex I, Paragraph 3.2).

The 500mm minimum thickness AGB, at a permeability no greater than $1x10^{-8}$m/s is proposed to provide the geological barrier for lateral containment. In reality, the infilled waste mass will act as a geological barrier, see further information in report K0158-BLP-R-ENV-06-02. Engineering requirements for the construction of an AGB are outlined in Environment Agency guidance 'How to comply with your environmental permit, Landfill (EPR 5.02)' – Now Withdrawn (21st April 2021) and replaced with on-line guidance[14].

For steeper sections of the side slope (vertical faces) and in areas where there are quarry interburden / overburden, the infilling will be placed in lifts commensurate to the rising waste fill deposits to ensure stability. Where there are already placed, extensive thicknesses of interburden / overburden overlying the natural strata, the top surface will be reworked or if required enhanced by imported material to create the engineered AGB. The mineral liner will be placed in accordance with the Environment Agency guidance LFE4 – Earthworks in Landfill Engineering and will be subject to independent third party CQA.

Due to the nature of the waste to be deposited (and the associated potential source term) it has been demonstrated through the Hydrogeological Risk Assessment (report reference K0158-BLP-R-ENV-06-02) that leachate collection is not required. As there is no requirement to collect leachate within the site, it is considered that there is no requirement to install an artificial sealing liner (ASL). Environment Agency guidance[10] describes the ASL is part of the leachate collection and sealing system mostly met by the inclusion of geomembrane.

This engineering approach is widely used across similar sites with identical infilling schemes, as per previous applications undertaken previously by TerraConsult (now ByrneLooby). Infilling operations will be "below ground level" throughout the majority of the development.

On issue of the Environmental Permit for the infilling, a detailed CQA design, construction and method statement will be submitted to the Environment Agency for approval. The mineral liner (AGB) will be placed in accordance with the Environment Agency guidance LFE4 – Earthworks in

[14] https://www.gov.uk/guidance/landfill-operators-environmental-permits

Landfill Engineering[15] and will be subject to independent third party CQA. Based on the identification of receptors detailed herein and derivation of the sites conceptual site model (underpinned by a source – pathway – receptor framework) it is therefore considered that the proposed engineering design of Ravenhead Quarry Landfill is compliant with the requirements of the Landfill Directive.

2.4.2 Capping System

On completion of the filling a 500mm thick mineral capping layer will be placed (selected low-permeability materials) to limit infiltration. A final capping layer will be installed over each engineered phase of the completed landfill, the cap is designed to:

- prevent the waste from being disturbed;
- control water infiltration;
- be stable to erosion;
- be resistant to penetration by roots; and
- be able to tolerate the long-term strains caused by any minor settlement.

2.4.3 Restoration and Aftercare

The final infilling at Site will involve a design height to the restoration scheme which allows for surface water to flow passively to the proposed attenuation area in the southeast corner of Site, before discharging to surface water sewer located on Chequer Lane in accordance with permission from United Utilities. The overall fall is from circa 130mAOD in the south of the landfill, to a low point of ~110mAOD in the west (drawing ESID 6). Restoration will meet the objectives of the current planning application, selected materials will be utilised to assist in surface water control. A typical thickness of 1m of restoration soils is proposed over the cap.

The restoration profile has been designed with slopes to convey surface water towards the proposed surface water attenuation pond. This restoration profile will be designed so that the geological SSSI along the south-eastern cliff and southern faces (uppermost levels) are preserved (where possible) whilst still ensuring surface water run-off can be managed and discharged.

The soils will be seeded with grass to prevent erosion and provide a low maintenance surface. The grass cover will be encouraged as part of the restoration to minimise maintenance at the site.

The restoration profile is depicted on Drawing ESID 6, surface water flows are presented on ESID 13.

2.5 Engineering Properties

Hydraulic conductivities for the engineered clay AGB and cap are as stated above, 500mm thick with a maximum permeability of $1x10^{-8}$m/s.

[15] LFE4 - Earthworks in landfill engineering, Design, construction and quality assurance of earthworks in landfill engineering. Environment Agency

2.6 Groundwater Management

Currently groundwater and incident precipitation surface water collect within the quarry and are removed by pumping to a foul sewer on Chequers Lane in accordance with a permission issued by United Utilities. The current permitted discharge is limited to 5 l/s and is sufficient to maintain the quarry dry during the current extraction.

This pumped discharge to foul sewer will be maintained during the construction of the AGB and during the early phases of filling. This will be achieved by the construction of stone drains dug into the formation layer at the base of the quarry. The stone drains will direct groundwater into a chamber constructed in the footprint of the last phase of filling (Drawing ESID 8D). Pumping to foul sewer will be maintained throughout the filling process until all fill levels exceed the anticipated groundwater recovery level of at least 91mAOD (K0158-BLP-R-ENV-08-02, Plough Geotechnical).

The dewatering chamber will be retained as operational until groundwater levels stabilised to a level which is below the surface of the infill. Following confirmed cessation of pumping the chamber will be decommissioned and backfilled with bentonite pellets and inert fill.

Current extraction has revealed very limited seepages of groundwater at levels above the base of the quarry, however if any seepages are noted they will be subject to localised collection and diverted to the dewatering chamber.

2.7 Leachate / Infill pore-water Management and Monitoring

It has been demonstrated by the Hydrogeological Risk Assessment and through experienced gained at other similar sites that by controlling the nature of the waste inputs, leachate collection will not be necessary.

However, if present, leachate monitoring will be undertaken utilising a single monitoring chamber and basal spine drains (Drawing ESID 7A, 7B).

This will further assist in establishing source term characteristics of the infill (leachable pore-water quality) and accords with overarching agreed principles applied to similar infill schemes for other operators that have been recently accepted and permitted.

2.7.1 Waste infill Characteristics - Overview

The wastes proposed consist of excavation, construction and demolition wastes and potentially some similar industrial wastes that are inert or non-hazardous with low levels of contamination to be confirmed by waste pre-acceptance procedures. It is anticipated that the majority of wastes will be either:

- excavated soil and stones including clays and silts; or
- similar materials resulting from the treatment of mixed construction, demolition and excavation wastes.

Experience has shown that such materials tend to have a relatively high silt and clay content and as a result following placement achieve low vertical permeability.

As the site is not yet operational; there are no samples of the waste available. However, ByrneLooby has been provided laboratory test results of four samples from another site (not operated by Booth Ventures Waste (North West) Ltd) permitted to accept non-hazardous Qualifying Material. The four

samples all show well-graded particle size distributions (PSD's) with vertical permeability values reported in the range $1x10^{-10}$ to $3x10^{-10}$ m/s from laboratory testing in a 100 mm diameter triaxial cell.

Environment Agency guidance on hydrogeological risk assessments for landfill[16] (www.gov.uk) states that when determining an appropriate leachate source-term the following information should be considered in order of preference:

- Actual leachate composition from similar sites;
- Waste leaching data on the potential wastes; and
- Literature values.

Further details regarding the source term for the qualifying material infill is presented in the report referenced K0158-BLP-R-ENV-06-02 and waste acceptance report K0158-BLP-R-ENV-05-02. The potential leachate source term for the infill has significantly less polluting potential than non-hazardous bio-degradable waste sites (i.e. that contained within the adjacent sites to the north and northeast) already consented.

2.7.2 Leachate Chemistry

As referred to above, a leachate source term for the waste types proposed in this application will not contain a putrescible component to the waste stream. Consequently, the significant ammoniacal-N and dissolved organic matter (as represented by the COD) as well as other soluble salts will not be present as readily degradable organic matter and soluble salts are specifically excluded from the list of wastes described as QMs. Given that the proposed waste types are unlikely to contain a degradable organic content, elevated ammoniacal-N and BOD is not expected to be associated with the site. Similarly, solvents, refined petroleum fuels or other chemical sources will be excluded.

Further detail relating to the source term chemistry for similar sites (based on an identical waste inventory) is provided in the supporting Hydrogeological Risk Assessment (report K0158-BLP-R-ENV-06-02).

2.7.3 Requirements for Basal Drainage and Leachate Management

As detailed above, there are no requirements for a basal drainage layer at the site (above the geological barrier) as based on risk assessment there is no requirement to collect, manage or remove leachate.

When overall drainage behaviour has been assessed in similar applications for the infilled wastes, it is the 'large-scale' or mass permeability that controls drainage behaviour. The mass permeability of compacted well graded materials will tend toward the median or mean of the range of permeability that might be expected if individual loads were tested.

The action of tipping, dozing and compaction results in mixing of loads and means that even multiple loads of slightly higher or lower permeability do not have a significant effect on the mass permeability of the waste material. Therefore, the mass permeability of the placed waste to be of the order of 10^{-8} to 10^{-9} m/s (equivalent to the Landfill Directive requirements for geological barriers).

[16] https://www.gov.uk/guidance/landfill-operators-environmental-permits/what-to-include-in-your-hydrogeological-risk-assessment

Drainage measures would have negligible drainage effect in such very low permeability, well-graded soils. This is recognised in UK construction industry guidance CIRIA Report C750 Groundwater Control – Design and Practice, 2nd Edition (Preene et al., 2016 [17]) where Figure 1.10 of that report states that below a permeability of approximately 10^{-7} m/s '*Dewatering may not be feasible and may not be necessary*'. The 'may not be feasible' comment reflects the poor drainage behaviour discussed above. The 'may not be necessary' comment reflects the fact that very low permeability soils are often hardly affected by destabilising effects of groundwater flow that can occur in more permeable soils.

A combination of compaction during placement and the subsequent loading will result in variable permeability within the waste mass and is considered likely to be generally low to very low depending on the clay content in the waste soil.

However, it is considered unlikely that the soil fill will exhibit uniformly the same hydraulic properties[18,19] with the soil likely to be anisotropic with reduced vertical porosity/permeability. Consequently, it is considered highly likely that layers of soil will have varied composition and similarly variable permeability and porosity. The transit of liquid vertically downwards through this soil fill will therefore be limited by the soil layers of the lowest permeability. The location of such layers may vary throughout the fill and thus it is considered probable that the vertical transit of incidental rainfall to the base of the site will be minor compared to the lateral flow in the upper layers of saturated soils.

This lateral movement of liquid within fill is well recognised[20,21] and the effects of even limited quantities of soil have been identified by the Environment Agency whose guidance on the use of daily cover on biodegradable wastes states: *"You will need to consider the permeability of you chosen landfill cover material. Unless the material is known to degrade rapidly once buried, you must avoid a build-up of layers within the waste body. This is to prevent perched leachate within the site and impede the removal of landfill gas or leachate. You must remove any low permeability materials you've used for landfill cover before applying the next layer."* Effectively the proposed waste mass will consist of many layers of soil fill, many of which will be a low permeability material.

Any extraction of liquid from a basal drainage layer is limited by the rate of liquid ingress to the layer. Initially as the soils at the base of the site consolidate and excess pore pressure dissipates liquid may enter the drainage layer, however any vertical flow to the drainage layer will be limited by the low permeability of the soils above.

Therefore, if the drainage layer is 'pumped dry' the impact of this on the liquid content of the soils above will in all likelihood be much localised. It is considered improbable that all liquid within the significant thickness of overlying soils can be removed or that the upper level of saturated soil could be lowered by extraction of liquid at the base of the site. However, based on these details above and in accordance with information submitted previously in regard to similar applications (and

[17] Preene, M. Roberts, T.O.L. and Powrie (2016). Groundwater Control – Design and Practice, 2nd Edition. Construction Industry Research and Information Association, CIRIA Report C750, London.
[18] Ahuja LR et al , 1981, A Theoretical Analysis of Interflow of Water Through Surface Soil Horizons with Implications for Movement of Chemicals in Field Runoff, Water Resources Research Vol 17, No 1 pp65-71.
[19] Ahuja LR & Ross JD, 1983, Effect of Subsoil Conductivity and thickness on Interflow Pathways, Rates and Source Areas for Chemicals in a Sloping Layered Soil With Seepage Face, J. of Hydrology, 64, 189-204.
[20] Hall DGM et al, 1977, Soil Survey Technical Monograph No.9, Water Retention, Porosity and Density of Field Soils, Harpenden.
[21] White RE, 1987, Introduction to the Principles and Practice of Soil Science, Blackwell, ISBN 0-632-01606-x

approved by the Agency), the operator intends to include discretionary spine drains within the site design.

Imported stone (or similar applicable material) will be utilised to surround the spine drains. An extended leachate pad area will be included within the design to allow for retro installation of a secondary well of required.

Water / direct run-off from the waste materials during waste placement is outlined in Section 2.10.

2.7.4 Requirements for Water Balance

Under the conditions of infilling the Ravenhead Quarry void, and previous understanding in regard toaccumulation of water in low-permeability waste (detailed above), a water balance is not requiredand hence is not included in the supporting HRA (K0158-BLP-R-ENV-06-02). Surface waters (rainfallcollection) however will be managed and removed as required.

Based on the conceptual understanding of the site, it is expected that the water balance would be controlled by the following characteristics:

- Very limited potential for the placed waste to generate 'leachate' (i.e. mobile water) due to the low permeability (10^{-8} to 10^{-9} m/s) and the fine-grained nature of the waste.
- Due to the nature of the waste materials, that the majority of the water falling onto the waste during placement will become run-off and, subject to water quality, will be pumped away as part of surface water management (Section 2.10). Over the operational period of the site very little water is anticipated to soak into the waste and contribute to 'leachate' production, also referred to as a "soil mass porewater".
- The overall site run-off (when infilling and restoration is complete), is to be conveyed to the surface water sewer as part of the surface water management system.

2.7.5 Leachate Monitoring

During the initial stage of filling, it is anticipated that the low permeability of the restoration fill will limit the available liquid within the fill. Nevertheless, it is proposed to construct one monitoring point from which liquid samples (leachable pore-water) may be taken. The design of the monitoring point and location are illustrated on drawings ESID 7A / 7B. The monitoring point will be constructed so that it can be built up as filling progresses. The chamber will be surrounded by fines free selective fill to provide initial support and protection and to encourage the collection of liquid (if generated).

The monitoring point will be provided with a gas monitoring tap to allow for the monitoring of landfill gas. Additionally, spine drains will be installed within the cell directed to the leachate monitoring point. Details of these and the monitoring point is shown on the Engineering Detail drawing ESID 7B.

A target pad will be installed adjacent to the monitoring point in case of the requirement for a future replacement chamber.

2.8 Landfill Gas Management and Monitoring Infrastructure

It has been identified within similar applications and the associated accompanying Landfill Gas Risk Assessment (K0158-BLP-R-ENV-07-02) that the production of landfill gas will be negligible due to the non-biodegradable nature of the permitted waste types.

2.8.1 Landfill Gas Generation

Section 7.4.5 of the Agency's LFTGN03[22] discusses the role of microbial populations contained within the predominantly low permeability, soil rich wastes and cover materials oxidising a proportion of the methane generated within the waste mass. With the negligible amount of methane predicted to be generated, it is considered that this methane oxidation will have a significant role in the management and control of any landfill gas generated at Site. LFTGN03 states that this biological methane oxidation is considered and appropriate method for controlling landfill gas on low gassing sites. Further details are provided in report K0158-BLP-R-ENV-07-02.

2.8.2 Landfill Gas Monitoring

A gas monitoring tap will be installed to the leachate well to allow for monitoring purposes. In addition, following the completion of infilling, in waste landfill gas monitoring boreholes will be installed in accordance the requirements of Environment Agency landfill surrender guidance (EPR 5.02) (installed at a frequency of 2 per hectare), the restored area is measured at 4.7ha.

2.9 Surface Water Management System – Infilling Phase

During the filling process, water collected within the active void (cell base) will be treated as leachate, contained and removed accordingly. This will be addressed operationally in the construction of temporary bunds and appropriate waste grading so that rainfall derived run-off can be contained and tested.

If testing indicates the water is clean, it will be pumped to the surface water settlement pond and discharged to surface water sewer. If required for operational purposes (e.g. dust suppression on contained areas of site), a temporary storage pond to the north / northwest of the site would be considered. If necessary, water not considered suitable for discharge to the surface water sewer may be discharged to the foul sewer in accordance with the extant consent or removed by tanker.

2.10 Capping System

On completion of the filling a cap will be placed (selected low-permeability materials) to limit infiltration.

A final capping layer will be installed over the site as filling is completed, the cap is designed to:

- prevent the waste from being disturbed;
- control water infiltration;
- be stable to erosion;
- be resistant to penetration by roots; and
- be able to tolerate the long-term strains caused by differential settlement.

