

Our ref: 8271_FCA

Flood Consequences Assessment
for
Land off Gladstone Way, Mancot
Hawarden, Flintshire

For : Castle Green Homes Ltd
Unit 20, St Asaph Business Park
St Asaph
Denbighshire
LL17 0LJ

10th November 2023

Flood Consequences Assessment
Land off Gladstone Way, Mancot, Hawarden, Flintshire

Document Verification

Project Title	Land off Gladstone Way, Mancot, Hawarden, Flintshire
Project Number	8271
Document Title	Flood Consequences Assessment
Document Number	8271_FCA_Issue 1
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Prepared by



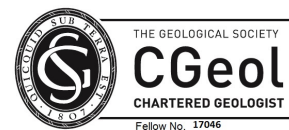
A Jones

Senior Infrastructure Engineer

Checked and Approved



P R Sykes

BSc (Hons), MSc (Eng), CGeol, FGS**Document Revision**

Report Reference	Date	Description	Prepared	Checked and Approved
8271_FCA	10/11//2023	Flood Consequences Assessment	A Jones	P R Sykes

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1.0 Introduction

Coopers (Chester) Ltd, (Coopers) have been appointed by Castle Green Homes Ltd to assess the risk of flooding for a parcel of land off Gladstone Way, Mancot, Hawarden, Flintshire. Castle Green Homes Ltd are proposing a new housing development, comprising of approximately 300 No. dwellings.

Castle Green Homes Ltd are planning the construction of a mixture of semi-detached and detached residential properties with associated access road, parking, vehicular access and landscaping subject to conditions. It is understood the site does not currently benefit from any planning decision.

This flood consequences assessment (FCA) evaluates the proposals regarding to flood risk, identifying and appraising potential flood risk both to and from the whole site. Coopers have carried out the following:

- i. Assessment of the development potential of the site in line with the Welsh Government's Technical Advice Note 15: Development and Flood Risk (TAN15) and;
- ii. An assessment of surface water runoff and drainage strategy

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100m². The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

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2.0 Site Characteristics

2.1 Site Location

The site is a parcel of agricultural land in Mancot to the north of Hawarden. The site is situated to the east of the A550 (Gladstone Way), at approximate grid reference SJ317665.

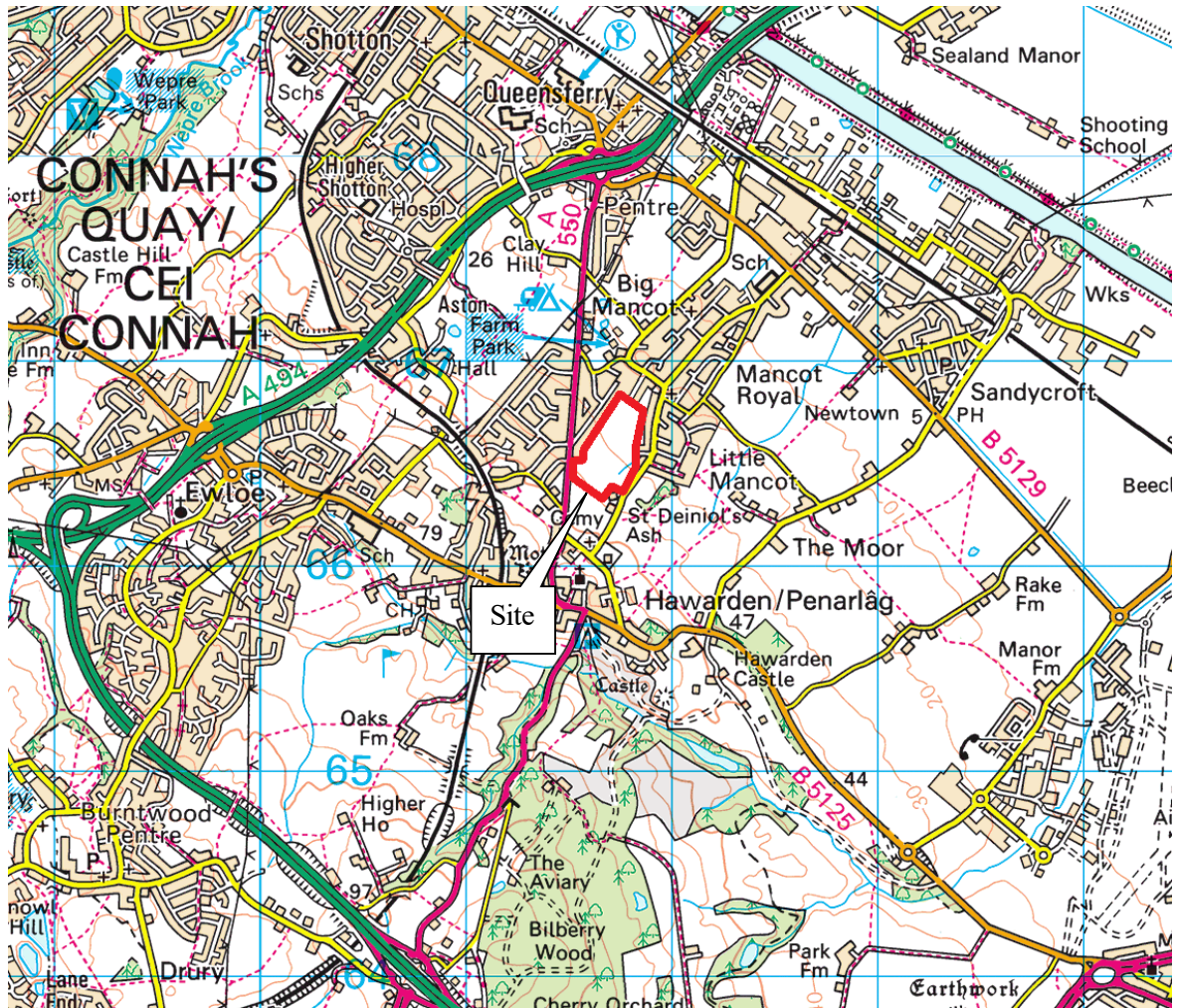


Figure 1 – Site Location

2.2 Site Description

The site covers an area of approximately 11.05 Hectares area of land located approximately 0.6km north of Hawarden Town Centre. The site forms part of St Deiniol's Ash Farm and is presently pasture ground, with hedgerows and trees located along the field boundaries.

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The surrounding area is primarily a mixture of residential, and agricultural land with existing properties along Gladstone Way and Park Avenue located to the northern end of the site, open fields to the south and an un-named watercourse along the eastern boundary which runs adjacent to the rear gardens of Ash Lane properties.

The topography of the site falls from the southwest near the boundary with Gladstone Way from a level of 40.5m AOD, to the northeast corner with a level of 23.00m AOD. The site therefore has an overall gradient of approximately 1 in 26. Refer to Appendix 1 for the Topographical Survey.



Figure 2 – Aerial View

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3.0 Sources of Flood Risk Information

3.1 The Welsh Government Development Advice Map

The Welsh Government Development Advice Map shows the site is located within Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 1 in 1000 (0.1%) annual probability of flooding in any given year.

The proposed residential development is considered to be a ‘highly vulnerable’ development in accordance with Figure 2 of the Welsh Governments Technical Advice Note 15. Highly vulnerable development is considered to be appropriate within Flood Zone A.

3.2 Natural Resources Wales

The NRW Flood Map shows the site is located within Flood Zone 1 – an area considered to have the lowest probability of fluvial flooding. It is assessed as having a less than 0.1% annual probability of flooding in any given year.



Figure 3 – Natural Resources Wales Flood Map for Planning (Sea)

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Figure 4 – Natural Resources Wales Flood Map for Planning (River)

Natural Resources Wales have responded to a flood information enquiry and provided river flood data for the River Dee (Tidal) and the Broughton Brook & Queensferry Drain watercourses. The modelled data levels and maps provided indicate the proposed development is not at risk from these receptors. See Appendix 4 for extracts of the NRW reports.

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The Natural Resources Wales long term flood risk maps do not indicate any flood risk from surface water.

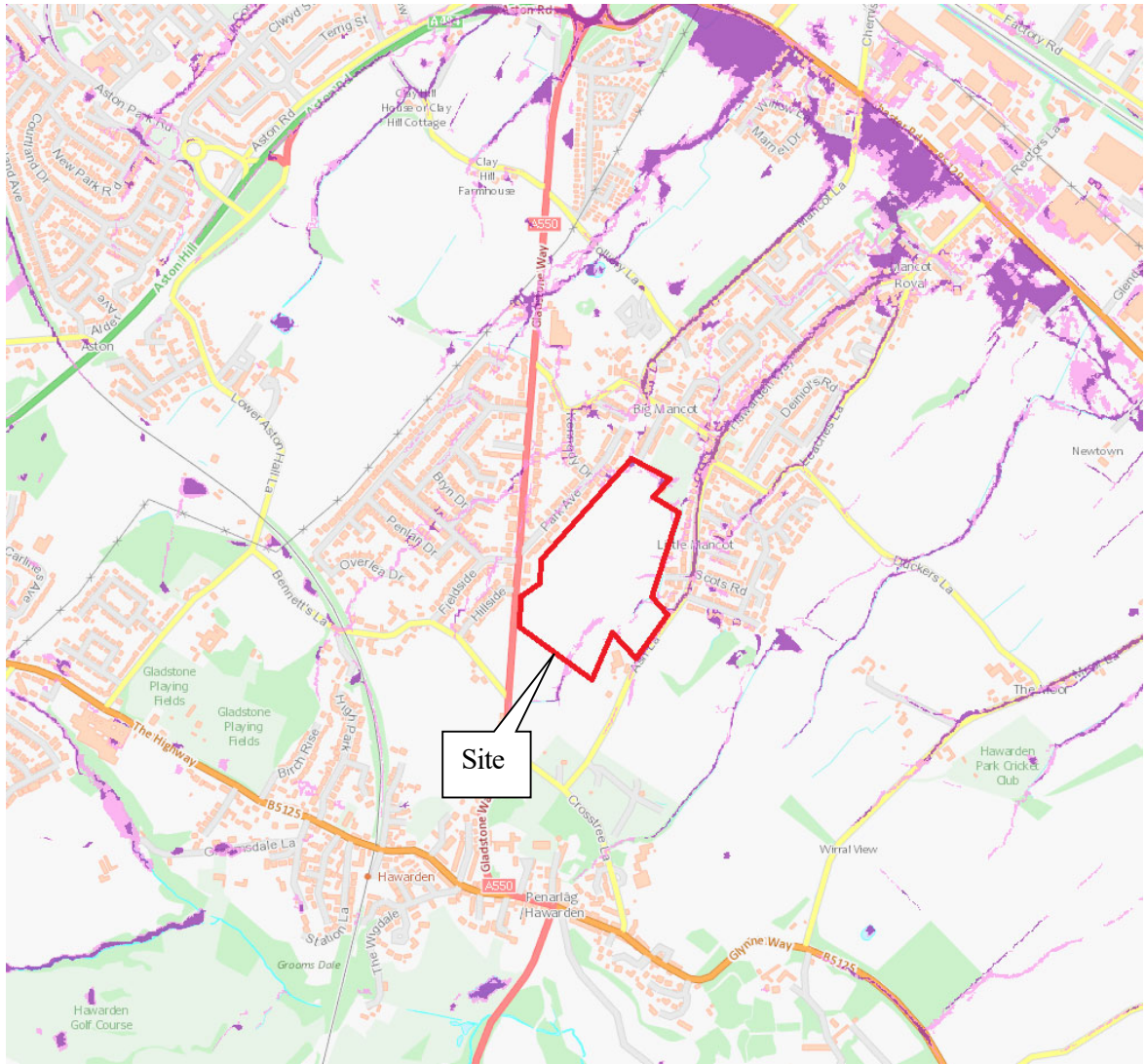


Figure 5 – Natural Resources Wales Surface Water Flooding Map

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The Natural Resources Wales long term flood risk maps do not indicate any flood risk from Development Advice Maps

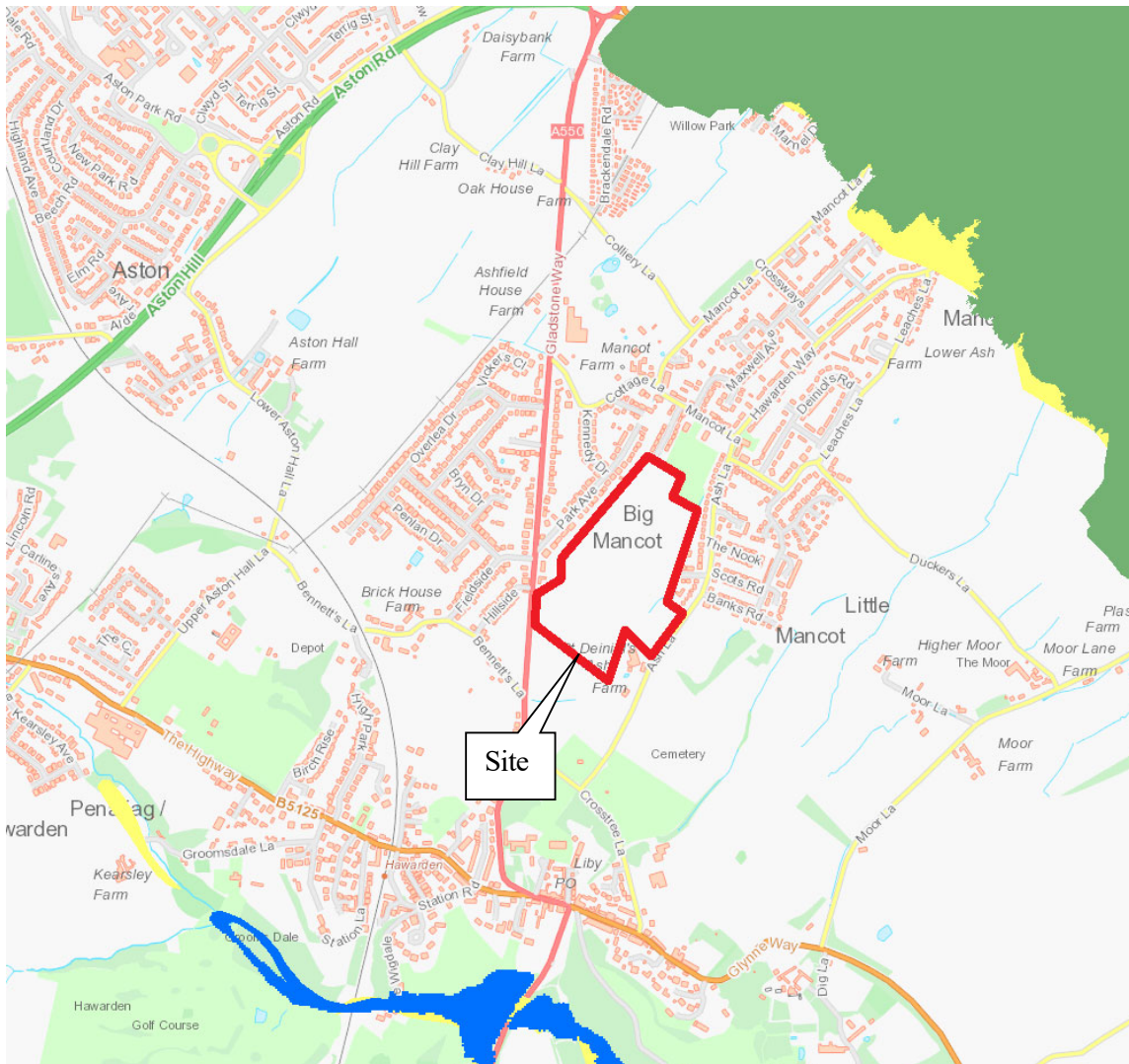


Figure 6 – Natural Resources Wales Development Advice Flooding (DAM) Map

It should be noted that flooding can occur at any time and in any place from sources such as rising groundwater levels, burst water mains, blocked road drains, run-off from hillsides, sewer overflows, etc.

3.3 Flintshire County Council LLFA

We have contacted Flintshire County Council for confirmation of any known historical flooding within the vicinity of the site. Whilst they have no records of flooding within the site, they have confirmed the surrounding highway network is susceptible to surface water flooding.

Refer to Appendix 4 for all correspondence.

4.0 Sources of Flood Risk

4.1 Fluvial

Extreme fluvial flood events have the potential to cause rapid inundation of the site whilst posing a threat to welfare and users. As outlined in Section 3.2; the site is within Flood Zone 1 and is, therefore not at risk from extreme fluvial or tidal flooding. Therefore, the risk from extreme fluvial flooding to the site is considered to be low.

4.2 Infrastructure Failure (Existing and Proposed)

The failure of infrastructure such as culverts or bridges could increase the risk of flooding at the site. There are a number of culverts along the existing watercourse along the eastern boundary. The client should consider construction of headwalls with safety grilles and ensuring a maintenance plan is in place to reduce the risk of blockages.

The risk of flooding is considered as low.

4.3 Overland Flow

Overland flow occurs when the infiltration capacity of the ground is exceeded in a storm event. This can result in water travelling as a sheet flow overland or excess water being conveyed from one location to another via local road networks. The site currently drains in a northeast direction towards the watercourse. Overland flow is not considered a significant risk as flows from the site will be significantly reduced post development with the incorporation of positive drainage and an internal road network.

4.4 Sewer Flooding

If the capacity of the sewers is exceeded in an extreme event, or a blockage occurs, surcharging of the network can result in surface flooding. Welsh Water sewer plans which are included in Appendix 1, indicate sewers within the surrounding road network.

We are proposing to discharge all foul flows into the 150mm Diameter foul sewer to the north of the site subject to Welsh Water approval.

Welsh Water may have confirmed they have no records or any known flooding within the vicinity of the site. Refer to Appendix 4 for correspondence.

The overall risk from sewer flooding is considered as low.

4.5 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying superficial deposits, bedrock or from springs.

Groundwater was encountered as seepage during the site investigation. Furthermore, the Envirocheck Flood Report presented in Appendix 2 indicates there is negligible risk of ground water flooding within the site boundary, although the BGS groundwater flooding susceptibility map indicates potential for groundwater flooding of property 'situated below ground level'. Proposed slab levels will be set above existing ground level to mitigate any risk.

The overall risk from groundwater flooding is considered as low.

