TREVAYNE FARM CARAVAN AND CAMPING PARK

EFFLUENT DISPOSAL STUDY

JANUARY 2021

Prepared for:

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A Whitehouse: .....

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TREVAYNE FARM CARAVAN AND CAMPING PARK

EFFLUENT DISPOSAL STUDY

Contents **Page**

EXECUTIVE SUMMARY

Trevayne Farm Caravan and Camping Park has operated at a coastal location between Saundersfoot and Tenby for at least approximately 50 years.

The site is also occupied by an operational farm.

Foul water drainage is collected into two systems as follows: -

- Collection / settlement tank (Tank A);
- Treatment Plan comprising tanks and blowers (Tank B).

The discharges from both of the above locations enters field drains which discharge into the underlying ground.

The total flow has been determined by measurement of the water meter serving the site to be 15m^3/day.

This volume reading ignores the meter used by the farm and therefore the foul water discharged from the site will be lower.

Desk study and site infiltration tests conclude that the underlying rock is highly permeable (Vp 3.4).

Sensitive aquatic receptors exist hydraulically downstream of the site.

Assessment of potential impact using H1 (Annex J) indicates that, whilst the potential impact at the ecologically sensitive receptors is likely to be low, the current discharges could adversely affect the groundwater beneath the site and immediately adjacent to it.

It is recommended that:-

- A treatment plant is constructed to treat the outflow from the tank. This should comprise a series of settlement tanks and aeration blowers a minimum (Tank A);
- Either raised infiltration zones or polishing reed beds should be constructed at the outflow from each of the two systems (Tank B).

As the dominant issue at this site is the high rate at which effluent infiltrates into the ground, the preferred solution would be to design infiltration pads in line with the current Code of Practice and Building Regulations.

The infiltration beds will need to be in hydraulic continuity with the permeable rock beneath the site.

INTRODUCTION

Trevayne Farm Caravan & Camping Park is an established 51 Ha caravan and camping site that is situated on a coastal headland between Tenby and Saundersfoot.

The location of the site is shown on Figure 1 below and the NGR is 213938 203186.

Figure 1 Trevayne Farm

The foul water drainage system has grown organically over the years that the site has been developed.

Foul water collected from the northern and eastern part of the site is collected into a treatment facility that is managed by an independent supplier. The system comprises settlement tanks and air blowers that provide good primary treatment to the sewage. Effluent from this system travels underground to an infiltration field to the east. The infiltration field is at a depth of around 2m according to the operator.

Foul water from the western and southern portion of the site is collected to a buried concrete tank and from there discharges to an infiltration system in a field to the south west.

An outline of the existing foul drainage layout is shown on Figure 2.

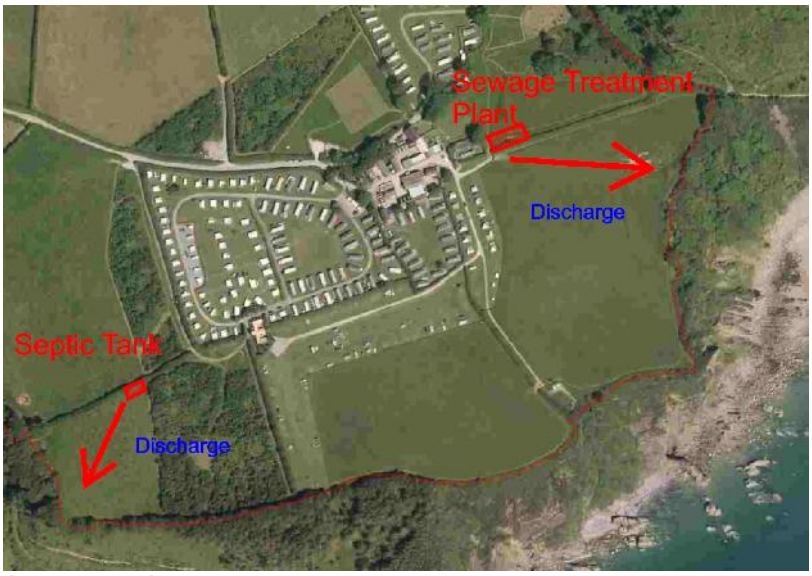


Figure 2 Drainage Layout

Both of the discharge systems comprise a series of filter drains that have been installed beneath the thin layer of superficial clay and just above the underlying weathered bedrock.

The site is used sporadically by residents and is more utilised in summer than in winter.

Consequently, normal design considerations on water use do not apply and therefore, in order to review discharge volumes, a detailed assessment of the water consumption for the past 5 years has been undertaken.

The results of this assessment confirm that the average consumption from the water meter, and therefore discharge to sewer, is around 15m^3/day.

This use includes that consumed by the working farm and consequently is considered to be conservative with respect to potential foul sewage discharge volume.

A review of the drainage discharge system has been requested by NRW and this report is designed to present the findings of this study together with recommendations for improvements that could be implemented.

The review has been undertaken under three main headings, namely: -

- Desk Study;
- Infiltration testing;
- Calculations;
- Review.

This report should be used to enable design of improvements to the foul water drainage system that will ensure compliance with current best practice.

2.0 DESK STUDY AND CONCEPTUAL MODEL

A desk study review has been undertaken by assessment of the data provided by Groundsure. A copy of this data is enclosed at Appendix A for completeness.

The farm lies on an elevated ridge at an elevation of around 87m and the land falls away quickly from this ridge towards the north and to the south downward to the sea.

2.1 Hydrology

There are two surface water courses that act as potential receptors for water from the site. These are shown on Figure 3.

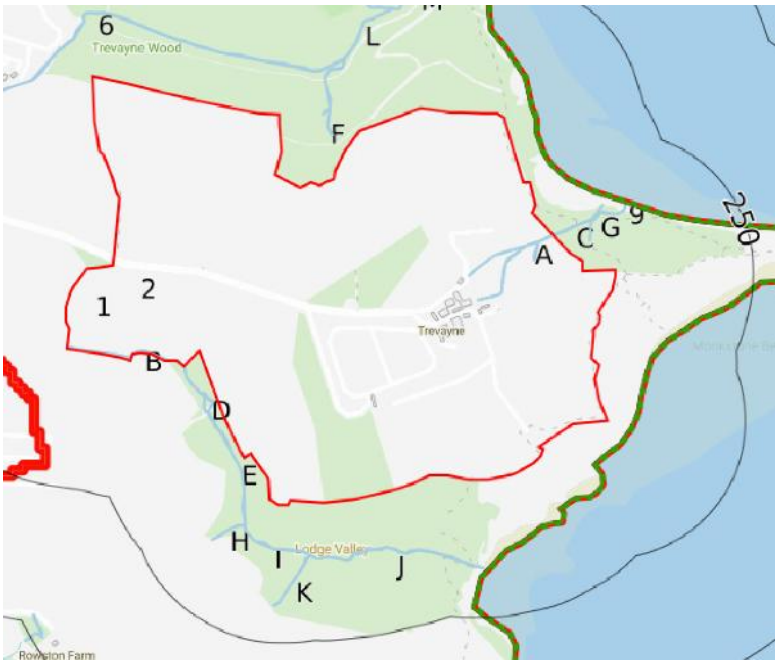


Figure 3 Potential Water Course Locations

The watercourse to the north of the site is associated with several springs that contribute to it and is travels to the sea over a series of waterfalls.

The water course to the south, which travels through Lodge Valley, also travels over a waterfall on its way to the sea.

One of the historical maps that from the desk study is reproduced below as Figure 4 to show the contours, springs and waterfalls.

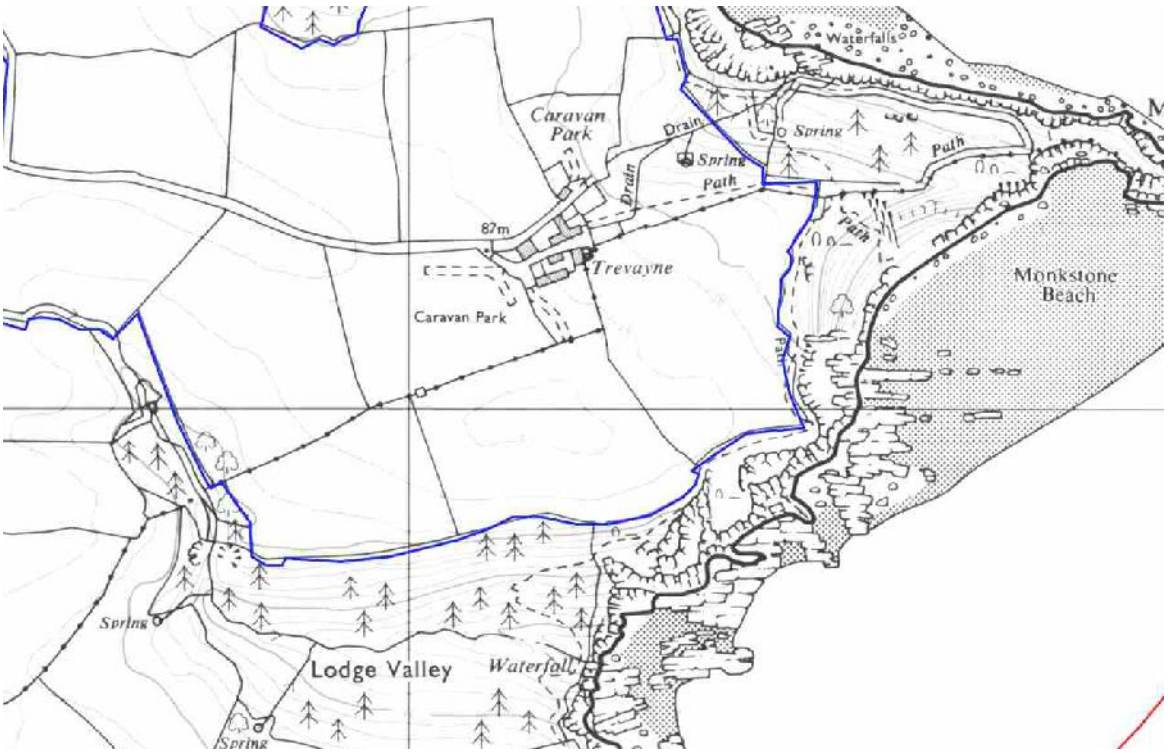


Figure 4 Contours Springs and Waterfalls.

2.2 Hydrogeology

The site is covered with a thin layer of clay which was encountered during trial pit investigation of the site (discussed below).

Beneath the thin superficial clay deposits, the underlying rock is Westphalian Sandstone of the Lower Coal Measures series.

It is anticipated that these deposits are highly permeable and that flow is via developed fractures.

The rock has a high infiltration value and is classified as a vulnerable resource.

This is outlined in section 5 of the desk study data which is enclosed at Appendix A.

2.3 Sensitive Receptors

2.3.1 Aquatic Environment

The site drains generally towards the coast where the discharge from the foul drainage will discharge. Immediately to the east of the site there is a strip of land that comprises the coastal belt.

The sea is designated as a Special Area of Conservation and a Special Protection Area whilst the coastal belt land is also designated as a Special Area of Conservation. (Subtidal sandbanks; Estuaries; Intertidal mudflats and sandflats; Lagoons; Shallow inlets and bays; Glasswort and other annuals colonising mud and sand; Cord-grass swards; Atlantic salt meadows; Dunes with sea-buckthorn; Sea caves; Sea lamprey; River lamprey; Allis shad; Twaite shad; Lesser horseshoe bat; Greater horseshoe bat; Otter; Grey seal).

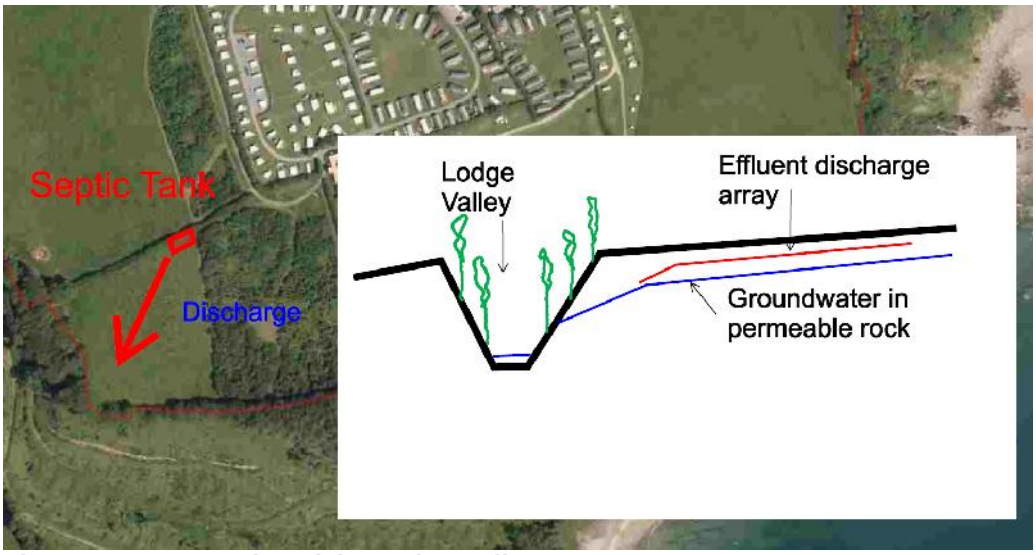
Springs are evident to the east of the site and could provide surface expression to the shallow groundwater within the site.

2.3.2 Ecology

Some of the woodland, which lies between the site and the sea, is designated Ancient Woodland.

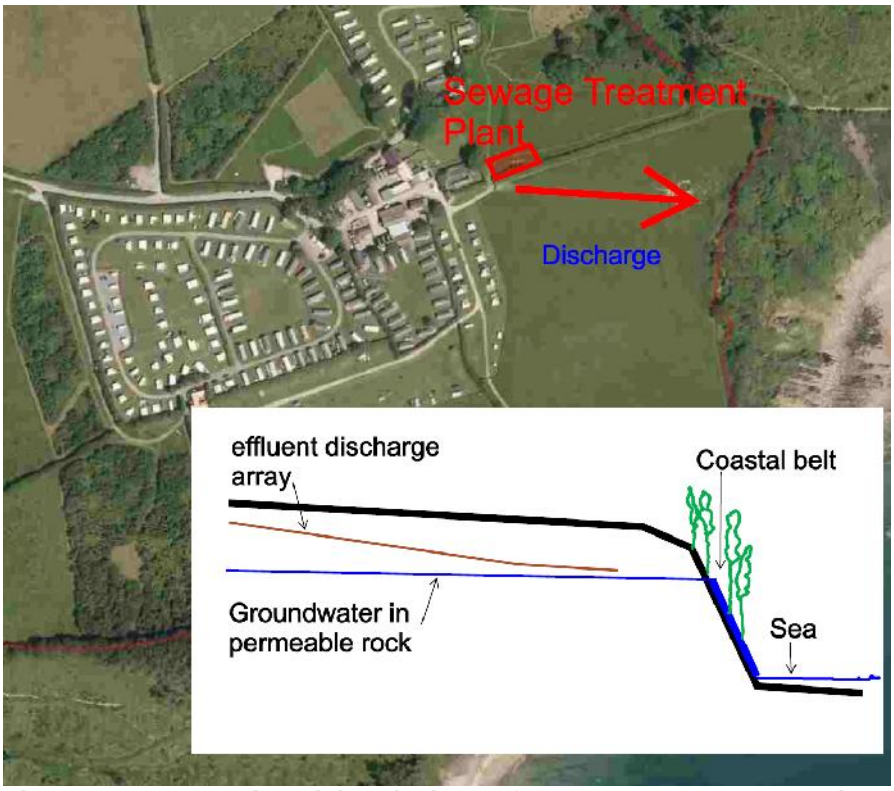
2.4 Conceptual Model

Based upon the findings of the desk study, site visits and the infiltration testing study, conceptual models have been developed for the discharge from the sewage treatment plant and also for the discharge from the septic tank. These are presented below as Figures 5 and 6.



Tank A

Figure 5 Conceptual Model – Lodge Valley.



Tank B

Figure 6 Conceptual Model – Discharge from Sewage Treatment Plant.

From the available desk study data and site inspections it is clear that there is a potential for rapid hydraulic conductivity between the two existing effluent infiltration locations and potentially sensitive receptors.

When assessing the sensitivity of the receiving environment we have reviewed both the freshwater and marine concentrations described in the Water Framework Directive.

3.0 INFILTRATION TESTS

The permeability of the Infiltration Zone was measured using standard protocols in the two fields where the discharge occurs.

Pits were excavated using hydraulic excavator and the water infiltration rate was measured 3 times at each location.

The near surface soils comprise impermeable clay and the existing infiltration systems are constructed on the underlying permeable strata. Consequently, the infiltration tests were undertaken on the top of the fractured bedrock which starts at a depth of around 1m.

The average results from the tests confirmed that the rock is permeable with a calculated Vp of between 3 and 8. (See tables 1 and 2 below).

Test 1 Avg.

depth to water	time	seconds from start						Vp
0.8	10 55	0	start	seconds	0.36	total drop		
0.9	11 00	300	75%		0.09	fall to give 25% drop		
0.92	11 05	600			0.27	fall to give 75% drop		
0.95	11 10	900		1200				8
1.01	11.15	1200			0.89	25% drop		
1.05	11.2	1500	25%		1.07	75% drop		
1.1	11.25	1800						
1.16	11.3	2100						

Table 1 Infiltration test Average at location 1

Test 2 Avg

depth to water	time	seconds from start						Vp
1.7	12 47	0	start		0.3	total drop		
1.725		150			0.075	fall to give 25% drop		
1.75	12 52	300		seconds	0.225	fall to give 75% drop		3.4
1.7725		345	25% drop	525				
1.795		390			1.775	25% drop		
1.84	12 55	480			1.925	75% drop		
1.9	13 00	780						
1.925		870	75% drop					
1.95		960						
2	13 06	1140						

Table 2 Infiltration Average at location 2

The worst case Vp has been assessed as being 3.4 and it is this value that has been adopted in the Annex J5 worksheets for the project.

4.0 ANNEX J5 INFILTRATION WORKSHEET OUTPUT

It is evident from the infiltration test results that the underlying rock is highly permeable and the desk study confirms that the receiving environment is environmentally sensitive.

An assessment has been undertaken using the Annex J5 Infiltration Worksheet that is designed to assess effluent discharge characteristics.

The worksheets, which rely on some assumptions, are enclosed in Appendix B1 (Lodge Valley) and B2 (Marine).

Whilst the results show that here is a potential for compliance at the stream in Lodge Valley and at the Marine environment, the rate of infiltration exceeds that which is acceptable under current guidelines.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Lodge Valley (Tank A)

In order to protect groundwater, we would recommend that a treatment plant is installed at the discharge point from the existing tank to enable pre -treatment of effluent prior to discharge.

5.2 Final Discharges

We would recommend that either: -

- a raised infiltration zone is constructed that will attenuate the discharge from the treated sewage or that a reed bed system is installed to polish the effluent;
- a reed bed is constructed to allow effluent polishing.

If a raised infiltration zone is constructed, the permeability (Vp) of the bed and underlying zone should be adjusted such that it falls between 15 and 100 in accordance with the recommendations in BS 6297.

If a reed bed is constructed then we would recommend that a retention capacity of at least 5 days is designed into the system.

APPENDIX A

Desk Study Data

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

214000, 203000,

Order Details

Date: 30/09/2020

Your ref: DS2254

Our Ref: HMD-142-7102685

Client: Excal Ltd

Site Details

Location: 213938 203186

Area: 51.04 ha

Authority: Sir Benfro - Pembrokeshire County 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	1	3	9	11	-
15	1.2	Historical tanks	0	0	2	0	-
15	1.3	Historical energy features	0	0	0	1	-
15	1.4	Historical petrol stations	0	0	0	0	-
16	1.5	Historical garages	0	0	0	0	-
16	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
17	2.1	Historical industrial land uses	1	6	12	14	-
19	2.2	Historical tanks	0	0	3	0	-
19	2.3	Historical energy features	0	0	0	2	-
20	2.4	Historical petrol stations	0	0	0	0	-
20	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
21	3.1	Active or recent landfill	0	0	0	0	-
21	3.2	Historical landfill (BGS records)	0	0	0	0	-
22	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
22	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
22	3.5	Historical waste sites	0	0	0	0	-
22	3.6	Licensed waste sites	0	0	0	0	-
22	3.7	Waste exemptions	0	0	0	8	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
24	4.1	Recent industrial land uses	2	0	2	-	-
25	4.2	Current or recent petrol stations	0	0	0	0	-
25	4.3	Electricity cables	0	0	0	0	-
25	4.4	Gas pipelines	0	0	0	0	-
25	4.5	Sites determined as Contaminated Land	0	0	0	0	-

25	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
26	4.7	Regulated explosive sites	0	0	0	0	-
26	4.8	Hazardous substance storage/usage	0	0	0	0	-
26	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
26	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
26	4.11	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-
27	4.12	Radioactive Substance Authorisations	0	0	0	0	-
27	**4.13**	**Licensed Discharges to controlled waters**	3	0	0	0	-
28	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
28	4.15	Pollutant release to public sewer	0	0	0	0	-
28	4.16	List 1 Dangerous Substances	0	0	0	0	-
28	4.17	List 2 Dangerous Substances	0	0	0	0	-
28	**4.18**	**Pollution Incidents (EA/NRW)**	1	0	1	4	-
29	4.19	Pollution inventory substances	0	0	0	0	-
30	4.20	Pollution inventory waste transfers	0	0	0	0	-
30	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
31	**5.1**	**Superficial aquifer**	Identified (within 500m)				
33	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
34	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
35	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
36	5.5	Groundwater vulnerability- local information	None (within 0m)				
37	5.6	Groundwater abstractions	0	0	0	0	0
38	**5.7**	**Surface water abstractions**	0	0	1	0	3
39	5.8	Potable abstractions	0	0	0	0	0
39	5.9	Source Protection Zones	0	0	0	0	-
39	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
40	**6.1**	**Water Network (OS MasterMap)**	8	7	15	-	-

43	6.2	Surface water features	1	6	15	-	-
43	6.3	WFD Surface water body catchments	1	-	-	-	-
44	6.4	WFD Surface water bodies	0	1	0	-	-
44	6.5	WFD Groundwater bodies	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
45	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	High (within 50m)				
46	7.2	Historical Flood Events	0	0	0	-	-
46	7.3	Flood Defences	0	0	0	-	-
46	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
46	7.5	Flood Storage Areas	0	0	0	-	-
47	7.6	Flood Zone 2	Identified (within 50m)				
48	7.7	Flood Zone 3	Identified (within 50m)				
Page	Section	Surface water flooding					
49	8.1	Surface water flooding	Negligible (within 50m)				
Page	Section	Groundwater flooding					
50	9.1	Groundwater flooding	Low (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
51	10.1	Sites of Special Scientific Interest (SSSI)	1	0	0	0	5
52	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
52	10.3	Special Areas of Conservation (SAC)	2	0	4	0	1
54	10.4	Special Protection Areas (SPA)	0	0	1	0	1
54	10.5	National Nature Reserves (NNR)	0	0	0	0	0
54	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
54	10.7	Designated Ancient Woodland	2	3	2	3	21
56	10.8	Biosphere Reserves	0	0	0	0	0
56	10.9	Forest Parks	0	0	0	0	0
56	10.10	Marine Conservation Zones	0	0	0	0	0
56	10.11	Green Belt	0	0	0	0	0
57	10.12	Proposed Ramsar sites	0	0	0	0	0