2.11 Sub-Cap Seepage Collection

Although the matrix conductivity of the infill is expected to be low and the potential to transmit high rates of flow limited, the soil infill is expected to act as the pore saturation limiting layer therefore the upper layers of the soil infill will become readily saturated during periods of high rainfall and infiltration will be diverted across the lowest point of the surface. Where this water is not lost

[22] Guidance on the Management of landfill gas, LFTGN03

through the processes of evaporation or transpiration, a theoretical vertical transit pathway exists to the recovered (rebounded) groundwater surface. As outlined in the supporting hydrogeological risk assessment, the unsaturated pathway to the water table is extensive with a range of between 6 and 22m. As such, vertical seepages to groundwater through this pathway (permeability expectation of $1x10^{-10}$m/s) are considered negligible.

As the proposed wastes have a low leaching potential and there will be limited contact with surface water and the wastes, it is anticipated that this run-off water could be discharged directly to the environment consistent with that of clean surface water at the site.

The source term should be monitored as outlined within the Emissions and Monitoring Plan (report K0158-BLP-R-ENV-09-02) from the in-waste monitoring point, and subsequently crossed checked against the assumptions contained with the HRA (report K0158-BLP-R-ENV-06-02). If, through the collection of the pore-water / leachate source term data there are any environmental concerns, or a significant deviation from the assumed source term is noted then a collection drain could be considered. The design (including collection chamber) would be approved via a submission of a CQA plan, it is unlikely that this will be required until at least year 6-8 (ESID 5B).

2.12 Restoration and Aftercare

The final infilling will involve a design height which allows for surface water to flow passively to the surface water settlement pond (drawing ESID 13). The infilling of the void will provide final restoration contours for the site to be commensurate with the surrounding land surface (as far as is reasonably practical).

The restored surface, 4.7Ha above the engineered element of the site (high point of 134mAOD in the southeast corner of site will convey rainfall run-off towards the western boundary to the surface water management / settlement pond.

Restoration will meet the objectives of the current planning application, a typical thickness of 1m of restoration soils is proposed over the cap, the full extent of the restoration scheme depicted on drawing ESID 6 is 8.63Ha (86,300m^3) which equates to a total of ~173,000t.

The soils will be seeded with grass to prevent erosion and provide a low maintenance surface. The grass cover will be encouraged as part of the restoration to minimise maintenance at the site. There are no specified phases in regard restoration scheme, restoration will be completed as soon as practicably possible on completion of infilling.

2.13 Surface Water Management System – Post Infilling / Restoration Phase

On final completion of infilling and restoration (drawing ESID 6), all surface water flow will be conveyed to the surface water sewer discharge point in accordance with the agreed consent (ESID 13).

2.14 Post Closure Controls

Completion criteria (when the waste is physically and chemically stable) will be determined based on the collection of monitoring data, future risk assessment i.e. the periodic 6yr HRA submissions (in addition to future Gas Risk Assessment) will delineate when the operator can apply to surrender the permit.

The conceptualisation of how the containment systems will operate throughout the life cycle of the proposed development is presented within Table 2.

Table 2 Management Measures and Technical Controls Throughout the Landfill Life Cycle

Landfill Phase	Leachate Management	Gas Management	Containment System	Landfill Cap
			Artificial Geological Barrier	
Operational	No requirement for management, no specified leachate limits required. Periodic monitoring undertaken for establishing surrender point	No requirement for management, no specified leachate limits required. Periodic monitoring undertaken for establishing surrender point	Operates as designed	N/A
Post Closure & Aftercare Period	Periodic monitoring undertaken for establishing surrender point, some degradation/ clogging of the drainage system	Periodic monitoring undertaken for establishing surrender point, some degradation/ well clogging of the monitoring system	Operates as designed	Operates as designed
Site Completion	None	None	Operates as designed	Operates as designed
Post Site Completion	None	None	Operates as designed	Operates as designed

The proposed aftercare will include enhancement of the geological SSSI. Further details are provided in the planning application submission to the LPA and associate Geological SSSI Management Scheme.

Monitoring of pore-water (leachate), gas and surface water on site will continue until permit surrender (monitoring locations for the site are depicted on drawing ESID 12). Post closure checks will be undertaken to review periodically the on-site management systems, and to check for subsidence or differential settlement.

2.15 On Site Processing

The aggregate recovery operation will be undertaken on a hardcore pad as illustrated on drawing ESID 4.

The pad will be placed on lower permeability soils which will direct surface water run-off into the quarry void, where the water will either be directed into the current dewatering discharge to foul sewer or to the engineered containment of the new landfill.

Only selected waste types will be suitable for the recovery of aggregates. These wastes are specified in Appendix C of the quality protocol and can be summarised as:

- Waste gravel and crushed rocks other than those mentioned in 01 04 07 (EWC 01 04 08)
- Waste sand and clays (EWC 01 04 09)
- Glass packaging (EWC 15 01 07) / Glass (EWC 19 12 05 / 20 01 02)
- Concrete (EWC 17 01 01)
- Bricks (EWC 17 01 02)
- Tiles and ceramics (EWC 17 01 03)
- Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06 (EWC 17 01 07)

- Glass (EWC 17 02 02)
- Bituminous mixtures other than those mentioned in 17 03 01 (EWC 17 03 02)
- Soils and stones other than those mentioned in 17 05 03 (17 05 04)
- Dredging spoil other than those mentioned in 17 05 05 (17 05 06)
- Track ballast other than those mentioned in 17 09 01, 17 09 02 and 17 09 03 (17 09 04)
- Mineral (for example sand and stones) 19 12 09
- Garden and park waste (including cemetery waste) – soil and stones (20 02 02)

Suitable wastes will be diverted from the disposal in the landfill and stockpiled until a sufficient quantity is available for the deployment of mobile plant to crush and /or screen the wastes. The most suitable wastes will be those which contain large amounts of stone, brick and concrete and are consequently the least susceptible to generation of wind-blown dust when stockpiles.

Assuming 5% of annual inputs to the site area is suitable for recovery approximately 15,000 tonnes of waste will be treated per year. All recovered aggregate will meet the end of waste criteria detailed in the quality protocol. The recovered aggregate may be utilised on site or exported for use in off-site construction projects.

The any waste from the treatment process will be used in the engineered landfill void subject to appropriate classification in accordance with WM3 and achieving the appropriate standards as dictated by any necessary testing to confirm status as QM as dictated by HMRC.

3 Pathway & Receptor Characterisation

3.1 Climate

Information contained on the Met Office website provides details for the local area. Key statistical information is presented below in Table 3 and Table 4.

Rainfall

Table 3presents the 30-year statistical averages for the area, covering the date period 1991-2020. The data is taken from the Crosby Climate Station, altitude 9m above mean sea level, 21.5km west-southwest of Site, annual rainfall is less than that detailed in MAFF 1976[23].

The average annual rainfall reported within MAFF 1976 is 1133 mm, with potential annual evapotranspiration of 484mm resulting in an effective annual rainfall of 649 mm.

Wind

A wind rose is presented below in Figure 6, this data shows a statistical representation of data obtained between 2016 and 2021. Predominant wind direction is from the west-southwest at a frequency of ~17.5%.

[23] MAFF Climate and Drainage Report 34, 1976 HMSO

Table 3 MAFF Agri-climatic Area 8 Average Climate Statistics (1991 – 2020)

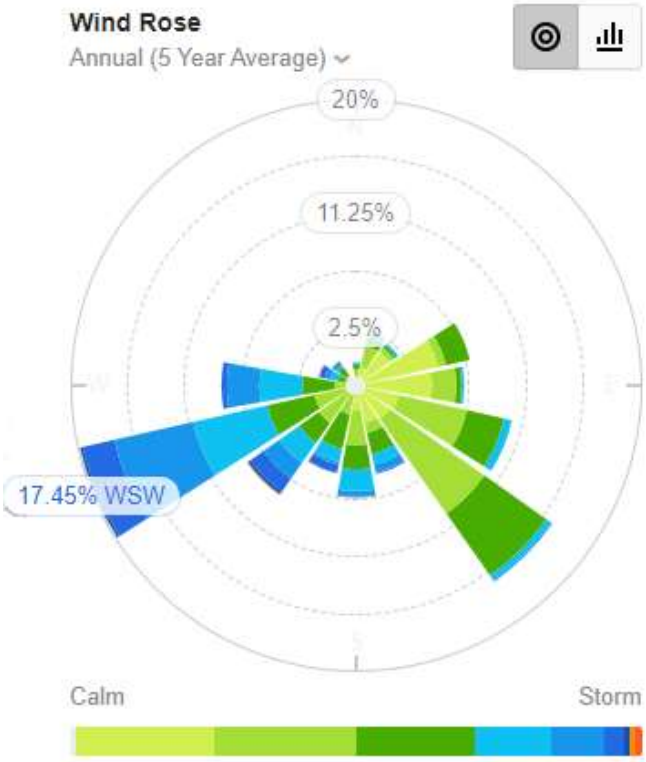
Month	Rainfall (mm)	Potential Transpiration (mm)	Effective Rainfall (mm)
January	108	1	107
February	77	9	68
March	67	30	37
April	70	53	17
May	73	80	-7
June	73	87	-14
July	88	85	3
August	112	71	41
September	118	43	75
October	114	20	94
November	115	5	110
December	118	0	118
Winter Total	599	65	534
Summer Total	534	419	115
Annual	**1133**	**484**	**649**

Table 4 Meteorological Office Average Climate Observations (1991 – 2020)[24]

Month	Max. temp (°C)	Min. temp (°C)	Days of air frost (days)	Rainfall (mm)	Days of rainfall >= 1 mm (days)	Monthly mean wind speed at 10m (knots)
Jan	7.5	2.8	6.8	69.4	13.8	13.2
Feb	7.9	2.7	6.2	57.1	11.5	13.0
Mar	9.9	3.9	3.7	53.3	11.3	11.9
Apr	12.8	5.6	1.5	49.8	10.0	10.9
May	15.9	8.3	0.4	52.5	9.8	10.7
Jun	18.4	11.3	0.0	64.4	10.4	10.8
Jul	20.0	13.5	0.0	65.5	11.0	11.1
Aug	19.7	13.5	0.0	72.1	12.2	10.9
Sep	17.7	11.2	0.0	76.6	11.8	11.2
Oct	14.2	8.5	0.7	89.7	14.4	11.7
Nov	10.5	5.7	2.7	82.2	15.5	12.3
Dec	8.0	3.1	6.5	91.9	15.4	12.5
Annual	**13.6**	**7.5**	**28.4**	**824.3**	**146.9**	**11.7**

[24] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gctb66ydw

Figure 6 Skelmersdale Wind Direction Distribution% (2016 – 2021)[25]



3.2 Geological Succession – Overview

The surrounding geological sequence comprises:

Glacial till, glaciofluvial sands and gravels and head deposits:

1. Glacial till – clay, with silt, sand and gravel (north, east and south of Site)
2. Glaciofluvial sheet deposits (Shirdley Hill Sand Formation) - sand and gravel (west of Site)
3. Head – clay, with silt, sand and gravel (500m east of Site)

The underlying geological sequence comprises:

Bedrock Strata:

1. Pennine Lower Coal Measures Formation – Mudstone, with siltstone and sandstone bands and coal seams
    a. Great Arc Sandstone – sandstone unit within the Pennine Lower Coal Measures Formation (present on eastern side of Site)
    b. Woodhead Hill Rock – sandstone unit within the Pennine Lower Coal Measures Formation (outcrops approximately 200m west of Site)
2. Millstone Grit Group – sandstones, interbedded with siltstone and mudstones

[25] https://wind.willyweather.co.uk/nw/lancashire/skelmersdale.html

a. Rough Rock – sandstone

b. Rossendale Formation – mudstone, sandstone and siltstone

   i. Haslingdon Flags – sandstone unit within the Rossendale Formation

   ii. Lower Haslingdon Flags - sandstone unit within the Rossendale Formation

c. Marsden Formation – sandstone, with siltstone and mudstone

   i. Holcombe Brook Grit – sandstone unit within the Marsden Formation

3.2.1 Regional Context and Literature Based Accounts

The regional geology is dominated by the Carboniferous Pennine Lower Coal Measures (around Site), which are of Westphalian A age, and specifically the Langsettian substage. These are underlain by the Rossendale Formation strata of Yeadonian substage, and at depth are the Marsden Formation strata (Marsdenian substage).

The coal measures west of Wigan are noted as being difficult to correlate with the coal measure of the rest of Lancashire and Yorkshire[26], due to their lack of subcrop exposure in the area. The geological map shows that the coal measures west of Wigan are heavily faulted, with fragmented blocks juxtaposed against both older and younger stratigraphy. The Regional geological sequence is summarised in Table 5.

3.3 Geological Succession – Site Area

3.3.1 Superficial Geology

The BGS website http://mapapps.bgs.ac.uk/geologyofbritain/home.html and BGS Map Sheet 84[27,28] indicate that the Site itself is devoid of superficial deposits, any formerly present have been removed during the development of the quarry. Surrounding the quarry are Glacial Till deposits, being present to the north, east and south. The Glacial Till deposits are described in borehole logs as predominantly clay deposits with sands and boulders, often with lens of sandier material between the mainly clay matrix.

They are poorly mixed and stratified, having been deposited during the retreat of the icesheets from Northern Britain at the end of the ice age.

To the west of Site are glaciofluvial sand and gravel sheet deposits and further west the Shirdley Hill Sand Formation sand and gravels. The glaciofluvial sands and gravels are considered likely to have been deposited from glacial meltwater streams emanating from the icesheets present in the area during the ice age.

The Shirdley Hill Sand Formation is described by the BGS as being interpreted as coastal windblown sands, therefore being well-sorted and fine grained. There are also peat layers identified in the lower parts of the formation.

[26] Eagar, R. M. C. 1950, A revision of the sequence and correlation of the Lower Coal Measures west of Wigan.
[27] British Geological Survey, 1970; England and Wales Sheet 84 Wigan, 1; 63,360 Drift
[28] British Geological Survey, 1977; England and Wales Sheet 84 Wigan, 1; 50,000 Solid

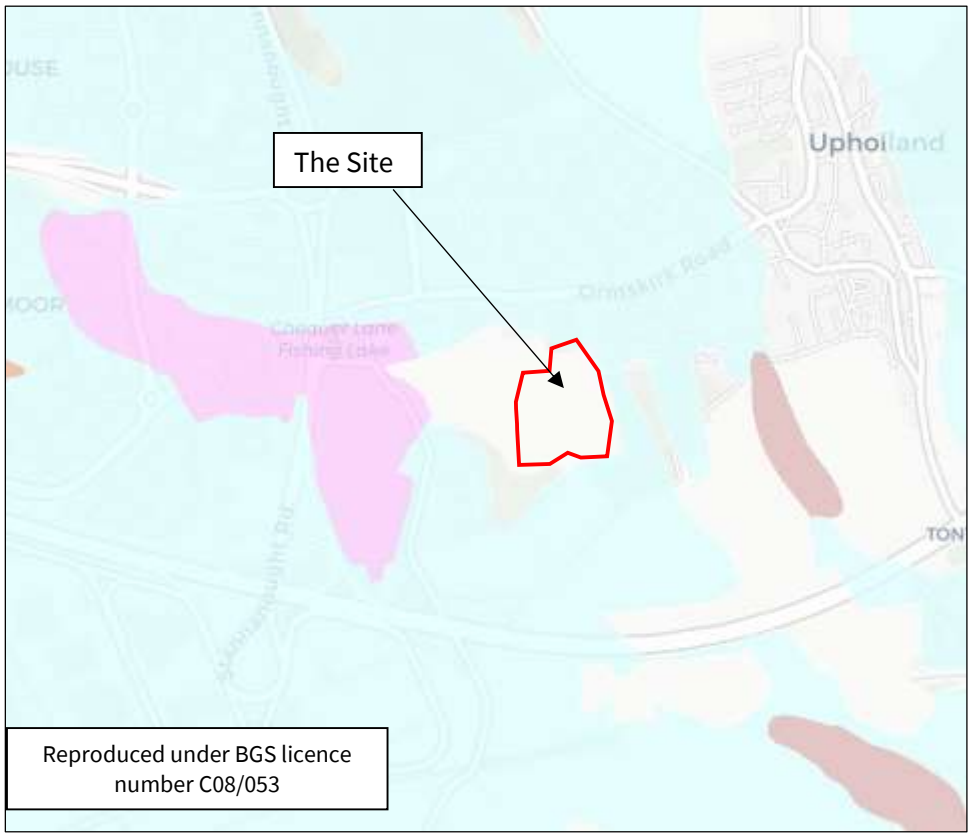
Table 5 Regional Geology

Period	Formation	Thickness (m)	Brief Description
Quaternary	Glaciofluvial Sheet Deposits	~1 to 2m	Sand and gravel, with some clay and silt, deposited in streams emanating from ice sheets
	Shirdley Hill Sand Formation	0.1-1.9m thick, at nearby Whitemoss landfill site	Sand, silty and clayed with rare peat, interpreted as coastal windblown sands
	Glacial Till	Up to 6.5m	Clay, with silt, some sand and gravel, deposited retreating ice sheets.
	Head	unknown	Clay, silt, sand and gravel. Poorly sorted and poorly stratified, with localised lenses of silt, clay, peat and organic material
Carboniferous	Pennine Lower Coal Measures	Up to 720	Predominantly interbedded mudstones, shales and siltstones, with common sandstone bands, the larger of which are typically named. There are numerous coal seams, with those in the upper part of the formation typically having a greater thickness. In the local area, named sandstone units within the formation include the Milnrow Sandstone, Great Arc Sandstone and the Woodhead Hill Rock. There are numerous named coal seams, with those local to the site explained in detail in Section 3.3.
	Rossendale Formation	Up to	Predominantly sandstones, fine to coarse grained, with interbedded siltstones and mudstones, and some rare coal seams. The thicker sandstone units are typically names, with the Rough Rock, Upper Haslington Flags and Lower Haslingdon Flags in the local area. The upper Rossendale Formation is dominated by sandstone sequences, whereas the lower portion is mudstone dominated.
	Marsden Formation	0-7.0	Predominantly sandstones, fine to coarse grained, with interbedded siltstones and mudstones, and black shales. There are also some thin coals within the formation.