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4.6 Coastal Flooding

The development site is located approximately 1.8km south of the River Dee Estuary. No flooding is indicated on NRW flood mapping and is therefore not at risk from tidal inundation.

Refer to Figure 3 – NRW Flood Map for Planning (Sea). Also see Appendix 4 NRW correspondence for the River Dee hydraulic modelling report summary.

4.7 Reservoirs

The site is not located in proximity of any reservoirs. Additionally, the NRW maps indicate the site is not at risk of flooding from reservoirs. Refer to Figure 7.

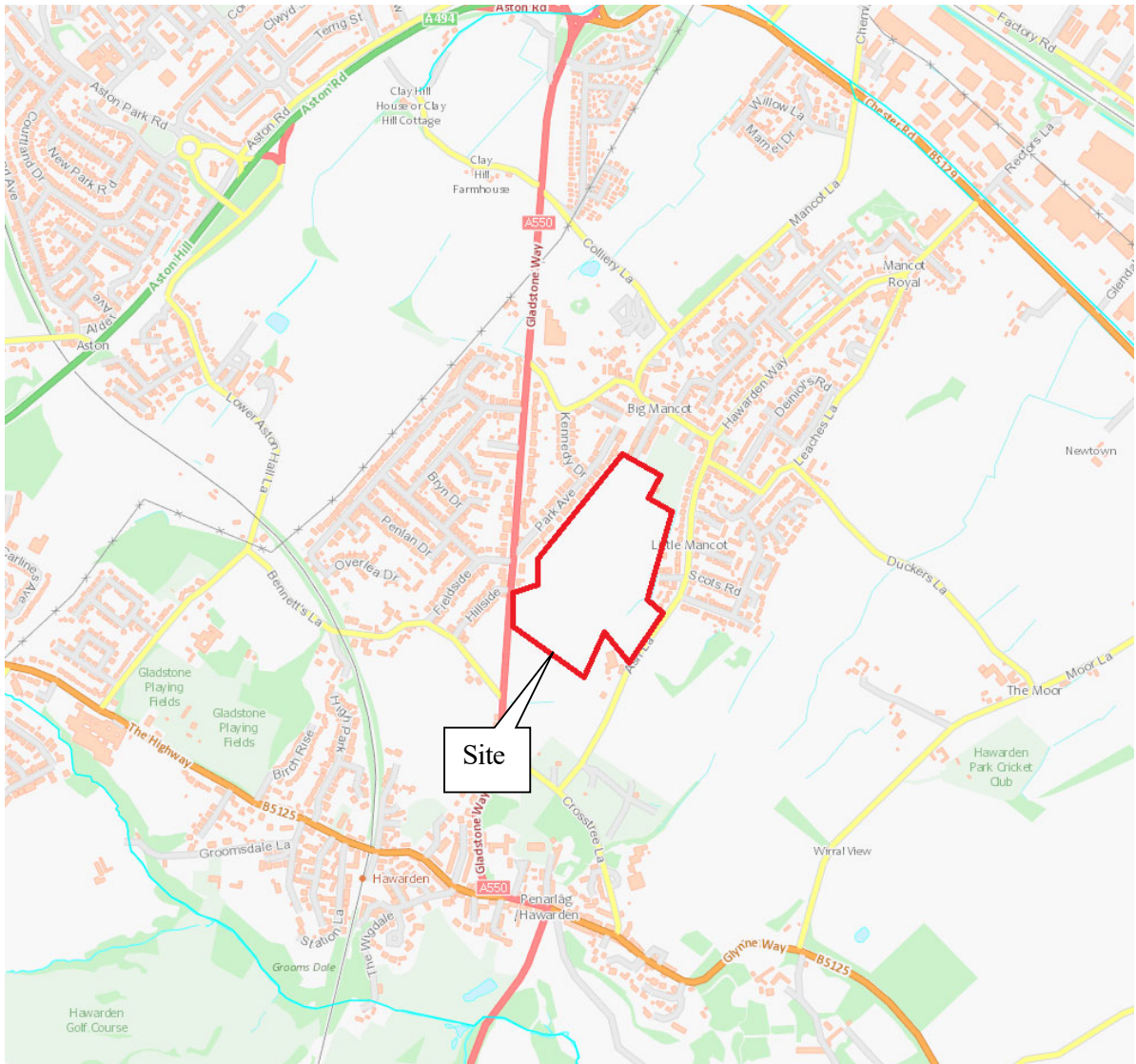


Figure 7 – Natural Resources Wales Reservoir Flooding Map

5.0 Surface Water Drainage

5.1 General

The design for a surface water drainage system for the proposed development will be guided by the principles set out in the Welsh Government's 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems' (2017)

The SuDS Standards Wales sets out the following hierarchy for surface water runoff destination:

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Note that Priority Level 1 is the preferred (highest priority) and that 4 and 5 should only be used in exceptional circumstances.

5.2 Existing Surface Water Drainage

The site does not benefit from any existing drainage and will rely on infiltration and surface water runoff to dispose of surface water flows. The flows will follow topography with the majority of the site draining to the watercourse along the eastern boundary. We are not aware of any existing land drainage within the site to assist with drainage.

5.3 Existing Site Runoff

The greenfield run-off rates for the site have been calculated using the HR Wallingford Greenfield runoff rate estimation tool. Calculations below are based on a 8.23ha developable site area and a soil type 3 indicated a mix of granular and cohesive materials with exhibiting limited infiltration.

1-year	= 21.47 l/s
30-year	= 43.42 l/s
100-year	= 53.18 l/s
QBAR	= 24.40 l/s

Refer to Appendix 5 for surface water run-off calculations.

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5.4 Proposed Surface Water Drainage and Runoff Rates

Priority Level 1

Whilst rainwater harvesting has been considered for the proposed development it should be noted that any device enabling water re-use cannot be taken into account when sizing attenuation as the storage facility may be full when a storm event occurs. Therefore, an overflow to an infiltration device (where ground conditions allow) or to a watercourse / sewer will be required.

Castle Green Homes Ltd are not proposing to incorporate rainwater harvesting within the development; however, they are proposing to install a water butt to each dwelling which will allow for water collection for garden re-use.

Priority Level 2

Site investigation has determined the site is not suitable for infiltration techniques to dispose of surface water flows from the site as the made ground and underlying soils are cohesive.

Refer to Appendix 3 for trial pit information.

Priority Level 3

An ordinary watercourse is located along the eastern site boundary, which runs at the edge of the development land and the adjacent residential rear gardens. This watercourse receives flows from the pre-developed site via overland flows. The watercourse is relatively shallow and flows north. The highest bed level of the watercourse is 40.5m AOD at the southern site boundary and the lowest bed level at the northeast site boundary is 23.0m AOD. Short sections of the watercourse are culverted through 450mm diameter precast concrete pipes along the eastern boundary. The watercourse emerges at a point to the north of the farm, where the watercourse is culverted from the south to bypass its original alignment around the edge of the field boundaries. Historic records show that the full length of the watercourse passing through the site was once in an open channel.

The site may have existing land drains discharging into this watercourse which would follow the topography, but this has not been proven at this time.

A review of levels has determined the entire site can drain to the watercourse, using a number of outfall locations to suit proposed sewer routes / networks.

Priority Level 4

A review of the Welsh Water sewer records indicates the presence of a 300mm Diameter surface water sewer within The Paddock to the north of the development. Refer to Appendix 1 for the Welsh Water sewer map.

Priority Level 5

The Welsh Water sewer maps indicate the presence of a 300mm Diameter combined sewer in Ash Lane / Mancot Lane to the north of the development. Refer to Appendix 1 for Welsh Water sewer map.

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5.5 SuDS Approval Bodies

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100m². The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Every SuDS application should go to every attempt to satisfy the Principles and Standards of the legislation. When vetting an application, the SAB officer will look at the clear red line boundary area of the site when considering space for SuDS and water management features and not the space that's left on the proposed site layout.

The principles are as follows:

SuDS schemes should aim to:

1. *manage water on or close to the surface and as close to the source of the runoff as possible;*
2. *treat rainfall as a valuable natural resource;*
3. *ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;*
4. *manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;*
5. *take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;*
6. *use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single "end of pipe" feature, such as a pond, to serve the whole development);*
7. *maximise the delivery of benefits for amenity and biodiversity;*
8. *seek to make the best use of available land through multifunctional usage of public spaces and the public realm;*
9. *perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;*
10. *avoid the need for pumping where possible; and*
11. *be affordable, taking into account both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system.*

Applicants seeking SAB Approval must demonstrate how they have complied with these principles or provide justification for any departure.

An indicative surface water strategy is presented in Appendix 1. We are proposing to drain the entire site into the watercourse via 3 new outfalls. 2 outfalls will discharge to the open watercourse and the other will discharge into a culverted section. The culvert will be a section of existing culverted watercourse which requires realignment to suit the proposed development layout. This will require

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consent via a formal Flood Defence Consent (FDC) Application with Flintshire Local Lead Flood Authority (LLFA). Flows will be restricted to greenfield QBAR rate and attenuation will be provided within a network of oversized on-line pipes, buried cellular tanks and SUDS basins.

The proposal will mimic the existing situation as the existing topography of the site generally falls northeast towards the watercourse. Flow controls will limit the flows to the greenfield QBAR run-off rate. This is the 2.3-year rainfall event, so any storm event greater than this will have a post development flow rate reduction in the receiving watercourse and therefore will provide a reduced post development flood risk.

Incorporation of additional source control SuDS components such as water butts, permeable paving, filter drains, and bioretention components (tree pits and rain gardens) will need to be considered further at detailed design stage to meet the 5mm interception design criteria.

Flood Defence Consent will be required from Flintshire LLFA for the surface water outfalls into the watercourse. Early discussions are advised to ensure that the proposed points of connection and flow rates are acceptable to the approving authority.

Flintshire LLFA will also advise on any requirements on the existing watercourse including minimum distances on buffer zones for future maintenance and wildlife corridors. This will generally be a minimum of 3m from top of bank.

5.6 Foul Drainage

We are proposing to discharge all foul flows into the existing 150mm Diameter foul public sewer in The Paddock to the north of the site. This will need to be discussed with Welsh Water to confirm this is an acceptable point of connection.

Topography and proposed site levels design will allow for a gravity network to serve the entire development without any need for a pumping station. Refer to the indicative drainage strategy presented in Appendix 1 for proposed foul routes and sewer levels.

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6.0 Conclusions and Recommendations

The site is located in Flood Zone 1 and has been shown to be at low risk of flooding from sea, rivers, surface water, groundwater, sewers and climate change. Therefore, mitigation measures are not considered necessary for any future development at the site.

All potential sources of flooding have been considered as part of this report. There are no known records of historical flooding at the site, other than the surrounding highway network.

The infiltration tests undertaken have determined that the underlying soils have poor infiltration characteristics. Therefore, surface water run-off from highways, roof and private drives will discharge into the ordinary watercourse.

The development will increase the impermeable area of the site. This results in an increase in surface water runoff rates and volumes. In order to ensure the increase in runoff will not have an impact elsewhere all flows will discharge via gravity to the watercourse and highway drain at greenfield QBAR flow rates.

All surface water run-off from highways, roof and private drives will be collected into gravity piped networks and discharged into networks of oversized pipes and SuDS attenuation features.

Additional on-site source control components such as permeable paving and bioretention components (tree pits and rain gardens) should be considered further at detailed design stage.

All foul sewers should be designed in accordance with Sewers for Adoption 7th Edition / Welsh Ministers Standards and will be subject to S104 Agreement.

A SuDS Maintenance and Management Plan should be produced to outline the activity and frequency of inspections and maintenance works required on any SuDS components subject to SAB Approval / Adoption.

This Flood Consequences Assessment should be submitted to the Local Planning Authority in support of the planning application.

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 properties or the construction area is more than 100m². The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

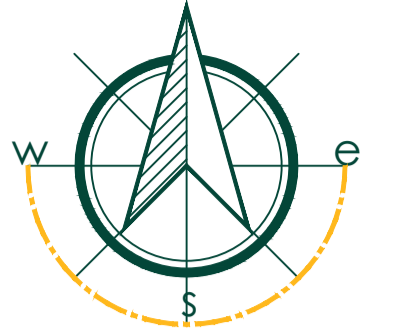
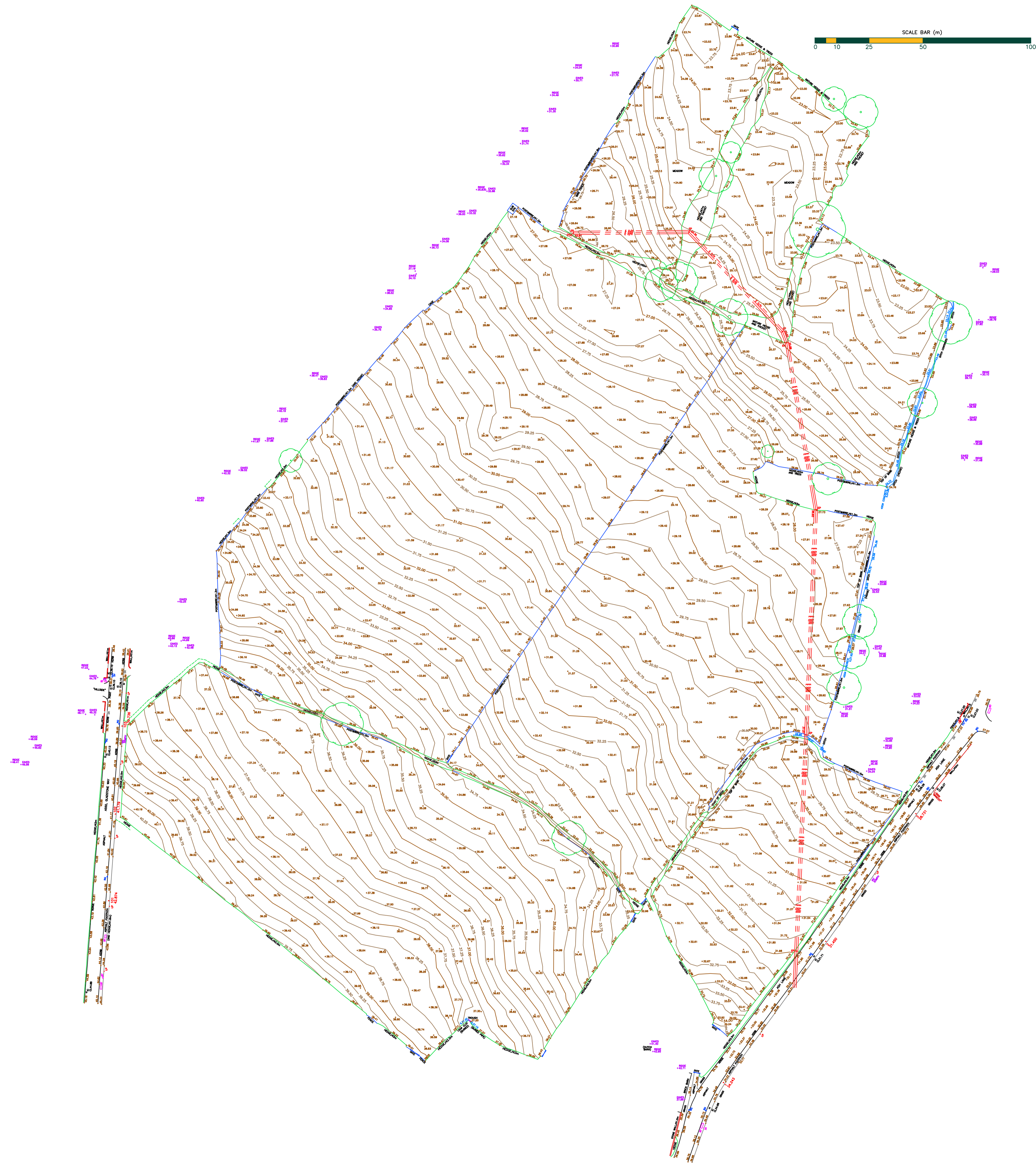
These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

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Appendix 1

Reference Drawings

<u>Drawing No.</u>	<u>Revision</u>	<u>Title</u>
SA 37262 (01)	-	Topographical Survey (Berrys)
PPA0007661	-	Welsh Water Sewer Map
8271 / SK01	A	Drainage Strategy
8271 / SK03	-	SUDS Details



OS Mapping obtained from Promap Licence No. 100022432
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 Please do not scale from this drawing. All dimensions are to be checked on site.

This survey is related to Ordnance Survey Level Datum (Newlyn) and pseudo Ordnance Survey Grid, based on use of a GPS SmartRover on the OS SmartNET. The survey is on a plane grid (scale factor of 1.0). This was applied, referenced on coordinates:
 331699.000 E 366588.000 N, using OS local scale factor 0.999659 (inverse 1.000341). A Leica TS12 Total Station was also used to carry out the survey.