57	**10.13**	**Possible Special Areas of Conservation (pSAC)**	0	0	1	0	0
57	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
57	10.15	Nitrate Sensitive Areas	0	0	0	0	0
58	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
59	10.17	SSSI Impact Risk Zones	0	-	-	-	-
59	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
60	11.1	World Heritage Sites	0	0	0	-	-
61	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
61	**11.3**	**National Parks**	1	0	0	-	-
61	11.4	Listed Buildings	0	0	0	-	-
62	11.5	Conservation Areas	0	0	0	-	-
62	11.6	Scheduled Ancient Monuments	0	0	0	-	-
62	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
63	**12.1**	**Agricultural Land Classification**	Grade 4 (within 250m)				
65	12.2	Open Access Land	0	0	0	-	-
65	12.3	Tree Felling Licences	0	0	0	-	-
65	12.4	Environmental Stewardship Schemes	0	0	0	-	-
65	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
66	13.1	Priority Habitat Inventory	0	0	0	-	-
66	13.2	Habitat Networks	0	0	0	-	-
66	13.3	Open Mosaic Habitat	0	0	0	-	-
66	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
67	**14.1**	**10k Availability**	Identified (within 500m)				
68	14.2	Artificial and made ground (10k)	0	0	0	0	-
69	14.3	Superficial geology (10k)	0	0	0	0	-

69	14.4	Landslip (10k)	0	0	0	0	-
70	14.5	Bedrock geology (10k)	0	0	0	0	-
70	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
71	15.1	50k Availability	Identified (within 500m)				
72	15.2	Artificial and made ground (50k)	0	0	0	0	-
72	15.3	Artificial ground permeability (50k)	0	0	-	-	-
73	15.4	Superficial geology (50k)	0	1	0	1	-
74	15.5	Superficial permeability (50k)	Identified (within 50m)				
74	15.6	Landslip (50k)	0	0	0	0	-
74	15.7	Landslip permeability (50k)	None (within 50m)				
75	15.8	Bedrock geology (50k)	3	0	1	4	-
76	15.9	Bedrock permeability (50k)	Identified (within 50m)				
76	15.10	Bedrock faults and other linear features (50k)	1	0	2	5	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
78	16.1	BGS Boreholes	0	0	0	-	-
Page	Section	Natural ground subsidence					
79	17.1	Shrink swell clays	Very low (within 50m)				
80	17.2	Running sands	Moderate (within 50m)				
82	17.3	Compressible deposits	Moderate (within 50m)				
84	17.4	Collapsible deposits	Very low (within 50m)				
85	17.5	Landslides	Moderate (within 50m)				
87	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
88	18.1	Natural cavities	0	0	0	0	-
89	18.2	BritPits	0	2	0	2	-
89	18.3	Surface ground workings	1	6	6	-	-
90	18.4	Underground workings	0	0	1	2	0
91	18.5	Historical Mineral Planning Areas	0	0	0	0	-

91	**18.6**	**Non-coal mining**	1	0	1	1	1
92	18.7	Mining cavities	0	0	0	0	0
92	18.8	JPB mining areas	None (within 0m)				
92	**18.9**	**Coal mining**	Identified (within 0m)				
92	18.10	Brine areas	None (within 0m)				
93	18.11	Gypsum areas	None (within 0m)				
93	18.12	Tin mining	None (within 0m)				
93	18.13	Clay mining	None (within 0m)				

Page	Section	Radon					
94	**19.1**	**Radon**	Between 3% and 5% (within 0m)				

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
96	**20.1**	**BGS Estimated Background Soil Chemistry**	10	9	-	-	-
97	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
97	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
98	21.1	Underground railways (London)	0	0	0	-	-
98	21.2	Underground railways (Non-London)	0	0	0	-	-
98	21.3	Railway tunnels	0	0	0	-	-
98	21.4	Historical railway and tunnel features	0	0	0	-	-
98	21.5	Royal Mail tunnels	0	0	0	-	-
99	21.6	Historical railways	0	0	0	-	-
99	21.7	Railways	0	0	0	-	-
99	21.8	Crossrail 1	0	0	0	0	-
99	21.9	Crossrail 2	0	0	0	0	-
99	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 18/06/2017

Site Area: 51.04ha

Recent site history - 2014 aerial photograph

Capture Date: 23/07/2014

Site Area: 51.04ha

Recent site history - 2009 aerial photograph

Capture Date: 11/09/2009

Site Area: 51.04ha

Recent site history - 2003 aerial photograph

Capture Date: 14/09/2003

Site Area: 51.04ha

Recent site history - 2000 aerial photograph

Capture Date: 17/06/2000

Site Area: 51.04ha

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	24

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**	**Unspecified Quarry**	**1887**	**257190**

ID	Location	Land use	Dates present	Group ID
A	14m W	Unspecified Quarry	1887	257187
A	18m W	Unspecified Pit	1963 - 1985	284158
A	18m W	Unspecified Pit	1906 - 1948	284171
B	183m N	Unspecified Heap	1906	258938
B	184m N	Refuse Heap	1887	270922
C	210m S	Unspecified Tank	1969 - 1985	301647
D	214m N	Old Lime Kiln	1887	265382
D	229m N	Unspecified Disused Kiln	1969 - 1985	311272
E	230m N	Unspecified Heap	1906 - 1948	301488
E	231m N	Unspecified Heap	1963	287769
E	232m N	Refuse Heap	1887	270923
2	234m N	Unspecified Disused Shaft	1985	269107
D	254m N	Unspecified Disused Shaft	1985	308080
D	259m N	Unspecified Disused Shaft	1969	282031
F	325m S	Unspecified Pit	1969 - 1985	301644
F	329m S	Unspecified Pit	1948	283565
F	331m S	Unspecified Pit	1887	304276
4	344m N	Magazine	1887	253467
5	372m SW	Old Gravel Pit	1887	263828
G	421m N	Unspecified Pit	1963	267432
G	422m N	Unspecified Old Quarry	1906 - 1948	311436
G	430m N	Unspecified Quarry	1969 - 1985	286538
G	431m N	Unspecified Old Quarry	1887	290519

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	2

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
C	218m S	Unspecified Tank	1966 - 1995	36465
C	219m S	Unspecified Tank	1989	35317

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	1

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
3	329m W	Electricity Substation	1995	17772

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	33

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 17**

ID	Location	Land Use	Date	Group ID
1	**On site**	**Unspecified Quarry**	**1887**	**257190**
A	14m W	Unspecified Quarry	1887	257187
A	18m W	Unspecified Pit	1985	284158

ID	Location	Land Use	Date	Group ID
A	18m W	Unspecified Pit	1969	284158
A	18m W	Unspecified Pit	1963	284158
A	18m W	Unspecified Pit	1906	284171
A	18m W	Unspecified Pit	1948	284171
B	183m N	Unspecified Heap	1906	258938
B	184m N	Refuse Heap	1887	270922
C	210m S	Unspecified Tank	1985	301647
C	210m S	Unspecified Tank	1969	301647
D	214m N	Old Lime Kiln	1887	265382
D	229m N	Unspecified Disused Kiln	1985	311272
D	229m N	Unspecified Disused Kiln	1969	311272
E	230m N	Unspecified Heap	1906	301488
E	230m N	Unspecified Heap	1948	301488
E	231m N	Unspecified Heap	1963	287769
E	232m N	Refuse Heap	1887	270923
2	234m N	Unspecified Disused Shaft	1985	269107
D	254m N	Unspecified Disused Shaft	1985	308080
D	259m N	Unspecified Disused Shaft	1969	282031
F	325m S	Unspecified Pit	1985	301644
F	325m S	Unspecified Pit	1969	301644
F	329m S	Unspecified Pit	1948	283565
F	331m S	Unspecified Pit	1887	304276
3	344m N	Magazine	1887	253467
4	372m SW	Old Gravel Pit	1887	263828
H	421m N	Unspecified Pit	1963	267432
H	422m N	Unspecified Old Quarry	1906	311436
H	422m N	Unspecified Old Quarry	1948	311436
H	430m N	Unspecified Quarry	1985	286538

ID	Location	Land Use	Date	Group ID
H	430m N	Unspecified Quarry	1969	286538
H	431m N	Unspecified Old Quarry	1887	290519

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**3**

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 17**

ID	Location	Land Use	Date	Group ID
C	218m S	Unspecified Tank	1995	36465
C	218m S	Unspecified Tank	1966	36465
C	219m S	Unspecified Tank	1989	35317

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**2**

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 17**

ID	Location	Land Use	Date	Group ID
G	329m W	Electricity Substation	1995	17772
G	329m W	Electricity Substation	1995	17772

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)

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	0

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.

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	0

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

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

3.7 Waste exemptions

Records within 500m	8

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 21**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	282m NW	Field Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME007427	Disposing of waste exemption	On a farm	Deposit of waste from dredging of inland waters
A	282m NW	Field Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME007427	Disposing of waste exemption	On a farm	Burning waste in the open
A	282m NW	Field Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME007427	Storing waste exemption	On a farm	Storage of waste in a secure place
A	282m NW	Field Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME007427	Using waste exemption	On a farm	Spreading waste on agricultural land to confer benefit
A	282m NW	Field Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME007427	Using waste exemption	On a farm	Use of mulch
A	282m NW	Clicketts Heath Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME026157	Disposing of waste exemption	On a farm	Burning waste in the open
A	282m NW	Clicketts Heath Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME026157	Using waste exemption	On a farm	Spreading waste on agricultural land to confer benefit
A	282m NW	Clicketts Heath Twycross Saundersfoot Sir Benfro SA699DJ	NRW-WME026157	Disposing of waste exemption	On a farm	Deposit of waste from dredging of inland waters

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

Licensed Discharges to controlled waters

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	4

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Company	Address	Activity	Category
1	**On site**	**Silo**	**Dyfed, SA69**	**Hoppers and Silos**	**Farming**
3	**On site**	**Mast**	**Dyfed, SA69**	**Telecommunications Features**	**Infrastructure and Facilities**
5	223m S	Tank	Dyfed, SA70	Tanks (Generic)	Industrial Features

ID	Location	Company	Address	Activity	Category
6	228m N	Farmtec Ltd	The Retreat, Swallow Tree, Saundersfoot, Dyfed, SA69 9DD	Agricultural Contractors	Contract Services

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	0

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

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

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

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

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

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

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

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

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

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

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

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

Records within 500m	0

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.

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	3

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

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Address	Details	
A	**On site**	**Trevayne Farm, Monkstone, Saundersfoot, Pembrokeshire, SA69 9DL**	**Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: BP0371501 Permit Version: 0 Receiving Water: groundwater via infiltration system**	**Status: Effective Issue date: 14/01/2008 Effective Date: 14/01/2008 Revocation Date: -**
A	**On site**	**TREVAYNE FARM, MONKSTONE, SAUNDERSFOOT, PEMBROKESHIRE, SA69 9DL**	**Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: BP0371501 Permit Version: 1 Receiving Water: GROUND WATERS VIA SOAKAWAY**	**Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 14/01/2008 Effective Date: 14/01/2008 Revocation Date: 14/01/2020**
A	**On site**	**TREVAYNE FARM, MONKSTONE, SAUNDERSFOOT, PEMBROKESHIRE, SA69 9DL**	**Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: BP0371501 Permit Version: 1 Receiving Water: GROUND WATERS VIA SOAKAWAY**	**Status: Effective Issue date: 14/01/2008 Effective Date: 14/01/2008 Revocation Date: -**

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	6

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 24**

ID	Location	Details	
2	**On site**	**Incident Date: 24/02/2002** **Incident Identification: 60223** **Pollutant: Agricultural Materials and Wastes** **Pollutant Description: Slurry and Dilute Slurry**	**Water Impact: Category 3 (Minor)** **Land Impact: Category 3 (Minor)** **Air Impact: Category 4 (No Impact)**
4	86m N	Incident Date: 15/07/2002 Incident Identification: 91636 Pollutant: Agricultural Materials and Wastes Pollutant Description: Silage Liquors	Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
7	407m W	Incident Date: 16/08/2003 Incident Identification: 182757 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
8	409m NW	Incident Date: 26/06/2002 Incident Identification: 87591 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Dust	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
9	463m W	Incident Date: 22/05/2002 Incident Identification: 80994 Pollutant: Organic Chemicals/Products Pollutant Description: Paints and Varnishes	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
10	477m NW	Incident Date: 14/03/2014 Incident Identification: 1218016 Pollutant: Other Pollutant Pollutant Description: Natural Ochre	Water 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.

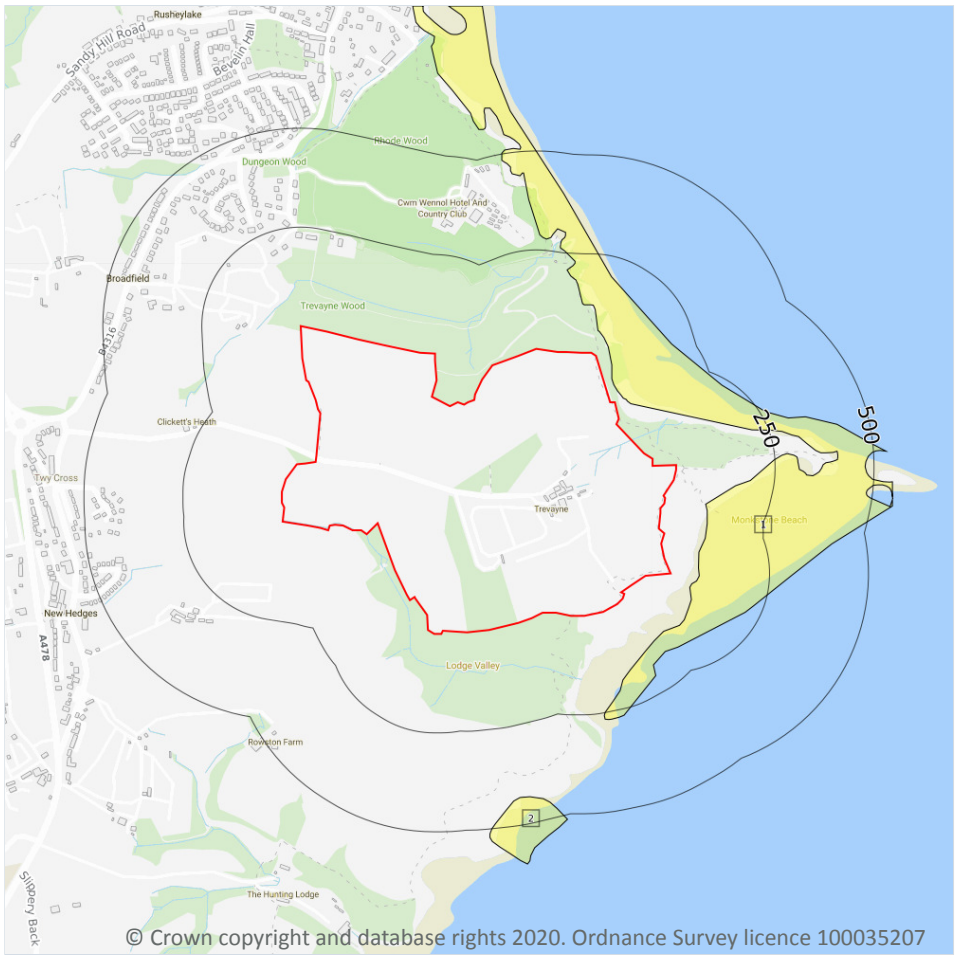
4.21 Pollution inventory radioactive waste

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	2

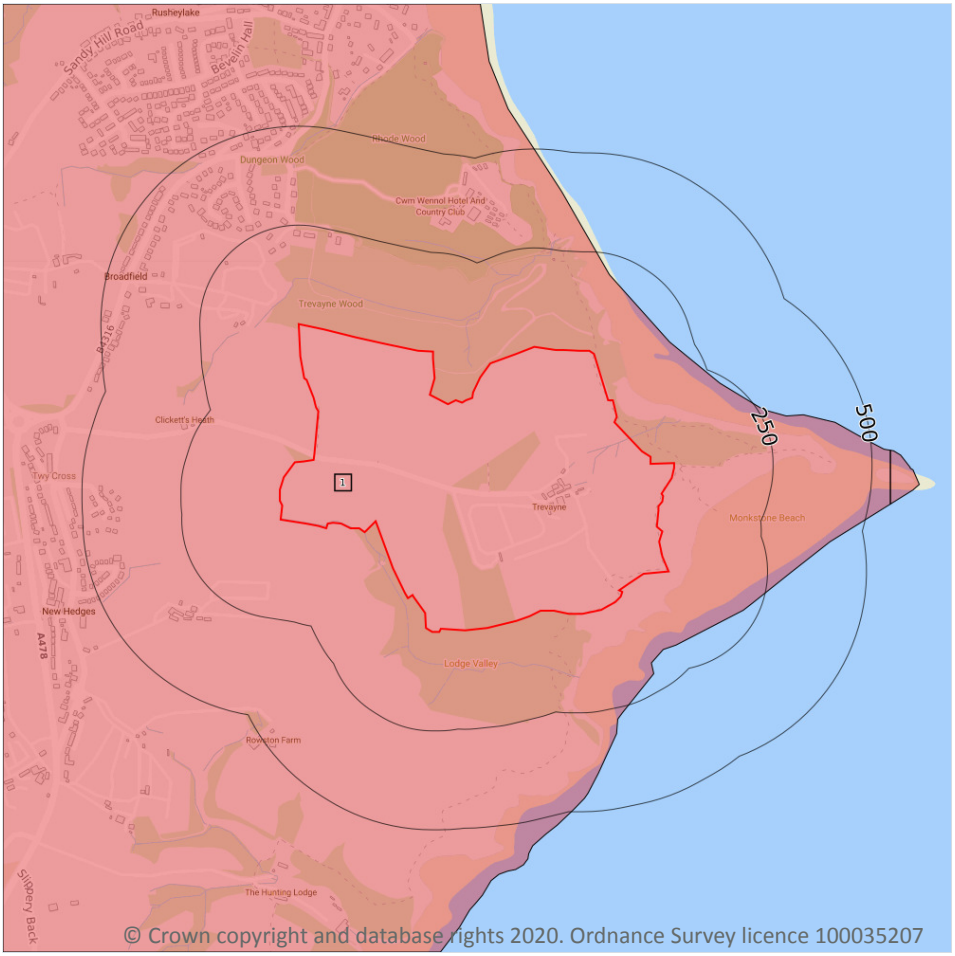
Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 31**

ID	Location	Designation	Description
1	21m E	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	430m S	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

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

Bedrock aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive

5.2 Bedrock aquifer

Records within 500m	1

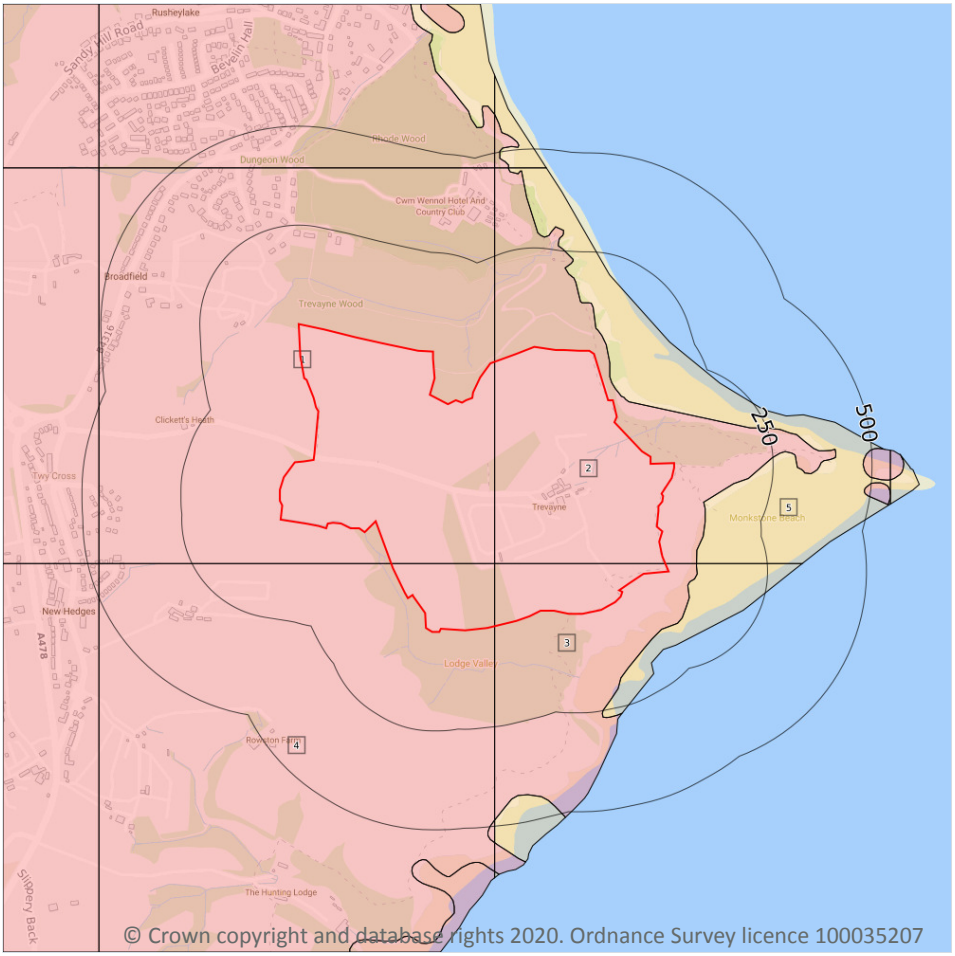
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 33**

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**

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

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	5

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 34**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	**On site**	**Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: High Infiltration value: <40% Dilution value: >550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures**
2	**On site**	**Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: High Infiltration value: >70% Dilution value: >550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures**
3	**On site**	**Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: High Infiltration value: >70% Dilution value: >550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures**
4	**On site**	**Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: High Infiltration value: <40% Dilution value: >550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures**
5	21m E	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: >550mm/year	Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: High 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	0

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.