The Shirdley Hill Sand Formation is located approximately 1.5km west of Site, whereas the glaciofluvial sand and gravel is located approximately 300m from Site (Figure 7). There are head deposits approximately 500m to the east of Site, but they are of limited areal extent. Based upon the geological map and the topographic map, the head deposits appear to be likely formed from outwash from the Glacial Till by a small watercourse.

Like the Glacial Till, these head deposits are likely to be poorly sorted and poorly stratified clays, silts and sands.

Figure 7 Superficial Geology



BGS borehole logs around the Site indicate that the Glacial Till is between 5m and 6.5m thick, whereas the glaciofluvial sands and gravels are only 1m to 2m thick. The Shirdley Hill Sand Formation is up to 1.9m thick and appears to sit directly on top of the Glacial Till, as does the glaciofluvial sand and gravels.

3.3.2 Bedrock Geology

Stratigraphy

The bedrock sequence is illustrated in the section line of the BGS map sheet 84 (Wigan, see Figure 10), with the section line located north of the site. In addition, the geology of the coal measures has been documented in geological memoires and other literature. Site investigation boreholes drilled by SLR on behalf of Ibstock Brick Limited around the perimeter of the site provide details on the lithology at Site.

The strata dip to the east-northeast, meaning that the youngest strata is present to the east of Site and the strata to the west gets progressively older. The onsite strata are best summarised within the URS Geological SSSI Management Scheme report[29] (updated in report K0158-BLP-R-ENV-11-02), with a summary of the described strata presented in Table 6.

There are noted discrepancies between publications around the naming of the different strata, with a notable difference being that the BGS now refer to the Bullion Mine Rock as the Great Arc Sandstone.

[29] URS 2013, Geological SSSI Management Scheme: Ibstock Brick (1996)

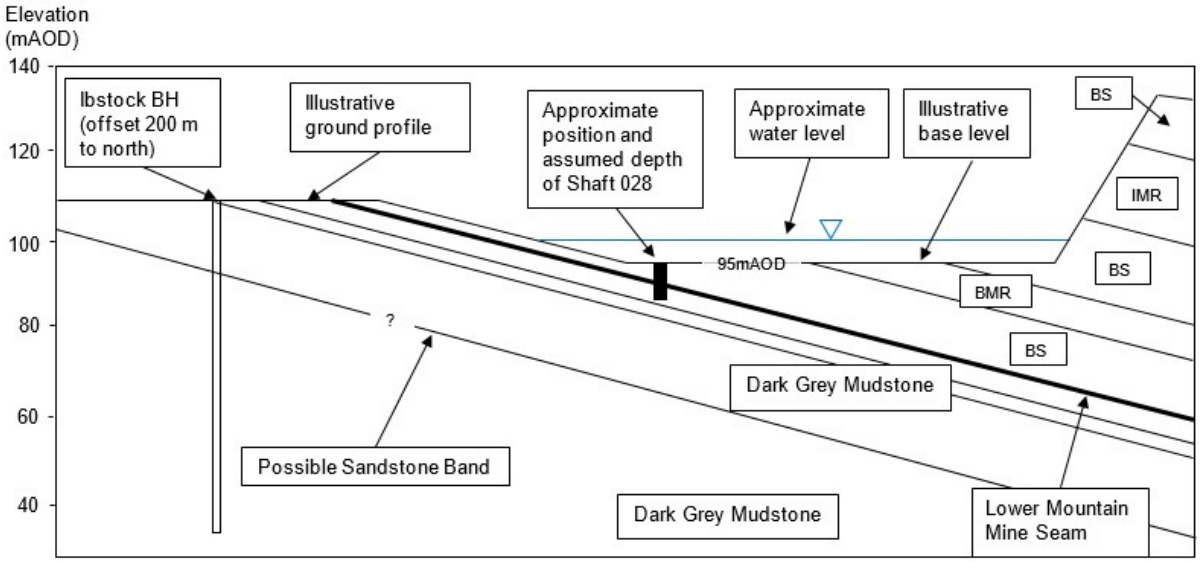
Table 6 On-site bedrock geological sequence

Unit	Lithology
Measures	Silty mudstones
Inch Mine Coal	Coal
Inch Mine Rock	Sandstone
Measures	Shales, mudstones
Bullion Mine Marine Band	Mudstone
Bullion Mine Coal	Coal
Bullion Mine Rock	Sandstone
Measures	shales, sandstones
Lower Mountain Mine Coal	Coal
Fireclay	Shale
Rambler Mine Coal	Coal
Ganister	Sandstone

Additionally, the separate coal seams have often been attributed different names when they are being transposed across different sites. Hence, the Lower Mountain Mine Coal is sometimes referred to as the Middle Mountain Mine Coal, and there are reports of an Upper Mountain Mine Coal which may correspond to what is currently reported as the Bullion Mine Coal or the Inch Mine Coal.

Figure 8 presents a schematic understanding of the sequence at Site giving a rough indication of the position of the separate units within the Pennine Lower Coal Measures within the quarry.

Figure 8 West to East cross-sectional line through Ravenhead Quarry



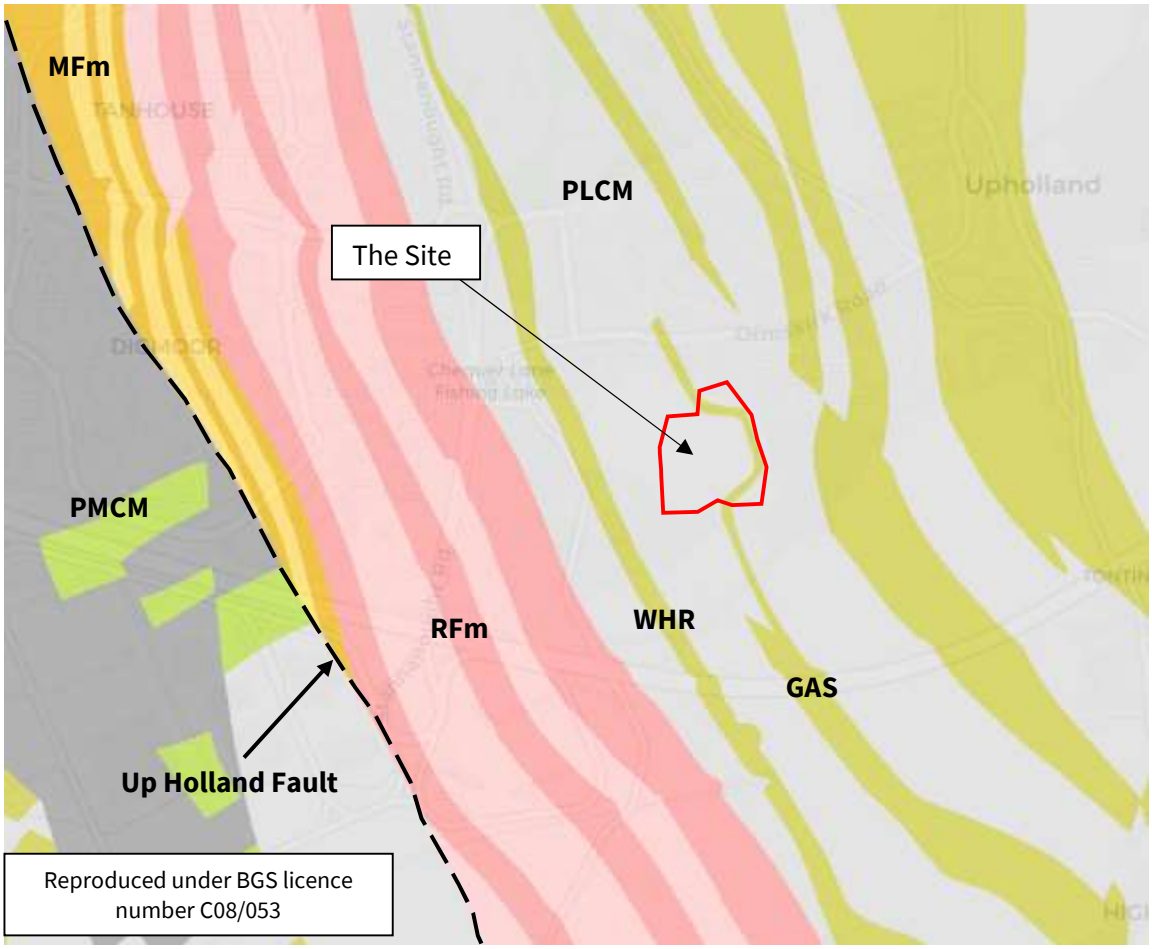
Note: BS = Brick Shale, IMR = Inch Mine Rock, BMR = Bullion Mine Rock.

The on-site borehole logs (Appendix D) show that to the west of the site, the bedrock is predominantly mudstones, with only a thin 20cm unit of sandstone. It is considered likely that this sandstone is the Woodhead Hill Rock as described by the BGS. To the east, the two borehole logs BH02-19 and BH02A-19 are relatively close to each other and show that the upper 34m of the sucesion are predominately mudstone with some thin coal seams (<0.5m). There is a 5.4m thick sandstone at 34m below ground (104.5mAOD), which is considered likely to be the Inch Mine Rock, and another sandstone unit (6.7m thick) at 50.8m below ground (87.7mAOD) which is considered likely to be the Bullion Mine Rock. The borehole terminates within a third sandstone (intercepted at

74.6m below ground – 63.9mAOD), which is considered likely to be the Ganister. Recorded in between the sandstone units are mudstones and shales.

The third borehole to the east is BH03-19, and is located southeast of site, and directly south of boreholes BH02-19 and BH02A-19. This borehole intercepts a shallow sandstone at 11.7m below ground (130.3mAOD), which could be the Inch Mine Rock, and then there is another sandstone intercepted approximately 30m lower down (97mAOD) that is considered likely to be the Bullion Mine Rock. As with the two boreholes to the north, numerous thin coal seams were intercepted (<0.8m), which can be attributed to their respective sandstone names.

Figure 9 Bedrock Geology



Note: PLCM – Pennine Lower Coal Measures, PMCM – Pennine Middle Coal Measures, RFm – Rossendale Formation, MFm – Marsden Formation, GAS – Great Arc Sandstone, WHR – Woodhead Hill Rock.

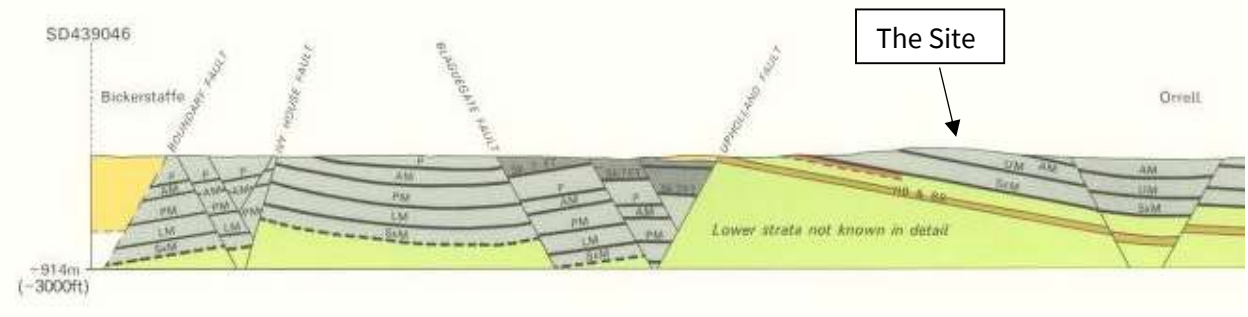
None of the on-site borehole extend through the coal measures, therefore there is no on-site data on the underlying Rossendale Formation and Marsden Formation. Neither of these units are considered to be receptors due to the thickness of the coal measures at site, and the distance to the outcrop of the Rossendale Formation and Marsden Formation from the boundary of the Site (Figure 9).

Structure

BGS map sheet 84 indicates that the bedrock strata are generally dipping between 9° and 15° towards the east-northeast. There are a number of faults in the wider local area, with a large named fault located approximately 1.1km to the west-southwest of Site called Up Holland Fault. This fault trends north-northwest / south-southeast, with the west side being downthrown and the eastern

side being upthrown. On a wider regional scale, the major faults tend to trend either north-northwest / south-southeast like the Up Holland Fault, or northeast / southwest.

Figure 10 Geological Cross-Section Sheet 84 (1977, Solid Geology) 1:50,000



3.3.3 Pathway Properties

With a lack of superficial deposits at site, due to their removal as part of the quarrying process, the bedrock coal measures is the immediate strata beneath and around the Site. As there has not been any on-site geo-technical testing or pump testing at site, the pathway properties for the Pennine Lower Coal Measures are derived from literature sources.

The BGS Minor Aquifer Properties Manual give a permeability for the Lower Coal Measures west of the Pennines, however they acknowledge that the data they used will be from the larger sandstone bands within the Lower Coal Measures. The permeability values provided by the BGS Minor Aquifer Properties Manual range from a minimum of 6.4 x 10^{-4} m/d to a maximum of 3.7 m/d, with a mean of 0.42m/d and a median of 1.4 x 10^{-3} m/d.

There are values for hydraulic conductivity for the Pennine Lower Coal Measures in the Skelmersdale area used by H Fraser Consulting Ltd for a hydrogeological assessment of Whitemoss Landfill[30]. These values were originally reported in a 2003 Hydrogeological Risk Assessment (HRA) for Whitemoss landfill site, which is situated approximately 4km to the west of Ravenhead Quarry. The values used by H Fraser Consulting Ltd were derived from rising and falling head tests, and give a range of hydraulic conductivity values of 2.3 x 10^{-7} m/d to 2.3 x 10^{-5} m/d.

As the values referenced by H Fraser Consulting Ltd are from the same Pennine Lower Coal Measures, and are in the local area to Ravenhead Quarry, they are considered to be more representative than those given by the BGS Minor Aquifer Properties Manual for the Lower Coal Measures west of the Pennines.

The BGS Minor Aquifer Properties Manual states that in general for the Pennine Lower Coal Measures, as well as Middle and Upper Coal Measures, the primary groundwater flow mechanism within the strata is via fractures and joints. Significant intergranular permeability is generally absent within the formation, and this is noted as being the case at Site from anecdotal evidence of a lack of groundwater flow out of the rock matrix.