Abbreviations (Where Applicable)

- BT Telecom Inspection Cover
- CB Control Box
- CL Cover Level
- DK Kerb (Drop Kerb)
- EP Electricity Pole / Pylon
- FH Fire Hydrant
- IC Inspection Cover
- IL Invert Level
- LP Lamp Post
- RG Road Gully
- RS Road Sign
- SV Stop Valve
- TP Telegraph Pole

- E O/H— Overhead Electric Cables
- T O/H— Overhead Telecom Cables
- 31.75— Contour interval 0.25m
- ▲ 34.243 Survey Station (Level quoted)

Survey Station Coordinates			
Station	Easting	Northing	Level
1	331767.710	366338.632	34.243
2	331815.087	366404.032	31.450
3	331856.811	366463.184	28.731
101	331482.994	366422.856	42.874
102	331486.126	366462.991	41.179
103	331489.228	366503.789	39.736

Amendments:

BERR
 PROPERTY | BUSINESS | PLANNING
 0745 294697 | SY2 6FG
www.berrys.uk.com

Client: Hawarden Estate

Project: Land at Mancot

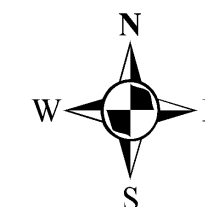
Drawing: Topographic Survey

Drawing Number: SA 37262 (01)
 Date: 23/07/2020
 Scale: Not to scale
 Paper: A1
 Drawn By: [Signature]



Dŵr Cymru
Welsh Water

PPA0007661



LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Foul
- Surface Water
- Former S24 sewers (for indicative purposes only)
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

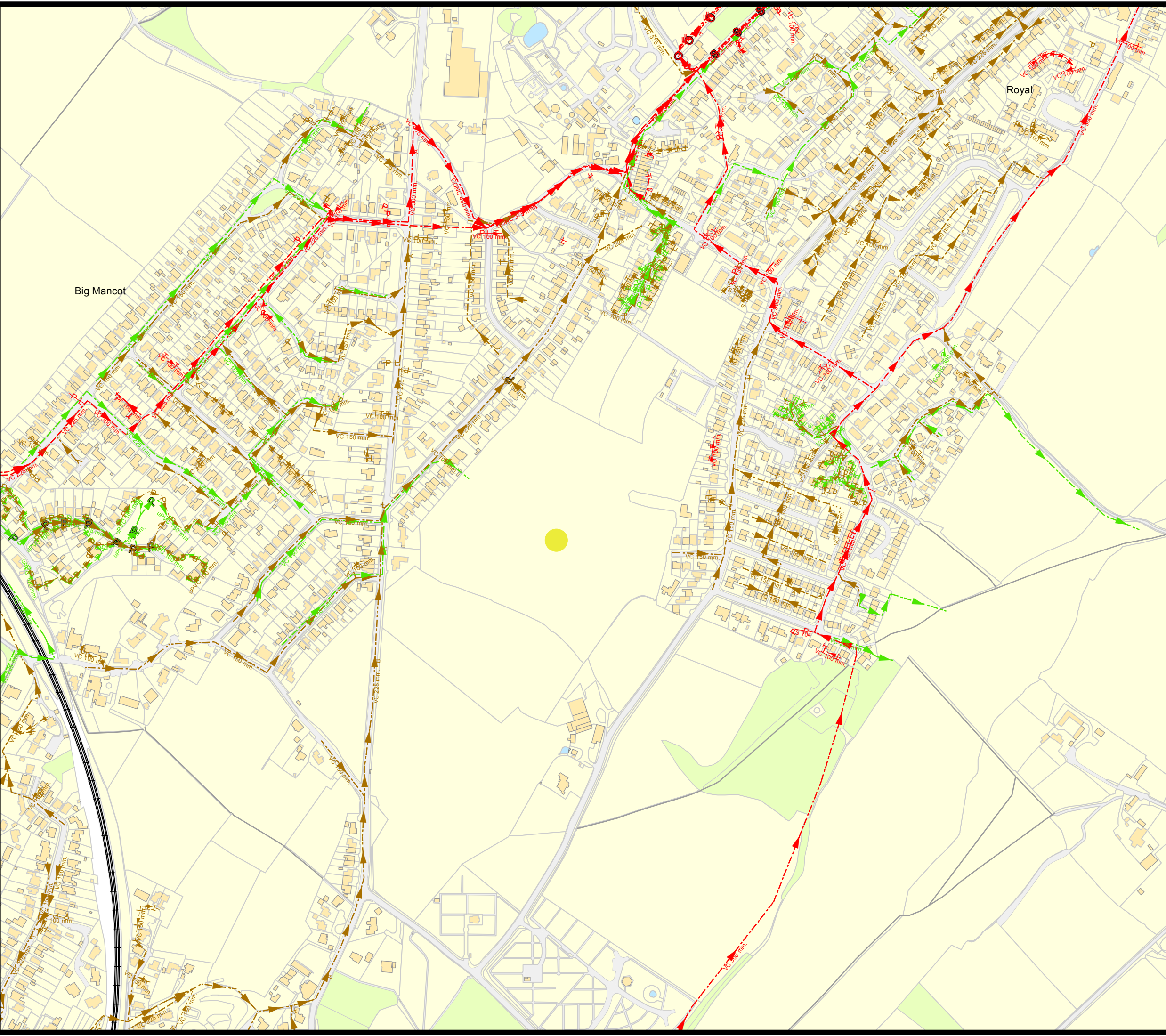
Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref: 331737,366592
Map scale: 1:4250
Printed by: Gillian Williams
Printed on: 21 Mar 2023



DO NOT SCALE

STORM Network 2											
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Cover	Number	Downstream Manhole Invert	Cover	
1.000	750	402	Circular	16,077	S201	34.06	38.74	S202	34.01	38.14	
1.001	900	403	Circular	19,746	S202	33.86	38.14	S203	33.81	37.55	
1.002	900	398	Circular	25,094	S203	33.81	37.55	S204	33.75	36.91	
1.003	1050	403	Circular	18,938	S204	33.62	36.91	S205	33.55	36.43	
1.004	1050	400	Circular	19,976	S205	33.55	36.43	S206	33.50	35.75	
1.005	300	54	Circular	24,988	S206	33.50	35.75	S207	33.64	34.94	
1.006	150	17	Circular	13,978	S207	33.04	34.94	S208	31.53	33.174	
1.007	300	98	Circular	19,422	S208	31.53	33.74	S209	31.74	33.24	
1.008	150	266	Circular	23,689	S209	29.24	32.24	S210	29.16	32.16	
1.009	150	396	Circular	14,651	S210	29.16	32.76	S211	29.12	32.46	
1.010	1350	405	Circular	15,783	S211	29.12	32.46	S212	29.08	32.15	
1.011	1350	296	Circular	28,107	S212	29.08	32.15	S213	29.07	31.69	
1.012	225	172	Circular	3,275	S213	28.97	31.99	S214	28.95	31.69	
2.000	1350	240	Circular	18,236	S214	28.95	34.99	S215	28.29	33.98	
2.001	1350	242	Circular	8,710	S215	28.29	33.66	S216	28.22	33.31	
2.002	1350	239	Circular	24,878	S216	28.22	33.31	S217	29.12	32.46	

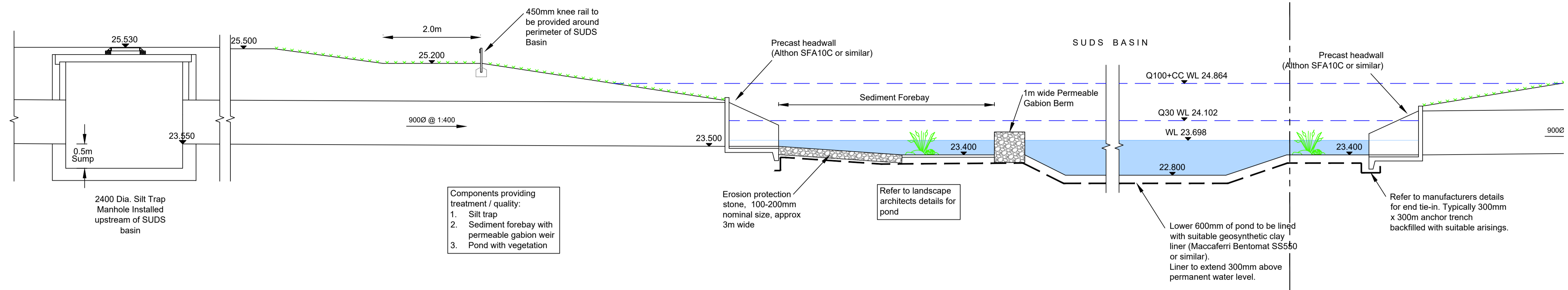
STORM Network 3											
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Cover	Number	Downstream Manhole Invert	Cover	
1.000	150	20	Circular	15,162	S301	37.79	39.14	S302	37.03	38.38	
1.001	150	20	Circular	8,449	S302	37.03	38.38	S303	36.57	37.82	
1.002	225	45	Circular	14,589	S303	36.49	37.92	S304	36.17	37.60	
1.003	225	40	Circular	13,620	S304	36.17	37.60	S305	35.84	37.26	
1.004	225	30	Circular	13,884	S305	35.84	37.26	S306	35.37	36.79	
1.005	225	29	Circular	12,422	S306	35.37	36.79	S307	34.94	36.37	
1.006	225	29	Circular	10,963	S307	34.94	36.37	S308	34.57	35.99	
1.007	225	30	Circular	17,686	S308	34.57	35.99	S309	33.88	35.46	
1.008	300	240	Circular	11,812	S309	33.90	35.40	S310	33.85	35.19	
1.009	300	240	Circular	11,812	S310	33.85	35.19	S311	33.80	35.03	
1.010	300	240	Circular	5,747	S311	33.80	35.03	S312	33.78	35.01	
1.011	225	170	Circular	29,715	S312	33.78	35.21	S313	33.60	35.00	

STORM Network 4											
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Cover	Number	Downstream Manhole Invert	Cover	
1.000	150	39	Circular	13,387	S101	34.71	36.06	S102	34.38	35.73	
1.001	150	32	Circular	13,788	S102	34.38	35.73	S103	34.03	35.38	
1.002	150	29	Circular	22,100	S103	33.95	35.38	S104	33.18	34.53	
1.003	225	24	Circular	7,886	S104	33.11	34.53	S105	32.77	34.20	
1.004	225	24	Circular	8,919	S105	32.77	34.20	S106	32.41	33.84	
1.005	225	25	Circular	54,128	S106	32.41	33.84	S107	30.25	31.68	
1.006	300	30	Circular	24,974	S107	30.25	31.68	S108	29.81	31.24	
1.007	300	29	Circular	42,352	S108	29.01	30.51	S109	27.54	29.32	
1.008	375	24	Circular	51,152	S109	27.47	29.22	S110	25.34	27.34	
1.009	400	400	Circular	32,384	S110	24.34	27.34	S111	24.36	27.35	
1.010	600	401	Circular	19,241	S111	24.08	27.35	S112	24.01	27.11	
1.011	600	400	Circular	14,395	S112	24.01	27.11	S113	23.97	26.93	
1.012	900	400	Circular	46,893	S113	23.67	26.93	S114	23.55	26.53	
1.013	900	396	Circular	15,459	S114	23.55	26.53	S115	23.52	26.35	
1.014	900	401	Circular	52,887	S115	23.26	26.54	S116	23.26	26.25	
1.015	300	53	Circular	18,917	S116	23.26	26.54	S117	23.10	25.50	
2.000	525	401	Circular	17,638	S117	24.28	27.12	S118	24.21	27.34	
3.000	225	30	Circular	41,589	S118	21.03	32.84	S119	28.79	30.32	
3.001	300	30	Circular	49,255	S119	28.72	30.22	S120	27.07	28.57	
3.002	375	26	Circular	47,763	S120	27.00	28.57	S121	25.21	27.11	
4.000	300	170	Circular	21,695	S121	27.00	30.12	S122	27.43	30.48	
4.001	300	170	Circular	12,891	S122	27.43	29.86	S123	27.55	30.12	
4.002	300	170	Circular	21,695	S123	27.55	30.12	S124	27.43	30.48	
4.003	375	300	Circular	29,388	S124	27.25	29.89	S125	27.15	29.15	
4.004	375	300	Circular	25,145	S125	27.15	29.15	S126	26.85	28.32	
4.005	375	300	Circular	8,501	S126	26.85	28.32	S127	26.82	28.33	
4.006	450	400	Circular	13,616	S127	26.85	28.32	S128	26.81	28.33	
4.007	450	400	Circular	14,683	S128	26.81	28.33	S129	26.85	28.38	
4.008	450	204	Circular	31,233	S129	26.77	28.38	S130	26.62	28.15	
4.009	450	75	Circular	17,884	S130	26.62	28.15	S131	26.38	28.28	
4.010	450	918	Circular	13,788	S131	26.38	28.28	S132	26.34	28.26	
4.012	900	403	Circular	12,486	S132	23.89	28.32	S133	23.66	27.70	
4.013	900	403	Circular	15,988	S133	23.66	27.70	S134	23.65	27.69	
4.014	900	400	Circular	8,351	S134	23.63	27.62	S135	23.61	26.58	
4.015	900	398	Circular	20,722	S135	23.61	26.58	S136	23.55	25.53	
5.000	225	90	Circular	16,441	S136	23.55	25.53	S137	23.57	30.30	
5.001	225	79	Circular	11,096	S137	28.77	30.20	S138	28.63	30.05	
5.002	225	99	Circular	16,432	S138	28.63	30.05	S139	28.49	29.89	
6.000	225	40	Circular	61,914	S139	29.68	31.08	S140	28.13	29.83	

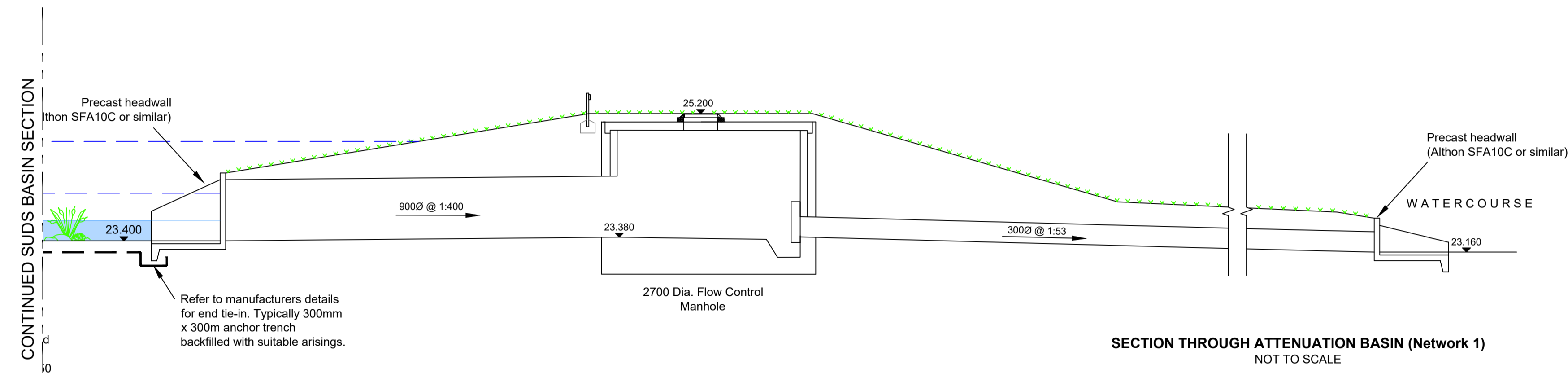
STORM Network 5											
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Cover	Number	Downstream Manhole Invert	Cover	
1.000	150	20	Circular	15,162	S301	37.79	39.14	S302	37.03	38.38	
1.001	150	20	Circular	8,449	S302	37.03	38.38	S303	36.57	37.82	
1.002	225	45	Circular	14,589	S303	36.49	37.92	S304	36.17	37.60	
1.003	225	40	Circular	13,620	S304	36.17	37.60	S305	35.84	37.26	
1.004	225	30	Circular	13,884	S305	35.84	37.26	S306	35.37	36.79	
1.005	225	29	Circular	12,422	S306	35.37	36.79	S307	34.94	36.37	
1.006	225	29	Circular	10,963	S307	34.94	36.37	S308	34.57	35.99	
1.007	225	30	Circular	17,686	S308	34.57	35.99	S309	33.88	35.46	
1.008	300	240	Circular	11,812	S309	33.90	35.40	S310	33.85	35.19	
1.009	300	240	Circular	11,812	S310	33.85	35.19	S311	33.80	35.03	
1.010	300	240	Circular	5,747	S311	33.80	35.03	S312	33.78	35.01	
1.011	225	170	Circular	29,715	S312	33.78	35.21	S313	33.60	35.00	

STORM Network 6											
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Cover	Number	Downstream Manhole Invert	Cover	
1.000	150	39	Circular	13,387	S101	34.71	36.06	S102	34.38	35.73	
1.001	150	32	Circular	13,788	S102	34.38	35.73	S103	34.03	35.38	
1.002	150	29	Circular	22,100	S103	33.95	35.38	S104	33.18	34.53	
1.003	225	24	Circular	7,886	S104	33.11	34.53	S105	32.77	34.20	
1.004	225	24	Circular	8,919	S105	32.77	34.20	S106	32.41	33.84	
1.005	225	25	Circular	54,128	S106	32.41	33.84	S107	30.25	31.68	
1.006	300	30	Circular	24,974	S107	30.25	31.68	S108	29.81	31.24	
1.007	300	29	Circular	42,352	S108	29.01	30.51	S109	27.54	29.32	
1.008	375	24	Circular	51,152	S109	27.47	29.22	S110	25.34	27.34	
1.009	400	400	Circular	32,384	S110	24.34	27.34	S111	24.36	27.35	
1.010	600	401	Circular	19,241	S111	24.08	27.35	S112	24.01	27.11	
1.011	600	400	Circular	14,395	S112	24.01	27.11	S113	23.97	26.93	
1.012	900	400	Circular	46,893	S113	23.67	26.93	S114	23.55	26.53	
1.013	900	396	Circular	15,459	S114	23.55	26.53	S115	23.52	26.35	
1.014	900	401	Circular	52,887	S115	23.26	26.54	S116	23.26	26.25	
1.015	300	53	Circular	18,917	S116	23.26	26.54	S117	23.10	25.50	
2.000	525	401	Circular	17,638	S117	24.28	27.12	S118	24.21	27.34	
3.000	225	30	Circular	41,589	S118	21.03	32.84	S119	28.79	30.32	
3.001	300	30	Circular	49,255	S119	28.72	30.22	S120	27.07	28.57	
3.002	375	26	Circular	47,763	S120	27.00	28.57	S121	25.21	27.11	
4.000	300	170	Circular	21,695	S121	27.00	30.12	S122	27.43	30.48	
4.001	300	170	Circular	12,891	S122	27.43	29.86	S123	27.55	30.12	
4.002	300	170	Circular	21,695	S123	27.55	30.12	S124	27.43	30.48	
4.003	375	300	Circular	29,388	S124	27.25	29.89	S125	27.15	29.15	
4.004	375	300	Circular	25,145	S125	27.15	29.15	S126	26.85	28.32	
4.005	375	300	Circular	8,501	S126	26.85	28.32	S127	26.82	28.33	
4.006	450	400	Circular	13,616	S127	26.85	28.32	S128	26.81	28.33	
4.007	450	400	Circular	14,683	S128	26.81	28.33	S129	26.85	28.38	
4.008	450	204	Circular	31,233	S129	26.77	28.38	S130	26.62	28.15	
4.009	450	75	Circular	17,884	S130	26.62	28.15	S131	26.38	28.28	
4.010	450	918	Circular	13,788	S131	26.38	28.28	S132	26.34	28.26	
4.012	900	403	Circular	12,486	S132	23.89	28.32	S133	23.		