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

5.7 Surface water abstractions

Records within 2000m	4

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

Features are displayed on the Abstractions and Source Protection Zones map on **page 37**

ID	Location	Details	
1	146m W	Status: Historical Licence No: 22/61/6/0071 Details: Spray Irrigation - Direct Direct Source: EAW Surface Water Point: UNNAMED STREAM AT CLICKETT'S HEATH USED AT LEISURE PARK Data Type: Point Name: Saundersfoot Bay Leisure Park Ltd Easting: 213360 Northing: 203570	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 01/04/2005 Version End Date: -
2	767m SW	Status: Active Licence No: 22/61/6/0065 Details: Unknown (Impounding) - Direct Source: - Point: - Data Type: Point Name: - Easting: 213500 Northing: 202140	Annual Volume (m^3): 0 Max Daily Volume (m^3): - Original Application No: - Original Start Date: Dec 19 1984 12:00AM Expiry Date: - Issue No: - Version Start Date: - Version End Date: -
-	1012m W	Status: Historical Licence No: 22/61/6/0083 Details: Spray Irrigation - Storage Direct Source: EAW Surface Water Point: RESERVOIR FED BY SPRINGS FEEDING KNIGHTSTON BROOK Data Type: Point Name: Marden Easting: 212480 Northing: 203450	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 13/12/1993 Version End Date: -

ID	Location	Details	
-	1662m NW	Status: Historical Licence No: 22/61/6/0095 Details: Spray Irrigation - Storage Direct Source: EAW Surface Water Point: UNNAMED STREAM AND LAND DRAINS AT BONVILLE'S COURT Data Type: Line Name: Shimmin Easting: 212600 Northing: 205100	Annual Volume (m^3): 1500.18 Max Daily Volume (m^3): 50.006 Original Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 01/04/2000 Version End Date: -

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.

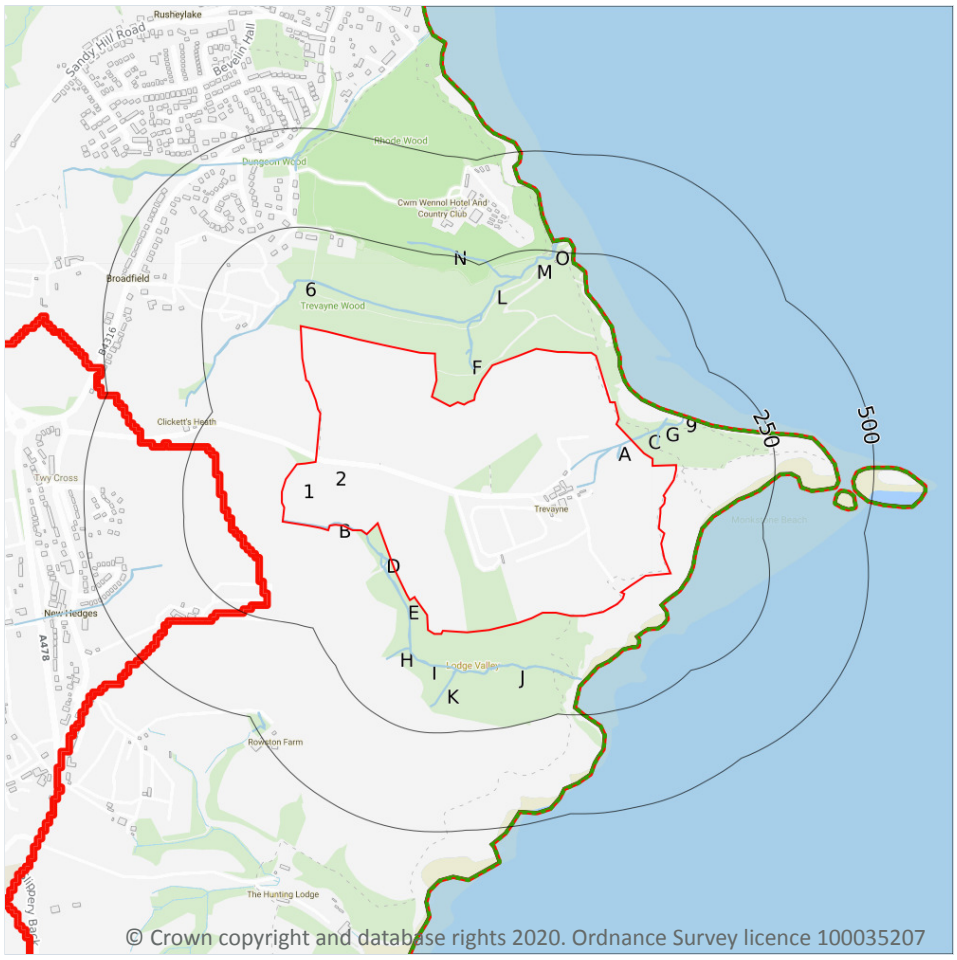
5.10 Source Protection Zones (confined aquifer)

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	**30**

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 40**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	**On site**	**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
A	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
A	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
A	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
A	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
A	**On site**	**Inland river not influenced by normal tidal action.**	**Underground**	**Watercourse contains water year round (in normal circumstances)**	**-**
B	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
C	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
D	7m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	13m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	15m W	Lake, loch or reservoir.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	19m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	24m W	Lake, loch or reservoir.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
F	32m NW	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
G	35m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
H	63m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
I	63m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
F	67m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
F	67m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
6	74m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
J	92m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
K	95m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
9	110m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
L	133m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
M	184m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
L	187m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
L	227m N	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	-

ID	Location	Type of water feature	Ground level	Permanence	Name
N	233m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
O	233m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
O	233m N	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	22

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 40**

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 40**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
2	**On site**	**Coastal catchment**	**Not part of a river WB catchment**	**244**	**Coastal streams of South Pembs and South Milford Haven - Pendine to Landshipping**	**Cleddau and Pembrokeshire Coastal Rivers**

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.

Features are displayed on the Hydrology map on **page 40**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
4	40m SE	Coastal	Carmarthen Bay	GB611008590002	Moderate	Fail	Moderate	2016

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

6.5 WFD Groundwater bodies

Records on site	1

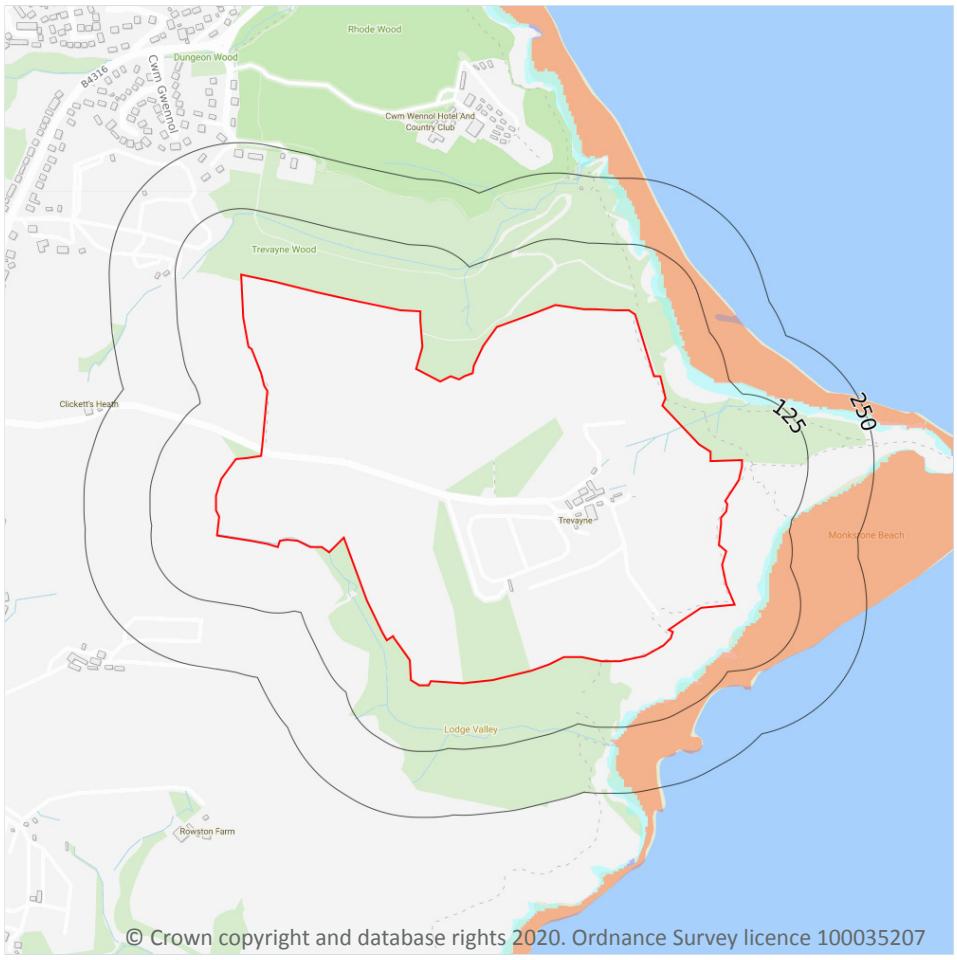
Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place.

Features are displayed on the Hydrology map on **page 40**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	**On site**	**Pembrokeshire Carboniferous Limestone**	**GB41002G206000**	**Good**	**Good**	**Good**	**2016**

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

7 River and coastal flooding



Site Outline

Search buffers in metres (m)

Environment Agency river and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m	3

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; 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).

Features are displayed on the River and coastal flooding map on **page 45**

Distance	RoFRaS flood risk
On site	**N/A**
0 - 50m	High

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.

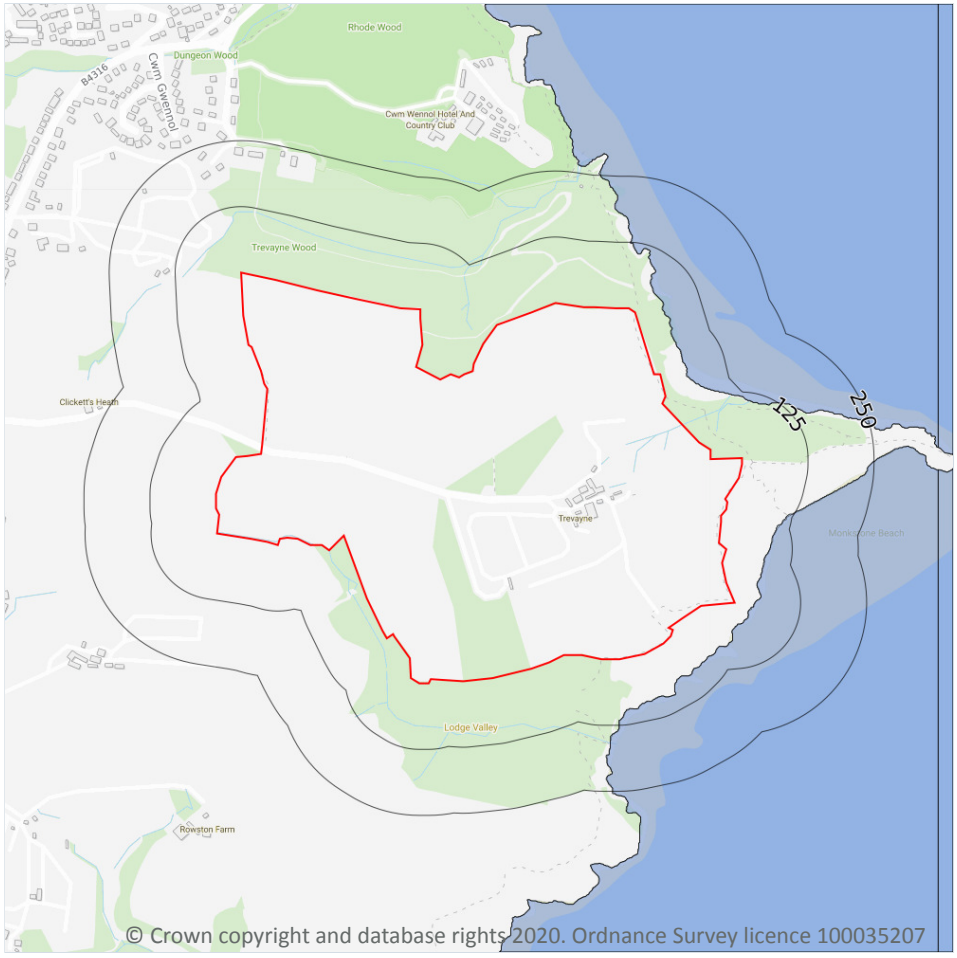
7.5 Flood Storage Areas

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



Site Outline

Search buffers in metres (m)

Flood zone 2

Flood zone 3

7.6 Flood Zone 2

Records within 50m	1

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.

Features are displayed on the River and coastal flooding map on **page 45**

Location	Type
30m SE	Zone 2 - (Fluvial /Tidal Models)

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

7.7 Flood Zone 3

Records within 50m	1

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.

Features are displayed on the River and coastal flooding map on **page 45**

Location	Type
31m SE	Zone 3 - (Fluvial Models)

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

8 Surface water flooding

8.1 Surface water flooding

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

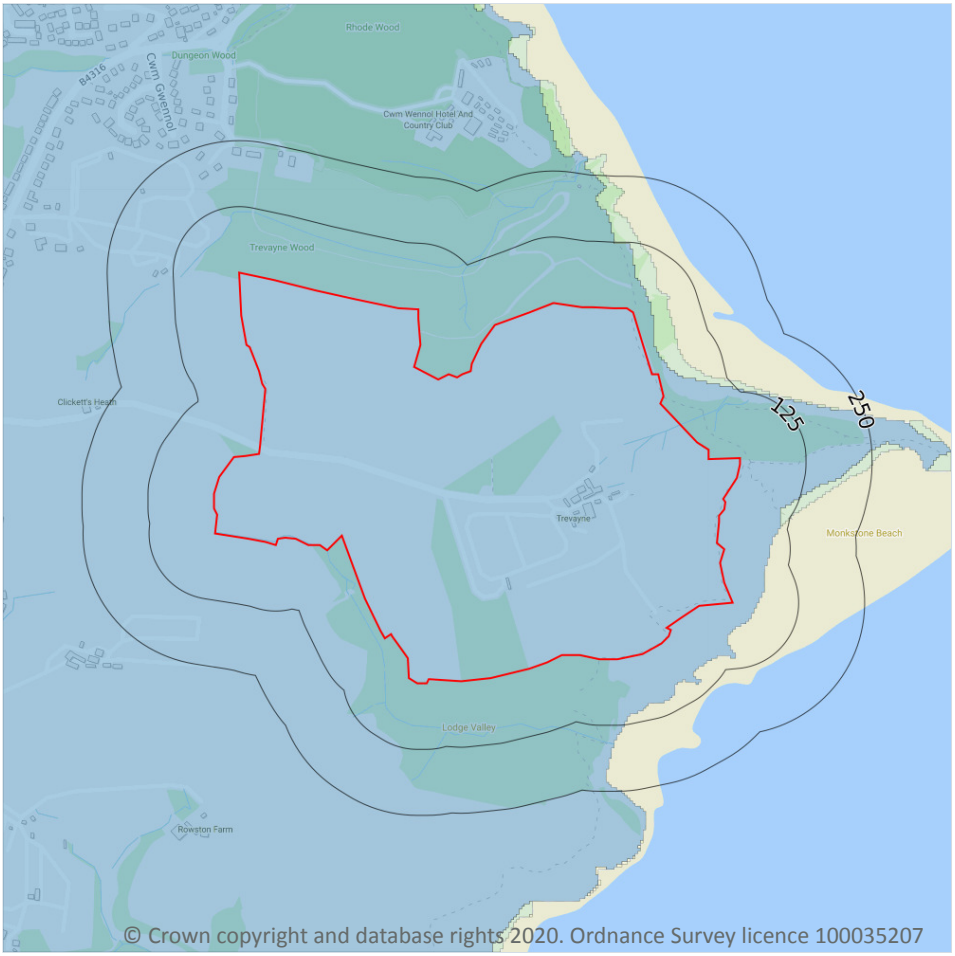
Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year 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.

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

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

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

9.1 Groundwater flooding

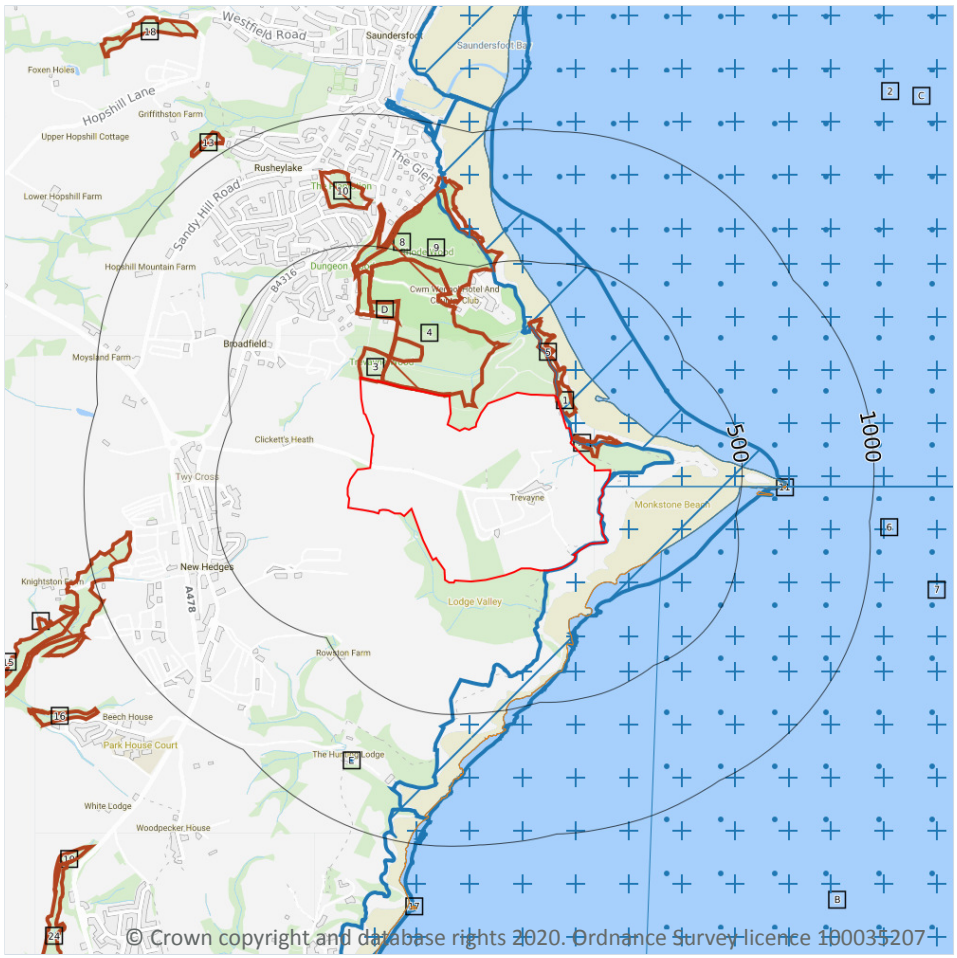
Highest risk on site	**Negligible**
Highest risk within 50m	**Low**

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 50**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations



Site Outline

Search buffers in metres (m)

Sites of Special Scientific Interest (SSSI)

Special Areas of Conservation (SAC)

Special Protection Areas (SPA)

Designated Ancient Woodland

Possible Special Areas of Conservation (pS

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	6

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 51**

ID	Location	Name	Data source
A	**On site**	**Waterwynch Bay To Saundersfoot Harbour**	**Natural Resources Wales**

ID	Location	Name	Data source
11	658m E	Waterwynch Bay To Saundersfoot Harbour	Natural Resources Wales
E	766m SW	Beech Cottage, Waterwynch	Natural Resources Wales
12	875m S	Tenby Cliffs And St. Catherine's Island	Natural Resources Wales
14	1070m N	Arfordir Saundersfoot - Telpyn / Saundersfoot - Telpyn Coast	Natural Resources Wales
17	1233m S	Tenby Cliffs And St. Catherine's Island	Natural Resources Wales

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	**7**

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

Features are displayed on the Environmental designations map on **page 51**

ID	Location	Name	Features of interest	Habitat description	Data source
2	**On site**	**Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd**	**Subtidal sandbanks; Estuaries; Intertidal mudflats and sandflats; Lagoons; Shallow inlets and bays; Glasswort and other annuals colonising mud and sand; Cord-grass swards; Atlantic salt meadows; Dunes with sea-buckthorn; Sea caves; Sea lamprey; River lamprey; Allis shad; Twaite shad; Lesser horseshoe bat; Greater horseshoe bat; Otter; Grey seal.**	**Shingle, Sea cliffs, Islets; Marine areas, Sea inlets; Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins); Salt marshes, Salt pastures, Salt steppes**	**Natural Resources Wales**
B	**On site**	**Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd**	**Subtidal sandbanks; Estuaries; Intertidal mudflats and sandflats; Lagoons; Shallow inlets and bays; Glasswort and other annuals colonising mud and sand; Cord-grass swards; Atlantic salt meadows; Dunes with sea-buckthorn; Sea caves; Sea lamprey; River lamprey; Allis shad; Twaite shad; Lesser horseshoe bat; Greater horseshoe bat; Otter; Grey seal.**	**Shingle, Sea cliffs, Islets; Marine areas, Sea inlets; Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins); Salt marshes, Salt pastures, Salt steppes**	**Natural Resources Wales**
B	132m SE	Bristol Channel Approaches / Dynesfeydd Môr Hafren	Harbour porpoise.	Marine areas, Sea inlets	Natural Resources Wales
B	132m SE	Bristol Channel Approaches / Dynesfeydd Mor Hafren	Harbour porpoise.	Marine areas, Sea inlets	Natural England
C	139m E	Bristol Channel Approaches / Dynesfeydd Môr Hafren	Harbour porpoise.	Marine areas, Sea inlets	Natural Resources Wales
C	139m E	Bristol Channel Approaches / Dynesfeydd Mor Hafren	Harbour porpoise.	Marine areas, Sea inlets	Natural England
E	766m SW	Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton	Calcium-rich nutrient-poor lakes, lochs and pools; Dry grasslands and scrublands on chalk or limestone; Bullhead; Lesser horseshoe bat; Greater horseshoe bat; Otter.	Improved grassland; Dry grassland, Steppes; Inland water bodies (Standing water, Running water); Broad-leaved deciduous woodland; Bogs, Marshes, Water fringed vegetation, Fens; Mixed woodland; Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites); Heath, Scrub, Maquis and Garrigue, Phygrana	Natural Resources Wales

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

10.4 Special Protection Areas (SPA)

Records within 2000m	2

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.

Features are displayed on the Environmental designations map on **page 51**

ID	Location	Name	Species of interest	Habitat description	Data source
7	139m E	Bae Caerfyrddin / Carmarthen Bay	Black (common) scoter	Marine areas, Sea inlets	
-	1637m N	Bae Caerfyrddin / Carmarthen Bay	Black (common) scoter	Marine areas, Sea inlets	

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	0

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.