[30] H Fraser Consulting Ltd 2014, Hydrogeological Assessment of Whitemoss Landfill

3.4 Hydrogeology / Groundwater

3.4.1 Aquifer Classification and Vulnerability

There are no superficial deposits onsite, with the Glacial Till and the Shirdley Hill Sand Formation being the closest superficial deposits around the Site. The Glacial Till deposits and the head deposits are designated as Secondary Undifferentiated (Figure 11), due to the highly variable nature of the unit. This means that there are parts of the unit that are effectively Unproductive Strata and parts which may be more permeable, such as the sandier lenses within the unit.

The Shirdley Hill Sand Formation is classified as a Secondary A Aquifer, which is defined by the Environment Agency as one that holds sufficient water and with a permeability that allows the supporting of water supplies on a local scale and supporting base flow to rivers. The limited areal extent of the Shirdley Hill Sand Formation in the local area around Site means that in reality the capacity to hold sufficient water to support water supplies or provide base flow is likely to be limited.

Figure 11 Superficial (left) and Bedrock (right) Aquifer Status – Details

The Pennine Lower Coal Measures are designated as a Secondary A aquifer at Site and in the wider surrounding area. Secondary A aquifers are defined as – "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".

It is considered that the formation as a whole is designated as a Secondary A aquifer due to the overall permeability of the formation, which is expected to be linked to that reported in the BGS Minor Aquifer Properties Manual (see Section 3.3.3). As shown from the permeability values reported in the local Pennine Lower Coal Measures at Whitemoss Landfill, the permeability is considerably lower than that of the formation as a whole and is not likely to have sufficient permeability to support significant water supplies locally. This is evidenced in the lack of significant groundwater abstractions in the local area.

The local Pennine Lower Coal Measures may provide base flow for rivers and streams locally however, and is expected to be supporting base flow in the River Tawd to the west, the Dean Brook to the east and the Sand Brook and Black Brook to the south.

3.4.2 Hydraulic Properties

There is no data for the hydraulic properties of the Pennine Lower Coal Measures at site, however the very nature of the strata as predominantly clay and silt rich mudstones and well cemented sandstones infers that the matrix permeability will be very low and that the predominant permeability will via fracture flow.

3.4.3 Groundwater Abstraction

There is an unlicenced groundwater abstraction at the Ibstock brickworks site, with the borehole located approximately 200m to the northwest of the nearest part of the proposed excavation. Ibstock Brick Ltd brickworks were contacted regarding the details of the abstraction detailing an annual abstraction of circa 6,000m^3 per year.

The only active groundwater abstraction licence within 2km of the Site is located at Dean Wood Golf Club approximately 1.6km to the northeast of Ravenhead quarry. This licence is for spray irrigation, with a daily volume of 92m^3/d and an annual volume of 10,000m^3/d.

There are no groundwater source protection zones (SPZ) present within the Pennine Lower Coal Measures at Site or in the wider area. The closest SPZ is located approximately 6.5km to the west of Site, in the Sherwood Sandstone Group of strata, and therefore hydrogeologically unconnected to the groundwater at Site.

3.4.4 Groundwater Levels and Hydraulic Direction

Groundwater level monitoring is currently being undertaken at Site to inform baseline conditions, however, the local groundwater level can be inferred from historical sources including the lagoon at the base of the quarry and water strikes on perimeter boreholes constructed by Ibstock Brick Ltd in 2019. This quarry lagoon is not lined and constructed directly into the rock and passively recharged. Consequently, the lagoon is assumed to be in continuity with groundwater and therefore representative of groundwater levels. Topographical surveys from October 2018 and August 2019 recorded a water level in the lagoon of 95.62mAOD and 97.2mAOD respectively. The most recent topographical survey of the site in October 2020 (Drawing PSS-180-003-017) identified a water level in the lagoon of 101mAOD. The water levels appear to be increasing over time.

Ibstock Brick Ltd commissioned SLR Consulting Ltd to construct three groundwater monitoring wells around the perimeter of their site in October 2019. The report produced by SLR outlines the water strikes and rest groundwater levels for the three completed boreholes. Borehole (RH-BH01-19) to the west of the quarry has a rest groundwater level of 100.5mAOD and two boreholes (RH-BH02A-19 and RH-BH03-19) to the east of the quarry with rest groundwater levels of approximately 105.7mAOD. These water levels are similar to the lagoon water level within the quarry.

Although the borehole water levels were recorded in October 2019, it is considered likely that the relationship between groundwater levels in the boreholes will remain roughly the same throughout

the year as there are no large scale groundwater abstractions near the site, and there is sufficient topographical change to render it likely that groundwater recharge is likely to always come from the higher ground to the east.

It should be noted however that these monitoring boreholes extend to a much greater depth than the base of the quarry (down to 50mAOD) and have screened sections far greater than the proposed depth of dewatering (between 29m and 75m below ground level).

A groundwater flow direction within the Pennine Lower Coal Measures cannot be determined from the existing infrastructure (as the Site is undergoing active dewatering), however, a conservative assumption would be that groundwater flow general follows surface topography and flows down to the nearest spring or river/stream where it can contribute a baseflow to surface water features. The Ordnance Survey map indicates this would either be northwest towards the River Tawd, or on a more regional scale towards the west-southwest, where the topography is lowest. The groundwater levels within the SLR monitoring wells indicates an approximate east to west groundwater flow.

However, the Coal Mining Risk Assessment and the URS Hydrology and Hydrogeology report discusses the potential that the mines and mine shafts in the local area around the site could provide preferential flow pathways and interrupt the natural flow patterns. Therefore, any groundwater flow assumptions must be used with caution due to the unusual groundwater characteristics caused by coal mines.

The water levels were recorded in October 2019, however it is considered likely that the relationship between groundwater levels in the boreholes will remain roughly the same throughout the year as there are no large scale groundwater abstractions near the site, and there is sufficient topographical change to render it likely that groundwater recharge is likely to always come from the higher ground to the east.

The water level in the quarry lagoon was survey in October 2020, and is reported as being at 101mAOD. This level suggests that the water level within the lagoon is likely to be reflective of groundwater levels. The groundwater level data within the boreholes and the quarry lagoon indicate that groundwater flow appears to be flowing from east to west, following the topographic slope from the high ground east of the Site at Tower Hill to the lower ground to the west and the River Tawd.

The groundwater within the bedrock is confined beneath the extensive Glacial Till deposits in the local area, however it is considered likely that groundwater within the bedrock will provide base flow to the River Tawd down-gradient of the Site, as the geological map indicates areas of little or no superficial deposits at the river. The River Tawd is at approximately 50mAOD to 75mAOD west-northwest of Site, which would fit with the overall groundwater flow direction. There are also reported issues (springs) close to the river in these locations.

3.4.5 Groundwater Quality

Groundwater monitoring has been undertaken post April 2022 to assist in establishing baseline conditions. Statistical summaries are provided in Table 7, Table 8 and Table 9.

Table 7 Groundwater data – Matrix Ions mg/l (2022)

			Ca	Mg	K	Na	SO_4	NH_4-N	Chloride	EC	pH	Alkalinity
Up-gradient	BH02A/19	Max	104	28	5	23	77	0.3	30	704	7.3	269
		95th %ile	102	27	5	22	76	0.3	30	702	7.3	267
		85th %ile	99	26	5	21	73	0.2	29	699	7.3	263
		Mean	94	25	4	21	66	0.2	29	674	7.2	258
		Min	74	23	4	21	59	0.2	27	622	7.0	241
	BH03/19	Max	95	26	9	21	81	0.3	33	718	7.4	262
		95th %ile	95	26	9	21	77	0.3	33	715	7.3	261
		85th %ile	95	25	9	20	68	0.2	32	708	7.2	259
		Mean	88	24	6	18	48	0.1	29	650	7.1	248
		Min	75	23	4	14	4	<0.01	24	550	6.9	227
Down-gradient	BH01/19	Max	173	29	14	34	44	1.0	121	1090	7.4	402
		95th %ile	166	28	13	33	36	1.0	110	1080	7.4	396
		85th %ile	154	25	11	32	20	0.9	90	1057	7.3	384
		Mean	150	24	10	30	22	0.6	76	962	7.2	360
		Min	143	22	9	23	17	0.2	30	854	6.9	290
Whole Site		Max	173	29	14	34	81	1.0	121	1090	7.4	402
		95th %ile	153	28	11	32	77	0.9	90	1054	7.4	383
		85th %ile	147	26	9	31	68	0.8	75	958	7.3	367
		Mean	111	24	7	23	45	0.3	45	767	7.2	291
		Min	74	22	4	14	4	<0.01	24	550	6.9	227

Table 8 Groundwater data – Metals mg/l (2022)

			Arsenic	Cadmium	Copper	Lead	Mercury	Nickel	Chromium	Zinc
Up-gradient	BH02A/19	Max	**0.002**	**0.00004**	**<0.001**	**<0.001**	**<0.00003**	**<0.001**	**0.001**	**0.022**
		95th%ile		0.00004						0.020
		85th%ile		0.00004						0.017
		Mean		0.00004						0.010
		Min	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002
	BH03/19	Max	0.002	0.00003	<0.001	<0.001	<0.00003	<0.001	0.001	0.008
		95th%ile		0.00003						0.008
		85th%ile		0.00003						0.007
		Mean		0.00003						0.004
		Min	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002
Down-gradient	BH01/19	Max	0.002	0.00005	<0.001	<0.001	<0.00003	<0.001	0.002	0.024
		95th%ile		0.00005						0.021
		85th%ile		0.00005						0.016
		Mean		0.00004						0.009
		Min	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002
Whole Site		Max	0.002	0.00005	<0.001	<0.001	<0.00003	<0.001	0.002	0.024
		95th%ile		0.00005						0.022
		85th%ile		0.00005						0.015
		Mean		0.00004						0.008
		Min	<0.001	0.00003	<0.001	<0.001	<0.00003	<0.001	<0.001	<0.002

Table 9 Groundwater data – Hazardous and Non-hazardous Screen (2022)

	Units	BH 19-01	BH 19-2A	BH 19-03
Analyte		**22/04/2022**	**22/04/2022**	**22/04/2022**
1,1,1,2-Tetrachloroethane	µg/l	<1	<1	<1
1,1,1-Trichloroethane	µg/l	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg/l	<1	<1	<1
1,1,2-Trichloroethane	µg/l	<1	<1	<1
1,1-Dichloroethane	µg/l	<1	<1	<1
1,1-Dichloroethene	µg/l	<1	<1	<1
1,1-Dichloropropene	µg/l	<1	<1	<1
1,2,3,4-Tetrachlorobenzene	µg/l	<0.01	<0.01	<0.01
1,2,3-Trichlorobenzene	µg/l	<0.01	<0.01	<0.01
1,2,3-Trichlorobenzene	µg/l	<5	<5	<5
1,2,3-Trichloropropane	µg/l	<1	<1	<1
1,2,4-Trichlorobenzene	µg/l	<5	<5	<5
1,2,4-Trimethylbenzene	µg/l	<1	<1	<1
1,2-Dibromo-3-chloropropane	µg/l	<5	<5	<5
1,2-Dibromoethane	µg/l	<1	<1	<1
1,2-Dichlorobenzene	µg/l	<5	<5	<5
1,2-Dichloroethane	µg/l	<1	<1	<1
1,2-Dichloropropane	µg/l	<1	<1	<1
1,3,5-Trichlorobenzene	µg/l	<0.01	<0.01	<0.01
1,3,5-Trimethylbenzene	µg/l	<1	<1	<1
1,3-Dichloropropane	µg/l	<1	<1	<1
1,4-Dichlorobenzene	µg/l	<1	<1	<1
2,2-Dichloropropane	µg/l	<1	<1	<1
2,3,6-TBA	µg/l	<0.02	<0.02	<0.02
2,4,5-T	µg/l	<0.03	<0.03	<0.03
2,4-D	µg/l	<0.03	<0.03	<0.03
2,4-DB	µg/l	<0.04	<0.04	<0.04
2,4-Dinitrophenol	µg/l	<0.05	<0.05	<0.05
2,6-Dichlorobenzonitrile	µg/l	<0.01	<0.01	<0.01
2-Chlorotoluene	µg/l	<1	<1	<1
4-Chlorotoluene	µg/l	<1	<1	<1
Aldrin	µg/l	<0.01	<0.01	<0.01
Alpha-HCH	µg/l	<0.01	<0.01	<0.01
Azinphos-ethyl	µg/l	<0.01	<0.01	<0.01
Azinphos-methyl	µg/l	<0.01	<0.01	<0.01
Benazolin	µg/l	<0.04	<0.04	<0.04
Bentazone	µg/l	<0.02	<0.02	<0.02
Benzene	µg/l	<1	<1	<1
Beta-HCH	µg/l	<0.01	<0.01	<0.01
Bromobenzene	µg/l	<1	<1	<1
Bromochloromethane	µg/l	<1	<1	<1
Bromodichloromethane	µg/l	<1	<1	<1
Bromoform	µg/l	<1	<1	<1
Bromomethane	µg/l	<5	<5	<5
Bromoxynil	µg/l	<0.03	<0.03	<0.03
Carbofenthion	µg/l	<0.01	<0.01	<0.01
Carbon Tetrachloride	µg/l	<1	<1	<1
Chlorobenzene	µg/l	<1	<1	<1

Chloroethane	µg/l	<5	<5	<5
Chloroform	µg/l	<5	<5	<5
Chloromethane	µg/l	<1	<1	<1
Chlorpyrifos	µg/l	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	µg/l	<0.01	<0.01	<0.01
Chlorthalonil	µg/l	<0.01	<0.01	<0.01
cis 1,2-Dichloroethene	µg/l	<5	<5	<5
cis 1,3-Dichloropropene	µg/l	<1	<1	<1
cis-Chlordane	µg/l	<0.01	<0.01	<0.01
cis-Permethrin	µg/l	<0.01	<0.01	<0.01
Clopyralid	µg/l	<0.02	<0.02	<0.02
Clorfenvinfos	µg/l	<0.01	<0.01	<0.01
Delta-HCH	µg/l	<0.01	<0.01	<0.01
Diazinon	µg/l	<0.01	<0.01	<0.01
Dibromochloromethane	µg/l	<1	<1	<1
Dibromomethane	µg/l	<1	<1	<1
Dibutyltin as Sn	ng Sn/l	<200	<20	<200
Dicamba	µg/l	<0.04	<0.04	<0.04
Dichlorodifluoromethane	µg/l	<1	<1	<1
Dichloroprop	µg/l	<0.02	<0.02	<0.02
Dichlorvos	µg/l	<0.01	<0.01	<0.01
Dieldrin	µg/l	<0.01	<0.01	<0.01
Dimethoate	µg/l	<0.01	<0.01	<0.01
DNOC	µg/l	<0.04	<0.04	<0.04
Endosulfan I	µg/l	<0.01	<0.01	<0.01
Endosulfan II	µg/l	<0.01	<0.01	<0.01
Endosulfan sulfate	µg/l	<0.01	<0.01	<0.01
Endrin	µg/l	<0.01	<0.01	<0.01
Endrin ketone	µg/l	<0.01	<0.01	<0.01
Ethion	µg/l	<0.01	<0.01	<0.01
Ethylbenzene	µg/l	<1	<1	<1
Etrimphos	µg/l	<0.01	<0.01	<0.01
Fenitrothion	µg/l	<0.01	<0.01	<0.01
Fenoprop	µg/l	<0.02	<0.02	<0.02
Fenthion	µg/l	<0.01	<0.01	<0.01
Fluroxypyr	µg/l	<0.03	<0.03	<0.03
Gamma-HCH	µg/l	<0.01	<0.01	<0.01
Heptachlor	µg/l	<0.01	<0.01	<0.01
Heptachlor epoxide	µg/l	<0.01	<0.01	<0.01
Hexachlorobenzene	µg/l	<0.01	<0.01	<0.01
Hexachlorobutadiene	µg/l	<5	<5	<5
Ioxynil	µg/l	<0.04	<0.04	<0.04
Isodrin	µg/l	<0.01	<0.01	<0.01
iso-Propylbenzene	µg/l	<1	<1	<1
m and p-Xylene	µg/l	<1	<1	<1
Malathion	µg/l	<0.01	<0.01	<0.01
MCPA	µg/l	<0.02	<0.02	<0.02
MCPB	µg/l	<0.02	<0.02	<0.02
Mecoprop	µg/l	<0.02	<0.02	<0.02
Methacrifos	µg/l	<0.01	<0.01	<0.01
Methoxychlor	µg/l	<0.01	<0.01	<0.01
Mevinphos	µg/l	<0.01	<0.01	<0.01