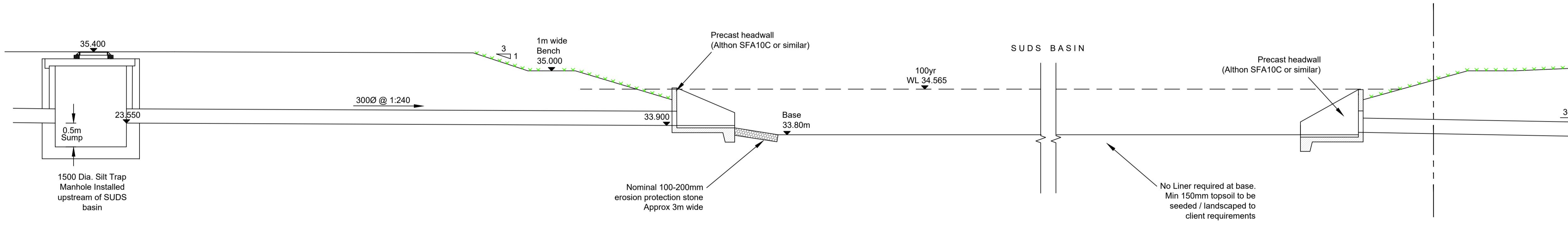
DO NOT SCALE



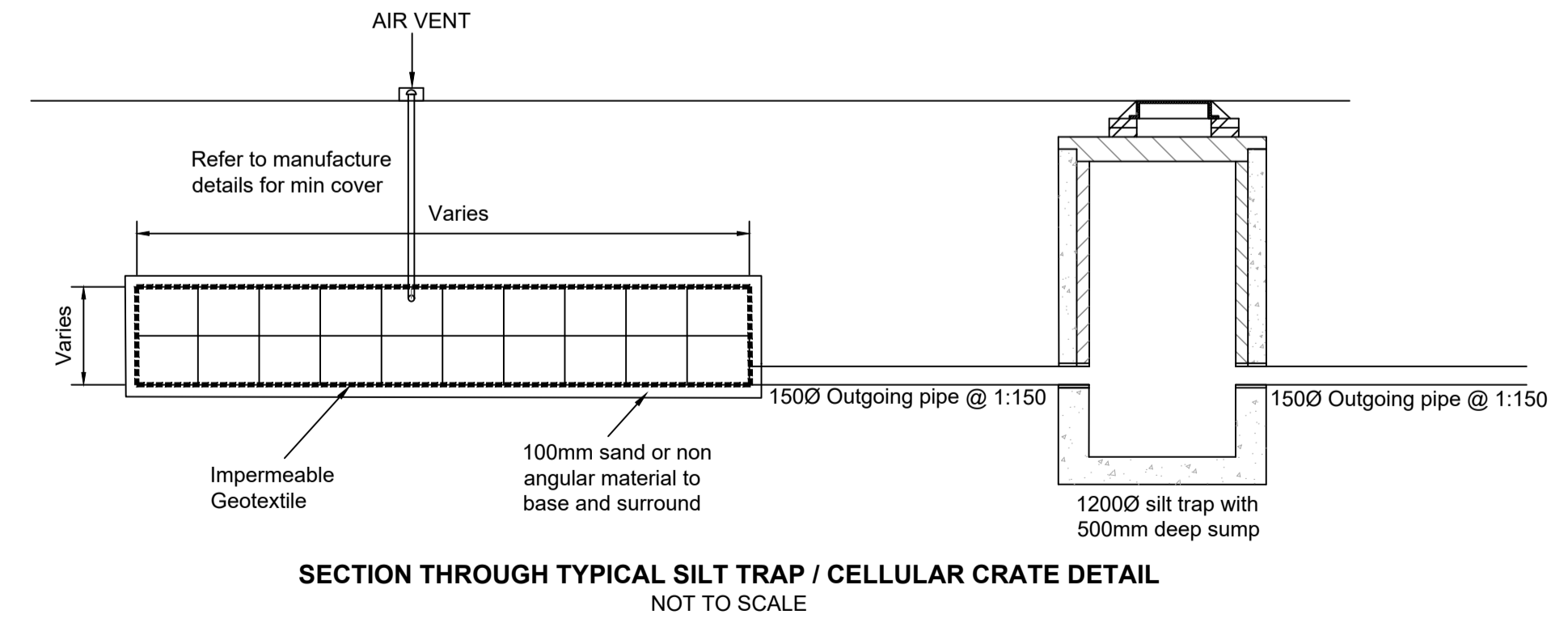
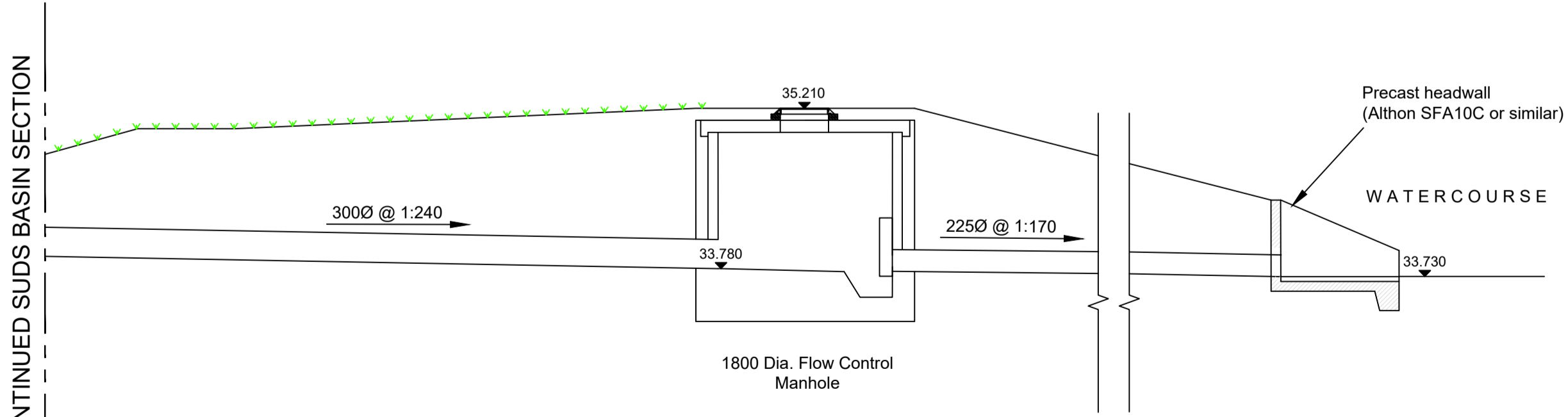
- Components providing treatment / quality:
1. Silt trap
 2. Sediment forebay with permeable gabion weir
 3. Pond with vegetation



SECTION THROUGH ATTENUATION BASIN (Network 1)
NOT TO SCALE



SECTION THROUGH ATTENUATION BASIN (Network 3)
NOT TO SCALE



SECTION THROUGH TYPICAL SILT TRAP / CELLULAR CRATE DETAIL
NOT TO SCALE

STRATEGY



Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Client



Project

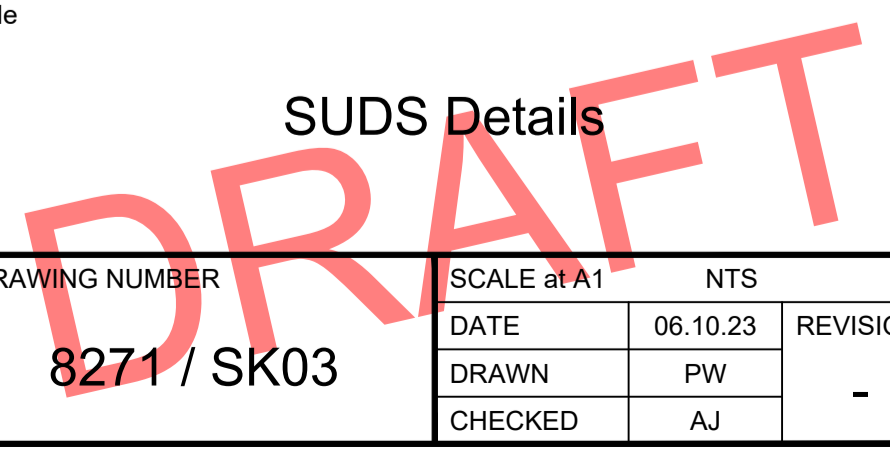
LAND OF GLADSTONE WAY,
MANCOT, HAWARDEN.

Title

SUDS Details

DRAWING NUMBER	SCALE at A1	NTS
8271 / SK03	DATE	06.10.23
	DRAWN	PW
	CHECKED	AJ
	REVISION	-

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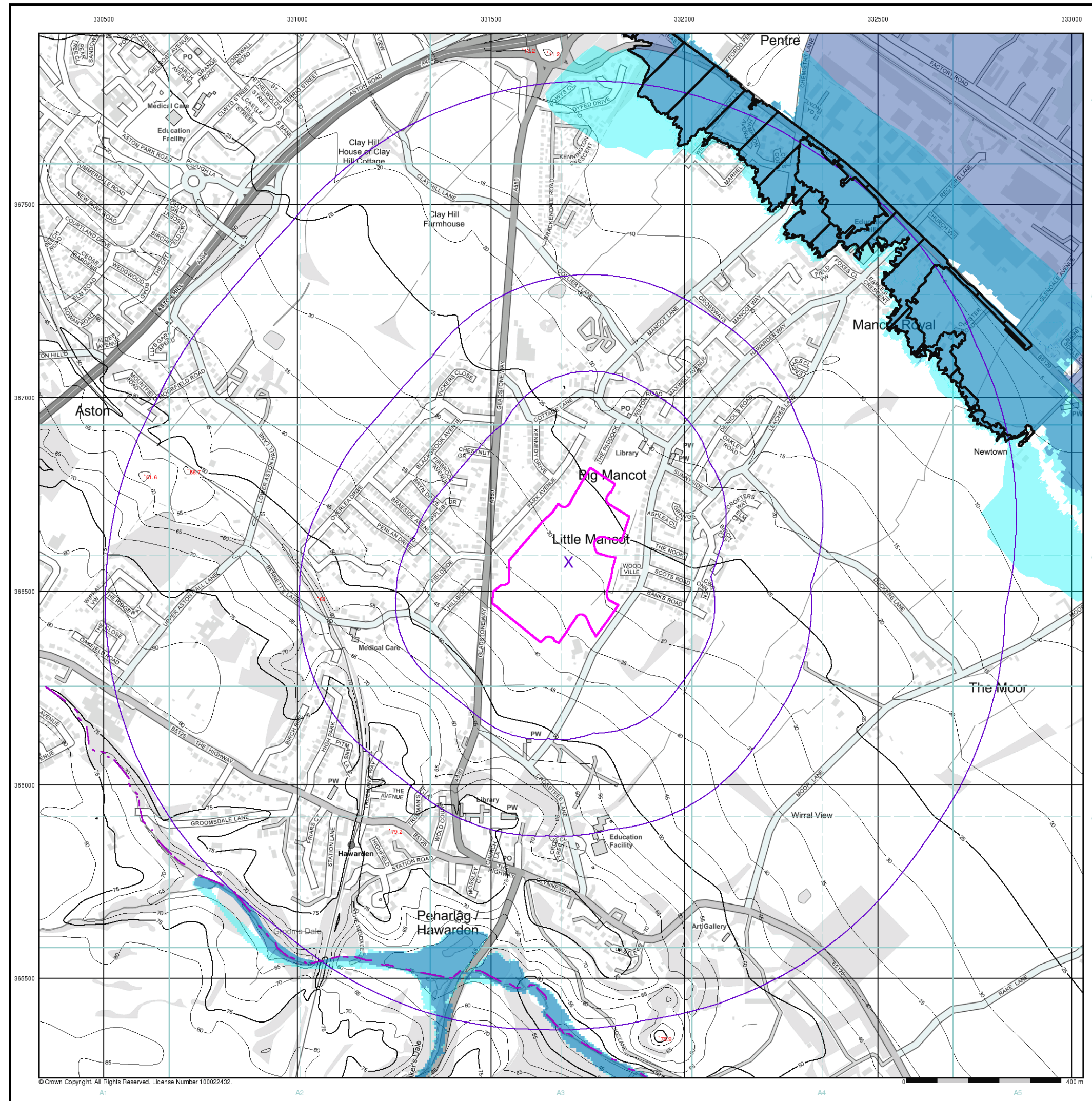


Flood Consequences Assessment
for Land off Gladstone Way, Mancot, Hawarden, Flintshire

Appendix 2

Envirocheck Flood Screening Report

Order Number: 317158724_1_1



EANRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

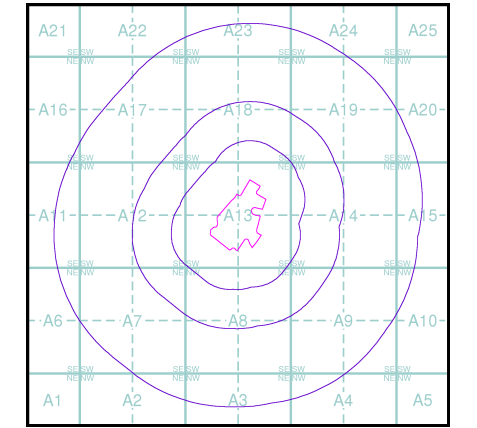
Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

- Standard Contour
- Master Contour
- Spot Height
- MLW - Mean Low Water
- MHW - Mean High Water

EANRW Flood Data Map - Slice A

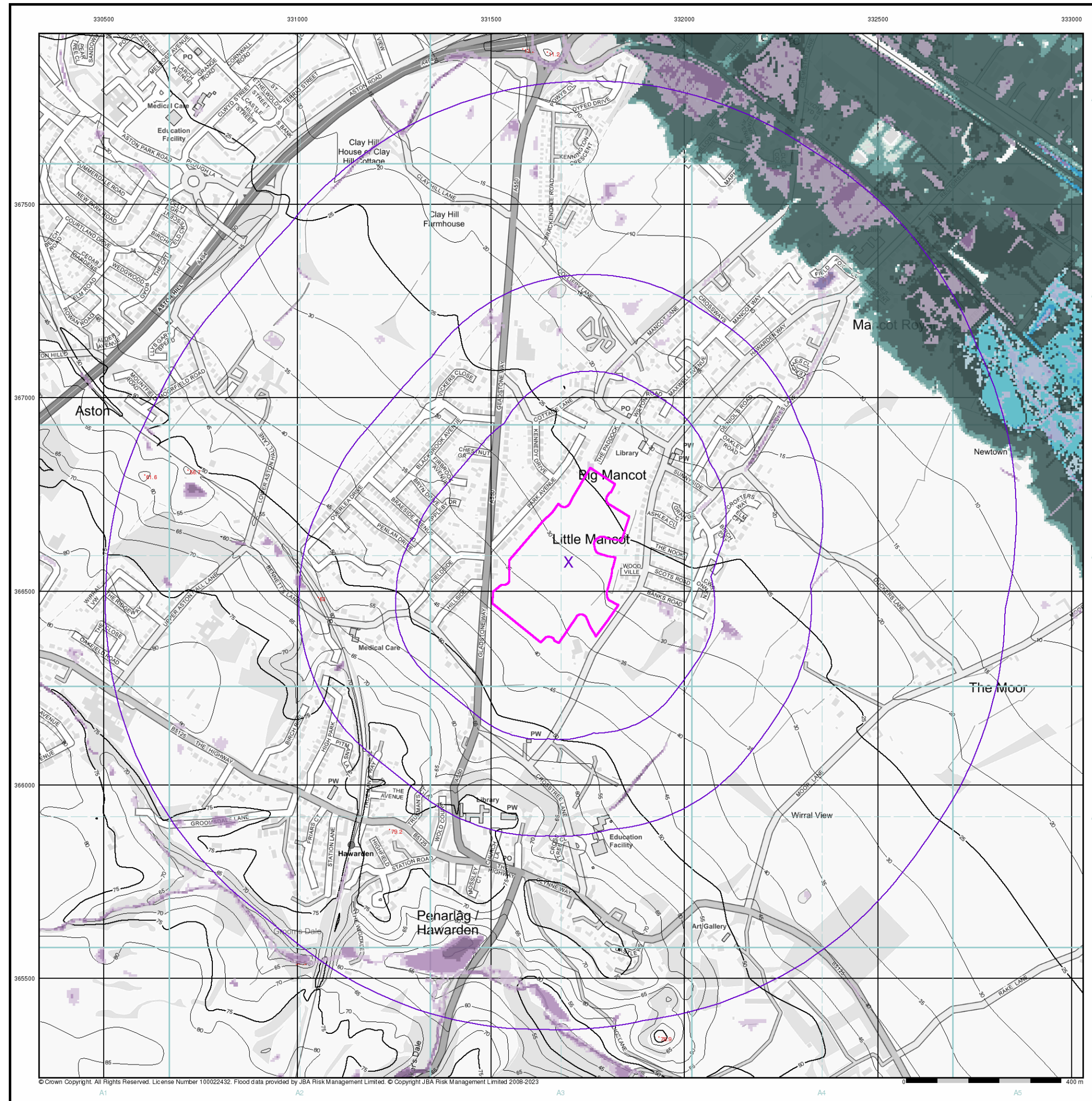


Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX



Envirocheck®

LANDMARK INFORMATION GROUP®

JBA 75 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

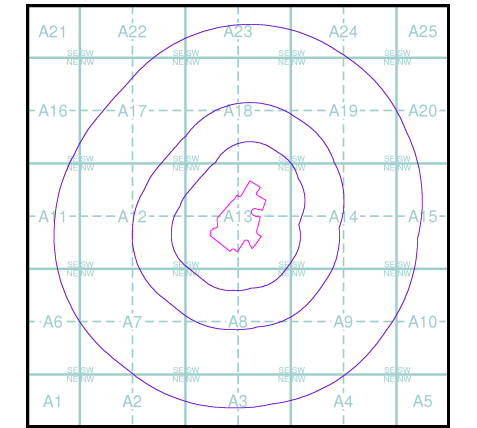
Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

- Standard Contour: 105, 100, 95
- Master Contour: 105, 100, 95
- Spot Height: 167.8
- MLW: Mean Low Water
- MHW: Mean High Water