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

10.7 Designated Ancient Woodland

Records within 2000m	31

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 51**

ID	Location	Name	Woodland Type
1	**On site**	**Unknown**	**Ancient Woodland Site of Unknown Category**
3	**On site**	**Unknown**	**Plantation on Ancient Woodland Site**
4	2m N	Unknown	Plantation on Ancient Woodland Site
A	2m E	Unknown	Plantation on Ancient Woodland Site
5	2m NE	Unknown	Plantation on Ancient Woodland Site
D	238m N	Unknown	Plantation on Ancient Woodland Site
8	238m N	Unknown	Restored Ancient Woodland Site
D	309m N	Unknown	Ancient Semi Natural Woodland
9	339m N	Unknown	Ancient Semi Natural Woodland
D	344m N	Unknown	Ancient Semi Natural Woodland
10	641m N	Unknown	Restored Ancient Woodland Site
F	832m W	Unknown	Restored Ancient Woodland Site
13	1030m NW	Unknown	Ancient Semi Natural Woodland
15	1101m W	Unknown	Restored Ancient Woodland Site
F	1204m W	Unknown	Restored Ancient Woodland Site
16	1226m SW	Unknown	Ancient Semi Natural Woodland
18	1438m NW	Unknown	Ancient Semi Natural Woodland
19	1614m SW	Unknown	Restored Ancient Woodland Site
-	1663m W	Unknown	Restored Ancient Woodland Site
-	1675m W	Unknown	Restored Ancient Woodland Site
-	1689m W	Unknown	Ancient Semi Natural Woodland
24	1698m SW	Unknown	Restored Ancient Woodland Site
-	1752m SW	Unknown	Restored Ancient Woodland Site
-	1783m N	Unknown	Plantation on Ancient Woodland Site
-	1871m N	Unknown	Plantation on Ancient Woodland Site
-	1900m N	Unknown	Restored Ancient Woodland Site
-	1923m N	Unknown	Restored Ancient Woodland Site
-	1923m N	Unknown	Restored Ancient Woodland Site

ID	Location	Name	Woodland Type
-	1931m W	Unknown	Ancient Semi Natural Woodland
-	1964m N	Unknown	Restored Ancient Woodland Site
-	1968m N	Unknown	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	0

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

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	1

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.

Features are displayed on the Environmental designations map on **page 51**

ID	Location	Name	Status
6	132m SE	Bristol Channel Approaches / Dynesfeydd Mor Hafren	Possible

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

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or ‘classified’) under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC

Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m	0

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

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

SSSI Impact Zones and Units

10.17 SSSI Impact Risk Zones

Records on site	0

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.

This data is sourced from Natural England.

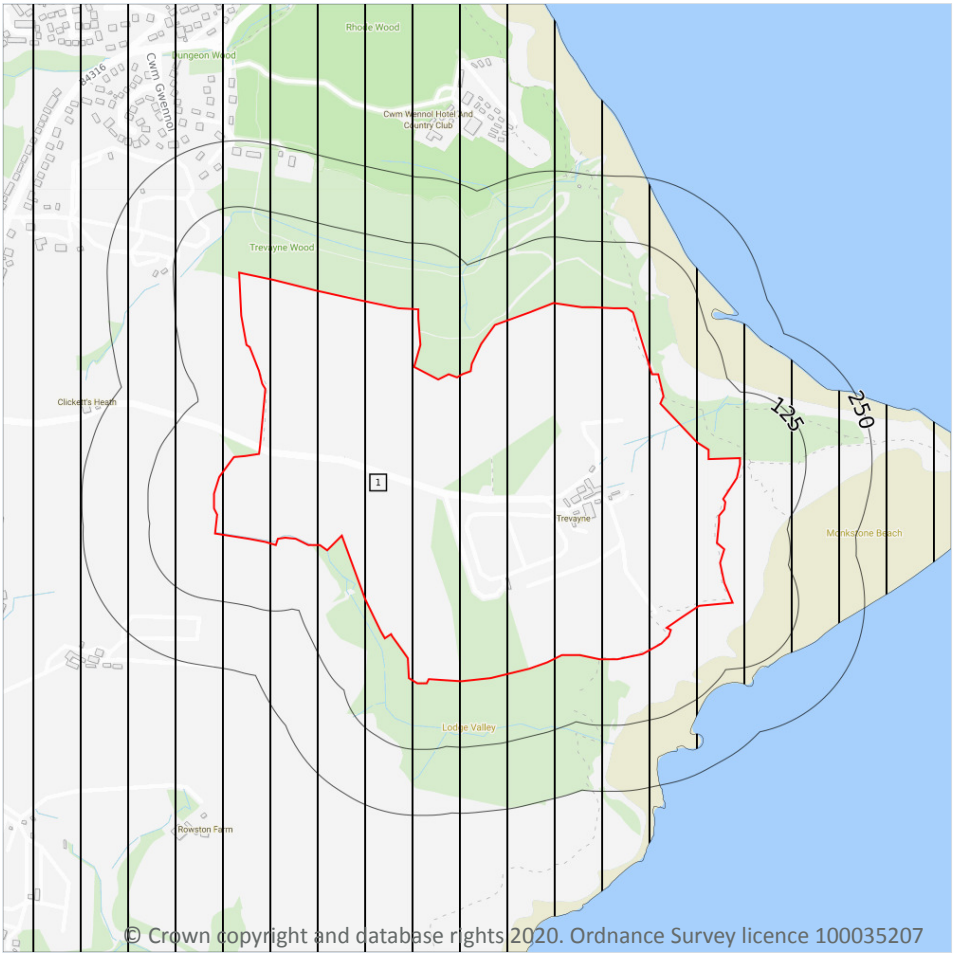
10.18 SSSI Units

Records within 2000m	0

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.

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

11 Visual and cultural designations



Site Outline

Search buffers in metres (m)

- Listed buildings
- Conservation areas
- Conservation areas - no data
- National Parks
- Areas of Outstanding Natural Beauty
- Registered parks and gardens
- Scheduled Monuments
- World Heritage Sites

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

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

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

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

11.3 National Parks

Records within 250m	1

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.

Features are displayed on the Visual and cultural designations map on **page 60**

ID	Location	Name	Data Source
1	**On site**	**Pembrokeshire Coast**	**Natural Resources Wales**

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 English Heritage, 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 English Heritage, 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 English Heritage, Cadw and Historic Environment Scotland.

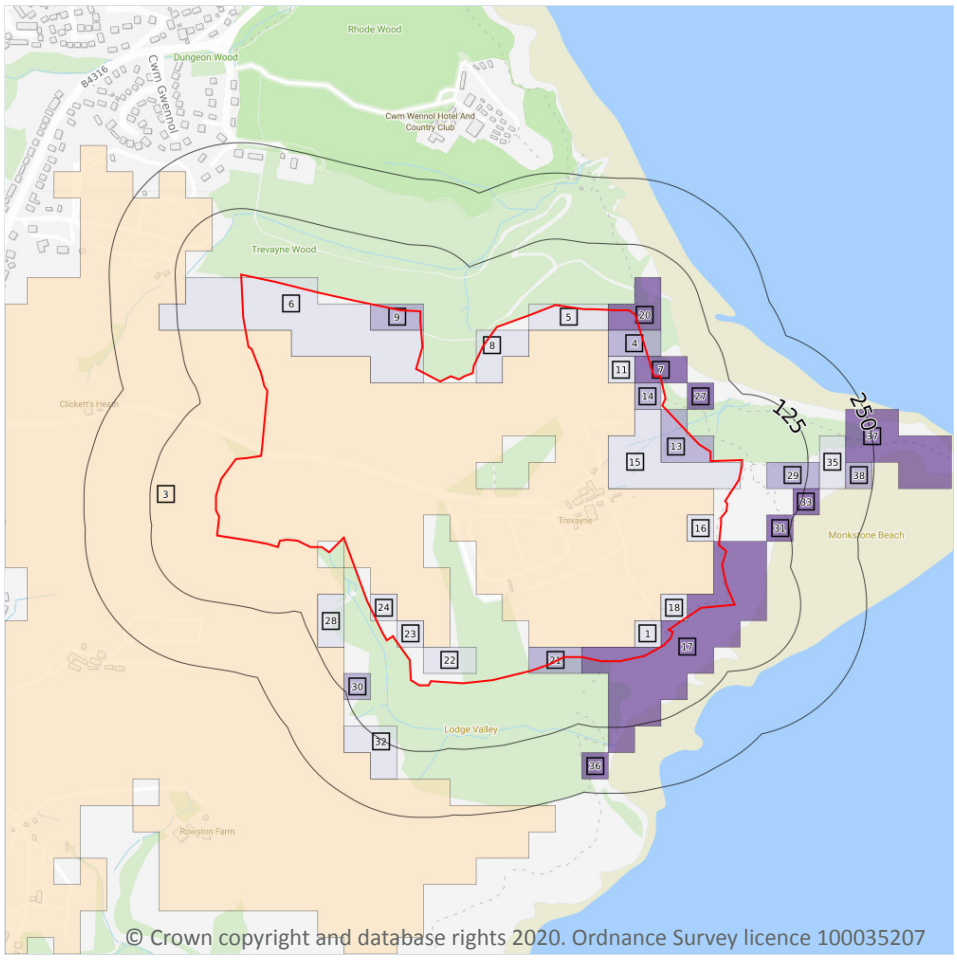
11.7 Registered Parks and Gardens

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 English Heritage, 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 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Timber felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	31

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 63**

ID	Location	Classification	Description
1	**On site**	**Grade 3b**	**Moderate quality agricultural land**
3	**On site**	**Grade 3a**	**Good to moderate quality agricultural land**
4	**On site**	**Grade 4**	**Poor quality agricultural land**

ID	Location	Classification	Description
5	**On site**	**Grade 3b**	**Moderate quality agricultural land**
6	**On site**	**Grade 3b**	**Moderate quality agricultural land**
7	**On site**	**Grade 5**	**Very poor quality agricultural land**
8	**On site**	**Grade 3b**	**Moderate quality agricultural land**
9	**On site**	**Grade 4**	**Poor quality agricultural land**
11	**On site**	**Grade 3b**	**Moderate quality agricultural land**
13	**On site**	**Grade 4**	**Poor quality agricultural land**
14	**On site**	**Grade 4**	**Poor quality agricultural land**
15	**On site**	**Grade 3b**	**Moderate quality agricultural land**
16	**On site**	**Grade 3b**	**Moderate quality agricultural land**
17	**On site**	**Grade 5**	**Very poor quality agricultural land**
18	**On site**	**Grade 3b**	**Moderate quality agricultural land**
20	**On site**	**Grade 5**	**Very poor quality agricultural land**
21	**On site**	**Grade 4**	**Poor quality agricultural land**
22	**On site**	**Grade 3b**	**Moderate quality agricultural land**
23	**On site**	**Grade 3b**	**Moderate quality agricultural land**
24	**On site**	**Grade 3b**	**Moderate quality agricultural land**
27	30m NE	Grade 5	Very poor quality agricultural land
28	36m W	Grade 3b	Moderate quality agricultural land
29	47m E	Grade 4	Poor quality agricultural land
30	70m SW	Grade 4	Poor quality agricultural land
31	77m E	Grade 5	Very poor quality agricultural land
32	88m SW	Grade 3b	Moderate quality agricultural land
33	104m E	Grade 5	Very poor quality agricultural land
35	147m E	Grade 3b	Moderate quality agricultural land
36	173m S	Grade 5	Very poor quality agricultural land
37	197m E	Grade 5	Very poor quality agricultural land
38	197m E	Grade 4	Poor quality agricultural land

This data is sourced from Natural Resources Wales.

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.

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

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	0

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.

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 67**

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.

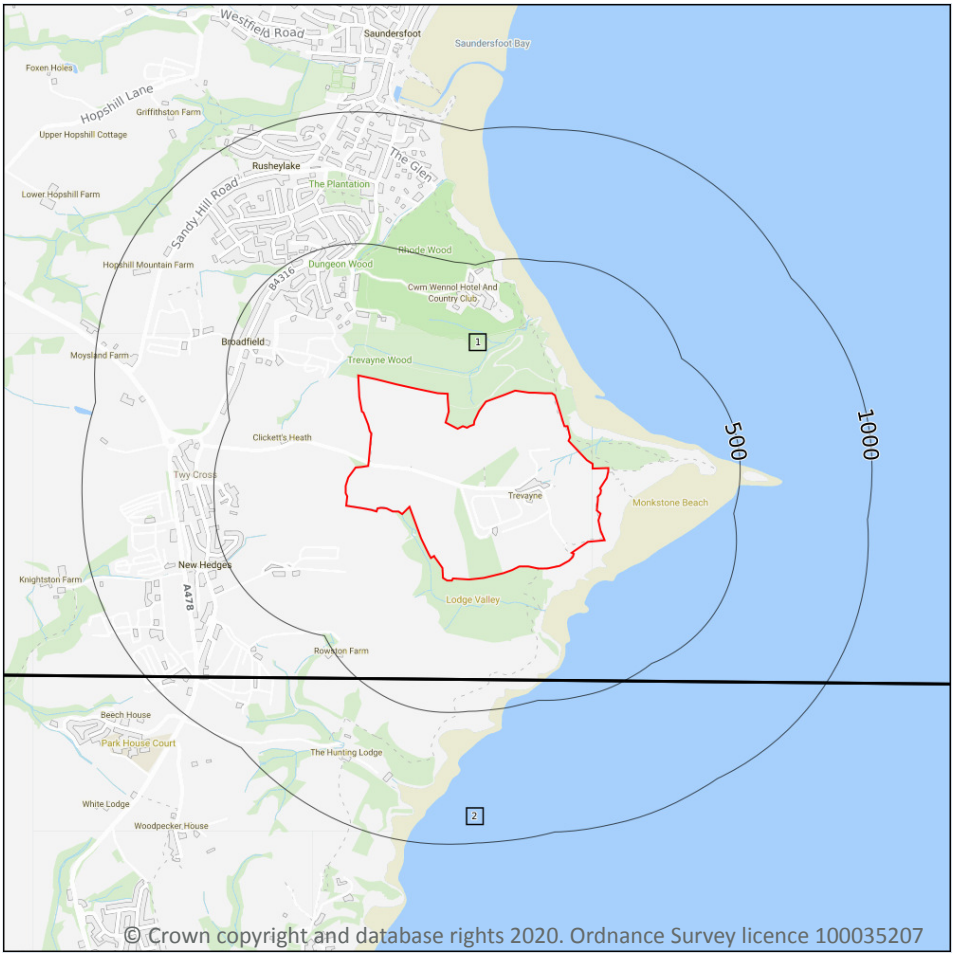
14.6 Bedrock faults and other linear features (10k)

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	2

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme. Where 50k data is not available, this area has been filled in with 625k scale data.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 71**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**Full**	**Full**	**No coverage**	**EW228_haverfordwest_v4**
2	375m S	No coverage	Full	Full	No coverage	EW244_245_pembroke_and_linney_head_v4

This data is sourced from the British Geological Survey.

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

15.2 Artificial and made ground (50k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

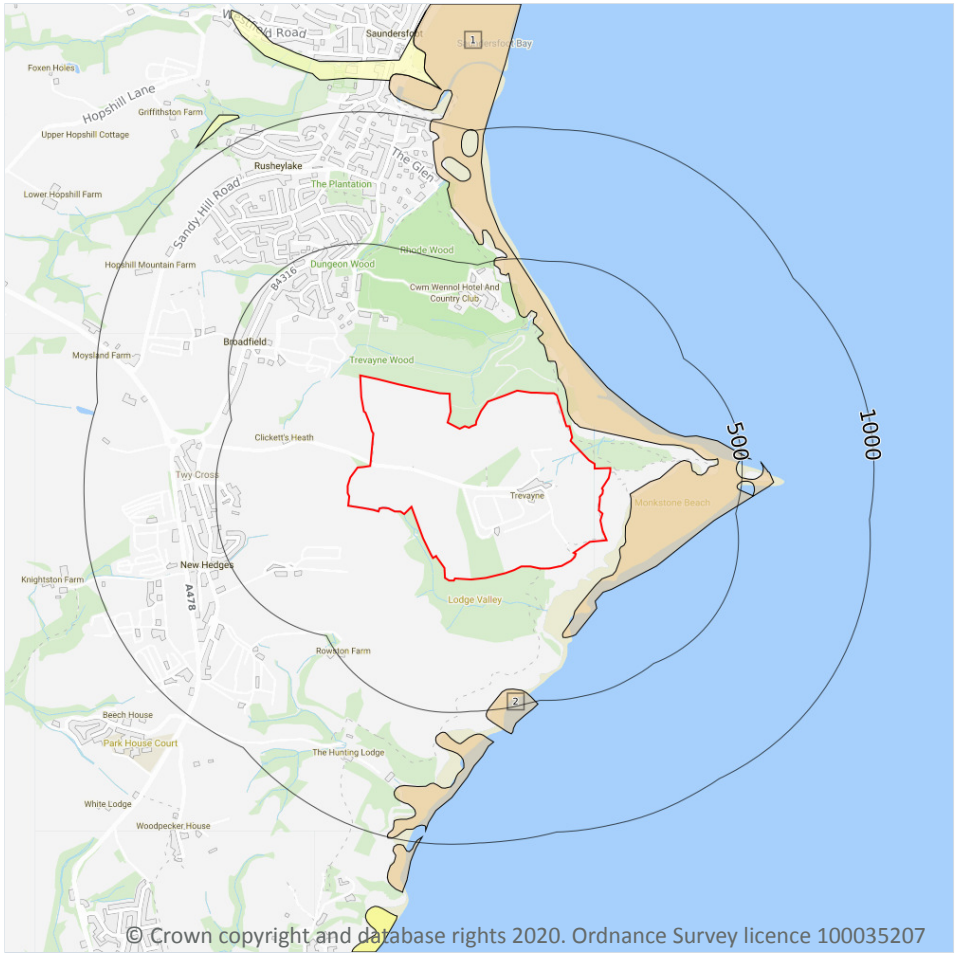
15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m	2

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 73**

ID	Location	LEX Code	Description	Rock description
1	21m E	BTFU-XSZC	BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED)	SAND, SILT AND CLAY
2	430m S	BTFU-XSZC	BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED)	SAND, SILT AND CLAY

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
21m NE	Intergranular	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.

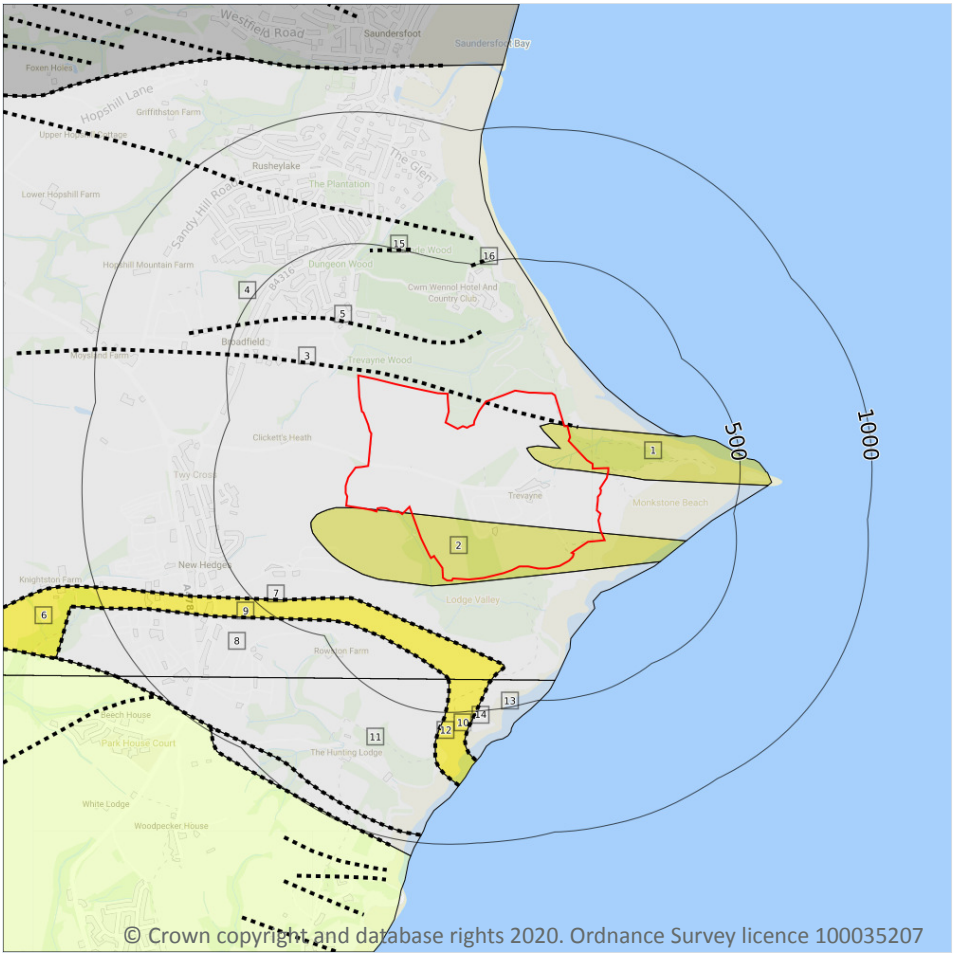
15.7 Landslip permeability (50k)

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	8

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 75**

ID	Location	LEX Code	Description	Rock age
1	On site	SWLCM-SDST	SOUTH WALES LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN
2	On site	SWLCM-SDST	SOUTH WALES LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN

ID	Location	LEX Code	Description	Rock age
4	**On site**	**SWLCM-MDSS**	**SOUTH WALES LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE**	**WESTPHALIAN**
6	203m SW	TELPP-MDSS	TELPYN POINT SANDSTONE FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	NAMURIAN
8	307m SW	SWLCM-MDSS	SOUTH WALES LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
10	374m S	TELPP-MDSS	TELPYN POINT SANDSTONE FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	NAMURIAN
11	374m S	SWLCM-MDSS	SOUTH WALES LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
13	387m S	SWLCM-MDSS	SOUTH WALES LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m **3**

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**	**High**	**Moderate**
On site	**Fracture**	**Moderate**	**Low**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m **8**

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 75**

ID	Location	Category	Description
3	**On site**	**FAULT**	**Fault, inferred, displacement unknown**
5	185m N	ROCK	Coal seam, observed
7	203m SW	FAULT	Fault, inferred, displacement unknown
9	307m SW	FOSSIL_HORIZON	Marine band
12	374m S	FOSSIL_HORIZON	Marine band
14	387m S	FAULT	Reverse fault, observed
15	476m N	ROCK	Coal seam, observed
16	493m N	ROCK	Coal seam, observed

This data is sourced from the British Geological Survey.