MTBE	µg/l	<1	<1	<1
Naphthalene	µg/l	<5	<5	<5
n-Butylbenzene	µg/l	<1	<1	<1
o,p'-DDD	µg/l	<0.01	<0.01	<0.01
o,p'-DDE	µg/l	<0.01	<0.01	<0.01
o,p'-DDT	µg/l	<0.01	<0.01	<0.01
o-Xylene	µg/l	<1	<1	<1
p,p'-DDD	µg/l	<0.01	<0.01	<0.01
p,p'-DDE	µg/l	<0.01	<0.01	<0.01
p,p'-DDT	µg/l	<0.01	<0.01	<0.01
Parathion	µg/l	<0.01	<0.01	<0.01
Parathion-methyl	µg/l	<0.01	<0.01	<0.01
PCB 101	µg/l	<0.01	<2.00	<0.01
PCB 118	µg/l	<0.01	<2.00	<0.01
PCB 138	µg/l	<0.01	<2.00	<0.01
PCB 153	µg/l	<0.01	<2.00	<0.01
PCB 180	µg/l	<0.01	<2.00	<0.01
PCB 28	µg/l	<0.01	<2.00	<0.01
PCB 52	µg/l	<0.01	<2.00	<0.01
Pendimethalin	µg/l	<0.01	<0.01	<0.01
Pentachlorobenzene	µg/l	<0.01	<0.01	<0.01
Pentachlorophenol	µg/l	<0.04	<0.04	<0.04
Phosalone	µg/l	<0.01	<0.01	<0.01
Phosphamidon	µg/l	<0.01	<0.01	<0.01
Pirimiphos-ethyl	µg/l	<0.01	<0.01	<0.01
Pirimiphos-methyl	µg/l	<0.01	<0.01	<0.01
p-Isopropyltoluene	µg/l	<1	<1	<1
Propetamphos	µg/l	<0.01	<0.01	<0.01
Propylbenzene	µg/l	<1	<1	<1
Propyzamide	µg/l	<0.01	<0.01	<0.01
sec-Butylbenzene	µg/l	<1	<1	<1
Styrene	µg/l	<1	<1	<1
Tecnazene	µg/l	<0.01	<0.01	<0.01
tert-Butylbenzene	µg/l	<1	<1	<1
Tetrachloroethene	µg/l	<5	<5	<5
Toluene	µg/l	<1	<1	<1
Total Cyanide	mg/l	<0.02	<0.02	<0.02
TPH by FTIR	mg/l	<0.3	<0.3	<0.3
trans 1,2-Dichloroethene	µg/l	<1	<1	<1
trans 1,3-Dichloropropene	µg/l	<1	<1	<1
trans-Chlordane	µg/l	<0.01	<0.01	<0.01
trans-Permethrin	µg/l	<0.01	<0.01	<0.01
Triadimefon	µg/l	<0.01	<0.01	<0.01
Triallate	µg/l	<0.01	<0.01	<0.01
Triazophos	µg/l	<0.01	<0.01	<0.01
Tributyltin as Sn	ng Sn/l	<200	<20	<200
Trichloroethene	µg/l	<5	<5	<5
Trichlorofluoromethane	µg/l	<1	<1	<1
Triclopyr	µg/l	<0.03	<0.03	<0.03
Trifluralin	µg/l	<0.01	<0.01	<0.01
Triphenyltin as Sn	ng Sn/l	<500	<50	<500
Vinyl Chloride	µg/l	<1	<1	<1

The Groundwater quality monitoring conducted at site indicates the quality is good with no apparent evidence of impact.

3.5 Hydrology

Flood risk / hydrology has been covered within the associated planning application submitted to Lancashire County Council (LCC). The site is not within a flood risk zone 1.

The nearest surface water features are field drains close to the eastern corner (135m), southern (70m) and western (15m) boundaries of the Site. The drains are considered to be sitting on the Glacial Till, and are topographically above the quarry, and do not link to any subsequent channels or water courses.

There are also small ponds, located 510m to the west-northwest, 700m east-southeast and 1.2km east of Site. It is considered that the pond to the west-northwest is likely to be located within the Glacial Till, whilst the pond to the east-southeast is likely to supplied by the local ditches / channels.

The River Tawd to the northwest, Dean Brook to the northeast, and the Rainford Brook, and its tributaries the Black Brook and Sand Brook, to the south and southwest, are the nearest water courses to Site.

The River Tawd flows westward away from Site and then turns northward where it meets the larger River Douglas approximately 8.5km to the north, whilst the Dean Brook flows northeast away from Site before confluence with the River Douglas 3.3km northeast of Site. The Sand Brook and the Black Brook flow southwest away from Site towards confluence with the Rainford Brook 5km southwest of Site, before the Rainford Brook flows southeast away from Site.

The Site sits at the upper end of the River Tawd catchment. This sub-catchment is considered the upper boundary limit within the wider Douglas Operational catchment area, which subsequently forms part of the Douglas drainage catchment.

The Environment Agency's catchment explorer (http://environment.data.gov.uk/catchment-planning/WaterBody/GB112070064790) designates this area as being heavily modified. It is recorded as having poor to moderate biologically qualifying elements and moderate physiochemical quality elements. Overall, the ecological classification of the water body is considered to be moderate. The total contributing area of the Tawd watershed is measured at 30.7 km^2, with a length of approximately 12.6 km.

4 Receptors and Compliance Points

4.1 Groundwater

Based on current guidance[31,32,33] the following compliance points (and positions) are proposed:

[31]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/602593/Groundwater-discernibility.pdf
[32]https://www.gov.uk/government/publications/groundwater-protection-technical-guidance/groundwater-protection-technical-guidance#discernibility
[33] https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit#identify-compliance-points

- For Hazardous substances the compliance point is the edge of site monitoring point. In reality, it is anticipated that hazardous substances (of concentrations that could cause environmental harm) are not expected to be present within the source term based on the proposed waste types.
- For non-hazardous pollutants the principal receptor is groundwater flowing around the site which practically is taken to be the Site's monitoring locations (at a pragmatic monitoring location). The compliance criteria will normally be Environmental Assessment Limits (EALs) typically developed by reference to UK Drinking Water Standards (or relevant equivalent) or Environmental Quality Standards (or relevant equivalent). Details are provided in the Emissions and Monitoring Plan that supports the permit application (K0158-BLP-R-ENV-09-02).

Further detail is provided in the supporting Hydrogeological Risk Assessment (K0158-BLP-R-ENV-06-02), monitoring locations are described in the associated monitoring plan (K0158-BLP-R-ENV-09-02).

The only known groundwater abstraction at risk from the proposed scheme is the Ibstock Brick Limited abstraction at the neighbouring brickworks. It is understood however that this abstraction is for industrial use only.

4.2 Surface Water

There are no surface water receptors on the site, the nearest surface water bodies are field drains near the perimeter of the Site. They are higher topographically than the infilling waste profile hence is not at risk from the scheme. Surface water run-off from the restored surface (ESID 6) will be monitored at a point prior to discharge to surface water sewer.

4.3 Amenity

The nearby receptors are identified within Table 1 and are described briefly within this document. An Amenity Risk Assessment (H1) has been undertaken and is provided as part of the permit application (report K0158-BLP-R-ENV-04-02). The assessment includes qualitative assessments of dust, odour, mud, noise, bird, insect and vermin. Receptor locations are provided on drawings ESID 2 and ESID 3.

Further consideration of the on-site processing / screening is provided therein, including mitigation and appropriate controls and monitoring.

4.4 Habitats

A Habitats Assessment has been provided in report K0158-BLP-R-ENV-04-02, this wider assessment details the potential hazards presented by landfilling activities on the SSSI and will include mitigating measures which prevent an adverse impact on the integrity of the SSSI. As outlined in section 1.3, a 'Nature and Heritage Conservation Screening Report' (ref: EPR/JB3708CA/A001) has also been obtained.

The Screening Report also highlighted that there are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), RAMSAR site, Sites of Special Scientific Interest (SSSI), or Local Naturel Reserves (LNR) located near the Site. The Screening Report is attached as Appendix E within the associated H1 Environmental Risk Assessment (Report K0158-BLP-R-ENV-04-02). The closest LNR is

Greenslate Water Meadows (Local Nature Reserve) is located 1.8km to the southeast. The Pimbo Lane Pit LWS (Local Wildlife Site) is located ~60m to the southeast adjacent to Well Cross Farm.

4.5 Source – Pathway – Receptor Framework

A simple conceptual model can be constructed for the Site, based on the relationship

$$\text{Source} \rightarrow \text{Pathway} \rightarrow \text{Receptor}$$

Where the:

- Source is the Qualifying Materials used to fill the void
- The Pathway is the basal and sidewall engineering and the geological pathway towards a water resource; and
- The Receptor is an underlying or adjacent water resource.

Source:

- Source is the Qualifying Materials used to fill the void

Pathways:

- The Pathway is the basal and sidewall engineering and the geological pathway towards a water resource; and

Receptor:

- For Hazardous Substances – groundwater at the down-gradient boundary of the landfill, (including dilution)[34,35]
- For Non-Hazardous Substances – groundwater at the down-gradient boundary of the landfill (pragmatically positioned peripheral monitoring boreholes)

With the lack of groundwater abstractions down-gradient of the Site, the primary receptor will be the surface water body or bodies that the groundwater supports via base flow. This is inferred to be either the River Tawd >2km to the northwest or the Rainford Brook >3km to the southwest.

5 Monitoring

A rationalised schedule is proposed in the supporting monitoring plan, this is derived based on risk assessment and targeted specifically towards sensitive receptors. Relevant guidance has been reviewed including LFTGN02 (Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water) and aftercare monitoring detailed within How to surrender your environmental permit Additional guidance for: Landfill (EPR 5.02) version 2, September 2014.

Monitoring and inspection details are provided in report K0158-BLP-R-ENV-09-02

[34] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/602593/Groundwater-discernibility.pdf

[35] https://www.gov.uk/government/publications/groundwater-protection-technical-guidance/groundwater-protection-technical-guidance#discernibility

5.1 Leachate Monitoring

No leachate monitoring will be required as the infilling Qualifying Materials have very low content of putrescible matter, therefore the production of "free pore water" or leachate is anticipated to be minimal (see Section 2.6.2). Notional monitoring is proposed in accordance with similarly permitted sites with leachate spine drains (ESID 7A) and vertical chamber within the cell (ESID 7B).

5.2 Landfill Gas

The use of Qualifying Materials as the infill means that there will not be degradable material component that can produce landfill gas (K0158-BLP-R-ENV-07-02). Data will be collected from "in-waste" infrastructure as part of a proposed monitoring programme in line with similar applications at other sites K0158-BLP-R-ENV-09-02.

5.3 Groundwater Monitoring

This aspect is described further in the supporting HRA (K0158-BLP-R-ENV-06-02) and monitoring plan K0158-BLP-R-ENV-09-02.

5.4 Surface Water Monitoring

This aspect is described further in the supporting HRA (K0158-BLP-R-ENV-06-02) and monitoring plan K0158-BLP-R-ENV-09-02

5.5 Ground Gas Monitoring

No ground gas monitoring will be required in accordance with the proposed infilling scheme, however as part of good practice and to validate the source term, a nominal number of boreholes are proposed adjacent to key amenity receptors. Further detail is provided in report K0158-BLP-R-ENV-07-02.

6 Site Condition Report

6.1 Site Report

Background information

The details of the Site including location, proposed permit boundary and surrounding receptors are presented in Section 1. An outline of the proposed development is detailed in Section 2, geology and hydrogeology are described in Section 3.

Assessment Objectives

The 2016 Regulations require that a permit application must be accompanied by a (Baseline) Site Report, which describes the condition of the whole site, not just the landfill. It is a requirement that operators applying for a permit "identify any substances in, on or under land which may constitute a pollution risk". The Site Report needs to be a factual "baseline" account of the land that may later be compared against the findings of a Closure Site Report, or the results of other investigations. It allows pollutants that were present on site prior to the issue of the permit to be distinguished from those that occurred as a result of its operation under the permit.

This section (Section 6) of the Environmental Setting and Installation Design Report constitutes the Site Report for the proposed Ravenhead landfill site and is written in line with the Environment Agency's guidance for meeting the requirements of a Site Report. However, the Site Report is not required to provide a "baseline" for areas of permanent deposit of wastes, although this remains a requirement for other areas of the Site, e.g. leachate treatment compound or gas utilisation plant compound, neither of which however form part of this application.

The different types of contaminants to be considered at the site include the components of landfill leachate (pore-water) in addition to the activities associated with site's history including the quarrying of clay for brick manufacture.

These are discussed in Section 2 and 3, environmental risk has been covered in reports K0158-BLP-R-ENV-04-02 (amenity), K0158-BLP-R-ENV-05-02 (groundwater / surface water), K0158-BLP-R-ENV-07-02 (gas) and K0158-BLP-R-ENV-08-02 (stability).

Site Investigation

A Groundsure report / historic map search is included at Appendix B, borehole logs are provided at Appendix D. Investigations where relevant and associated findings are summarised within associated qualitative assessments (K0158-BLP-R-ENV-06-02, K0158-BLP-R-ENV-08-02).

Data Collection

Details relating to the baseline conditions for the Site obtained to date are detailed within this permit application, a proposed program of monitoring will be undertaken in accordance with report K0158-BLP-R-ENV-09-02. As a result of the dewatering activities for void preparation, infilling is unlikely to commence for ~1 year and hence further information will be collated prior to infilling activities. Recently obtained data from the existing site boreholes is provided at Appendix C.

The further collection of information will include additional groundwater and perimeter gas data.

Data Interpretation

The purpose of this section of the report is to define baseline conditions for non-disposal areas of the Site prior to the granting of the Environmental Permit. Assessment protocols for the continued monitoring of potential receptors of emissions associated with the Site are presented in the Amenity Risk Assessment (K0158-BLP-R-ENV-04-02) and the accompanying Emissions and Monitoring Management Plan (K0158-BLP-R-ENV-09-02). Interpretations of analytical results are provided in the associated technical risk assessments that support the application, a baseline appraisal should be documented prior to waste infilling activities.

Off-waste Areas

A site condition report (SCR) is required for areas of the Site where that are not subject to the permanent deposit of waste (i.e. outside the area of engineered landfill) where there may be a significant risk to land or groundwater (e.g. leachate treatment compound). A summary is provided in the Environment Agency H5 template below. All land is previously modified with the exception of the field to the south of the two lakes, near to the proposed access.