JBA 75 Year Return Flood Map (Undefended) - Slice A



Order Details

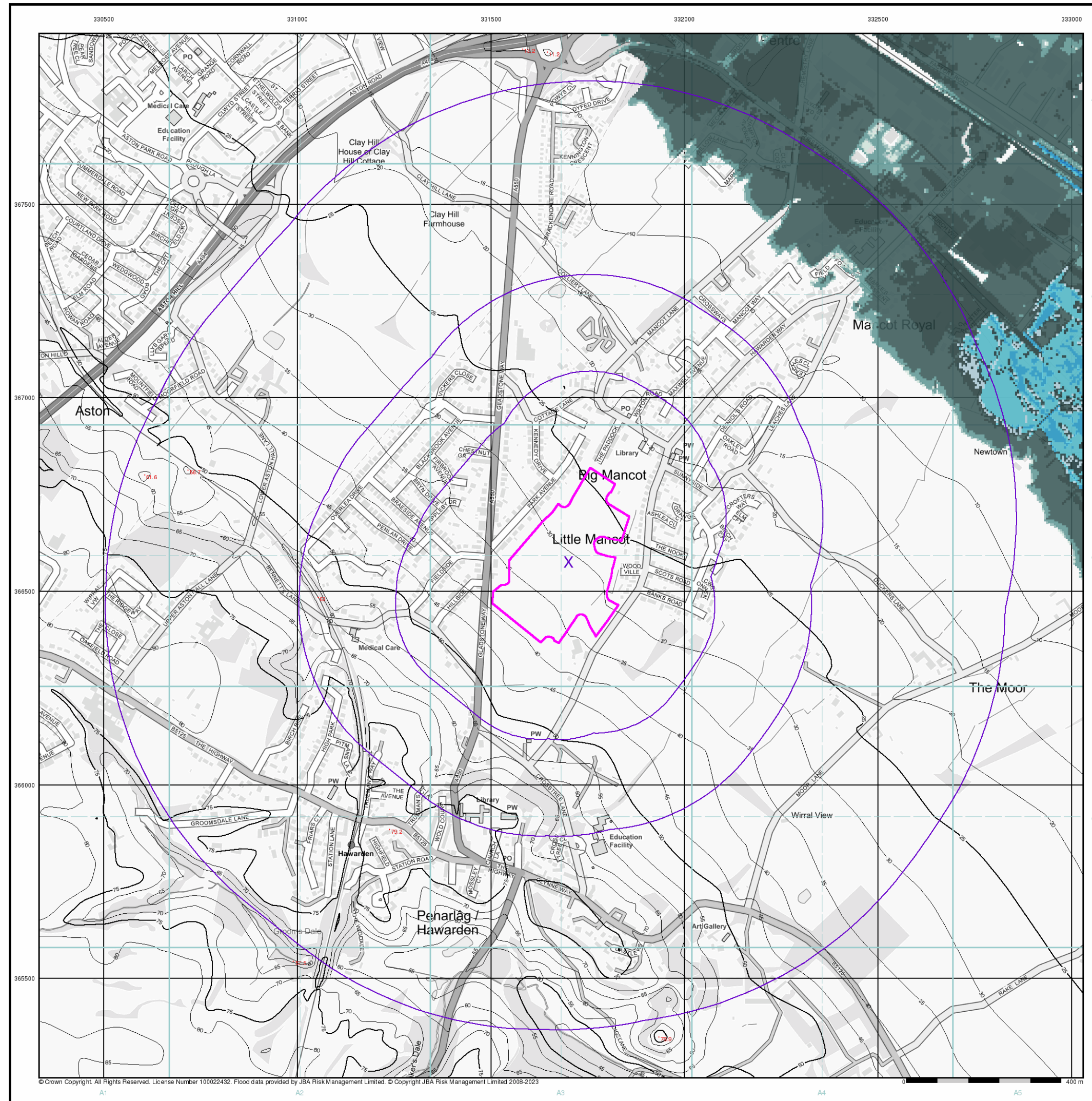
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



JBA 100 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

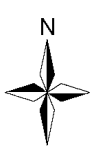
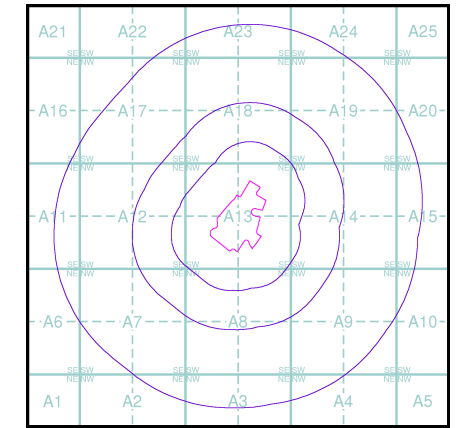
Modelled Flood Depth

Fluvial Depth	Coastal Depth
0.01m - 0.05m	0.01m - 0.05m
0.05m - 0.1m	0.05m - 0.1m
0.1m - 0.3m	0.1m - 0.3m
0.3m - 1m	0.3m - 1m
>1m	>1m

Contours (height in metres)

- Standard Contour 105 MLW Mean Low Water
- Master Contour 100 MHW Mean High Water
- Spot Height 167.8

JBA 100 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX

JBA 200 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

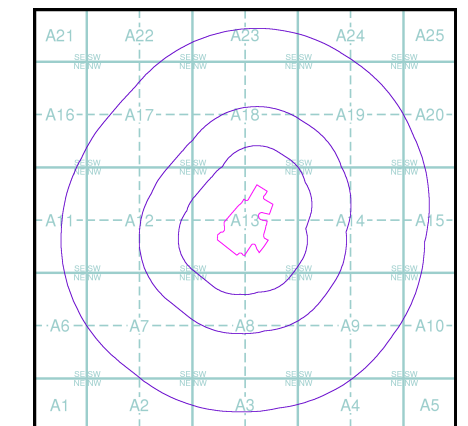
Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

- Standard Contour 105
- Master Contour 100
- Spot Height 167.8
- Mean Low Water
- Mean High Water

JBA 200 Year Return Flood Map (Undefended) - Slice A

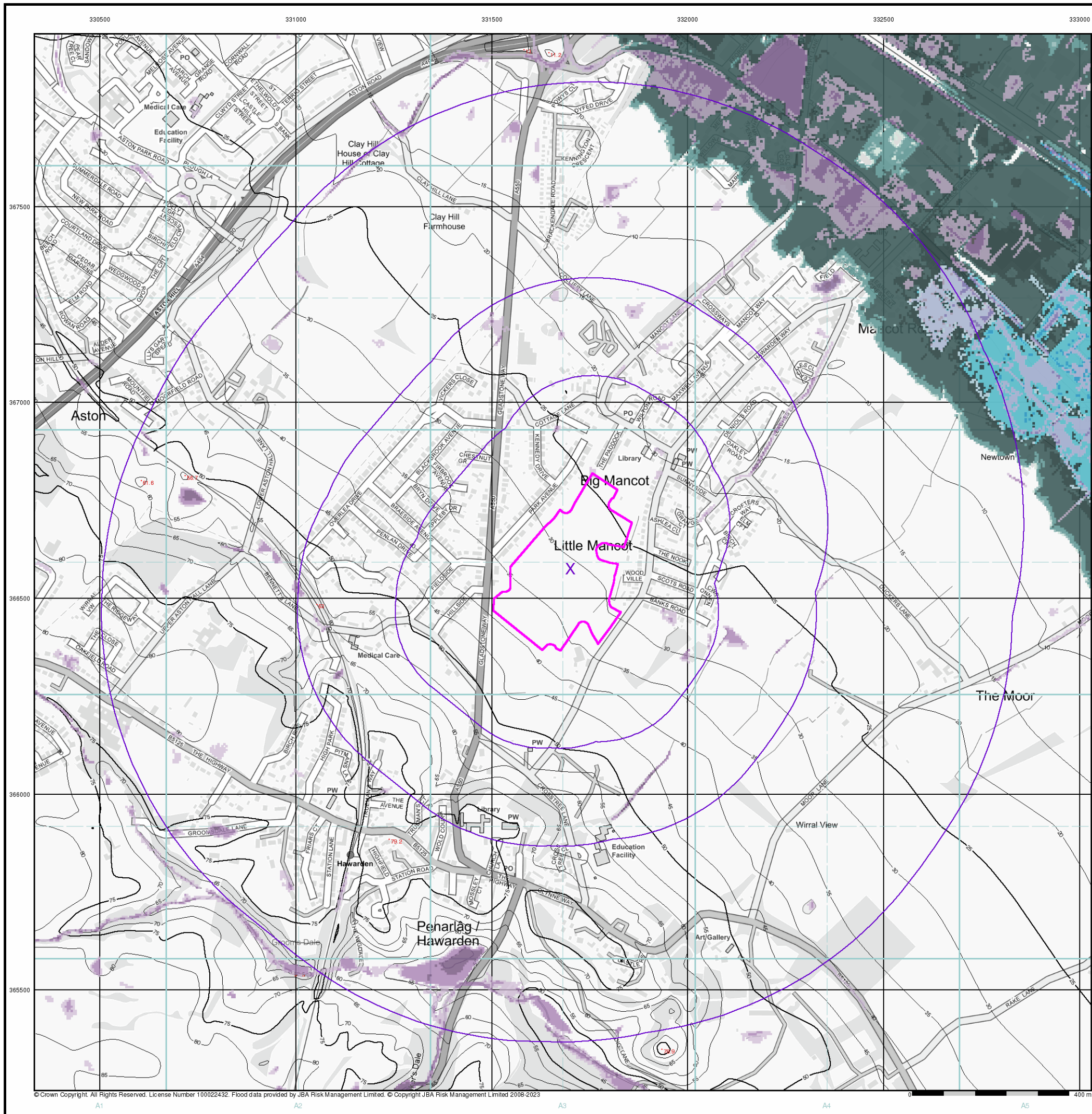


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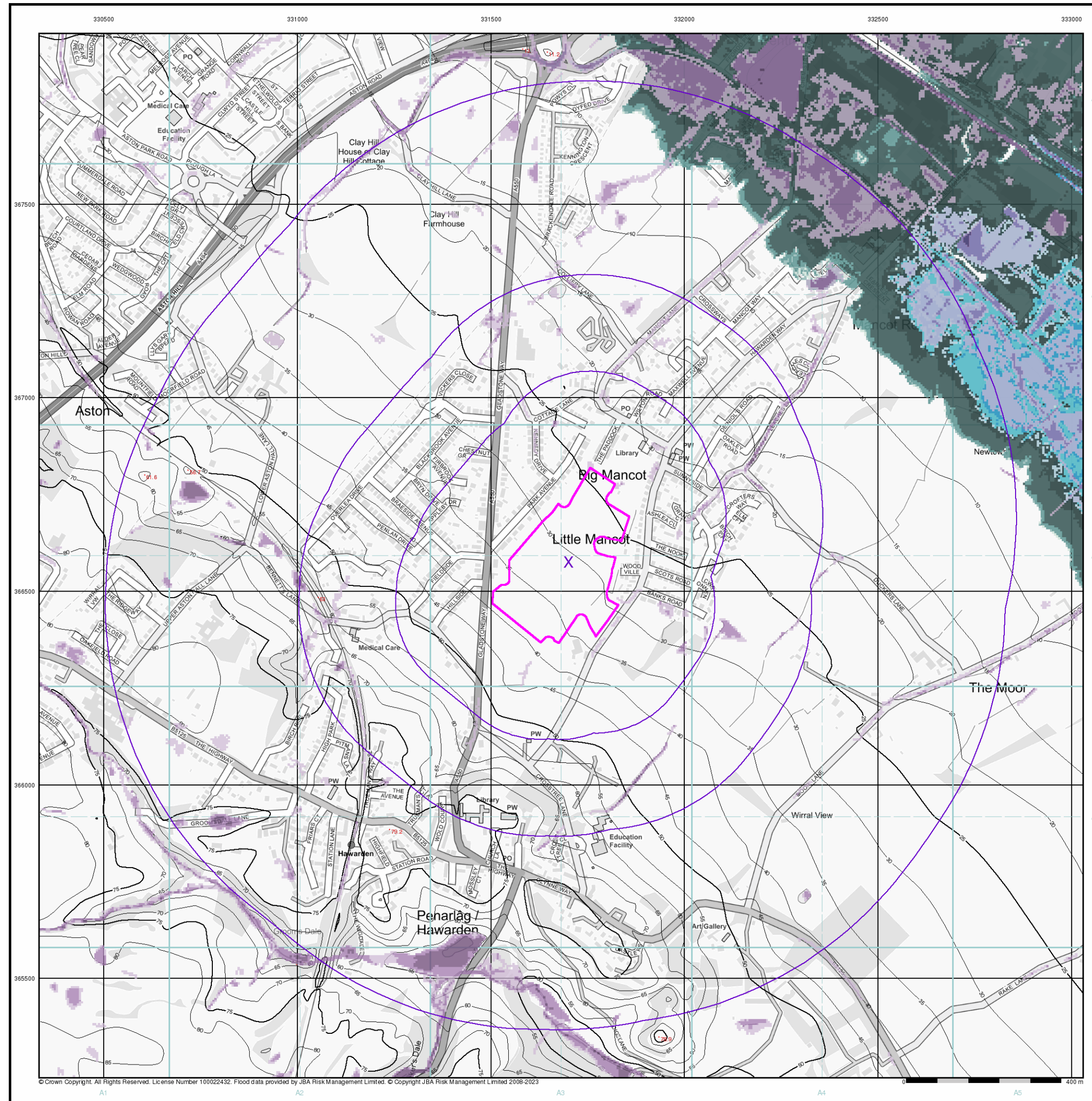
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX



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JBA 1000 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

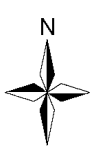
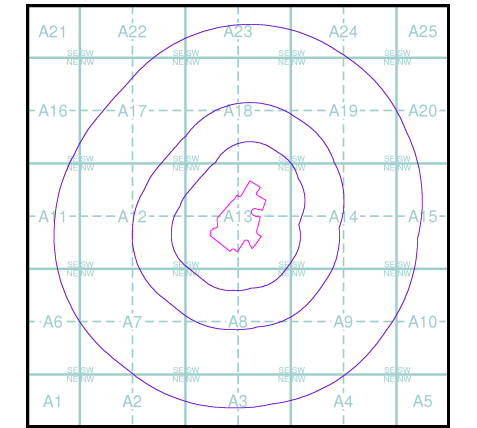
Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

- Standard Contour: 105, 100, 95
- Master Contour: 105, 100, 95
- Spot Height: 167.8
- MLW: Mean Low Water
- MHW: Mean High Water

JBA 1000 Year Return Flood Map (Undefended) - Slice A



Order Details

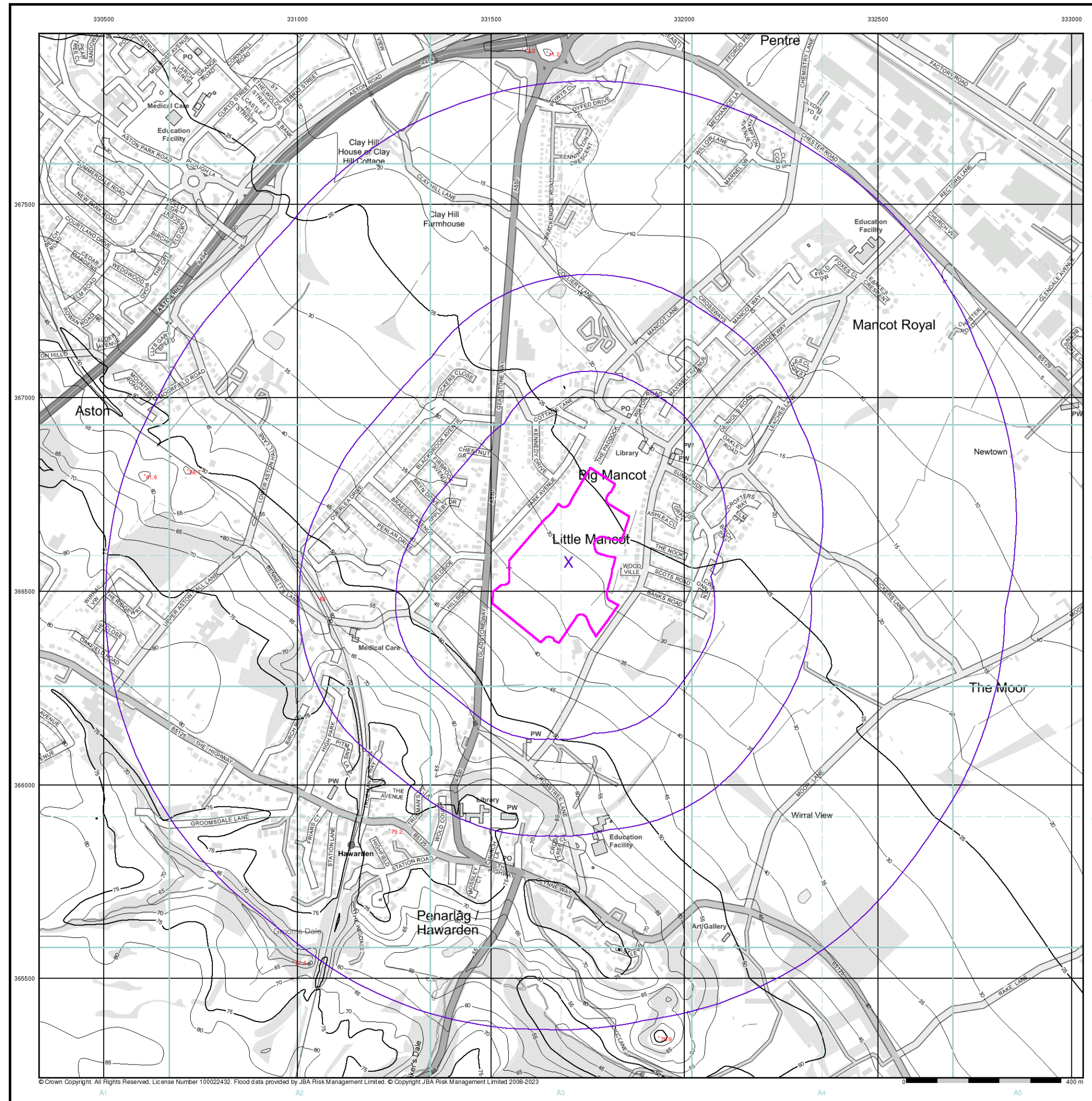
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