16 Boreholes

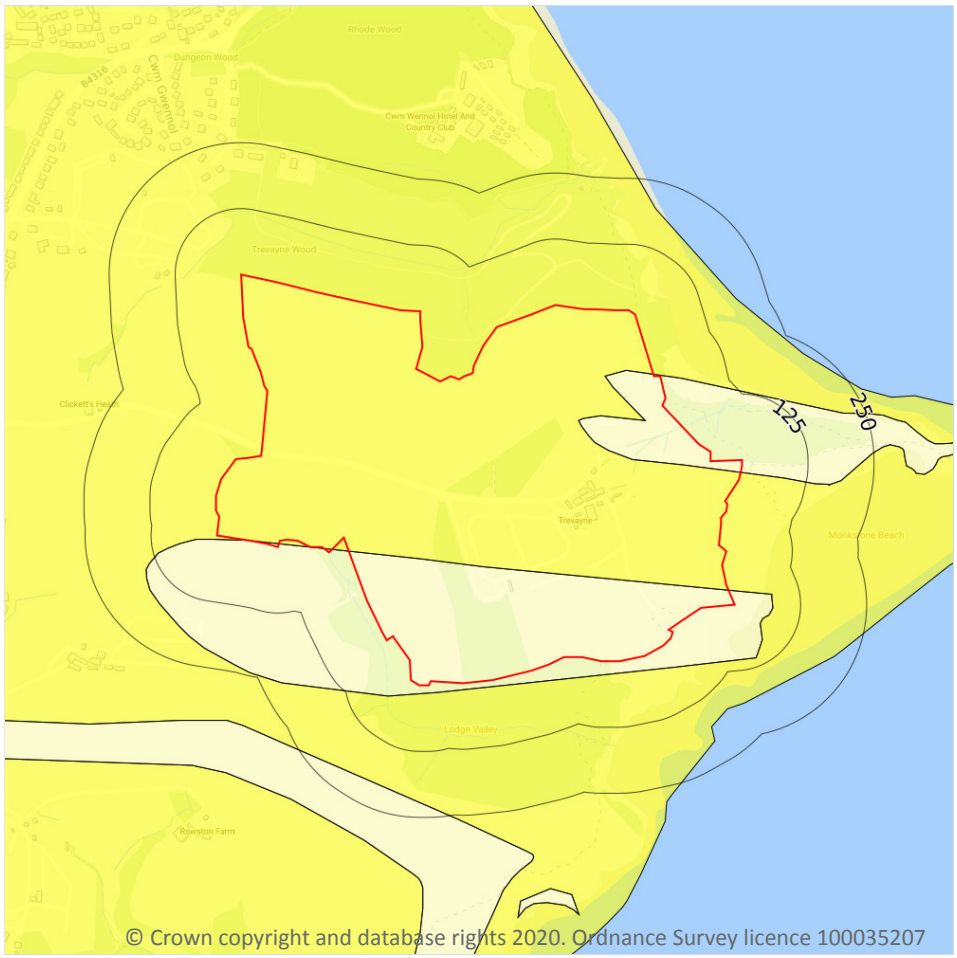
16.1 BGS Boreholes

Records within 250m	0

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.

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	2

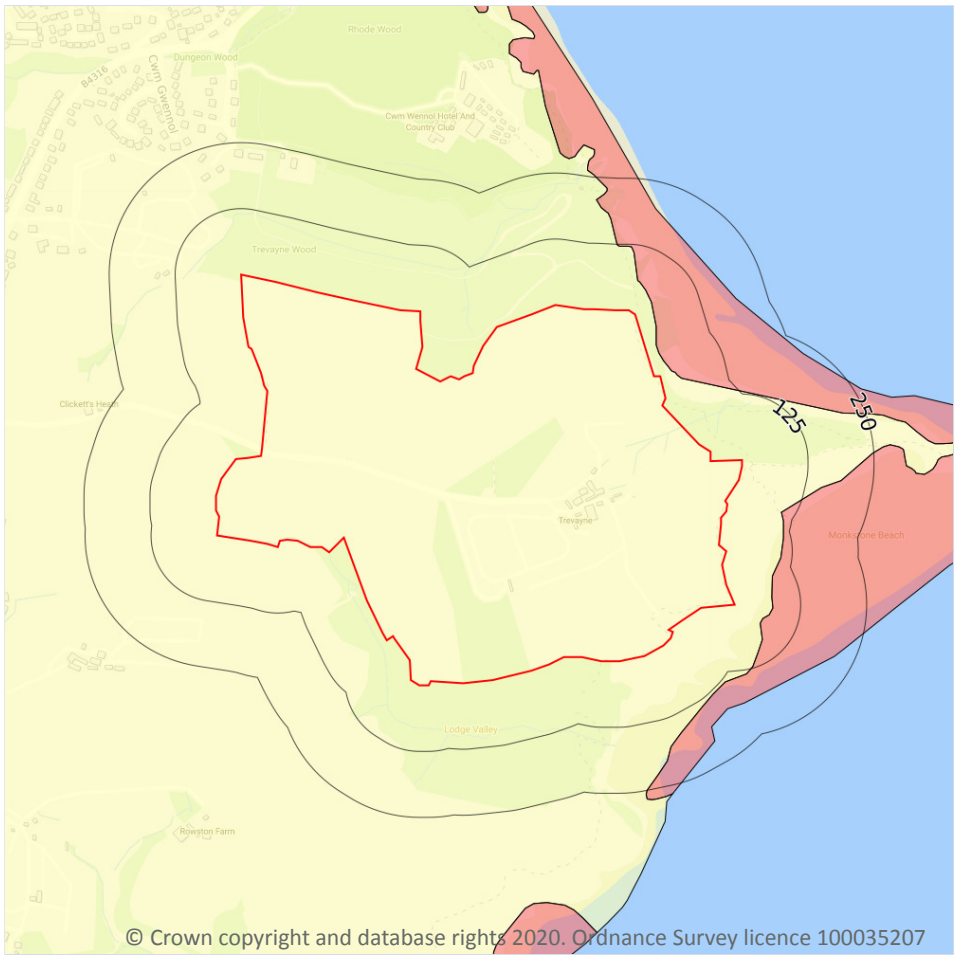
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 79**

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

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

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

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.

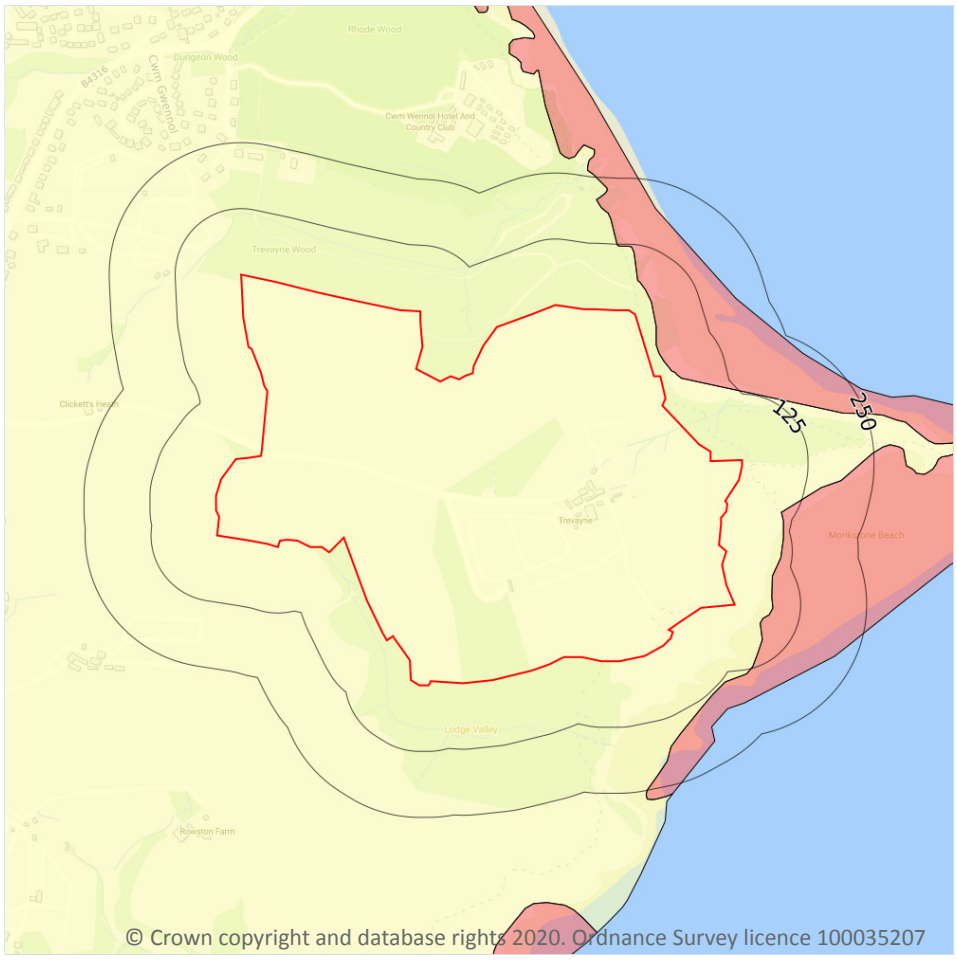
Features are displayed on the Natural ground subsidence - Running sands map on **page 80**

Location	Hazard rating	Details
On site	**Negligible**	**Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.**

Location	Hazard rating	Details
21m E	Moderate	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.

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	2

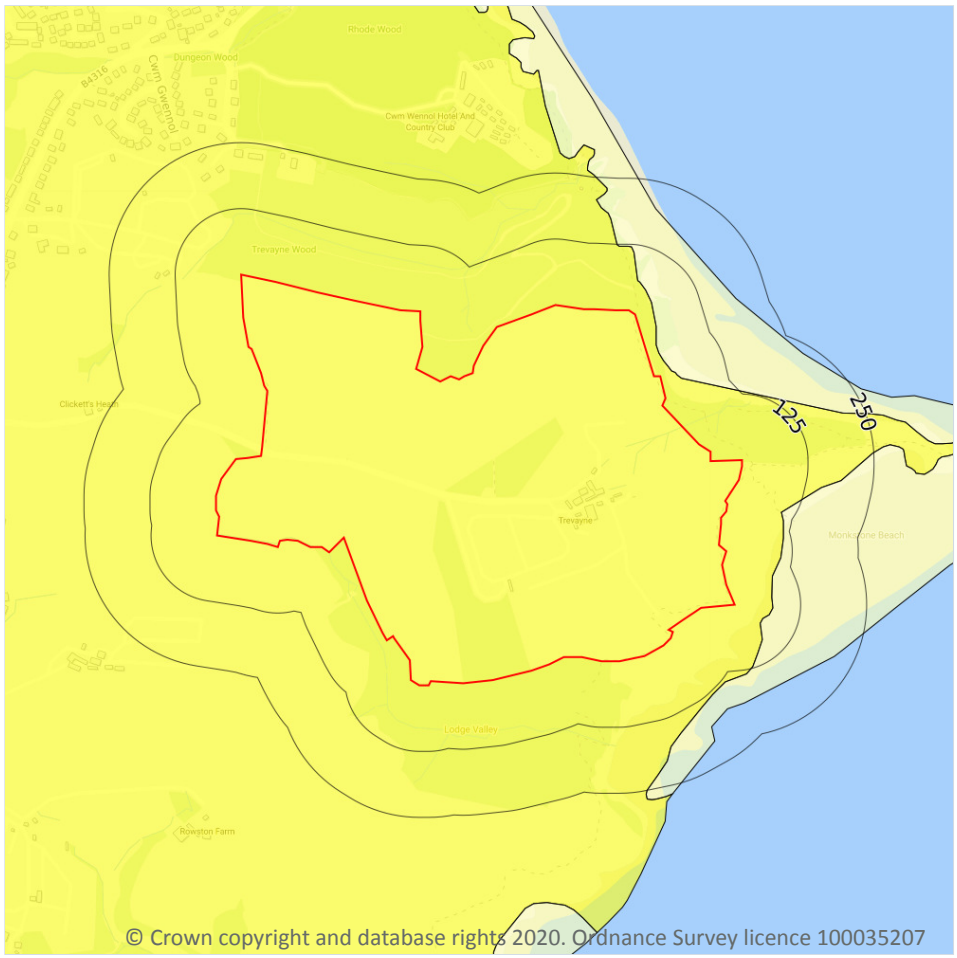
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 82**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**
21m E	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

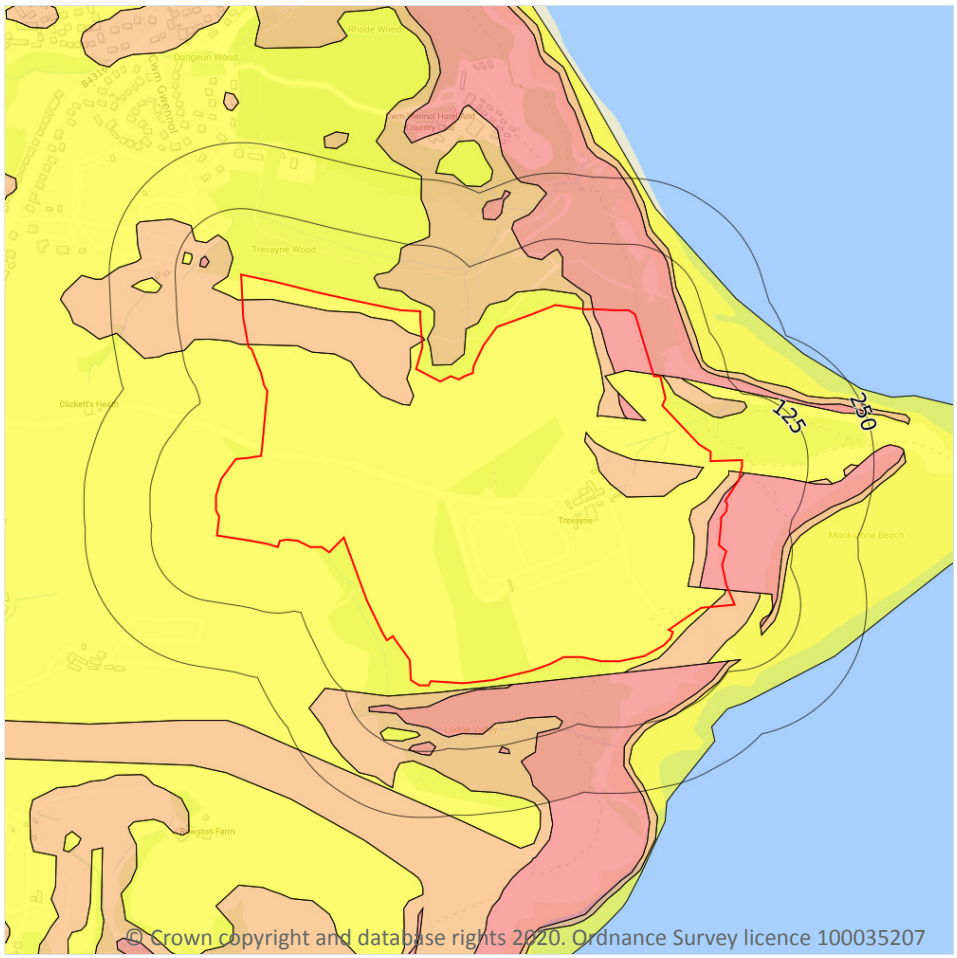
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 84**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**
21m E	Negligible	Deposits with potential to collapse when loaded and saturated are believed not 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	6

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.

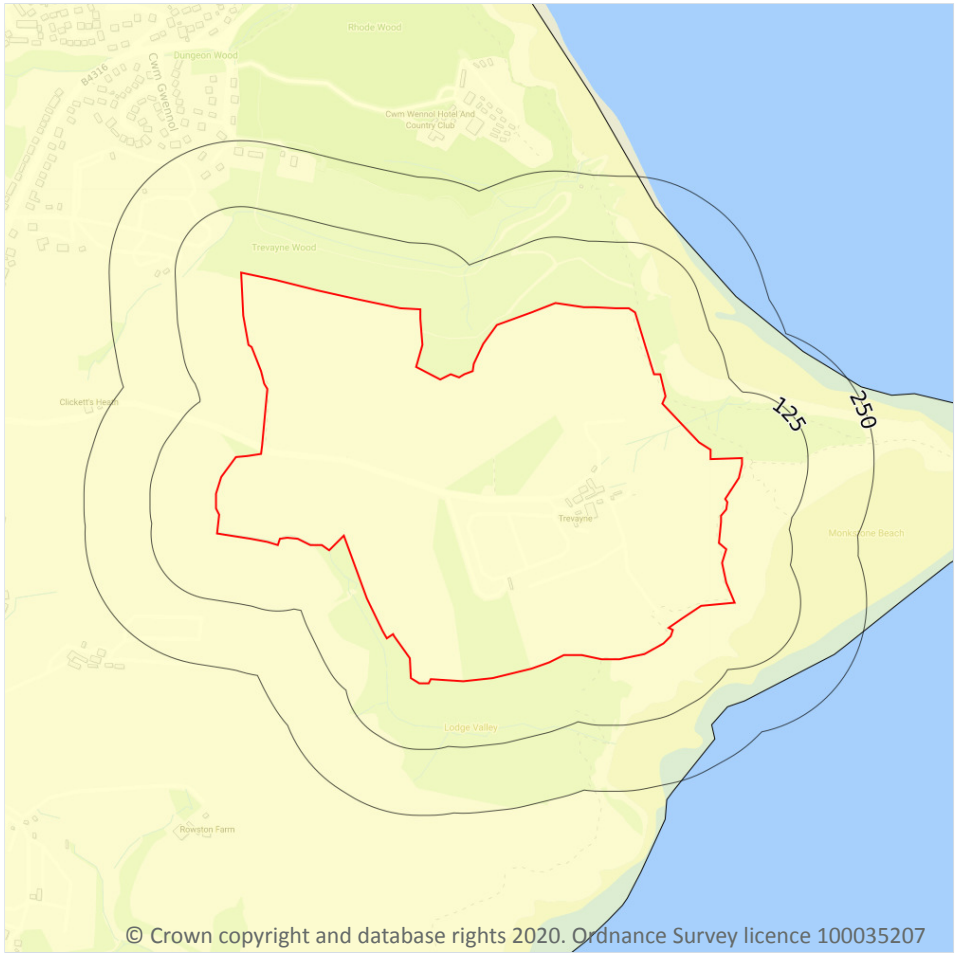
Features are displayed on the Natural ground subsidence - Landslides map on **page 85**

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.**
On site	**Moderate**	**Slope instability problems are probably present or have occurred in the past. Land use should consider specifically the stability of the site.**
4m E	Low	Slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site.
12m S	Low	Slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site.
15m S	Moderate	Slope instability problems are probably present or have occurred in the past. Land use should consider specifically the stability of the site.

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	1

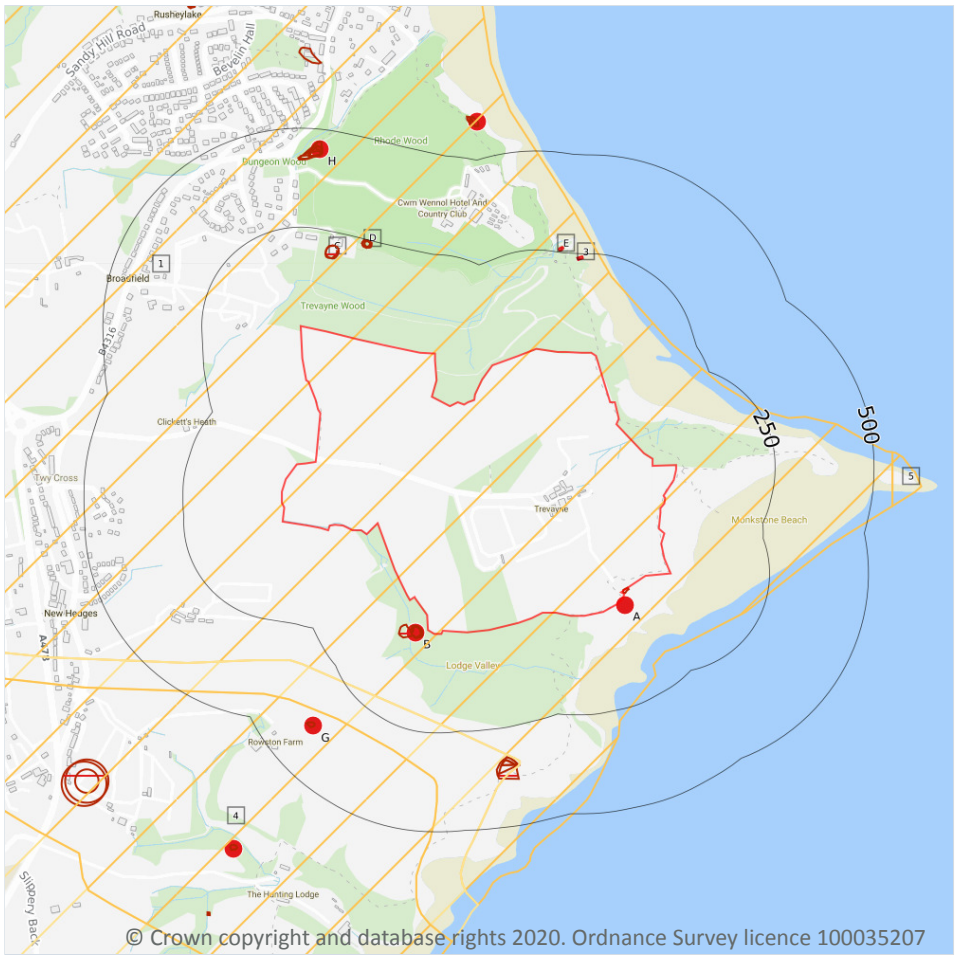
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 87**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



Site Outline

Search buffers in metres (m)

Natural cavities (Area)

Natural cavities (Point)

BritPits

Surface ground workings

Underground workings

Historical Mineral Planning Areas

Mining Cavities

Non Coal Mining

Sporadic underground mining of restricted extent possible

Localised small scale underground mining possible

Small scale mining possible

Underground mining known or likely within or in close proximity

Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Peter Brett Associates (PBA).

18.2 BritPits

Records within 500m	4

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 88**

ID	Location	Details	Description
A	15m SE	Name: Trevane Address: TENBY, Pembrokeshire Commodity: Sandstone Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased 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	32m W	Name: New Hedges Address: TENBY, Pembrokeshire Commodity: Sandstone Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased 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
G	376m SW	Name: Rowston Farm Address: TENBY, Pembrokeshire Commodity: Sand & Gravel Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased 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	449m N	Name: Stammers Address: Saundersfoot, TENBY, Pembrokeshire Commodity: Sandstone Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased 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	13

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 88**

ID	Location	Land Use	Year of mapping	Mapping scale
A	**On site**	**Unspecified Quarry**	**1887**	**1:10560**
B	14m W	Unspecified Quarry	1887	1:10560
B	18m W	Unspecified Pit	1985	1:10000
B	18m W	Unspecified Pit	1969	1:10560
B	18m W	Unspecified Pit	1963	1:10560
B	18m W	Unspecified Pit	1906	1:10560
B	18m W	Unspecified Pit	1948	1:10560
C	183m N	Unspecified Heap	1906	1:10560
C	184m N	Refuse Heap	1887	1:10560
D	230m N	Unspecified Heap	1906	1:10560
D	230m N	Unspecified Heap	1948	1:10560
D	231m N	Unspecified Heap	1963	1:10560
D	232m N	Refuse Heap	1887	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	**3**

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 88**

ID	Location	Land Use	Year of mapping	Mapping scale
3	234m N	Unspecified Disused Shaft	1985	1:10000
E	254m N	Unspecified Disused Shaft	1985	1:10000
E	259m N	Unspecified Disused Shaft	1969	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	4

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 88**

ID	Location	Name	Commodity	Class	Likelihood
1	**On site**	**Not available**	**Iron Ore (Bedded)**	**B**	**Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered**
2	203m 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
4	307m SW	Not available	Iron Ore (Bedded)	B	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
5	547m E	Not available	Iron Ore (Bedded)	B	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or 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 Peter Brett Associates (PBA).

18.8 JPB mining areas

Records on site	0

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

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	1

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	**The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.**

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Mining Searches UK.