H5 Site Condition Report

1.0 SITE DETAILS	
Name of the applicant	Booth Ventures Waste (North West) Limited (company number 12508201)
Activity address	Ravenhead Quarry
National grid reference	(NGR) TL 048 456

Document reference and dates for Site Condition Report at permit application and surrender	Application Documents K0158-BLP-R-ENV-01-02, to K0158-BLP-R-ENV-09-02 inclusive

Document references for site plans (including location and boundaries)	ESID drawings contained therein (ESID 1 to ESID 13 inclusive)

2.0 Condition of the land at permit issue	
Environmental setting including: • geology • hydrogeology • surface waters	Superficial Deposits (removed through extraction activities) Coal Measures Strata (variable thickness) K0158-BLP-R-ENV-03-02 - chemical and water level data K0158-BLP-R-ENV-03-02, K0158-BLP-R-ENV-06-02 Surface Water – not present
Pollution history including: • pollution incidents that may have affected land • historical land-uses and associated contaminants • any visual/olfactory evidence of existing contamination • evidence of damage to pollution prevention measures	Previous Mineral Extraction Previous Landfilling (Ravenhead) drainage, road constructions, mine shafts, grouting data included in Groundsure Report (Appendix B of K0158-BLP-R-ENV-03-02)
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	Groundsure Report (Appendix B of K0158-BLP-R-ENV-03-02)

Baseline soil and groundwater reference data	Groundsure Report (Appendix B of K0158-BLP-R-ENV-03-02)
Supporting information	• Source information identifying environmental setting and pollution incidents • Historical Ordnance Survey plans • Site reconnaissance • Historical investigation / assessment / remediation / verification reports • Baseline soil and groundwater reference data **See additional information included in:** Groundsure Report (Appendix B of K0158-BLP-R-ENV-03-02)

3.0 Permitted activities	
Permitted activities	Application for a non-hazardous landfill – the non-landfill areas only. No leachate, gas impact expected to off-waste areas. Fuel storage, vehicle storage to be undertaken with appropriate management / containment practices
Non-permitted activities undertaken	None
Document references for: • plan showing activity layout; and • environmental risk assessment.	Application Documents K0158-BLP-R-ENV-01-02 to K0158-BLP-R-ENV-09-02 inclusive ESID drawings contained therein (ESID 1 to ESID 13 inclusive)

Appendix A – Drawings

Drawings

- ESID1 Site Location
- ESID2 Environmental Site Setting
- ESID3 Cultural and Natural Heritage
- ESID4 Existing Site Layout (Permit Boundary)
- ESID5A Installation Phasing Plan – Final Extraction
- ESID5B Installation Phasing – Infill Phasing Plan
- ESID6 Proposed Restoration & Cross Sections (including extent of landfill area)
- ESID7A Leachate Management (location of spine drains)
- ESID7B Installation Engineering Details (leachate monitoring chamber / target pad design)
- ESID8A Section line locations B-B', C-C' & D-D'
- ESID8B Section lines B-B', C-C' & D-D' (for Stability assessment)
- ESID8C Schematic Engineering Details (stone finger drain, groundwater chamber and sidewall liner) including section line location A-A'
- ESID8D Schematic Engineering Details (groundwater dewatering chamber).
- ESID9 Regional Geology
- ESID10 Regional Hydrogeology
- ESID11 Geological / Hydrogeological Cross Sections
- ESID12 Monitoring Plan
- ESID13 Surface Water Management

Appendix B – Groundsure Enviro+Geo Insight and Historic Maps

Appendix C – Monitoring Data (Groundwater & Gas)

Appendix D – Borehole Logs & Previous Drilling Report (including BH Inspection Review)

Appendix E – Environment Agency Cultural and Heritage Screen & Geological SSSI Management Scheme (reference K0158-BLP-R-011-1)

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Booth Ventures Limited

Report No. K0158-BLP-R-011-1
September 2022

Ravenhead Quarry

Geological SSSI Management Scheme

BOOTH VENTURES

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Document Control

Document: Geological SSSI Management Scheme

Project: Ravenhead Quarry

Client: Booth Ventures Limited

Report Number: K0158-BLP-R-011-1

Document Checking:

Revision	Revision/ Review Date	Details of Issue	Authorised		
			Prepared By	Checked By	Approved By
01	September 2022	Final	Phil Scotney	Phil Roberts	John Baxter
Disclaimer: Please note that this report is based on specific information, instructions and information from our Client and should not be relied upon by third parties.					

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Contents

FIGURES

1 Introduction

1.1 Background

This document prepared by ByrneLooby (BL) provides an update to the approved Ravenhead Quarry Geological SSSI Management Scheme[1] (URS Infrastructure & Environment Limited, November 2013).

The scheme has undergone consultation with Natural England and once formally approved, the document will regularise the "ongoing management" of the SSSI at site (where management is appropriate and relevant). The Ravenhead Brickworks SSSI Unit ID is referenced as 1011636.

The 2013 scheme normalised the method by which relevant strata within the designation would be identified and preserved during the operational life of the quarry and following restoration. In doing so, the management scheme at that time fulfilled the application requirement to Lancashire County Council (LCC) for a ('ROMP') review of the conditions attached to the quarry's mineral planning permission, made under the Environment Act 1995 (as amended).

The 2022 scheme is based on a detailed technical review of:

- the available geological exposures
- published literature
- the proposed amendment to the site's restoration scheme, and
- incorporates discussions with Natural England's (NE) Geologist Dr David Evans based on a site walkover and meeting with on the 7th September 2022.

1.2 Management Scheme Update Objectives

This report has been prepared to serve the following purposes:

- Provide an update to the site SSSI Management Scheme, which
- Supports a revision to the site restoration scheme
    - subject to Lancashire County Council (LCC) approval
- Revises the current SSSI designation boundary as depicted on the Natural England web-based "Open Data "publication platform[2], and
- Allows for safer viewing of long-term retained exposures

The changes to the 2013 scheme however are minimal, keeping where possible to those aspects previously approved.

[1] URS Infrastructure & Environment Limited, November 2013. Ravenhead Quarry Geological SSSI Management Scheme

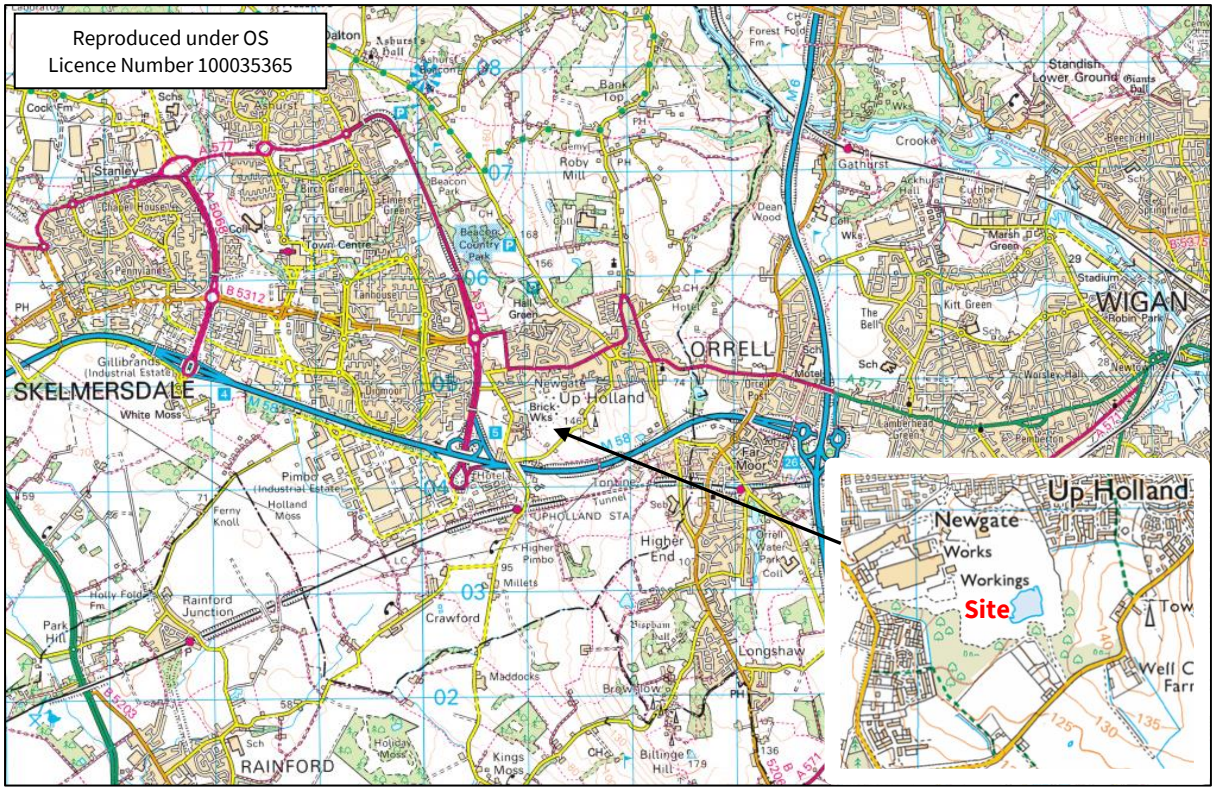
[2] https://naturalengland-defra.opendata.arcgis.com/datasets/f10cbb4425154bfda349ccf493487a80_0/explore?location=52.799987%2C-2.496337%2C7.72

2 Site Location and History

2.1 Site Location

The site (an active brickworks and quarry) is located on the eastern margin of Skelmersdale (West Lancashire), west of Up Holland and ~7km west of Wigan. The topographic height to the east is ~135mAOD, falling in a south-westerly directing to ~115mAOD in the area south of the brickworks.

Figure 1 Site Location



2.2 Site History

There is a long history of coal mining locally, with a number of former mine entrances and shallow seam workings identified in and around the site.

Historic maps indicate an "old coal pit" proximal to the site boundary on the 1849 edition Lancashire Sheet XCIII with progressive development of the site that included the citing of the Brick and Tile Works (including clay pit) and mineral railway on the northern boundary by 1894.

The quarry (owned Ibstock Bricks Ltd) has been worked more recently for fireclay (clay target mineral), over time the brickworks have moved to source its main feedstock from imported sources, subsequently, Booth Ventures Ltd has taken over excavations within the quarry to supply aggregates for the construction industry.

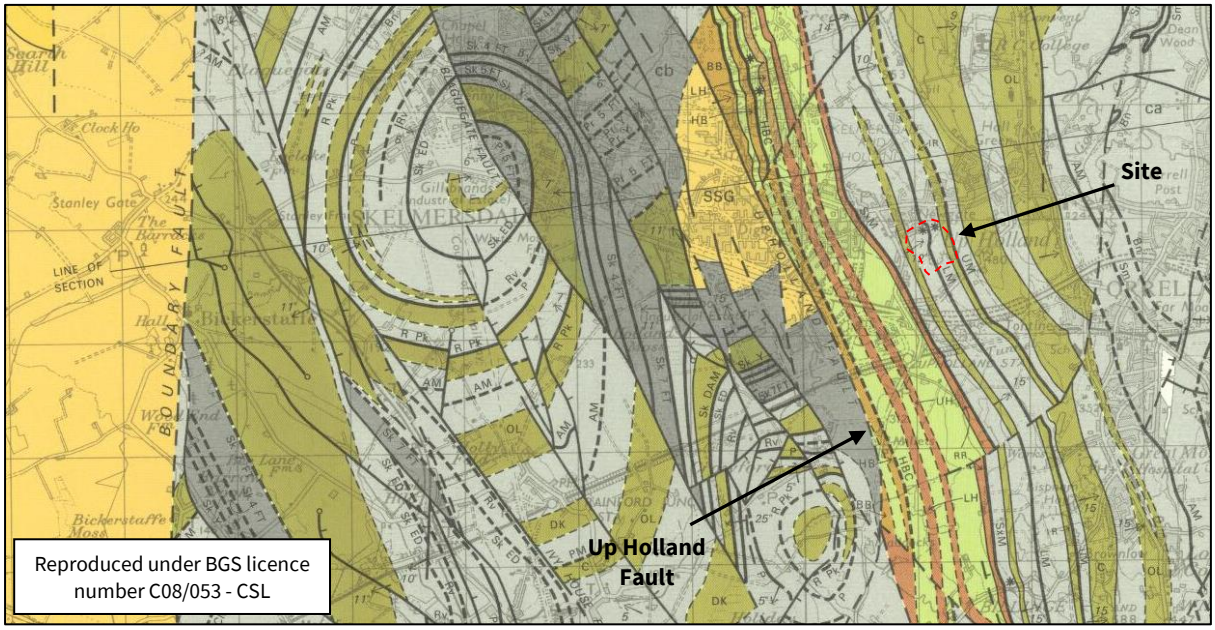
3 The Ravenhead Geological SSSI

3.1 Geological Context

Superficial deposits are not present within the site boundary as result of underlying mineral resource extraction. Locally, superficial glacial head, till and glacio-fluvial sheet deposits are recorded.

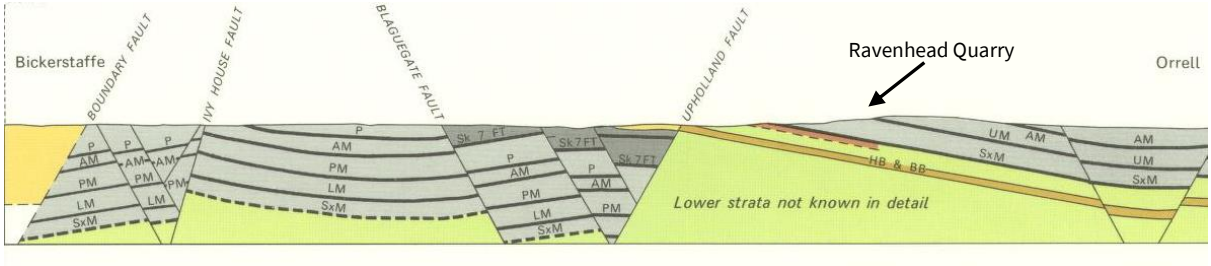
The bedrock strata (Figure 2) are part of the Carboniferous Pennine Lower Coal Measures Formation (Westphalian Stage). At site the Westphalian A strata dip ~ eastwards between 12 and 20°, with the succession of coals, seat earths (ganister), shales, marine bands and sandstones preserved within an upthrown block between the Up Holland Fault to the west (Figure 3) and Pemberton Fault to the east.

Figure 2 Local Geology



Approximate location of Ravenhead Quarry shown on BGS Map Sheet 84 (Wigan), Geological Survey of England and Wales 1:63,360/1:50,000

Figure 3 Geological Cross Section



East – West line of section as presented on Figure 2 above. Reproduced under licence number C08/053 – CSL. Approximate location of Ravenhead Quarry projected onto the line of section (area of **UM**, "Upper Mountain" and westerly towards **SxM**, "Six Inch"). The Pemberton Fault is located east, beyond the line of section, see BGS map 84 (Wigan, Solid, 1:50 000 date 1977). *The Westphalian is a stage in the regional stratigraphy of northwest Europe. It is a subdivision of the Carboniferous system or period and the regional Silesian series. The Westphalian is divided up into four regional substages (part of the British Carboniferous Stratigraphic System), from oldest to youngest these are Langsettian, Duckmantian, Bolsovian, and Westphalian D.* At Ravenhead Quarry, strata are assigned to the Langsettian substage (318-319Ma) - https://data.bgs.ac.uk/id/Geochronology/Division/CA.

3.2 Citation – Reason for Notification

"*Ravenhead Brickworks is a nationally important geological site for the exposures of the Late Carboniferous, Westphalian succession within this part of the Pennine Basin; lying between the Honley and Parkhouse Marine Bands. The sequence includes both marine and non-marine strata and demonstrates the patterns of deposition in a lower delta-plain setting at this time*".

3.3 Citation – General Description

"The site shows much of the characteristic sedimentology of the lower part of the Langsettian Stage in the Productive Coal Formation within the south-western part of the Pennine Basin. At least 90 metres of sediments, consisting of shales, siltstones, sandstones and thin coals are present. These form several coarsening-upward sequences but also include a succession of laminated sandstone/mudstone couplets, interpreted as crevasse splay deposits. The latter are of particular interest as they contain the moulds of bivalves as well as the traces of their burrows, some of which provide evidence for the swift escape of the bivalves under conditions where the sand was being rapidly deposited and the organisms threatened with suffocation. Each couplet has been interpreted as representing a year's deposition under seasonal conditions in a lacustrine setting. The coarsening-upward sequences show evidence that the environment of deposition changed from brackish at the base to non-marine at the top, whilst the upper parts of these sequences are capped by sandstones that sometimes show the development of seat-earths and thin coals above. These sequences are generally succeeded by a marine band.

All of the important marine bands of this part of the succession are represented here and both the Lower Foot Mine Marine Band and the Bullion Mine Marine Band have yielded faunas belonging to the Gastrioceras/Pectinoid Facies. The Bullion Mine Marine Band is particularly important for yielding well-preserved, three dimensional ammonoids from carbonate concretions. Non-marine bivalves form a sequence of assemblages in the basal 7 metres of the succession and again occur in the sandstone/mudstone couplets toward the middle of the succession.

The successions at Ravenhead Brickworks are of vital importance for the understanding of the environment and the deposition of the Productive Coal Formation, not only within the Pennine Basin, but also within the UK as a whole".

This citation has been taken from the reference "British Upper Carboniferous Stratigraphy (Cleal and Thomas, Chapter 10, Coal Measures of the Pennine Basin, 1996).

3.4 Citation – Other Information

"This is a *Geological Conservation Review* site".

3.5 SSSI Boundary

Covering an area of 21.9ha, the SSSI boundary is depicted for reference on Figure 4 which encompasses the area shaded green.

The SSSI designation covers an area that extends far beyond the current area of extraction (Figure 5) and any remaining rock exposure.