JBA Canal Failure Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

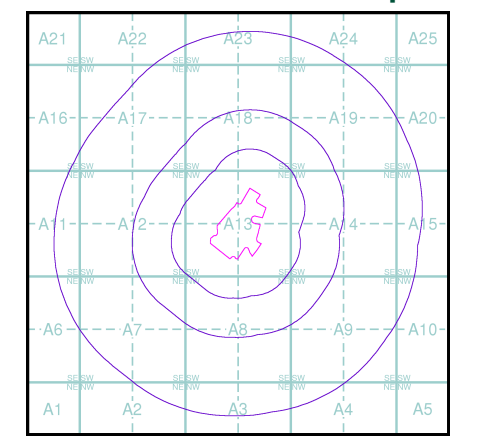
Flood Data

- Canal Failure
- Coverage

Contours (height in metres)

- Standard Contour
- Master Contour
- Spot Height
- MLW - Mean Low Water
- MHW - Mean High Water

JBA Canal Failure Flood Map - Slice A



Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

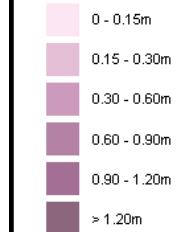
Site Details

Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX

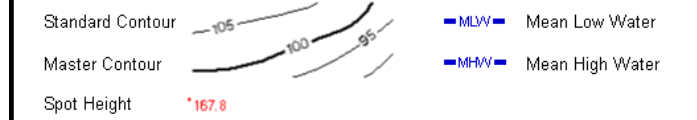
EANRW Surface Water 30 Year Return Depth Map (1:10,000)

General
 Specified Site (pink dot) Specified Buffer(s) (purple line) Bearing Reference Point (X)

Surface Water Depth



Contours (height in metres)

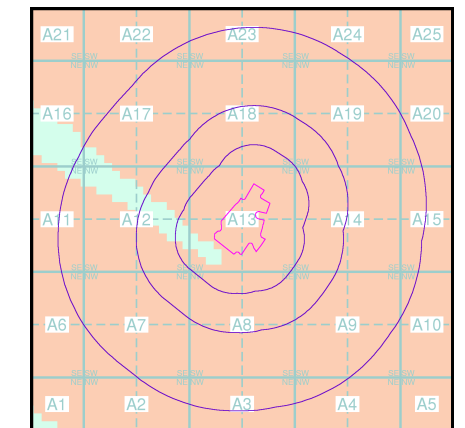


Suitability

See the suitability map below

- National to county (light green)
- County to town (orange)
- Town to street (blue)
- Street to parcels of land (pink)
- Property (yellow)

EANRW Suitability Map - Slice A

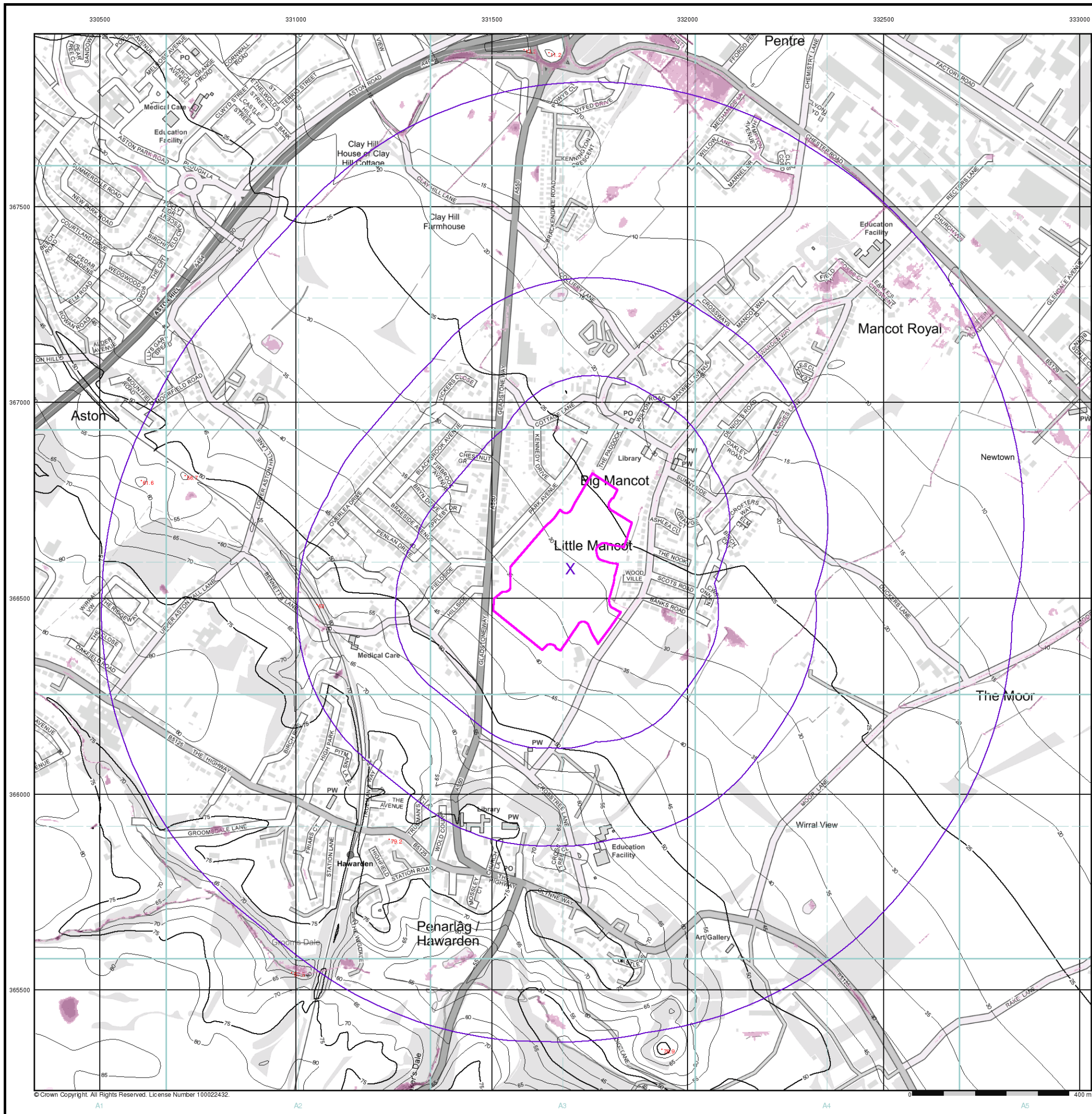


Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

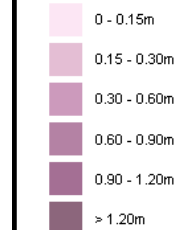
Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX



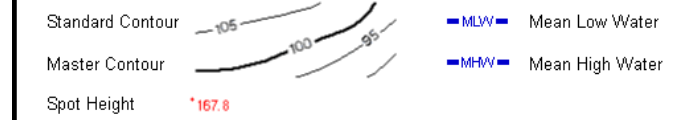
EANRW Surface Water 100 Year Return Depth Map

General
 Specified Site (pink outline) Specified Buffer(s) (purple outline) Bearing Reference Point (X)

Surface Water Depth



Contours (height in metres)

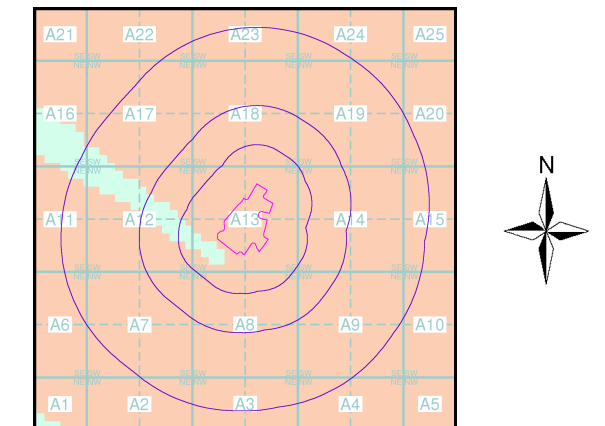


Suitability

See the suitability map below

- National to county (light green)
- County to town (orange)
- Town to street (blue)
- Street to parcels of land (pink)
- Property (yellow)

EANRW Suitability Map - Slice A

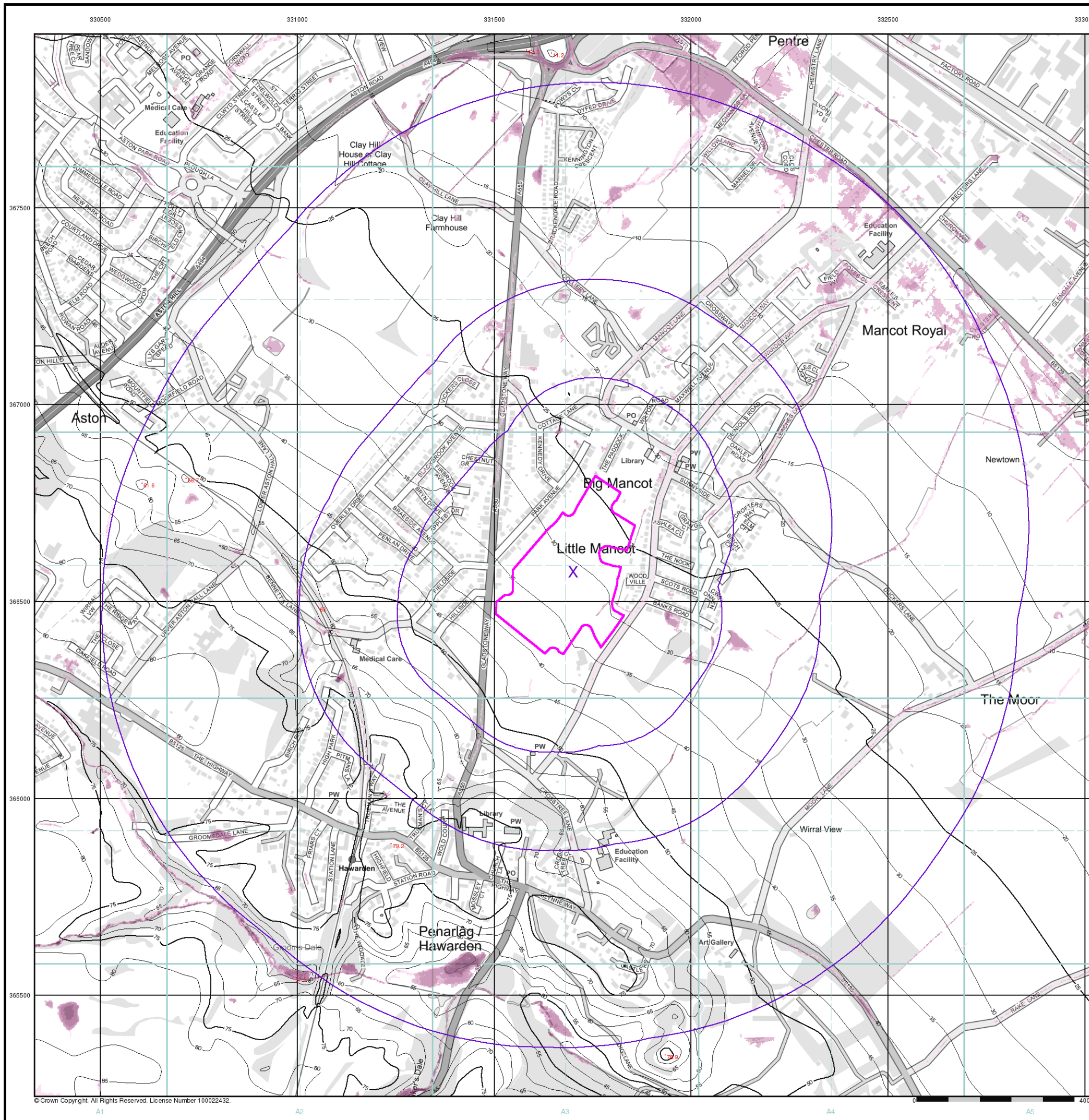


Order Details

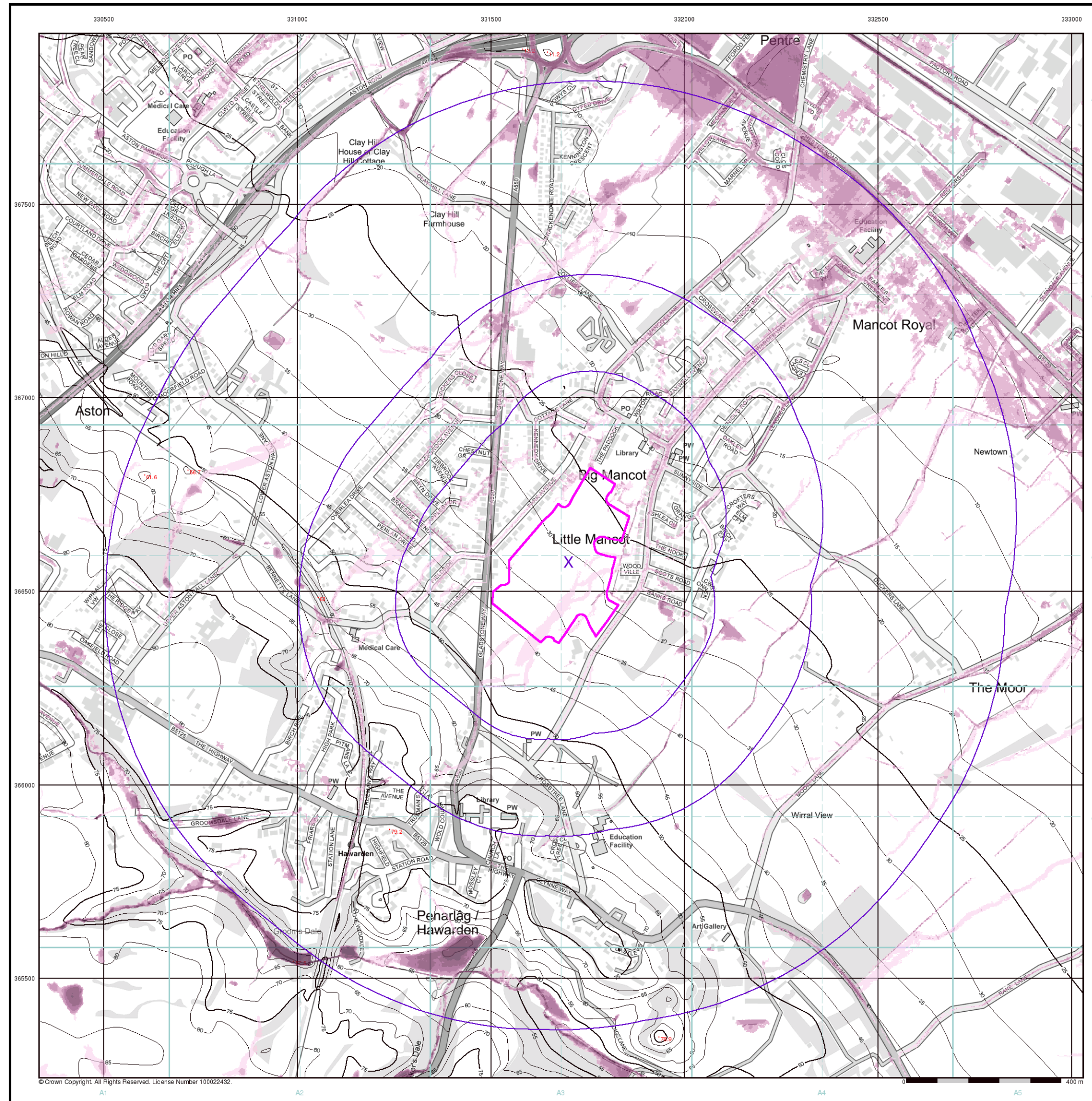
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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E/NRW Surface Water 1000 Year Return Depth Map (1:10,000)

General
 Specified Site (Red X) Specified Buffer(s) (Purple outline) Bearing Reference Point (Black X)

Surface Water Depth

0 - 0.15m
0.15 - 0.30m
0.30 - 0.60m
0.60 - 0.90m
0.90 - 1.20m
> 1.20m

Contours (height in metres)

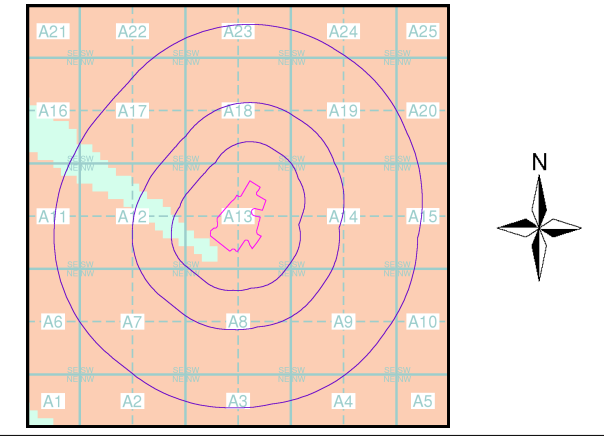
Standard Contour: 105, 100, 95
 Master Contour: 100
 Spot Height: *167.8

MLW Mean Low Water (Blue line)
 MHW Mean High Water (Blue line)

Suitability
 See the suitability map below

National to county	Street to parcels of land
County to town	Property
Town to street	