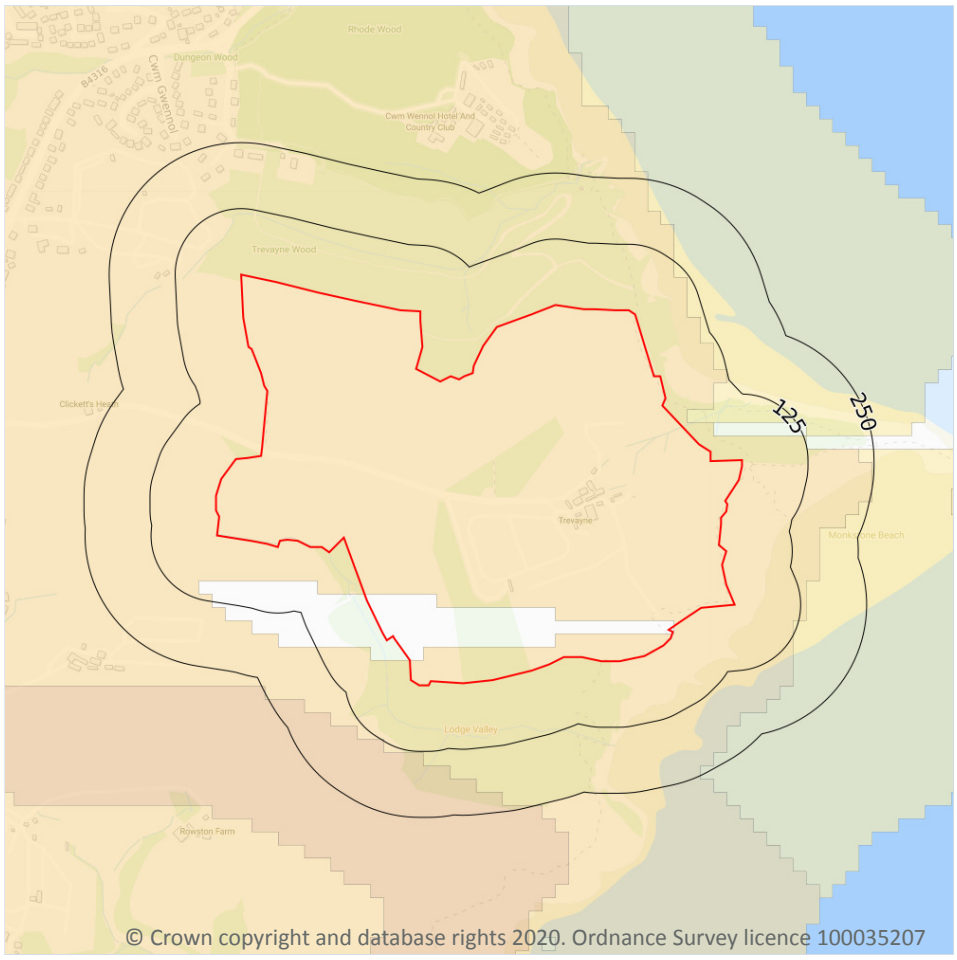
18.13 Clay mining

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	2

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 94**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****
On site	**Between 3% and 5%**	**Basic**

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	19

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 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 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 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 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 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 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 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 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 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 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
2m W	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
5m NW	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
12m S	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
15m SE	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
21m NE	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
30m NE	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
38m E	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
47m E	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
49m E	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 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

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

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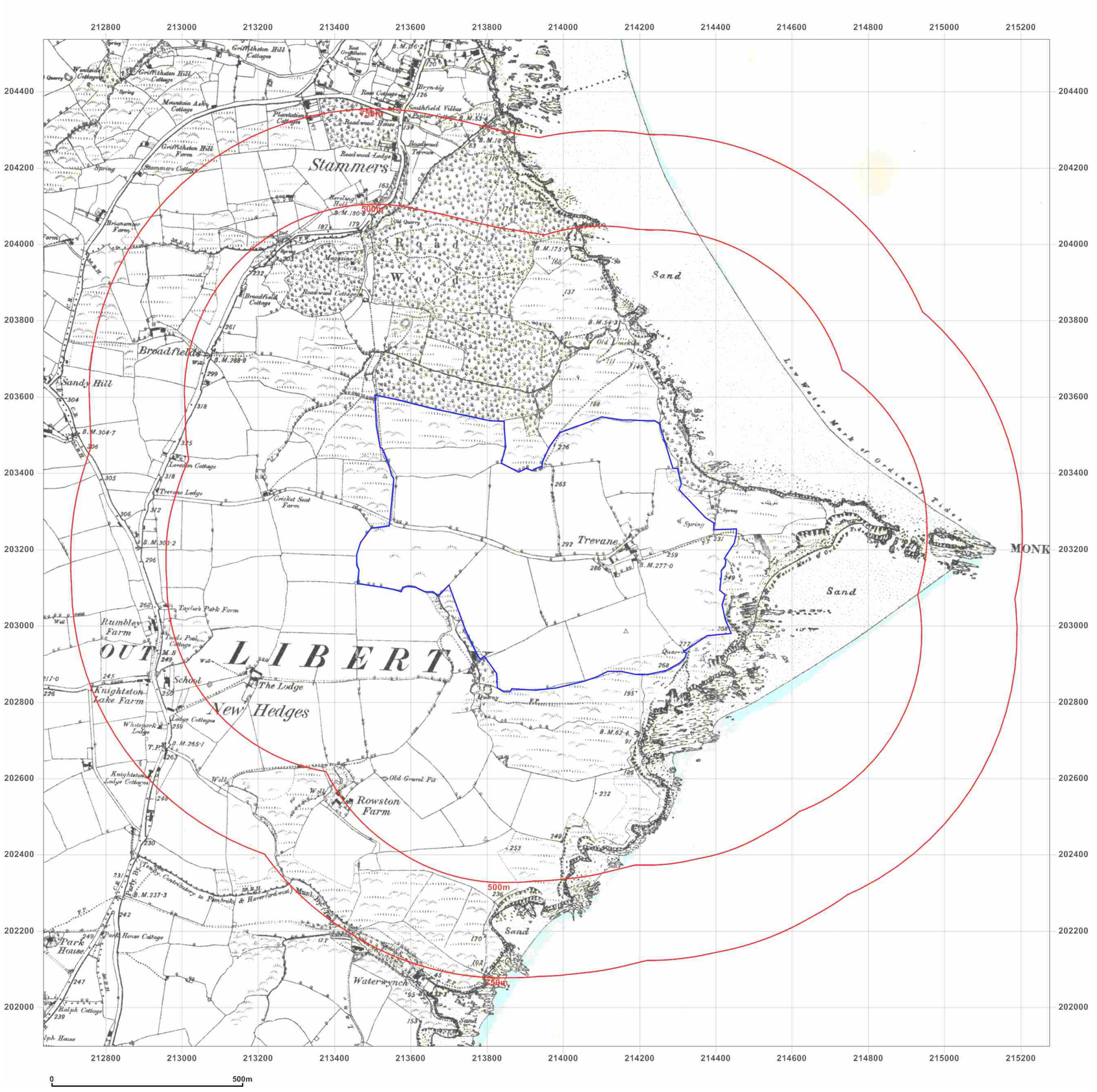

Groundsure INSIGHTS

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Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: County Series

Map date: **1887**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1887
Revised 1887
Edition N/A
Copyright N/A
Levelled N/A

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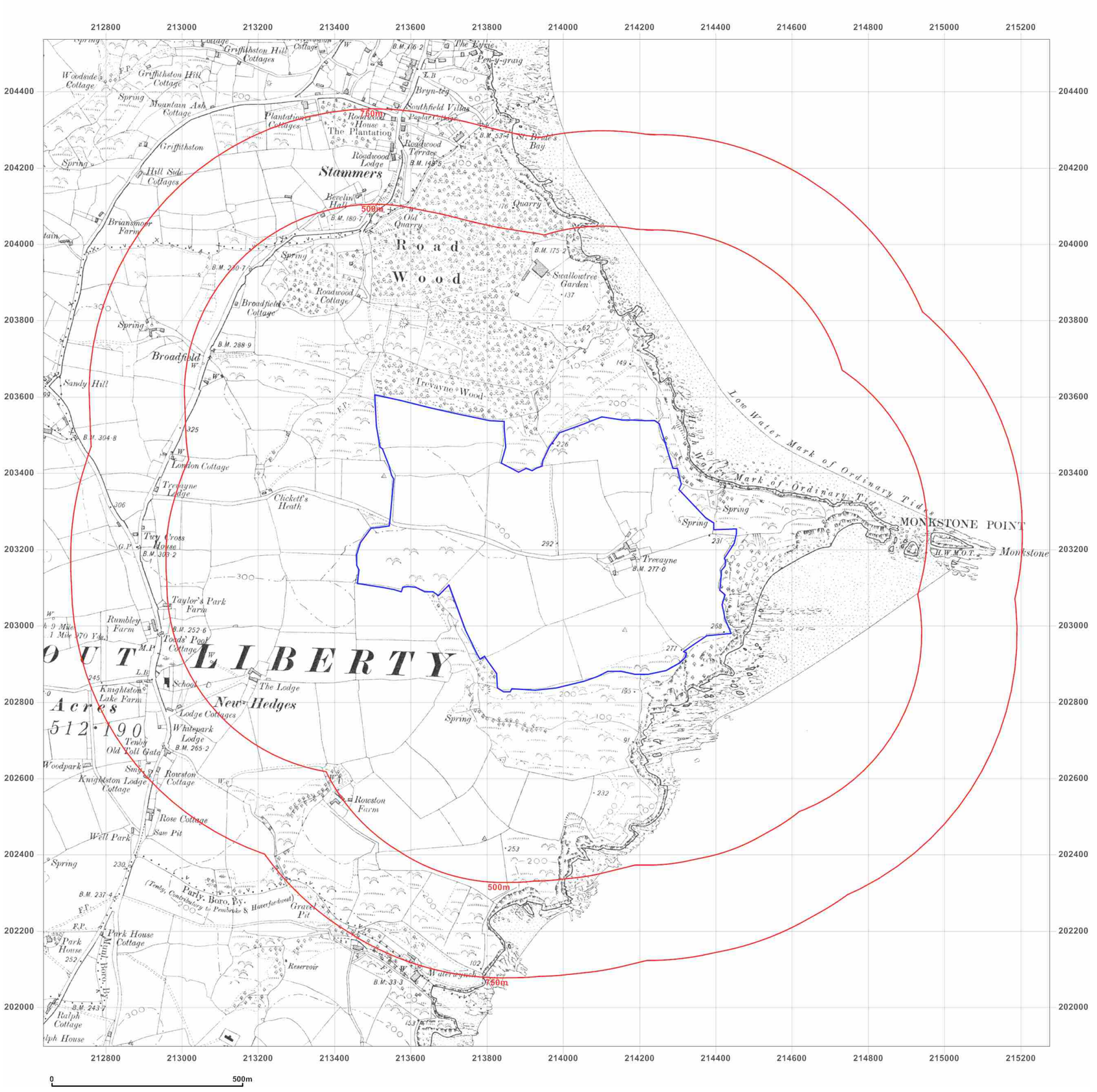

Groundsure INSIGHTS

Site Details:

214000, 203000

Client Ref: DS2254
Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: County Series

Map date: **1906**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1887
Revised 1906
Edition N/A
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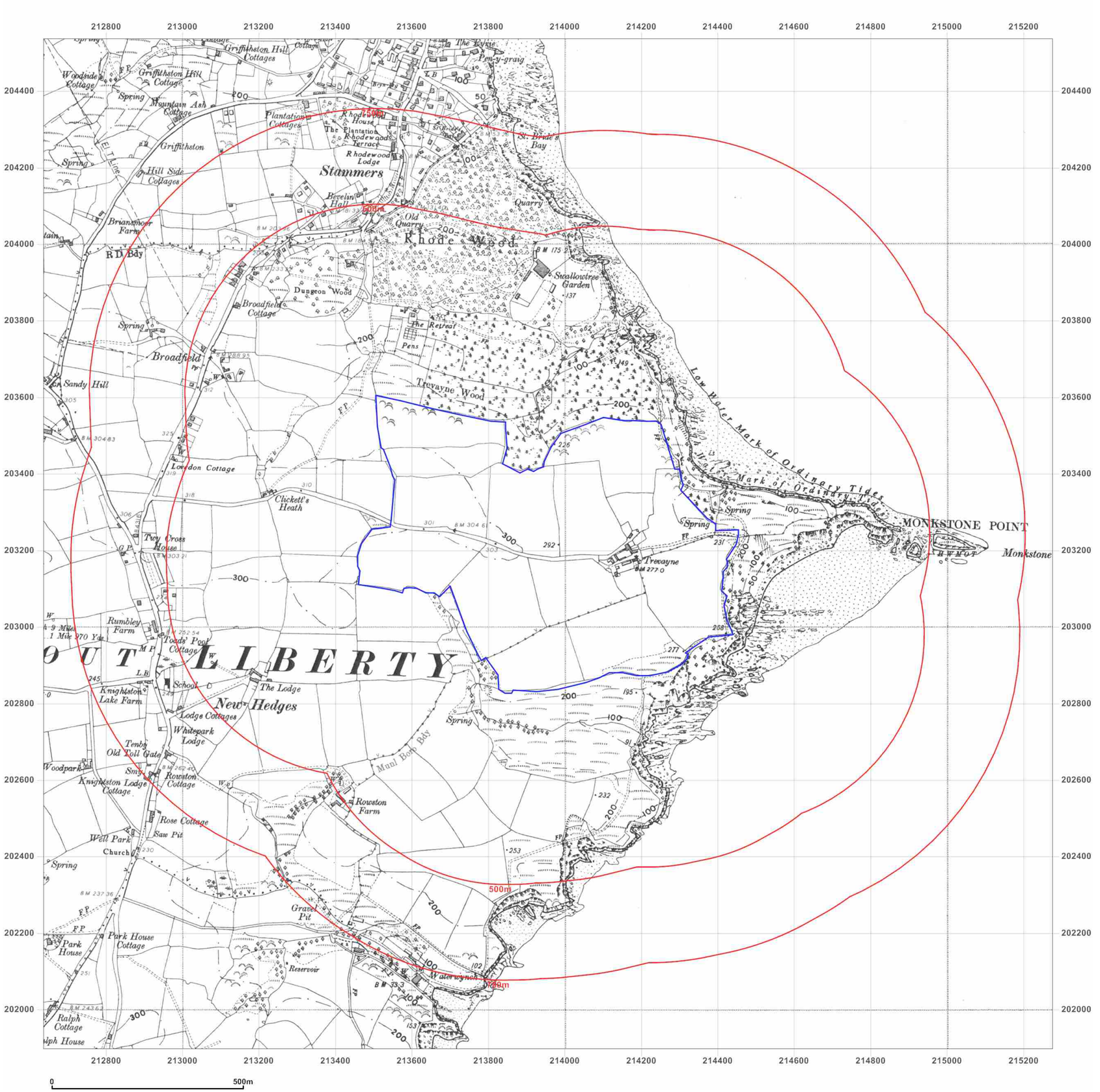

Groundsure INSIGHTS

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214000, 203000

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Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1948
Edition N/A
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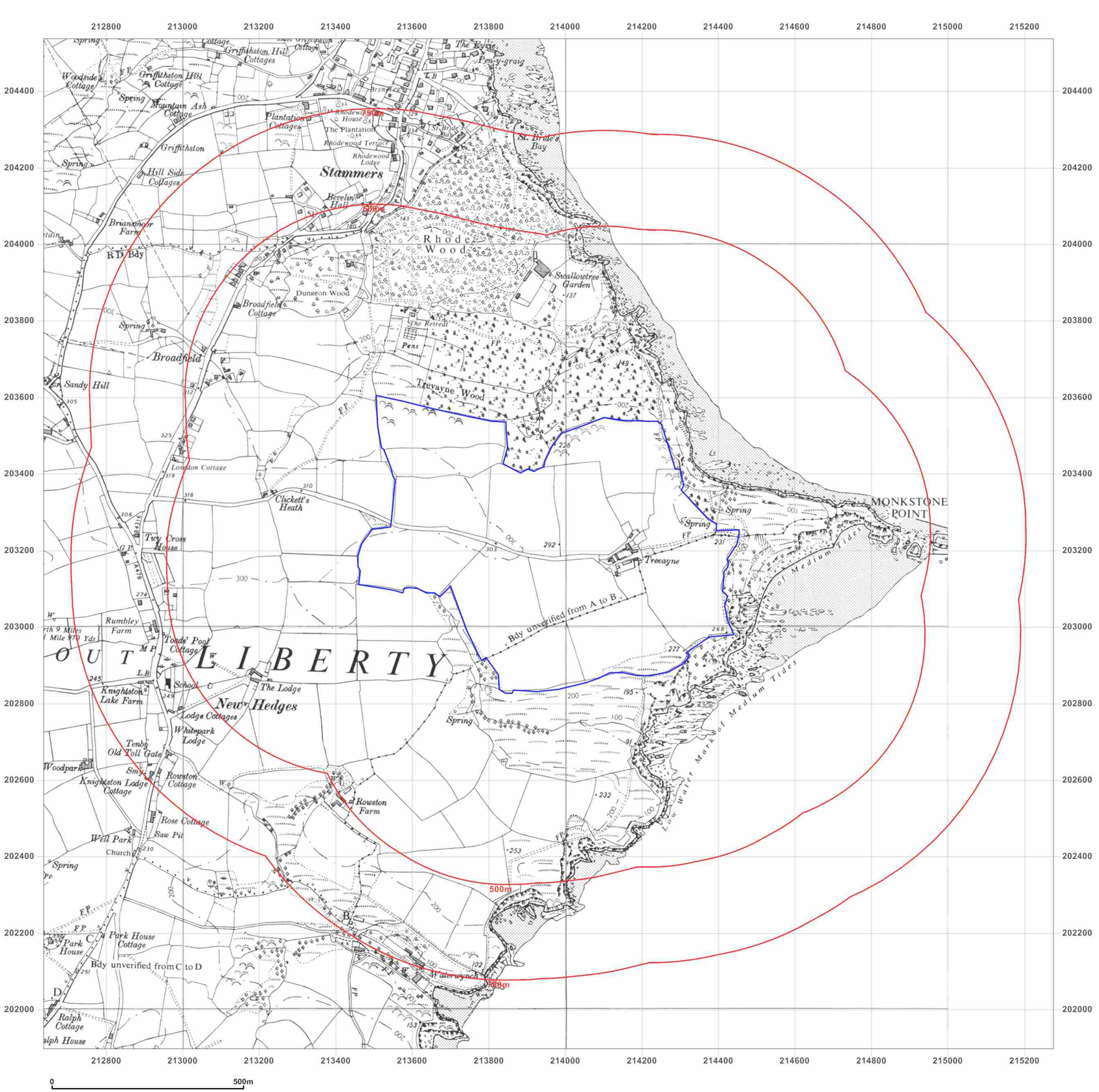

Groundsure INSIGHTS

Site Details:

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Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: Provisional

Map date: **1963**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1963
Edition N/A
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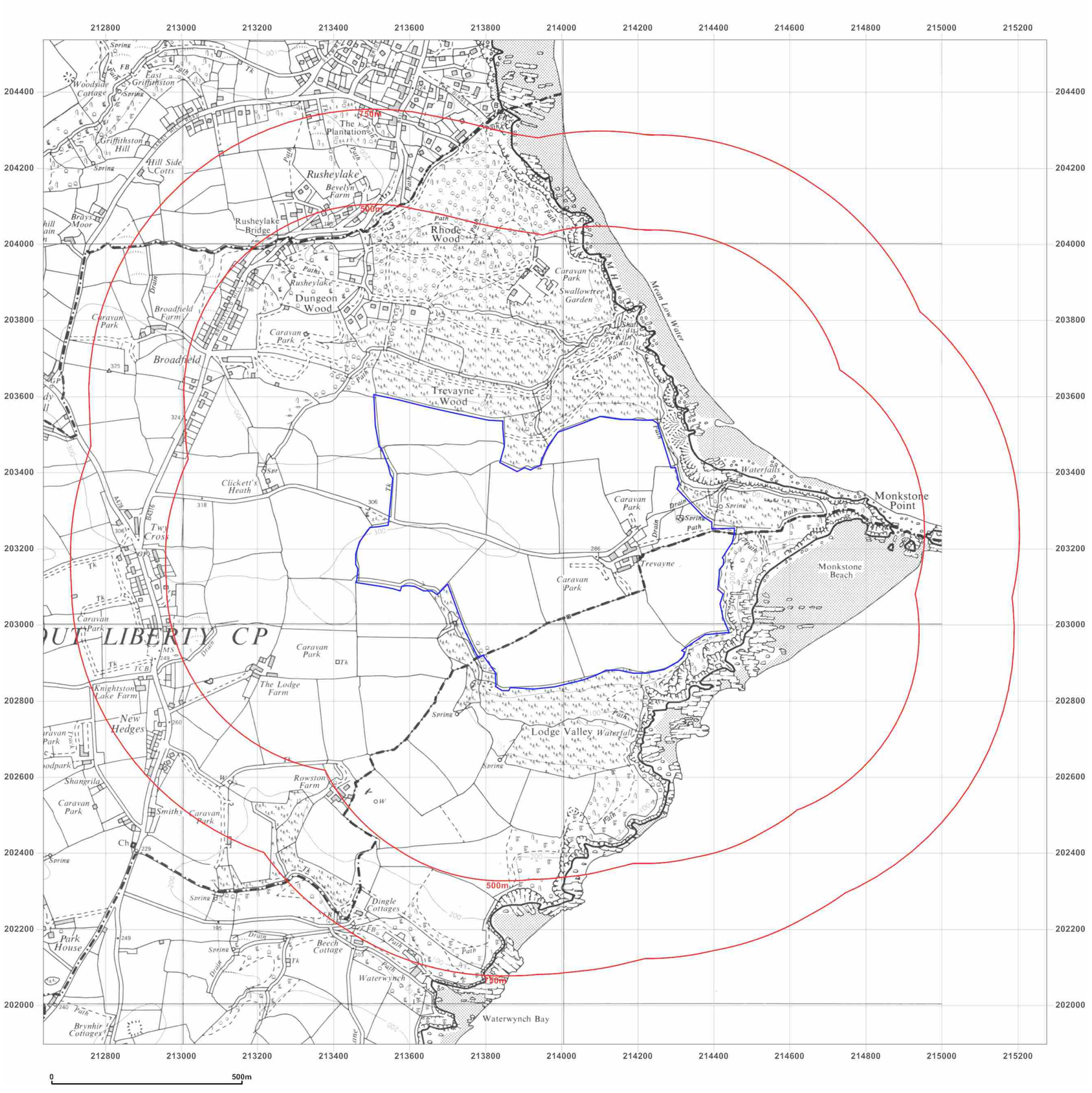

Groundsure INSIGHTS

Site Details:

214000, 203000

Client Ref: DS2254
Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: Provisional