Figure 4 Ravenhead Brickworks SSSI Boundary

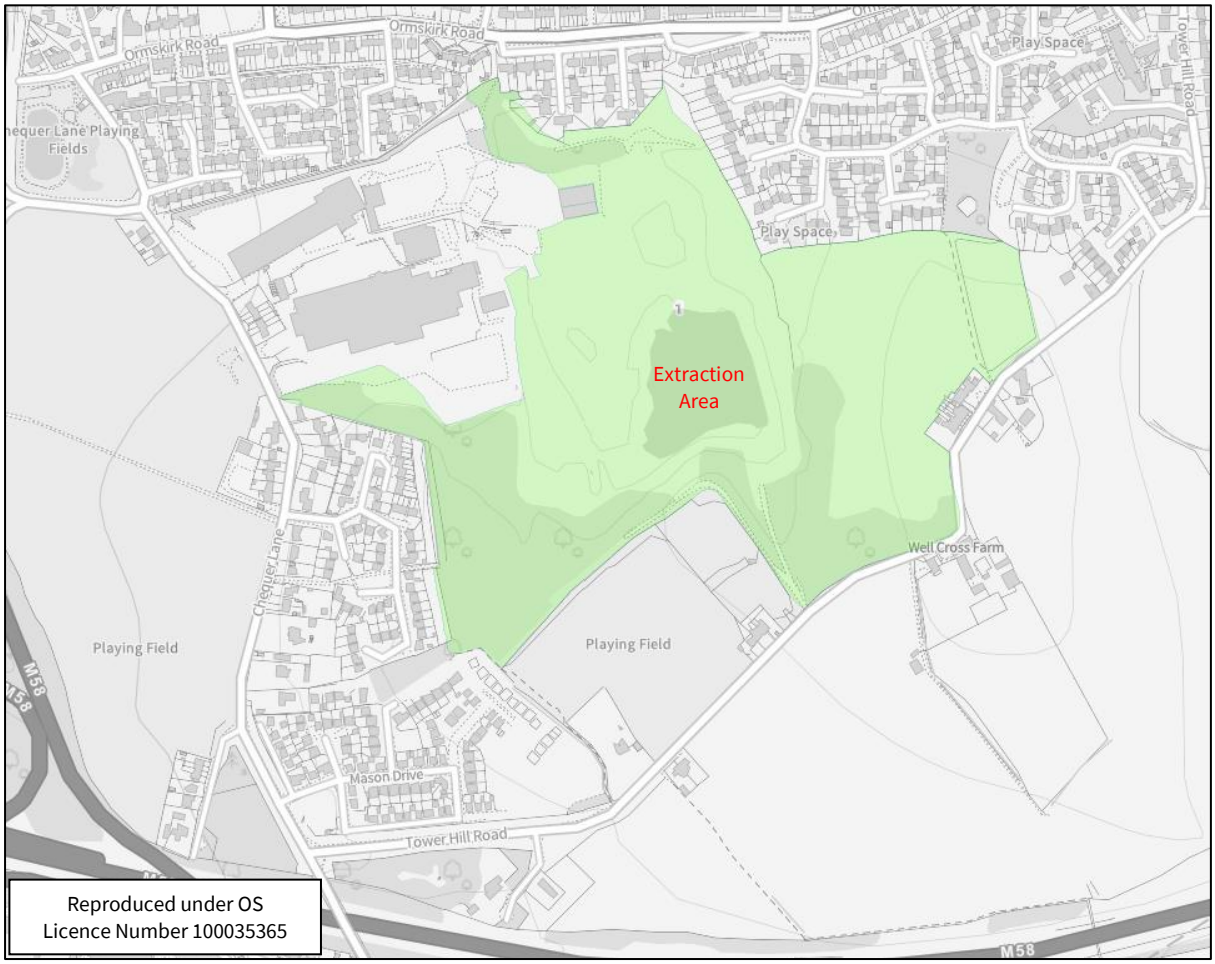


Figure 5 Remaining SSSI at Ravenhead

Shaded orange area denotes the only visible areas of SSSI remaining at site. X, Y and Z are areas detailed in the 2013 Management Scheme (URS Infrastructure & Environment Ltd); the revised scheme is discussed in Section 4.

It is important to note that through the approved historic and current mineral resources removal (and additionally including areas of previous restoration), the SSSI has been progressively lost.

- Only limited exposures of the features noted in Section 3.2 and 3.3 remain
- The SSSI extends into unworked areas beyond the site boundary (towards Well Cross Farm and Residential development at Up Holland, Figure 4, Figure 5)
- The SSSI extends into previously worked (comprising of site interburden / overburden) and restored areas north and west of the current extraction area

It is proposed that the SSSI boundary is amended in accordance with this Management Scheme and relevant points noted above.

3.6 Important Exposures Detailed in the 2013 SSSI Management Scheme

Exposures X, Y and Z (detailed on the Ravenhead Quarry ROMP Restoration Masterplan, drawing 66721.NTS.008, dated 11/2013, updated to drawing reference 3151-01-03, dated March 2022, Planning Permission LCC/2022/0016) identified the key parts of the sequence which would remain exposed as part of the proposed working and restoration scheme.

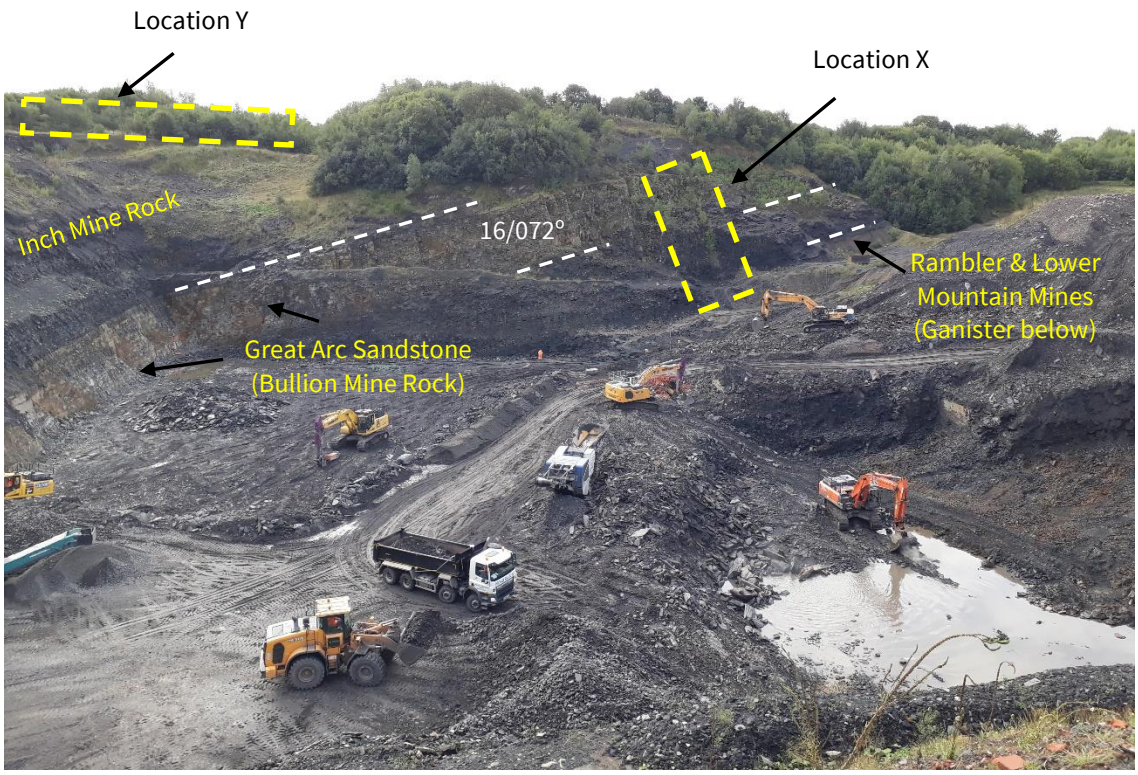
The key stratigraphical horizons were documented as:

- Measures overlying the Inch Mine Coal (silty mudstone)
- Inch Mine Coal
- Inch Mine Rock (Sandstone)
- Measures overlying the Bullion Mine Marine Band (flaggy shales and mudstones horizon)
- Bullion Mine Marine Band (mudstone with concretions)
- Bullion Mine Coal
- Bullion Mine Rock (sandstone) – Currently referred to as the “Great Arc Sandstone”
- Measures overlying the Lower Mountain Mine Coal (flaggy shales and sandstones - crevasse splay deposits)
- Lower Mountain Mine Coal
- Fireclay
- Rambler Mine Coal – exposed currently at 103mAOD to 110mAOD (east to west)
- Seat Earth / Ganister (base of excavation)

The locations of X and Y are presented on Figure 5 and Figure 6, location Z is presented on Figure 5 and Figure 7.

Location X is reported to define the sequence from the Ganister to the Bullion Mine Marine Band, Y was reported to define the sequence from the Inch Mine Rock and Z defined the Bullion Mine Rock, Coal and Bullion Marine Band.

Figure 6 Previously Referenced Exposures (Location X and Y) – URS 2013



View South from Location Z (See Figure 7 below). Dip / dip direction of Bullion Mine / Great Arc Rock 16/072° (basal surface).

Figure 7 Previously Referenced Exposure Z – URS 2013

View Northeast from Location Y (See Figure 6).

Current BGS nomenclature as defined on the web base platform "BGS Viewer" [3] indicates that the thickest sandstone (inferred as the Bullion Sandstone) is now termed as the Great Arc Sandstone[4].

It is important to note that the recently approved Planning Application (permission reference LCC/2022/0016) allows for the final extraction of the mineral resources (including clay) and additionally allows for the working / cutting back of the SSSI at location X in a southerly direction towards the Planning boundary.

3.7 Rationale and Requirement for Management Scheme Revision

The currently approved "Restoration Masterplan" is not deliverable primarily on the grounds of Health and Safety and water management.

The Ravenhead Quarry ROMP Restoration Masterplan drawing (66721.NTS.008, dated 11/20130, updated in March 2022 on drawing 3151-01-03, details a retained waterbody at a level of 97mAOD.

- Groundwater rebound (unpumped levels) indicate a water table in the Coal Measures strata of ~106mAOD and hence the lower part of the sequence will become flooded under this scenario (Figure 8).

Figure 8 Oblique Aerial Image South of Ravenhead Quarry (April 2021)

Proposed access to view the SSSI is indicated by the dashed line from Tower Hill Road, subject to Planning Application submission approval and amendment. A suitable track will be maintained as per Section 5.

[3] https://geologyviewer.bgs.ac.uk/
[4] https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=GAS

- The current scheme and retainment of a water body / pond will require water management and pumping in perpetuity (drawing reference 3151-01-03). This is not sustainable and additionally if the pumping systems were to fail, the site could flood to ~105mAOD (resulting in a significantly deep water body) which will inevitably become a summer attraction for unauthorised access and swimming.
- Access to view the SSSI would only be possible with the use of ropes or boat. There are Health and Safety implications for viewing the exposure, primarily at location X (Figure 6).
- Location Z is within the centre of the current void adjacent to the current haul road. Retaining this exposure sterilises any approved future infill scheme. It is additionally noted that this exposure is currently exposed on the uppermost benches of at Location X.

4 Updates required to the Geological SSSI Management Scheme

4.1 Removal of Exposure Z

Equivalent exposures previously detailed at location Z are currently exposed at location X.

Although the current extraction plan is to remove the northerly faces of this area, these high-level exposures are to be retained where possible on the southern site boundary.

- Location Z is removed from the SSSI Management Scheme.

4.2 Retainment of Exposure Y

- There are no proposed changes to this location.

The exposed face (primarily of non-marine siltstones) above the Inch Mine Rock is present within an ~300m section (parallel to the strike orientation) at an elevation between 123 – 124mAOD (base of exposure). The northern most point has been surveyed at E 351411, N 404766.

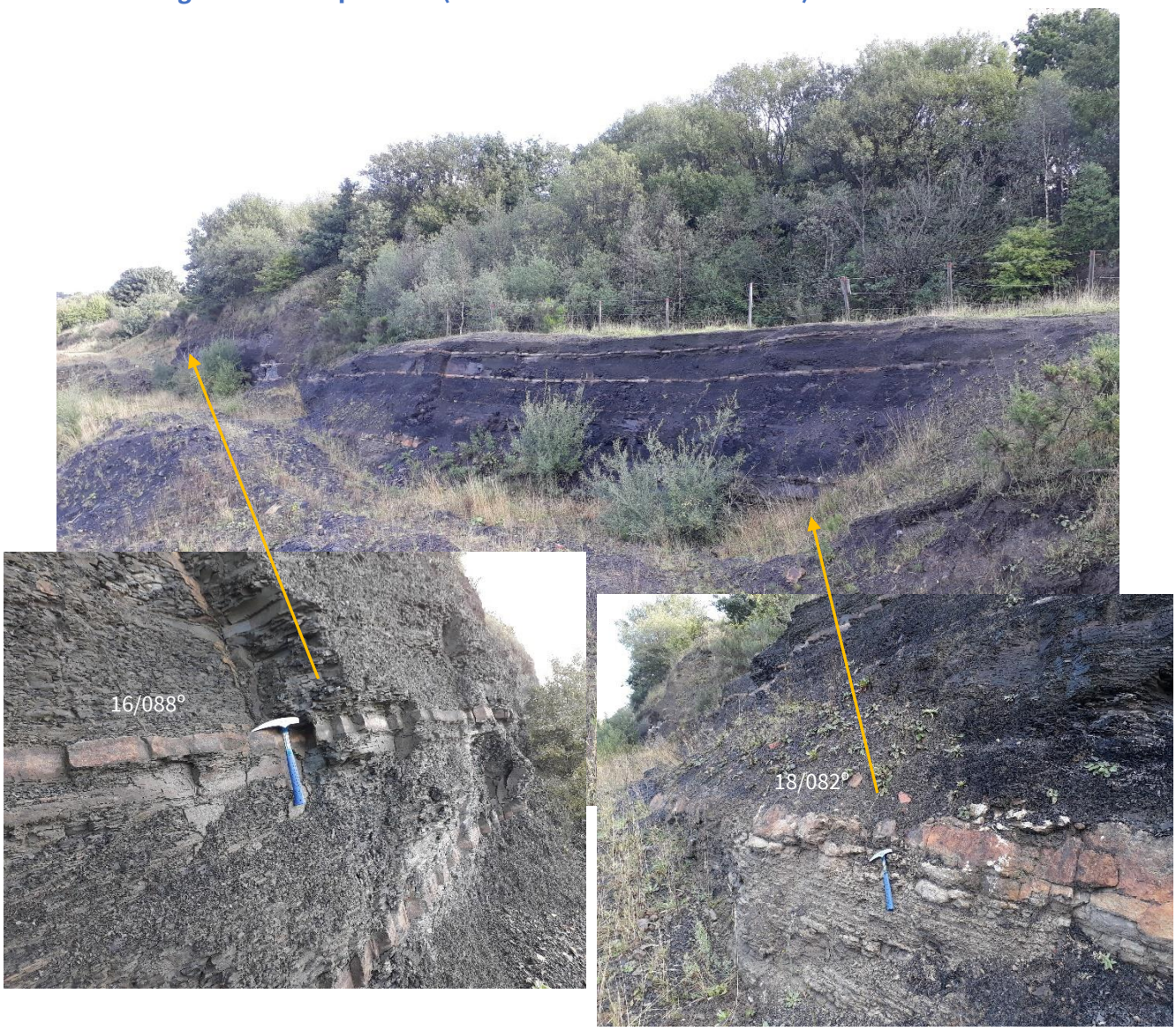
In accordance with Ramsbottom et al. 1978[5], the "Parkhouse Marine Band" (Section 3.2) is inferred as the black shales directly above the Inch Mine Rock, Figure 6 (locally referred to as the Inch Marine Band)[6].

There is no current exposure of this marine band unless the darker shales (at the southern end of the exposure) are correlated as per the appropriate biostratigraphic markers (fish scales). Conversely, this sequence is potentially the lower part of an overlying Marine Band related to the Cannel Mine as mapped previously close to the eastern site boundary[7].