E/NRW Suitability Map - Slice A

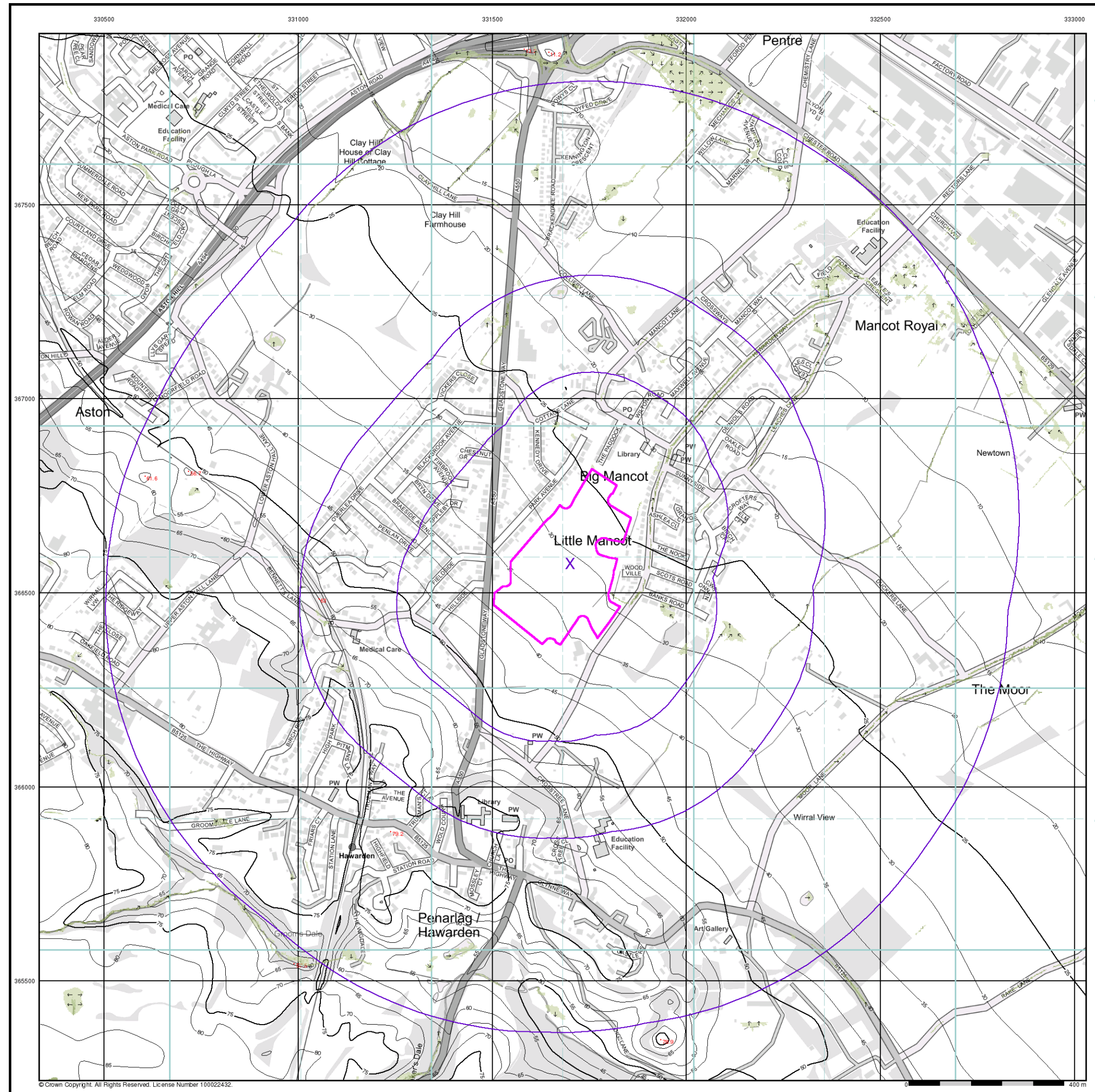


Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details
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E/ANRW Surface Water 30 Year Return Velocity and Flow Direction Map (1:10,000)

General
 Specified Site (pink outline) Specified Buffer(s) (purple circles) Bearing Reference Point (X)

Surface Water Velocity and Direction

0.00 - 0.25m/s	↑ Flow Direction at maximum velocity
0.25 - 0.50m/s	
0.50 - 1.00m/s	
1.00 - 2.00m/s	
> 2.00m/s	

Contours (height in metres)

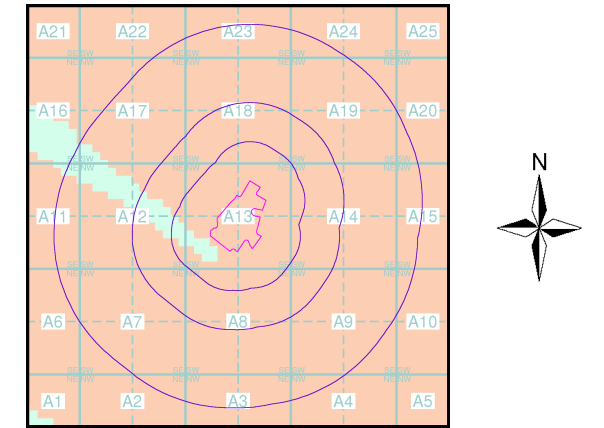
Standard Contour: 105, 100, 95
 Master Contour: 105, 100, 95
 Spot Height: *167.8

— MLW — Mean Low Water
 — MHW — Mean High Water

Suitability
 See the suitability map below

National to county	Street to parcels of land
County to town	Property
Town to street	

E/ANRW Suitability Map - Slice A

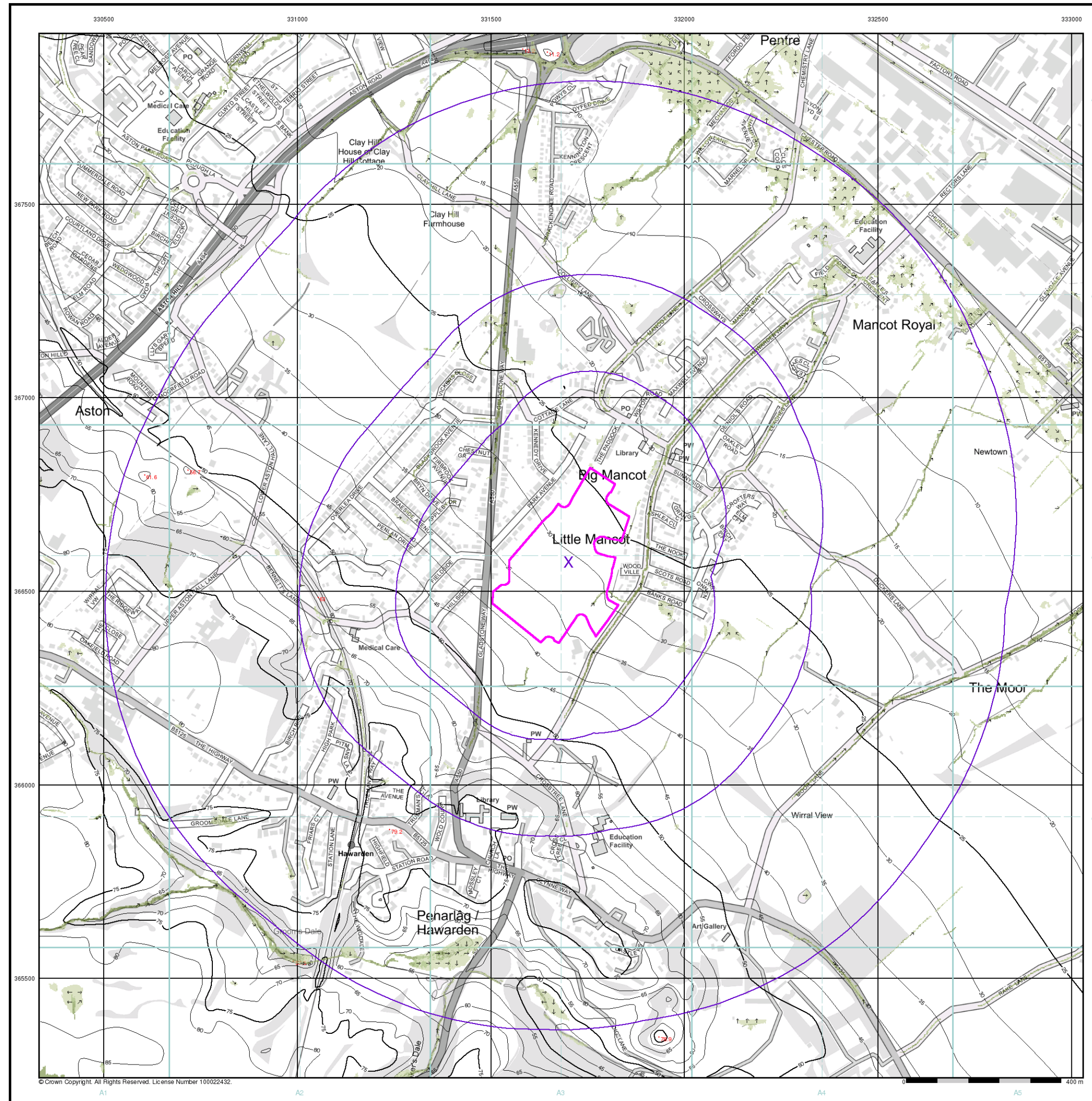


Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details
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E/ANRW Surface Water 100 Year Return Velocity and Flow Direction Map (1:10,000)

General
 Specified Site (pink polygon) Specified Buffer(s) (purple line) Bearing Reference Point (X)

Surface Water Velocity and Direction

0.00 - 0.25m/s	Flow Direction at maximum velocity (arrow)
0.25 - 0.50m/s	
0.50 - 1.00m/s	
1.00 - 2.00m/s	
> 2.00m/s	

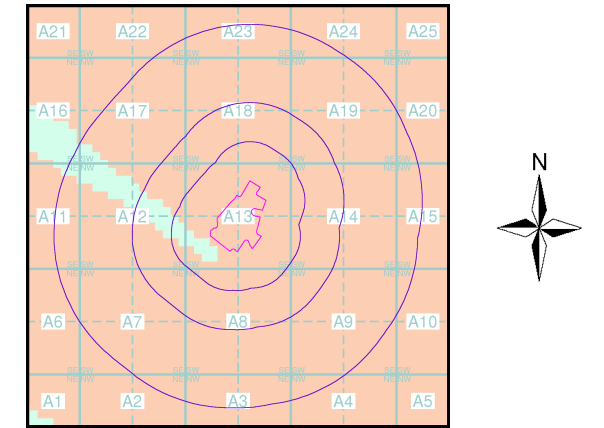
Contours (height in metres)

Standard Contour (105, 100, 95)	MLW (Mean Low Water)
Master Contour	MHW (Mean High Water)
Spot Height (167.8)	

Suitability
 See the suitability map below

National to county (light green)	Street to parcels of land (pink)
County to town (orange)	Property (yellow)
Town to street (blue)	

E/ANRW Suitability Map - Slice A



Order Details

Order Number:	317158724_1_1
Customer Ref:	8271
National Grid Reference:	331700, 366580
Slice:	A
Site Area (Ha):	8.63
Search Buffer (m):	1000

Site Details
 Land off Gladstone Way, Hawarden, Mancot, Deeside, CH5 2BX

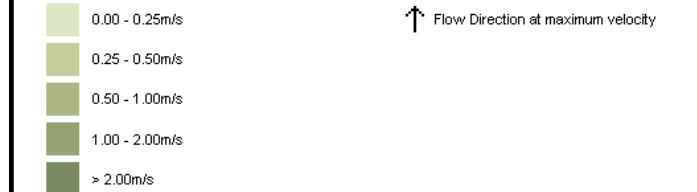
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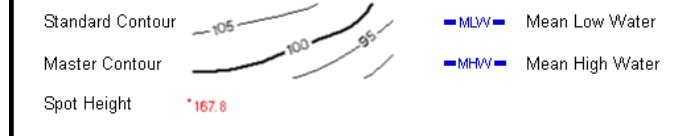
EANRW Surface Water 1000 Year Return Velocity and Flow Direction Map (1:10,000)

General
 Specified Site Specified Buffer(s) Bearing Reference Point

Surface Water Velocity and Direction



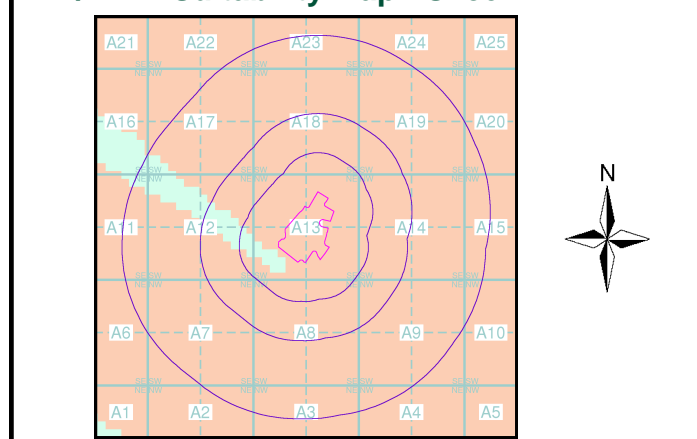
Contours (height in metres)



Suitability

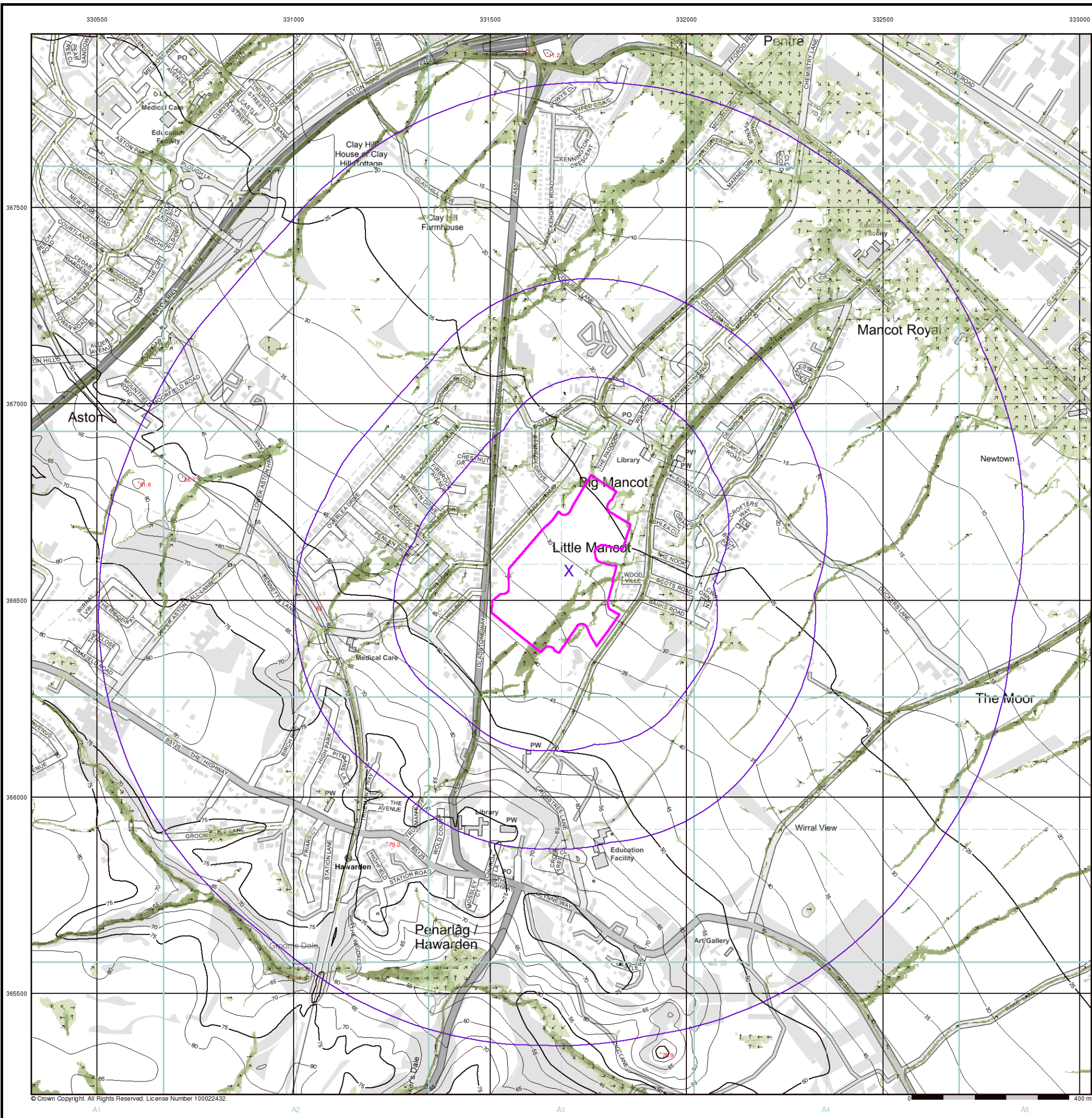


EANRW Suitability Map - Slice A

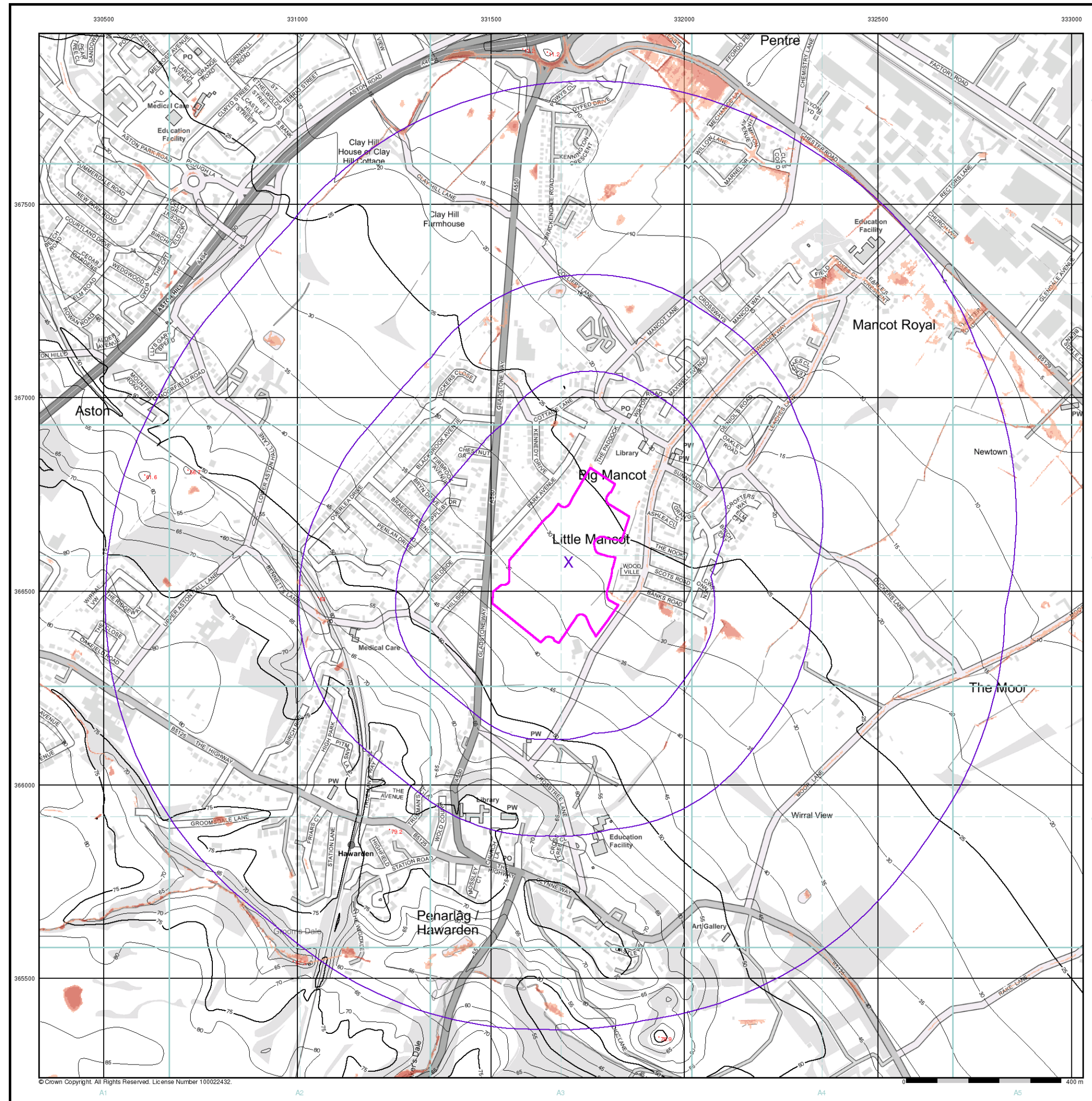


Order Details
 Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

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E/ANRW Surface Water 30 Year Return Hazard Rating Map (1:10,000)