Map date: **1969**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1969
Edition N/A
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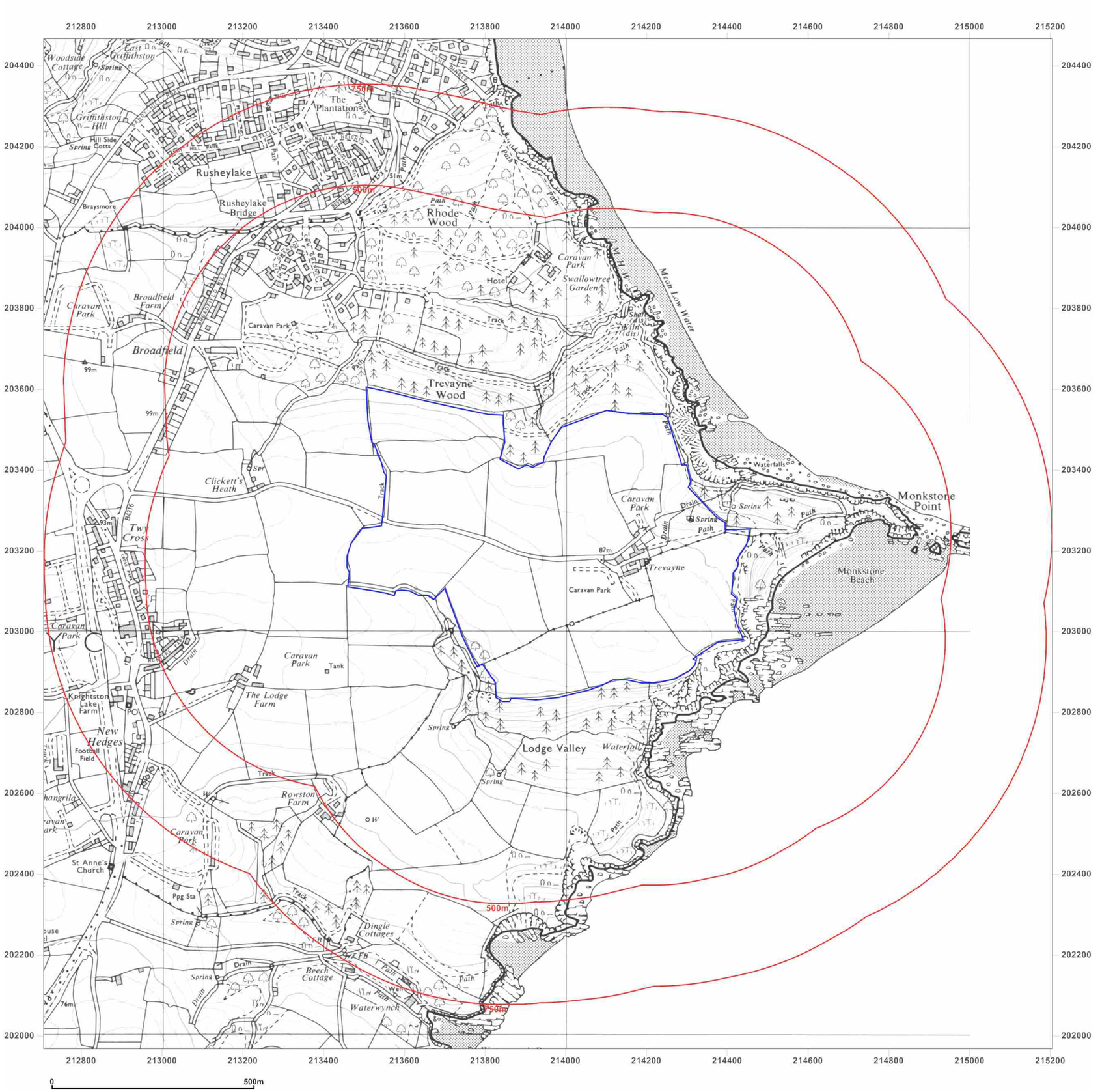

Groundsure INSIGHTS

Site Details:

214000, 203000

Client Ref: DS2254
Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: National Grid

Map date: **1985**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1975
Revised 1985
Edition N/A
Copyright N/A
Levelled N/A

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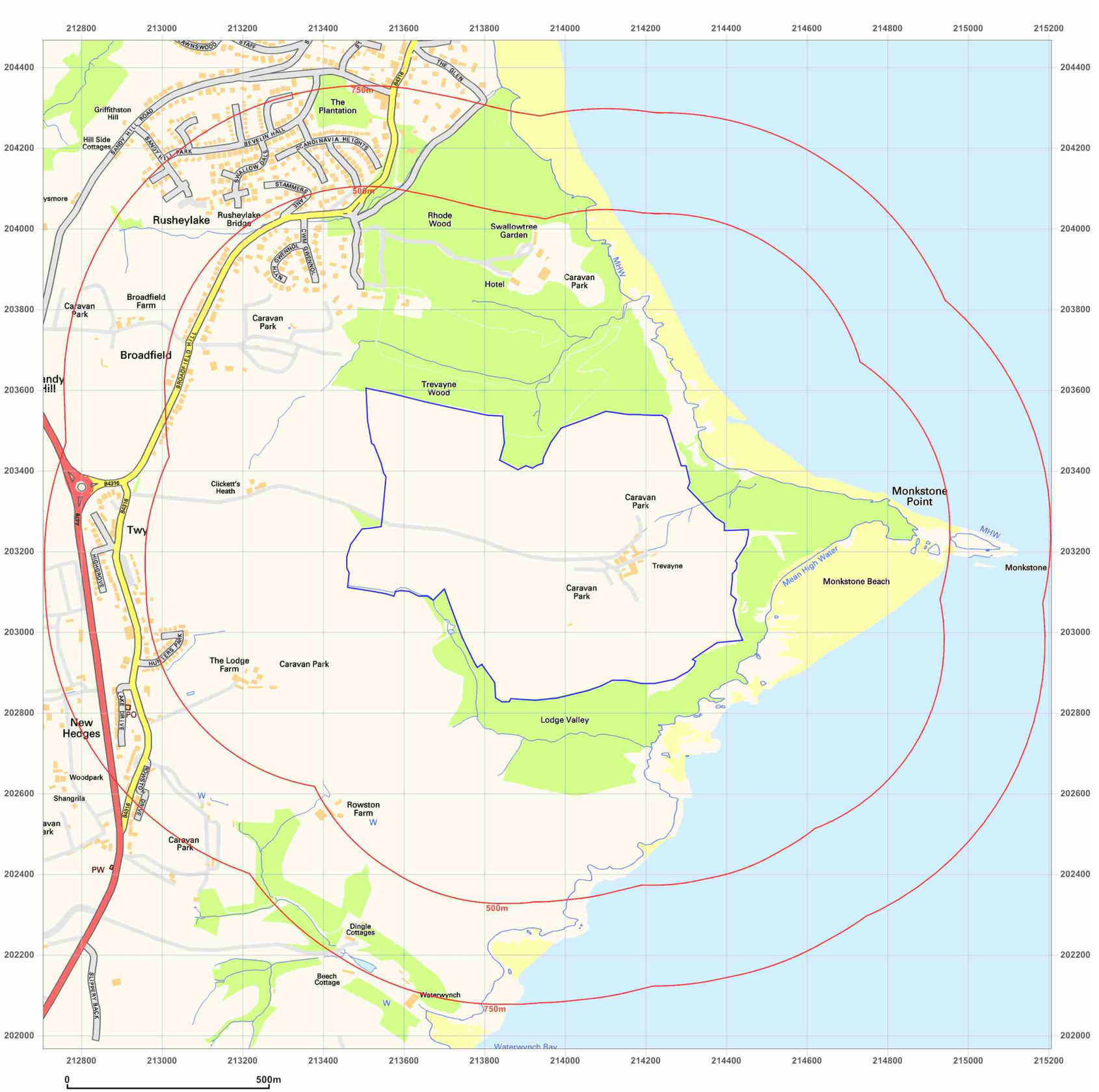

Groundsure INSIGHTS

Site Details:

214000, 203000

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Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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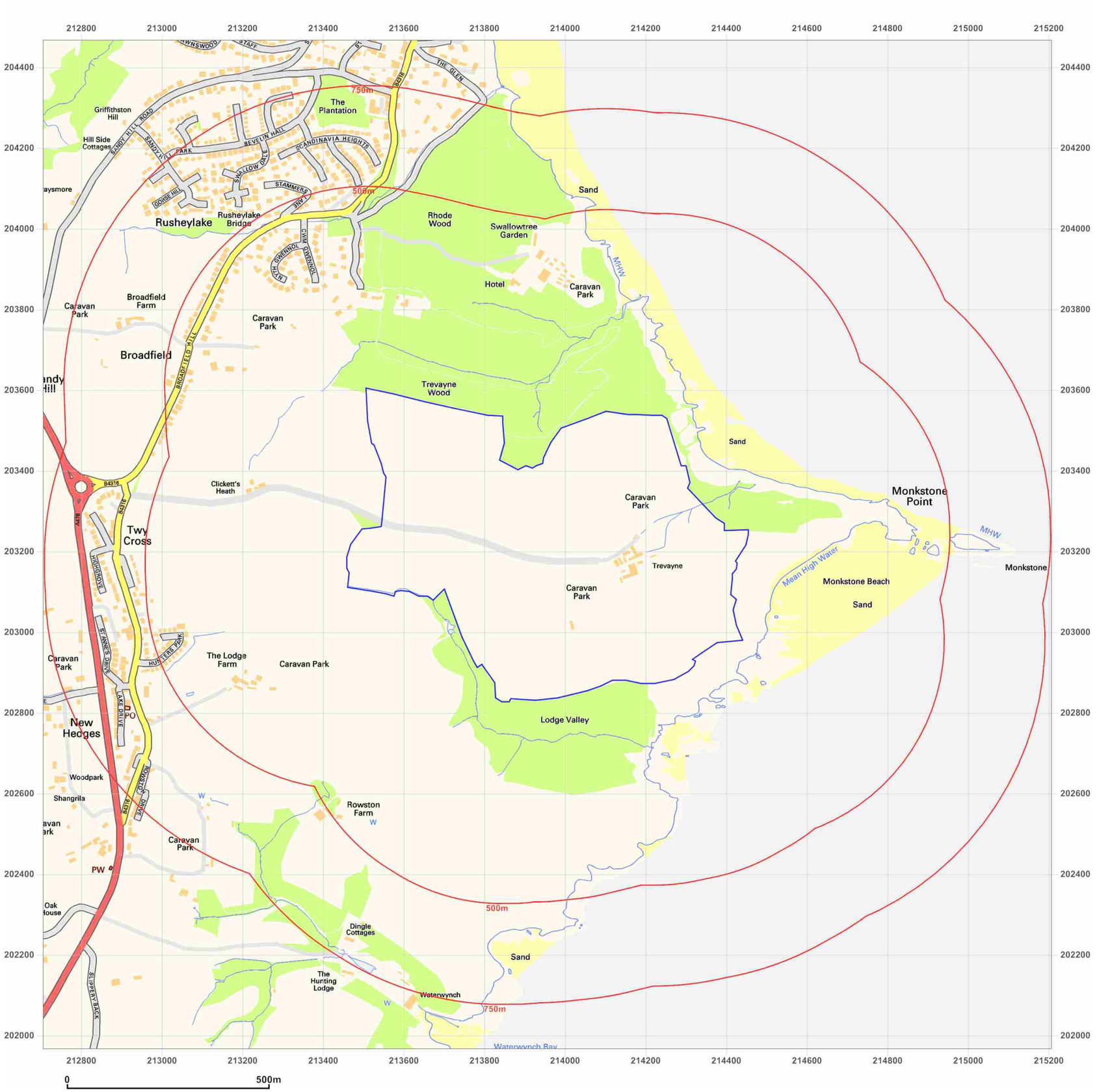

Groundsure INSIGHTS

Site Details:

214000, 203000

Client Ref: DS2254
Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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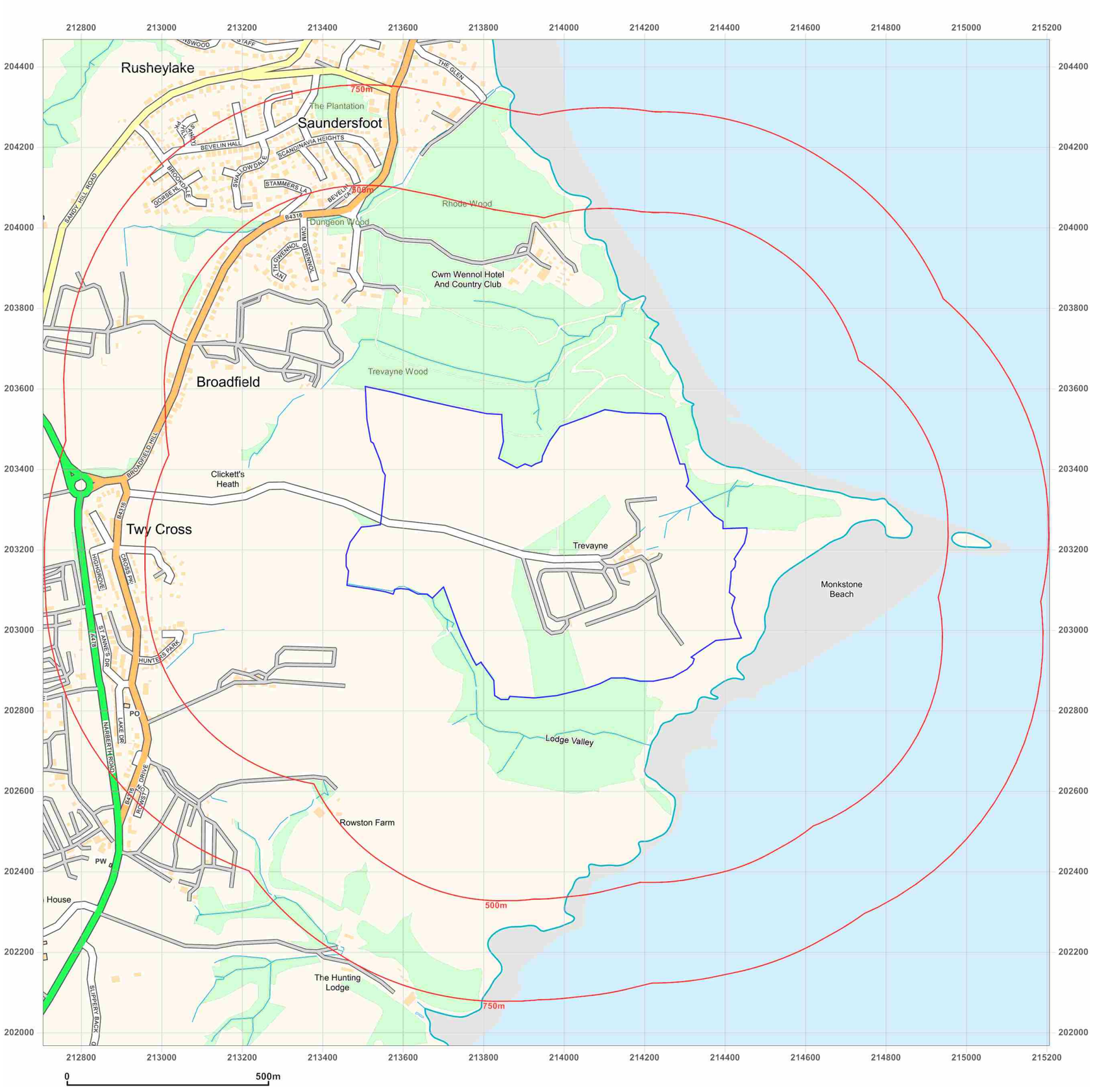
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

214000, 203000

Client Ref: DS2254
Report Ref: HMD-142-7102684
Grid Ref: 213955, 203216

Map Name: National Grid

Map date: **2020**

Scale: 1:10,000

Printed at: 1:10,000

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W: www.groundsure.com

Production date: 30 September 2020

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

APPENDIX B

J5 Infiltration Worksheet

Groundwater risk assessment for treated effluent discharges to infiltration systems

Infiltration Worksheet , Release v2.0

Date of Workbook Issue: December 2014

This worksheet has been produced in combination with the document: H1 Annex J5 User Manual version 2.0 (Environment Agency, 2014).

IMPORTANT: To enable MS Excel worksheet, click the Microsoft Office Button, click Excel Options, click Add-Ins. In the Manage box, select Excel Add-ins. Click Go. Select **Analysis ToolPak** and **Analysis ToolPak-VBA** (to calculate error functions)

Details to be completed for each assessment				
Site Name:	**trevayne**			
Site Address:	**saundersfoot**			
Completed by:	**decus research**			
Date:	**21 12 20**		**Version:**	**x.xx**
Substance	**ammonia**			
Environmental Standard (C_T)	**0.2**	**mg/l**	**Origin of C_T:**	**marine WFD 0.2 mg/l**

This spreadsheet has been developed as a tool to assist groundwater risk assessment for effluent discharges to infiltration systems. The following worksheets are available:

Site details entered on this page are automatically copied to each worksheet.
The worksheet uses the following colour coding:

	Worksheet option with pull down menu
	Data entry
	Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
	Data carried forward from an earlier worksheet
	Calculation

It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

Infiltration Worksheet

Infiltration System

This sheet allows user to enter effluent concentration and details of infiltration system

Substance		ammonia		From introduction sheet
Compliance value or environmental standard	C_T	2.00E-01	mg/l	From introduction sheet

Input Parameters	Variable	Value	Unit	Source of parameter value
Standard entry				
Concentration of substance in discharge (entering infiltration system)	C_e	4.00E+01	mg/l	assumed
Type of treatment plant		**Septic tank**		
Water use and percolation rate (for use only with septic tanls and package treatment plants)				
Number of persons	p	1.89E+02		varies and correlated with use to give total flow
Water use		7.94E+01	litres/person/day	measured from meter over long period
Percolation rate	Vp	3.50E+00	s/mm	average of tests EXCEEDS RECOMMENDED!
Specify discharge (Q1) or calculate based on use (Q2)		**Specified discharge Q1**		
Discharge rate	Q1	7.50E+00	m^3/d	from meter readings
Calculated discharge	Q2	1.50E+01	m^3/d	*Value specifed by user and not calculated*
Area of drainage fied and hydraulic loading				
Specify area of drainage field or calculate based on percolation rate		**Specify**		
Enter area of drainage field	A	1.00E+02	m^2	10m x 10m
Calculated area of drainage field	A	1.65E+02	m^2	*Value specifed by user and not calculated*
Calculated infiltration rate	Inf	7.50E-02	m/d	

Site being assessed:	trevayne
Completed by:	decus research
Date:	21 12 20
Version:	x.xx

Infiltration Worksheet

Attenuation unsaturated zone

This sheet calculates attenuation factor for the unsaturated zone; concentration at base of unsaturated zone and discharge consent limit

Contaminant		**ammonia**		From introduction sheet
Compliance value or environmental standard	C_T	**2.00E-01**	mg/l	From introduction sheet
Concentration of substance in substance in discharge (entering infiltration system)	C_e	**4.00E+01**	mg/l	From infiltration sheet

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Drainage Layer					
Infiltraton rate	**Inf**	**7.50E-02**	**m/d**	From infiltration sheet	
Thickness of drainage layer	S_1	5.00E-01	m	0.5m	
Water filled porosity	θ_1	1.00E-01	fraction	assumed	
Bulk density	ρ_1	2.20E+00	g/cm^3	assumed	
Calculated dispersivity	D_1	5.00E-02	m	calculated	
Option to select degradation		**Degradation occurs dissolved phase only**			
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days		Half life not required - No degradation occuring
Calculated decay rate	λ_1	2.14E-02	days^{-1}	calculated (very low value set if no degradation)	*Calculated from half life (above)*
Enter method of defining partition co-efficient (using pull down list)		**User specified value for partition coefficient**			
Entry if specify partition coefficient (option)					
Soil water partition coefficient	Kd_1	2.00E-01	l/kg	ssumed from EA research paper ISBN 1 84432 110	
Entry for organic chemicals (option)					
Fraction of organic carbon (in soil)	foc_1	1.00E-02	fraction		*Not valid - User specified value used*
Organic carbon partition coefficient	Koc_1	1.00E+01	l/kg		*Not valid - User specified value used*
Soil water partition coefficient used in assessment	**Kd_1**	**2.00E-01**	**l/kg**	*Specified value*	
Retardation factor	Rfu_1	5.40E+00			
Unretarded travel time (no dispersion)	tu_1	6.67E-01	d		
Unretarded travel time (with dispersion)	tu_1	6.00E-01	d		
Retarded travel time (with dispersion)	tr_1	3.24E+00	d		
Attenuation factor	AFu_1	1.08E+00			

Unsaturated Zone				
Thickness of unsaturated zone below drainage field	S_2	5.00E-01	m	assumed 0.5m
Water filled porosity	θ_2	3.00E-01	fraction	30% high porosity
Bulk density of unsaturated zone	ρ_2	2.20E+00	g/cm^3	from published data
Calculated dispersivity	D_2	5.00E-02	m	calculated
Option to select degradation		**Degradation occurs - sorbed and dissolved phases**		
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days	from published data
Calculated decay rate	λ_2	1.16E-01	days^{-1}	calculated (very low value set if no degradation)
Fraction of rapid flow through unsaturated zone	B	0.00E+00	fraction	
Enter method of defining partition co-efficient (using pull down list)		**User specified value for partition coefficient**		
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd_2	2.00E+00	l/kg	from EA research paper
Entry for organic chemicals (option)				
Fraction of organic carbon (in soil)	foc_2	1.00E-02	fraction	
Organic carbon partition coefficient	Koc_2	1.00E+01	l/kg	
Soil water partition coefficient used in assessment	**Kd_2**	**2.00E+00**	**l/kg**	*Specified value*
Retardation factor	Rfu_2	1.57E+01		
Unretarded travel time (no dispersion)	tu_2	2.00E+00	d	
Unretarded travel time (with dispersion)	tu_2	1.80E+00	d	
Retarded travel time (with dispersion)	tr_2	2.82E+01	d	
Attenuation factor	AFu_2	1.68E+01		
Total unretarded travel time	$tu_1 + tu_2$	2.67E+00	d	
Total retarded travel time	$tr_1 + tr_2$	3.49E+01	d	

Attenuation factor and discharge consent limit						
Drainage layer attenuation factor	**AFu_1**	**1.08E+00**				
Unsaturated zone attenuation factor	**AFu_2**	**1.68E+01**				
Concentration at base of drainage layer	**C_{dl}**	**3.71E+01**	**mg/l**			
Concentration at base of unsaturated zone	**C_{wt}**	**2.20E+00**	**mg/l**			
		and				

Site being assessed:	trevayne
Completed by:	decus research
Date:	21 12 20
Version:	x.xx

Infiltration Worksheet

Dilution

This sheet calculates the dilution factor for groundwater dilution below the drainage field.
Substance concentration in groundwater and discharge consent limit

Substance		**ammonia**		From introduction sheet
Compliance value or environmental standard	C_T	**2.00E-01**	**mg/l**	From introduction sheet
Source concentration	C_e	**4.00E+01**	**mg/l**	From infiltration sheet
Concentration at base of drainage layer	C_{wt}	**2.20E+00**	**mg/l**	From atten_unsatzone sheet