[5] Ramsbottom, W.H.C., Calver, M.A., Eagar, R.M.C., et al. (1978) A correlation of Silesian rocks in the British Isles. Special Report of the Geological Society of London, 10, 1-82

[6] Cleal, C.J. and Thomas, B. A. 1996. British Upper Carboniferous Stratigraphy. Geological Conservation Review Series No. 11. x + 399 p. Joint Nature Conservation Committee. Chapman & Hall

Figure 9 Exposure Y (Beds above the Inch Mine Rock)



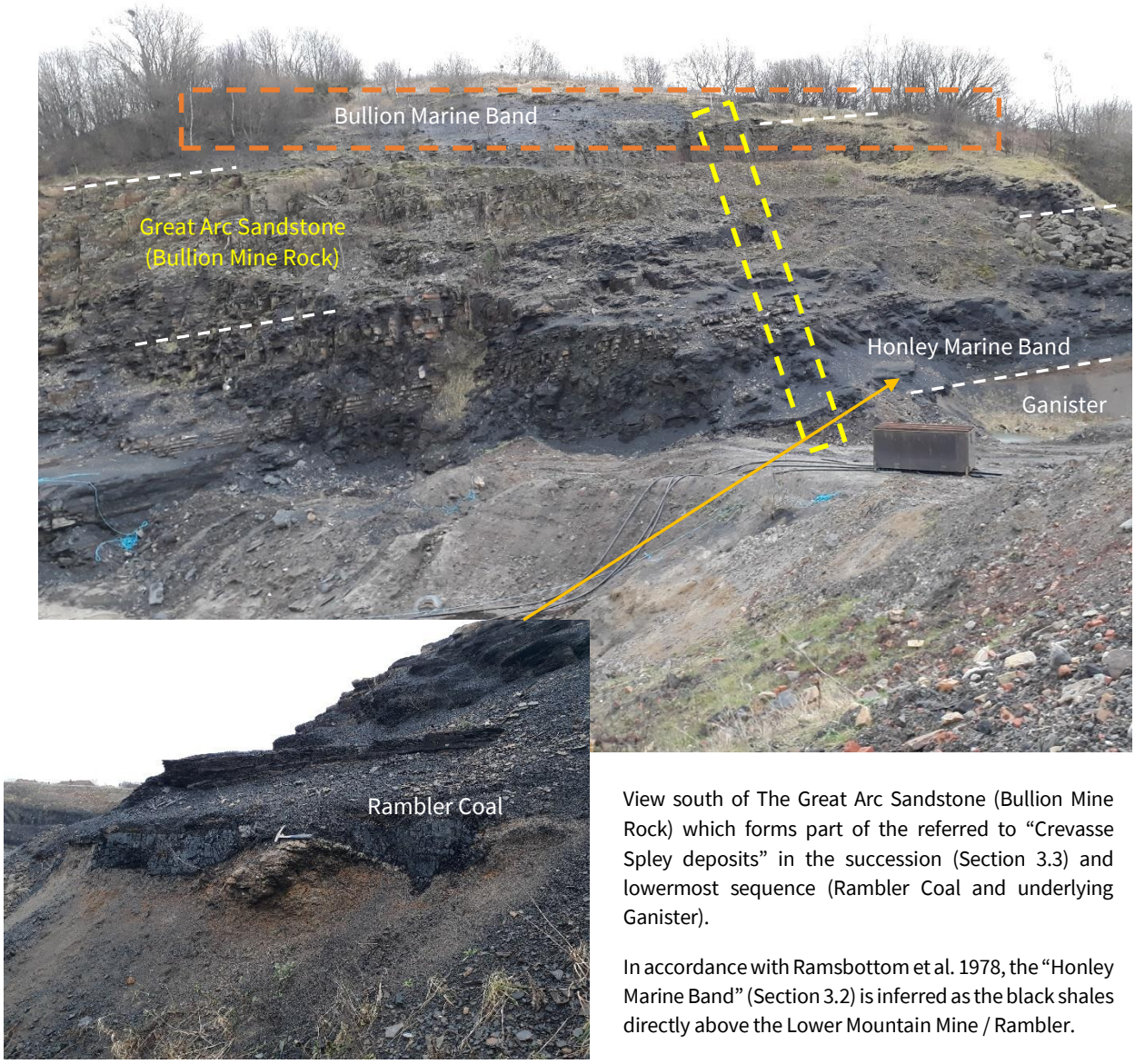
4.3 Amendment to Exposure X

- The amendment to location X is to revert from the current vertical section (yellow dashed line) to a horizontal section (orange dashed line).

This is illustrated in Figure 10 and will facilitate safer viewing of the uppermost section and older strata successively in “an up-dip” direction, as potentially exposed in a westerly direction at the site boundary.

As a result of the easterly dip of the strata (~12 - 20°), the basal succession rises towards land surface in a westerly direction. The current land surface at the site boundary is variably covered in scree and vegetation (Figure 6, Figure 8), as such the exposures below the Great Arc Sandstone in a westerly direction cannot be verified.

Figure 10 Exposure X (Beds between the Ganister and Bullion Marine Band)



View south of The Great Arc Sandstone (Bullion Mine Rock) which forms part of the referred to "Crevasse Spley deposits" in the succession (Section 3.3) and lowermost sequence (Rambler Coal and underlying Ganister).

In accordance with Ramsbottom et al. 1978, the "Honley Marine Band" (Section 3.2) is inferred as the black shales directly above the Lower Mountain Mine / Rambler.

It is also noted that faulting has been reported previously at site in the most westerly part of the exposure[7], as such theses offsets (now covered) do not readily allow a prediction of the Honley Marine Band and associated sequence outcropping to the land surface at the site boundary.

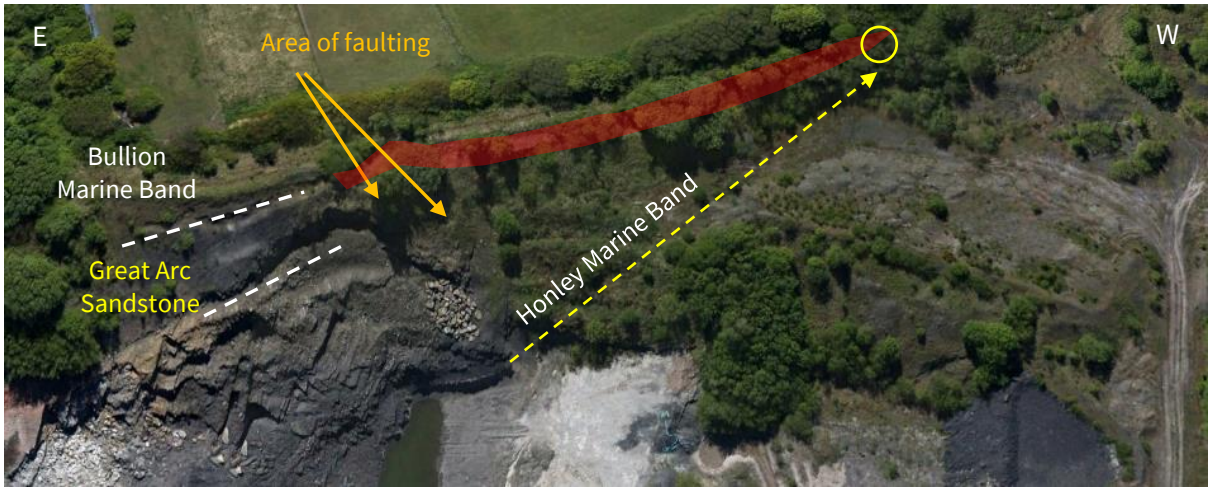
Based on a conservative dip of the stratigraphic sequence at ~12°, the basal succession has been projected to the site boundary as depicted visually in Figure 11.

- As part of a revised restoration scheme for the site, a path with a width of 3m (gradient of ~ 1:20) is proposed along the southern site boundary that would allow viewing of exposures from the Bullion Marine Band (Figure 10) to those sequences exposed during vegetation

[7] Broadhurst, F. et al. (eds) (1970), Edgar, R.M.C, Itinerary VI. The Area around Manchester. Geologists' Association Excursion Guides, 7, 51 pp

clearance in a westerly direction (Figure 11). Exposed faces should be kept to a maximum of height of 2m where possible for Health and Safety purposes and to minimise face degradation.

Figure 11 Prediction of the Potential Exposure Area of the Honley Marine Band



The area of clearance to expose strata below the Great Arc Sandstone would be undertaken within the red shaded area. The path level will tie into the proposed restoration surface and sequence at the base of the Bullion Marine Band. The restoration plan will be subject to separate Planning Application submission and subsequent approval.

5 Management of the SSSI

5.1 Quarry Health and Safety

As defined in the 2013 Management Plan, the SSSI occupies part of an active quarry which employs heavy plant and machinery, undertakes heavy lifting forms high quarry faces and deep excavations (which may contain deep water), and potential abandoned coal mine workings. As such management of the SSSI has to take into account the Health and Safety of employees, visitors and members of the public under Mines and Quarries legislation and other regulations. If a potential conflict arises between this scheme and site health and safety, health and safety will take precedence in the short term. However, the operator will inform NE and the MPA to discuss any longer-term implications to the scheme as required by the citation and regulations protecting SSSI's.

The quarry is not accessible to the general public, any visits to inspect the SSSI (including those related to research activities, sample collection or observations) are only permissible by prior arrangement and be accompanied or otherwise comply with quarry operator's site rules. This remains valid within this updated management plan.

5.2 Periodic Maintenance

Periodic maintenance should be undertaken on all retained faces, at location Y and additionally at the exposed sequences at location X (post vegetation clearance and attempted exposure of strata at the site boundary).

This will include shrub removal or evidence of tree establishment and removal of any excessive scree development. This should be undertaken on a 10 yearly basis. Path clearance and cutting of low-level grass should be undertaken on a 3 yearly basis.

5.3 Interpretation and Public Engagement

There is a recognition that the site contains an important geological exposure, as previously recorded (additional information / literature references are outlined in Section 8). Academic engagement (including public feedback) should be encouraged where possible. Any future collection of geological specimens should be undertaken with extreme caution, and damage caused to the outcrop / exposed faces or personal injury cannot be attributed the site operator or landowner.

On approval of the site's final restoration scheme, it is not expected that visitation to the SSSI will be possible until infilling operations are complete, as they will (in both areas to location X and Y) be subject to heavy vehicle movement. Notwithstanding the above, NE are welcomed to engage with the landowner / operator and if opportunities exist, collect fossil specimens outlined in NE's field visit notes dated 8th September 2022[8].

All approved viewing of the SSSI must be arranged 1 month prior to arrival in writing with the landowner.

6 Revised SSSI boundary

As outlined in NE feedback[8], it is agreed as pragmatic approach to make an amendment to the SSSI boundary founded on this management plan (and detail contained herein, c.f. Section 3.5).

- The revised SSSI boundary is presented on Figure 12, the SSSI management plan is only applicable to the area shaded red, not the entire area shaded green.

Listed Operations requiring NE's consent (7, 12, 14, 20, 21, 22, 23, 24) are disapplied to the area shaded green.

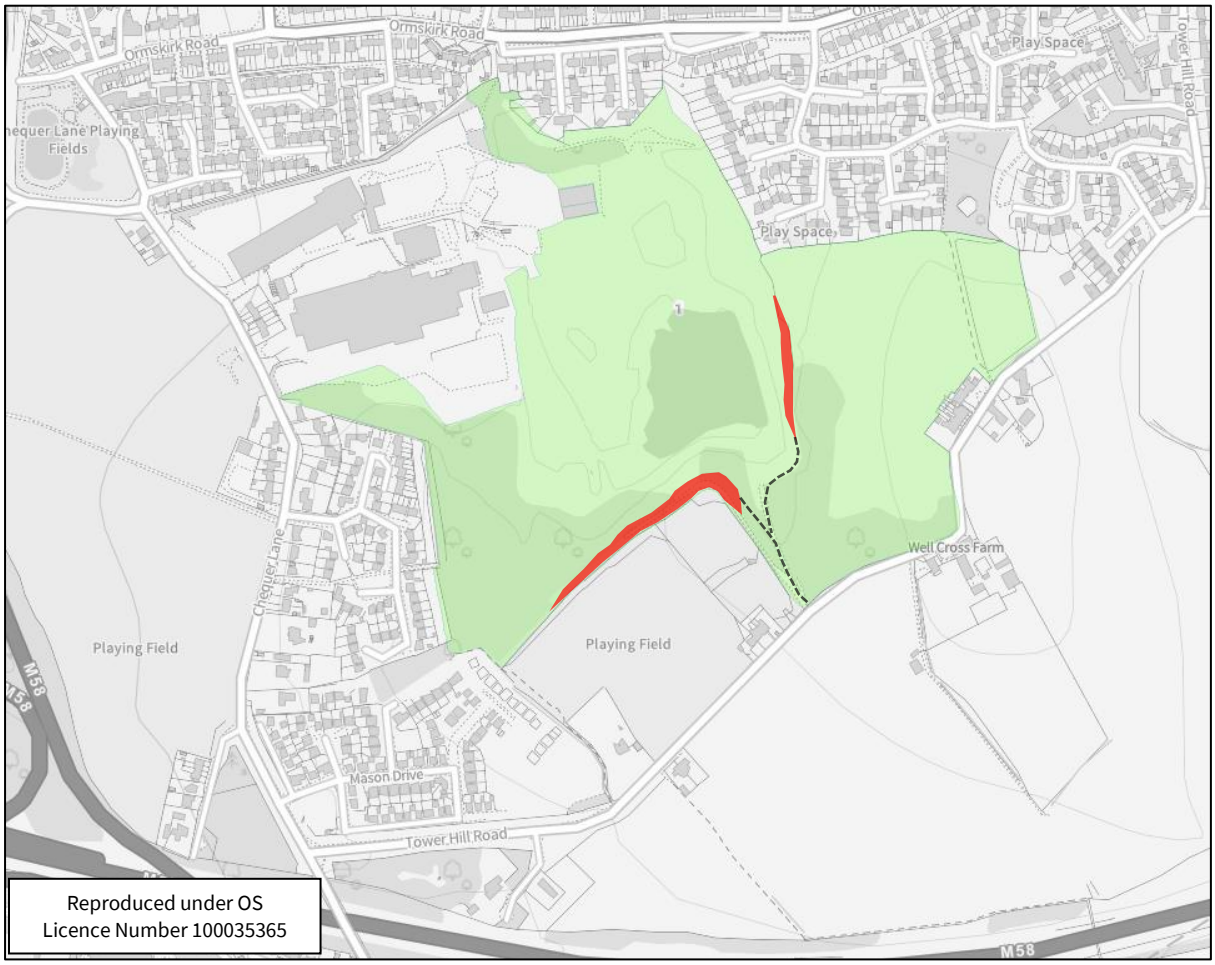
Operations likely to damage the special interest (as currently defined in regard to the SSSI) only apply to the area shaded red on Figure 12.

- 7 Dumping, spreading or discharge of any material.
- 12 The introduction of tree and/or woodland management including afforestation and planting.
- 14 The changing of water levels through the use of disused quarries for water storage.
- 20 Extraction of minerals, including topsoil, subsoil and spoil.
- 21 Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.

[8] Site visit to Ravenhead Brickworks SSSI, Lancashire - 7th September 2022. Dr D Evans, Natural England (14th September 2022)

- 22 Storage of materials on or against rock outcrops.
- 23 Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- 24 Modification of natural or man-made features, clearance of boulders, large stones, loose rock or scree and battering, buttressing, grading or seeding rock-faces and cuttings, infilling of pits and quarries.

Figure 12 Ravenhead Brickworks Revised SSSI Boundary (red area)



SSSI amended area shaded red. Connecting path indicatively show in dashed line (not part of the SSSI).

It is important to note however, all operations detailed above should be disapplied to location X (in the short term) to allow the exposure of strata in this location as per the proposals outlined herein.

7 Review of the SSSI Management Plan

This report (on approval) will be reviewed on a 10 yearly basis, identifying any concerns relevant to the safeguard of the SSSI or any additional observations recorded that require notification to NE. These observations may include evidence of unauthorised access, deliberate vandalism and any corrective measures deemed necessary for future SSSI protection / preservation.

8 Further Reading

- Cleal, C.J. and Thomas, B. A. 1996. British Upper Carboniferous Stratigraphy. Geological Conservation Review Series No. 11. x + 399 p. Joint Nature Conservation Committee. Chapman & Hall
- Ramsbottom, W.H.C., Calver, M.A., Eagar, R.M.C., et al. (1978) A correlation of Silesian rocks in the British Isles. Special Report of the Geological Society of London, 10, 1-82
- Eagar, R.M.C. 1971. A new section in the lower coal measures (Westphalian A) of Up Holland, near Wigan, Lancashire. Proceedings of the Geologists' Association, 82, Issue 1, 71-85
- Broadhurst, F. et al. (eds) (1970), Edgar, R.M.C, Itinerary VI. The Area around Manchester. Geologists' Association Excursion Guides, 7, 51 pp
- Eagar, R.M.C. 1951. A revision of the sequence and correlation of the Lower Coal Measures west of Wigan, Quarterly Journal of the Geological Society, 107, 23 – 50

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