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Infiltration	Inf	7.50E-02	m/d	From infiltration sheet
Area of drainage field	A	1.00E+02	m^2	From infiltration sheet
Entry for groundwater flow below site				
Length of drainage field in direction of groundwater flow	L	1.00E+01	m	**from client**
Saturated aquifer thickness	da	2.00E+01	m	
Hydraulic Conductivity of aquifer in which dilution occurs	K	6.00E+01	m/d	**estimated**
Hydraulic gradient of water table	i	8.00E-02	fraction	
Width of drainage field perpendicular to groundwater flow	w	1.00E+01	m	**from client**
Background concentration of substance in groundwater up-gradient of site	Cu	0.00E+00	mg/l	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**		
Enter mixing zone thickness	Mz	1.00E+01	m	
Calculated mixing zone thickness	Mz	1.21E+00	m	*Not valid - Value specified*
Groundwater flow (mixing zone) below drainage field	Gw	480.00	m^3/d	

Dilution factor and discharge consent limit

Dilution Factor	**DF**	**6.50E+01**		
Unsaturated zone attenuation factor	**AFu**	**1.68E+01**		From infiltration sheet
Concentration in groundwater below drainage field	C_{gw}	**3.39E-02**	**mg/l**	**below compliance value**
		or		
Discharge limit value	DL_2	**2.36E+02**	**mg/l**	**Discharge limit for discussion with Environment Agency**

Site being assessed:	trevayne
Completed by:	decus research
Date:	21 12 20
Version:	x.xx

Concentration immediately downgradient of drainage field below target concentration

Infiltration Worksheet

Attenuation in saturated zone

This sheet calculates attenuation factor for the saturated zone; substance concentration at downgradient compliance point and discharge consent limit

Environment Agency

Input Parameters	Variable	Value	Unit	Source
Substance		ammonia		From introduction sheet
Compliance value or environmental standard	C_T	2.00E-01	mg/l	From introduction sheet
Source concentration	C_e	4.00E+01	mg/l	From infiltration sheet
Dilution Factor	DF	6.50E+01		from dilution sheet
Unsaturated zone attenuation factor	AFu	1.68E+01		From atten_unsatzone sheet

	Variable	Value	Unit	Source of parameter value
Concentration in groundwater below drainage field	Cgw	3.39E-02	mg/l	from dilution sheet
Option to select degradation		Degradation occurs - sorbed and dissolved phases		
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days	
Calculated decay rate	λ	1.16E-01	$days^{-1}$	calculated (very low value set if no degradation)
Width of drainage field	w	1.00E+01	m	from dilution sheet
Mixing zone thickness	Mz	1.00E+01	m	from dilution sheet
Bulk density of aquifer materials	ρ	2.20E+00	g/cm^3	
Effective porosity of aquifer	n	2.00E-01	fraction	*from published data*
Hydraulic gradient	i_{corr}	8.13E-02	fraction	from dilution sheet (adjusted)
Hydraulic conductivity of saturated aquifer	K	6.00E+01	m/d	from dilution sheet
Distance to compliance point	x	5.00E+01	m	
Option to select time		Use steady state (recommended)		
Enter time	t	1.00E+02	days	time variant options only
Time since pollutant entered groundwater	t	1.00E+99		
Parameters values determined from options				
Partition coefficient	Kd	2.00E-01	l/kg	*see options*
Longitudinal dispersivity	ax	2.98E+00	m	*see options*
Transverse dispersivity	az	2.98E-01	m	*see options*
Vertical dispersivity	ay	2.98E-02	m	*see options*

Calculated Parameters	Variable	Value	Unit
Groundwater flow velocity	v	2.44E+01	m/d
Retardation factor	Rf	3.20E+00	fraction
Decay rate used	λ	1.16E-01	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i_{corr}	8.13E-02	fraction
Rate of contaminant flow due to retardation	u	7.62E+00	m/d
Attenuation factor	**AFs**	**3.23E+00**	**fraction**

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd	2.00E-01	l/kg

Entry for organic chemicals (option)

Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc		l/kg
Soil water partition coefficient	Kd	2.00E-01	l/kg

Define dispersivity (click brown cell and use pull down list)

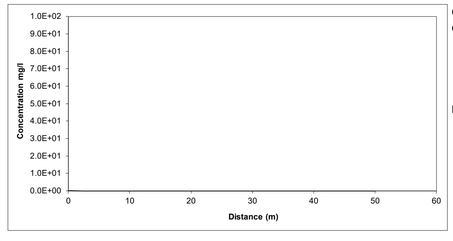
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value	Xu & Eckstein
Longitudinal dispersivity (m)	**ax**	1.00E-12	5.00E+00	2.98E+00
Transverse dispersivity (m)	**az**	1.00E-12	5.00E-01	2.98E-01
Vertical dispersivity (m)	**ay**	1.00E-12	5.00E-02	2.98E-02

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x



Calculated concentrations for distance-concentration graph

From calculation sheet

Distance m	Concentration mg/l
0	3.4E-02
2.5	3.27E-02
5.0	3.14E-02
7.5	2.98E-02
10.0	2.81E-02
12.5	2.64E-02
15.0	2.47E-02
17.5	2.31E-02
20.0	2.16E-02
22.5	2.02E-02
25.0	1.90E-02
27.5	1.78E-02
30.0	1.67E-02
32.5	1.57E-02
35.0	1.48E-02
37.5	1.39E-02
40.0	1.31E-02
42.5	1.24E-02
45.0	1.17E-02
47.5	1.11E-02
50.0	1.05E-02

Site being assessed:	trevayne
Completed by:	0
Date:	00-Jan-00
Version:	0

Attenuation and Dilution factors and discharge consent limit

Dilution Factor	DF	6.50E+01		
Unsaturated zone attenuation factor	AFu	1.68E+01		
Saturated zone attenuation factor	AFs	3.23E+00		
Concentration in groundwater at compliance point	C_{dcp}	1.05E-02	mg/l	below compliance value
		or		
Discharge limit value	DL_3	7.63E+02	mg/l	Discharge limit for discussion with Environment Agency
Distance to compliance point		50	m	

Concentration at compliance point below target concentration

Infiltration Worksheet

Summary of calculations for concentration of substance in groundwater

No input required,values taken from previous worksheets

Summary of compliance data, attenuation and dilution factors

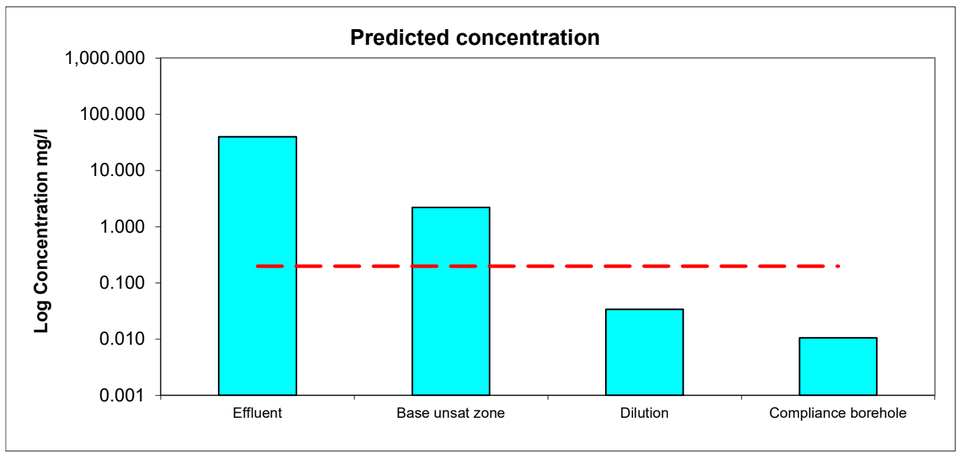
Substance		**ammonia**	
Effluent concentration	C_e	4.00E+01	mg/l
Compliance value or environmental standard	C_T	0.20	mg/l
Distance to compliance point		50.00	m
Attenuation factor - unsat zone	AFu	1.68E+01	
Dilution Factor	DF	6.50E+01	
Attenuation factor- sat zone	AFs	3.23E+00	

Predicted concentrations at compliance point based on proposed effluent concentration

Concentration at base of unsaturated zone	C_{wt}	2.20E+00	mg/l	Attenuation in unsaturated zone only
Concentration in groundwater below drainage field	C_{gw}	3.39E-02	mg/l	Dilution taken into account
Concentration in groundwater at compliance point	C_{dcp}	1.05E-02	mg/l	Attenuation in saturated zone taken into account

Provisional discharge limit values

Based on attenuation in unsaturated zone	DL_1	3.63E+00	mg/l	
Based on attenuation in unsaturated zone and dilution	DL_2	2.36E+02	mg/l	**Discharge limit for discussion with Environment Agency**
Based on dilution and attenuation in unsaturated and saturated zone	DL_3	7.63E+02	mg/l	**Discharge limit for discussion with Environment Agency**



Simple hydrogeological calculations

(These calculations are provided to allow additional hydrogeological calculations to be undertaken if required)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Groundwater risk assessment for treated effluent discharges to infiltration systems

Infiltration Worksheet , Release v2.0

Date of Workbook Issue: December 2014

This worksheet has been produced in combination with the document: H1 Annex J5 User Manual version 2.0 (Environment Agency, 2014).

IMPORTANT: To enable MS Excel worksheet, click the Microsoft Office Button, click Excel Options, click Add-Ins. In the Manage box, select Excel Add-ins. Click Go. Select **Analysis ToolPak** and **Analysis ToolPak-VBA** (to calculate error functions)

Details to be completed for each assessment				
Site Name:	**trevayne**			
Site Address:	**saundersfoot**			
Completed by:	**decus research**			
Date:	**21 12 20**		**Version:**	**x.xx**
Substance	**ammonia**			
Environmental Standard (C_T)	**0.021**	**mg/l**	**Origin of C_T:**	**marine WFD 21ug**

This spreadsheet has been developed as a tool to assist groundwater risk assessment for effluent discharges to infiltration systems. The following worksheets are available:

Site details entered on this page are automatically copied to each worksheet.
The worksheet uses the following colour coding:

	Worksheet option with pull down menu
	Data entry
	Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
	Data carried forward from an earlier worksheet
	Calculation

It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

Infiltration Worksheet

Infiltration System

This sheet allows user to enter effluent concentration and details of infiltration system

Substance		**ammonia**		From introduction sheet
Compliance value or environmental standard	C_T	**2.10E-02**	**mg/l**	From introduction sheet

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Concentration of substance in discharge (entering infiltration system)	C_e	1.00E+00	mg/l	sewage avg
Type of treatment plant		**Septic tank**		
Water use and percolation rate (for use only with septic tanls and package treatment plants)				
Number of persons	p	1.89E+02		varies and correlated with use to give total flow
Water use		8.00E+01	litres/person/day	measured from meter over long period
Percolation rate	Vp	3.50E+00	s/mm	average of tests EXCEEDS RECOMMENDED!
Specify discharge (Q1) or calculate based on use (Q2)		**Specified discharge Q1**		
Discharge rate	Q1	1.50E+01	m^3/d	from meter readings
Calculated discharge	Q2	1.51E+01	m^3/d	*Value specifed by user and not calculated*
Area of drainage fied and hydraulic loading				
Specify area of drainage field or calculate based on percolation rate		**Specify**		
Enter area of drainage field	A	1.00E+02	m^2	10m x 10m
Calculated area of drainage field	A	1.65E+02	m^2	*Value specifed by user and not calculated*
Calculated infiltration rate	Inf	1.50E-01	m/d	

Site being assessed:	trevayne
Completed by:	decus research
Date:	21 12 20
Version:	x.xx

Infiltration Worksheet

Attenuation unsaturated zone

This sheet calculates attenuation factor for the unsaturated zone; concentration at base of unsaturated zone and discharge consent limit

Contaminant		**ammonia**		From introduction sheet
Compliance value or environmental standard	C_T	**2.10E-02**	mg/l	From introduction sheet
Concentration of substance in substance in discharge (entering infiltration system)	C_e	**1.00E+00**	mg/l	From infiltration sheet

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Drainage Layer					
Infiltraton rate	**Inf**	**1.50E-01**	**m/d**	From infiltration sheet	
Thickness of drainage layer	S_1	5.00E-01	m	0.5m	
Water filled porosity	θ_1	1.00E-01	fraction	assumed	
Bulk density	ρ_1	2.20E+00	g/cm^3	assumed	
Calculated dispersivity	D_1	5.00E-02	m	calculated	
Option to select degradation		**Degradation occurs dissolved phase only**			
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days		Half life not required - No degradation occuring
Calculated decay rate	λ_1	2.14E-02	days^{-1}	calculated (very low value set if no degradation)	*Calculated from half life (above)*
Enter method of defining partition co-efficient (using pull down list)		**User specified value for partition coefficient**			
Entry if specify partition coefficient (option)					
Soil water partition coefficient	Kd_1	2.00E-01	l/kg	ssumed from EA research paper ISBN 1 84432 110	
Entry for organic chemicals (option)					
Fraction of organic carbon (in soil)	foc_1	1.00E-02	fraction		*Not valid - User specified value used*
Organic carbon partition coefficient	Koc_1	1.00E+01	l/kg		*Not valid - User specified value used*
Soil water partition coefficient used in assessment	**Kd_1**	**2.00E-01**	**l/kg**	*Specified value*	
Retardation factor	Rfu_1	5.40E+00			
Unretarded travel time (no dispersion)	tu_1	3.33E-01	d		
Unretarded travel time (with dispersion)	tu_1	3.00E-01	d		
Retarded travel time (with dispersion)	tr_1	1.62E+00	d		
Attenuation factor	AFu_1	1.04E+00			

Unsaturated Zone					
Thickness of unsaturated zone below drainage field	S_2	5.00E-01	m	assumed 0.5m	
Water filled porosity	θ_2	3.00E-01	fraction	30% high porosity	
Bulk density of unsaturated zone	ρ_2	2.20E+00	g/cm^3	from published data	
Calculated dispersivity	D_2	5.00E-02	m	calculated	
Option to select degradation		**Degradation occurs - sorbed and dissolved phases**			
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days	from published data	from published data
Calculated decay rate	λ_2	1.16E-01	days^{-1}	calculated (very low value set if no degradation)	*Default value of 1/10^99 used*
Fraction of rapid flow through unsaturated zone	B	0.00E+00	fraction		
Enter method of defining partition co-efficient (using pull down list)		**User specified value for partition coefficient**			
Entry if specify partition coefficient (option)					
Soil water partition coefficient	Kd_2	2.00E+00	l/kg	from EA research paper	
Entry for organic chemicals (option)					
Fraction of organic carbon (in soil)	foc_2	1.00E-02	fraction		*Not valid - User specified value used*
Organic carbon partition coefficient	Koc_2	1.00E+01	l/kg		*Not valid - User specified value used*
Soil water partition coefficient used in assessment	**Kd_2**	**2.00E+00**	**l/kg**	*Specified value*	
Retardation factor	Rfu_2	1.57E+01			
Unretarded travel time (no dispersion)	tu_2	1.00E+00	d		
Unretarded travel time (with dispersion)	tu_2	9.00E-01	d		
Retarded travel time (with dispersion)	tr_2	1.41E+01	d		
Attenuation factor	AFu_2	4.78E+00			
Total unretarded travel time	$tu_1 + tu_2$	1.33E+00	d		
Total retarded travel time	$tr_1 + tr_2$	1.75E+01	d		

Attenuation factor and discharge consent limit

Drainage layer attenuation factor	**AFu_1**	**1.04E+00**	
Unsaturated zone attenuation factor	**AFu_2**	**4.78E+00**	
Concentration at base of drainage layer	**C_{dl}**	**9.62E-01**	**mg/l**
Concentration at base of unsaturated zone	**C_{wt}**	**2.01E-01**	**mg/l**
		and	

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Infiltration Worksheet

Dilution

This sheet calculates the dilution factor for groundwater dilution below the drainage field.
Substance concentration in groundwater and discharge consent limit

Substance		**ammonia**		From introduction sheet
Compliance value or environmental standard	C_T	**2.10E-02**	**mg/l**	From introduction sheet
Source concentration	C_e	**1.00E+00**	**mg/l**	From infiltration sheet
Concentration at base of drainage layer	C_{wt}	**2.01E-01**	**mg/l**	From atten_unsatzone sheet

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Infiltration	Inf	1.50E-01	m/d	From infiltration sheet
Area of drainage field	A	1.00E+02	m^2	From infiltration sheet
Entry for groundwater flow below site				
Length of drainage field in direction of groundwater flow	L	1.00E+01	m	**from client**
Saturated aquifer thickness	da	1.00E+01	m	
Hydraulic Conductivity of aquifer in which dilution occurs	K	6.00E+01	m/d	**estimated**
Hydraulic gradient of water table	i	8.00E-02	fraction	
Width of drainage field perpendicular to groundwater flow	w	1.00E+01	m	**from client**
Background concentration of substance in groundwater up-gradient of site	Cu	0.00E+00	mg/l	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**		
Enter mixing zone thickness	Mz	1.00E+01	m	
Calculated mixing zone thickness	Mz	1.37E+00	m	*Not valid - Value specified*
Groundwater flow (mixing zone) below drainage field	Gw	480.00	m^3/d	

Dilution factor and discharge consent limit

Dilution Factor	**DF**	**3.30E+01**		
Unsaturated zone attenuation factor	**AFu**	**4.78E+00**		From infiltration sheet
Concentration in groundwater below drainage field	C_{gw}	**6.10E-03**	**mg/l**	**below compliance value**
		or		
Discharge limit value	DL_2	**3.44E+00**	**mg/l**	**Discharge limit for discussion with Environment Agency**

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Concentration immediately downgradient of drainage field below target concentration

Infiltration Worksheet

Attenuation in saturated zone

This sheet calculates attenuation factor for the saturated zone; substance concentration at downgradient compliance point and discharge consent limit

Environment Agency

Input Parameters	Variable	Value	Unit	Source
Substance		ammonia		From introduction sheet
Compliance value or environmental standard	C_T	2.10E-02	mg/l	From introduction sheet
Source concentration	C_e	1.00E+00	mg/l	From infiltration sheet
Dilution Factor	DF	3.30E+01		from dilution sheet
Unsaturated zone attenuation factor	AFu	4.78E+00		From atten_unsatzone sheet

	Variable	Value	Unit	Source of parameter value
Concentration in groundwater below drainage field	Cgw	6.10E-03	mg/l	from dilution sheet
Option to select degradation	Degradation occurs - sorbed and dissolved phases			
Half life for degradation of substance	$t_{1/2}$	6.00E+00	days	
Calculated decay rate	λ	1.16E-01	$days^{-1}$	calculated (very low value set if no degradation)
Width of drainage field	w	1.00E+01	m	from dilution sheet
Mixing zone thickness	Mz	1.00E+01	m	from dilution sheet
Bulk density of aquifer materials	ρ	2.20E+00	g/cm^3	
Effective porosity of aquifer	n	2.00E-01	fraction	*from published data*
Hydraulic gradient	i_{corr}	8.25E-02	fraction	from dilution sheet (adjusted)
Hydraulic conductivity of saturated aquifer	K	6.00E+01	m/d	from dilution sheet
Distance to compliance point	x	5.00E+01	m	
Option to select time	Use steady state (recommended)			
Enter time	t	1.00E+02	days	time variant options only
Time since pollutant entered groundwater	t	1.00E+99		
Parameters values determined from options				
Partition coefficient	Kd	2.00E-01	l/kg	*see options*
Longitudinal dispersivity	ax	2.98E+00	m	*see options*
Transverse dispersivity	az	2.98E-01	m	*see options*
Vertical dispersivity	ay	2.98E-02	m	*see options*

Calculated Parameters	Variable	Value	Unit
Groundwater flow velocity	v	2.48E+01	m/d
Retardation factor	Rf	3.20E+00	fraction
Decay rate used	λ	1.16E-01	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i_{corr}	8.25E-02	fraction
Rate of contaminant flow due to retardation	u	7.73E+00	m/d
Attenuation factor	**AFs**	**3.20E+00**	**fraction**

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd	2.00E-01	l/kg

Entry for organic chemicals (option)

Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc		l/kg
Soil water partition coefficient	Kd	2.00E-01	l/kg

Define dispersivity (click brown cell and use pull down list)

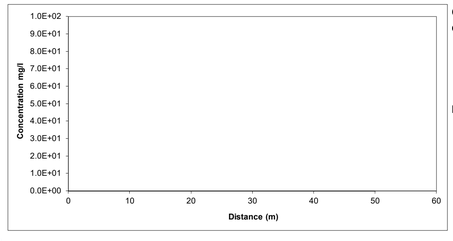
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value	Xu & Eckstein
Longitudinal dispersivity (m)	**ax**	1.00E-12	5.00E+00	2.98E+00
Transverse dispersivity (m)	**az**	1.00E-12	5.00E-01	2.98E-01
Vertical dispersivity (m)	**ay**	1.00E-12	5.00E-02	2.98E-02

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x



Calculated concentrations for distance-concentration graph

From calculation sheet

Distance m	Concentration mg/l
0	6.1E-03
2.5	5.88E-03
5.0	5.65E-03
7.5	5.38E-03
10.0	5.07E-03
12.5	4.76E-03
15.0	4.45E-03
17.5	4.17E-03
20.0	3.90E-03
22.5	3.66E-03
25.0	3.43E-03
27.5	3.22E-03
30.0	3.03E-03
32.5	2.85E-03
35.0	2.68E-03
37.5	2.53E-03
40.0	2.39E-03
42.5	2.25E-03
45.0	2.13E-03
47.5	2.01E-03
50.0	1.91E-03

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Attenuation and Dilution factors and discharge consent limit

Dilution Factor	DF	3.30E+01		
Unsaturated zone attenuation factor	AFu	4.78E+00		
Saturated zone attenuation factor	AFs	3.20E+00		
Concentration in groundwater at compliance point	C_{dcp}	1.91E-03	mg/l	below compliance value
		or		
Discharge limit value	DL_3	1.10E+01	mg/l	Discharge limit for discussion with Environment Agency
Distance to compliance point		50	m	

Concentration at compliance point below target concentration

Infiltration Worksheet

Summary of calculations for concentration of substance in groundwater

No input required,values taken from previous worksheets

Summary of compliance data, attenuation and dilution factors

Substance		**ammonia**	
Effluent concentration	C_e	1.00E+00	mg/l
Compliance value or environmental standard	C_T	0.02	mg/l
Distance to compliance point		50.00	m
Attenuation factor - unsat zone	AFu	4.78E+00	
Dilution Factor	DF	3.30E+01	
Attenuation factor- sat zone	AFs	3.20E+00	

Predicted concentrations at compliance point based on proposed effluent concentration

Concentration at base of unsaturated zone	C_{wt}	2.01E-01	mg/l	Attenuation in unsaturated zone only
Concentration in groundwater below drainage field	C_{gw}	6.10E-03	mg/l	Dilution taken into account
Concentration in groundwater at compliance point	C_{dcp}	1.91E-03	mg/l	Attenuation in saturated zone taken into account

Provisional discharge limit values

Based on attenuation in unsaturated zone	DL_1	1.04E-01	mg/l	
Based on attenuation in unsaturated zone and dilution	DL_2	3.44E+00	mg/l	**Discharge limit for discussion with Environment Agency**
Based on dilution and attenuation in unsaturated and saturated zone	DL_3	1.10E+01	mg/l	**Discharge limit for discussion with Environment Agency**