General
 Specified Site (pink X) Specified Buffer(s) (purple line) Bearing Reference Point (black X)

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

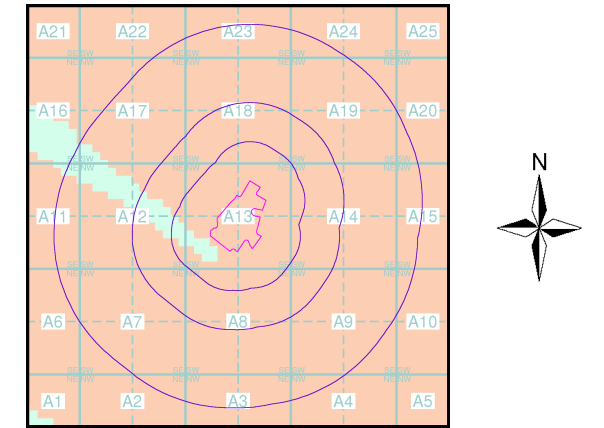
Contours (height in metres)

- Standard Contour (105, 100, 95)
- Master Contour (105, 100, 95)
- Spot Height (167.8)
- MLW (Mean Low Water)
- MHW (Mean High Water)

Suitability
 See the suitability map below

- National to county (light green)
- County to town (orange)
- Town to street (blue)
- Street to parcels of land (pink)
- Property (yellow)

E/ANRW Suitability Map - Slice A



Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details
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EANRW Surface Water 100 Year Return Hazard Rating Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- ✕ Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

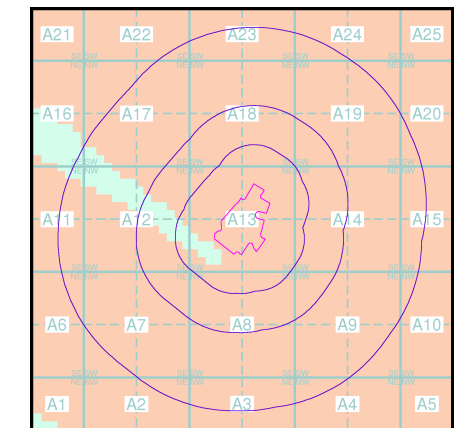
- Standard Contour
- Master Contour
- Spot Height
- MLW — Mean Low Water
- MHW — Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EANRW Suitability Map - Slice A

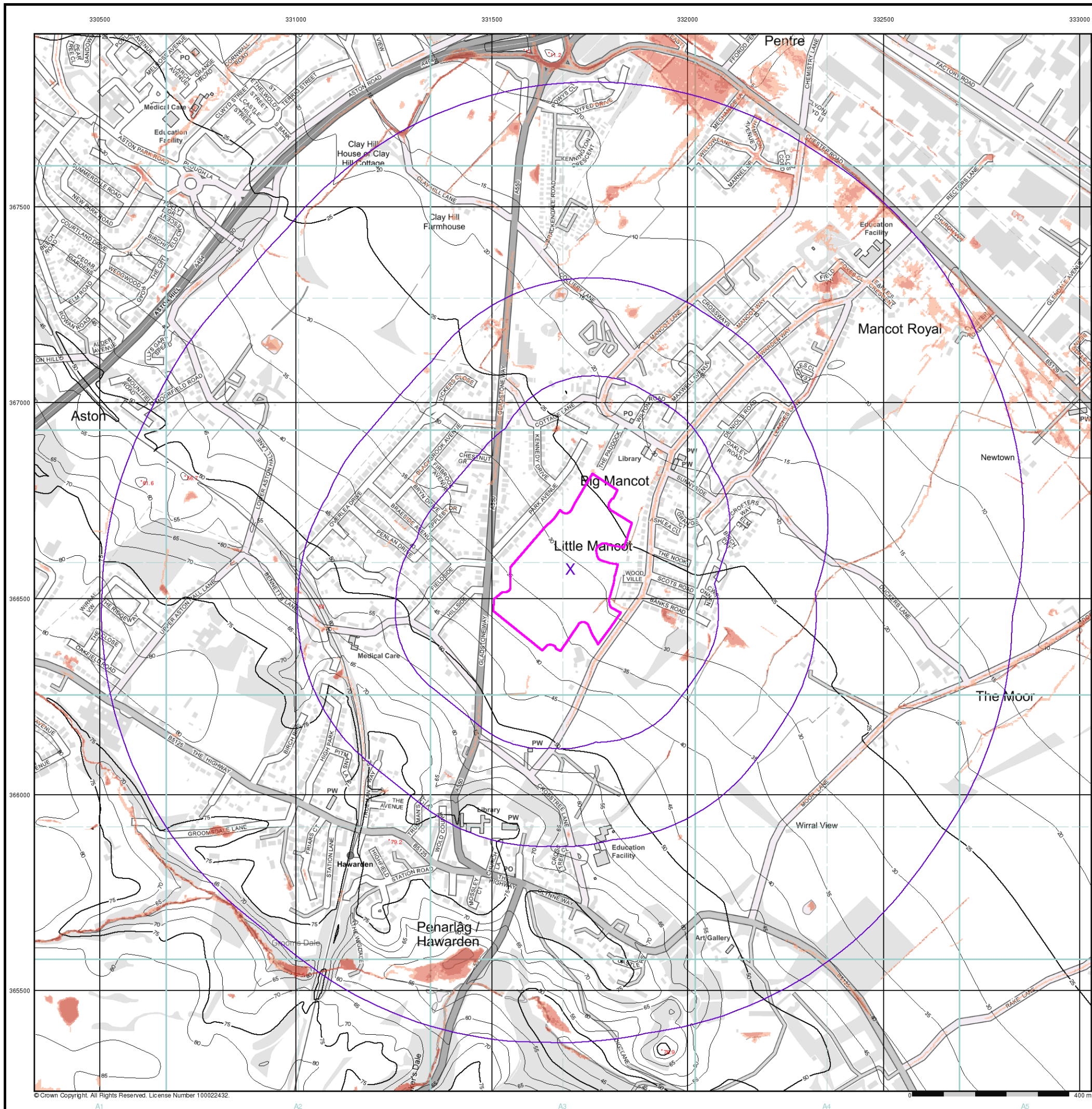


Order Details

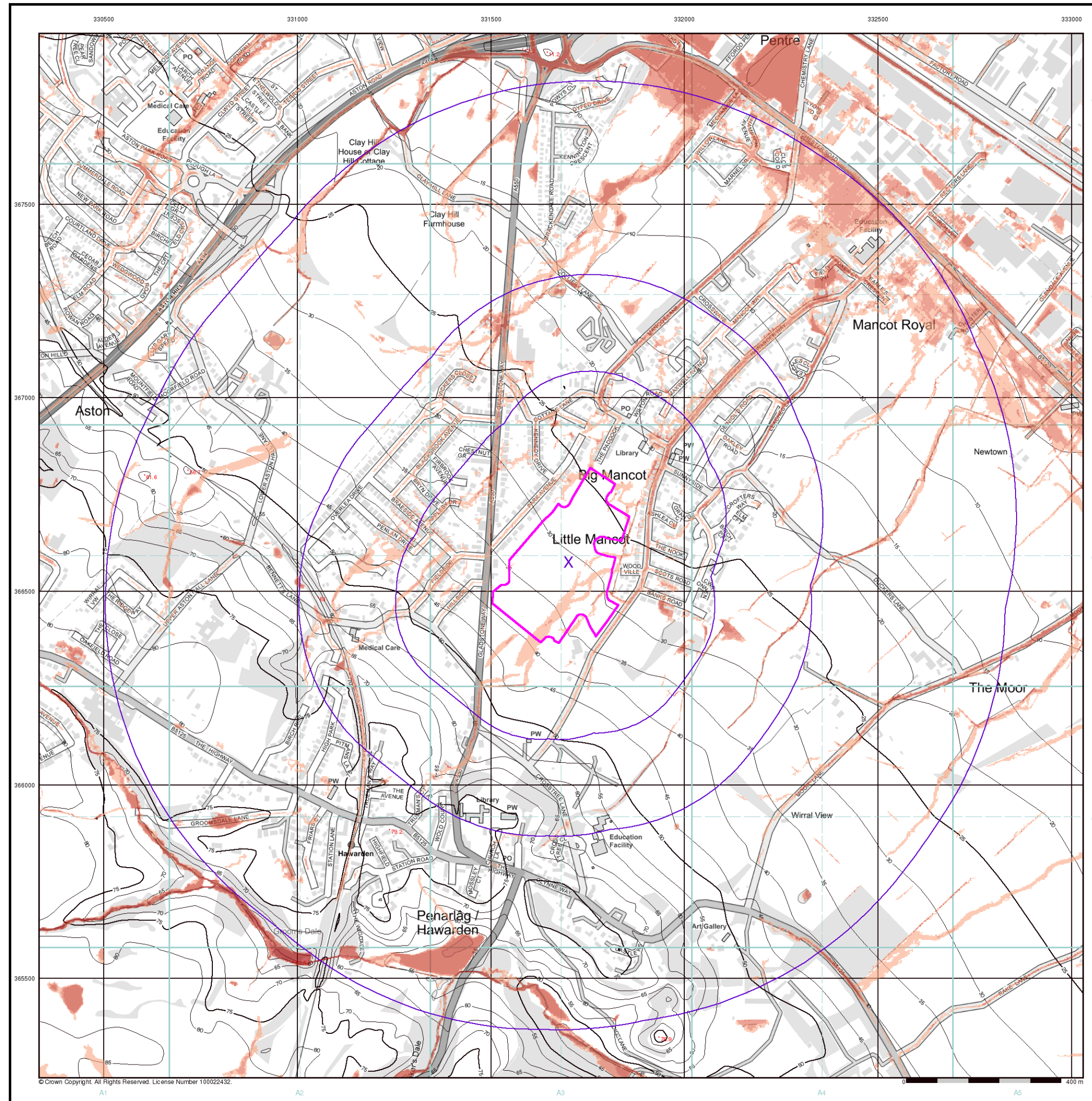
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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E/NRW Surface Water 1000 Year Return Hazard Rating Map (1:10,000)

General
 ● Specified Site ○ Specified Buffer(s) X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

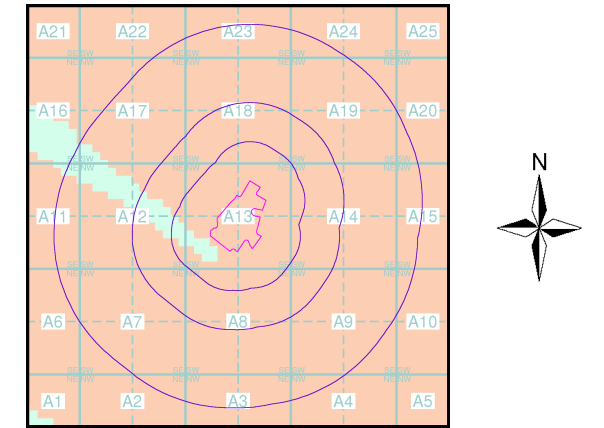
Contours (height in metres)

Standard Contour — 105 — — MLW — Mean Low Water
 Master Contour — 100 — — MHW — Mean High Water
 Spot Height * 167.8

Suitability
 See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

E/NRW Suitability Map - Slice A



Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details
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OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- ✕ Bearing Reference Point

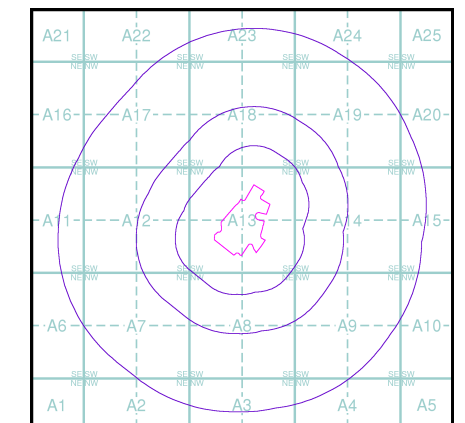
OS Water Network Data

- | | |
|----------------|---------------------------|
| — Canal | — Drain |
| — Reservoir | — Other |
| — Foreshore | — Lake |
| — Marsh | — Transfer |
| — Tidal River | — Lock Or Flight Of Locks |
| — Inland River | — Sea |
| ● Junction | ● Source |
| ● Outlet | ● Other |
| ● Pseudo | |

Contours (height in meters)

- Standard Contour 105
- Master Contour 100
- Spot Height 167.3
- MLW — Mean Low Water
- MHW — Mean High Water

OS Water Network Map - Slice A

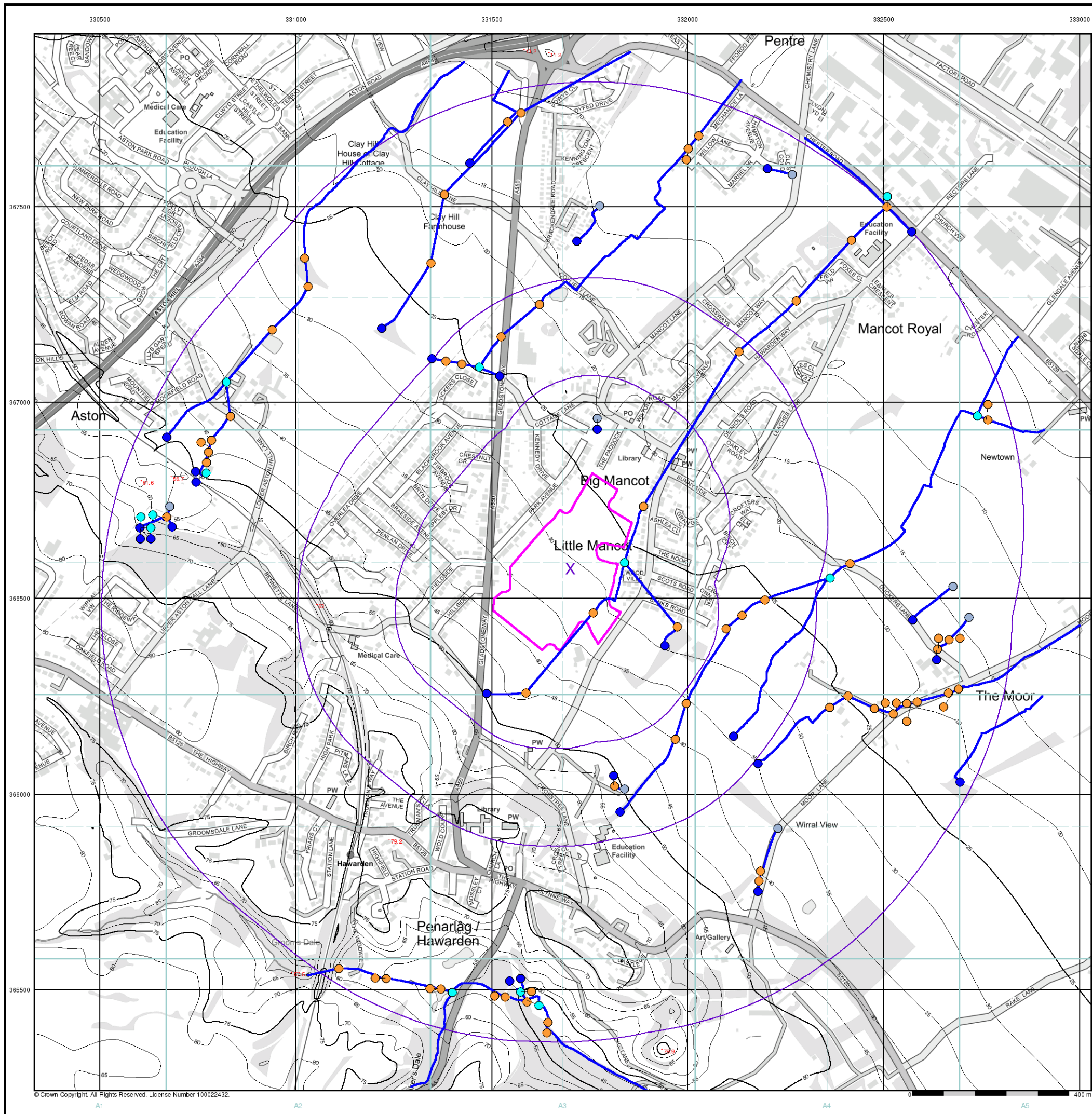


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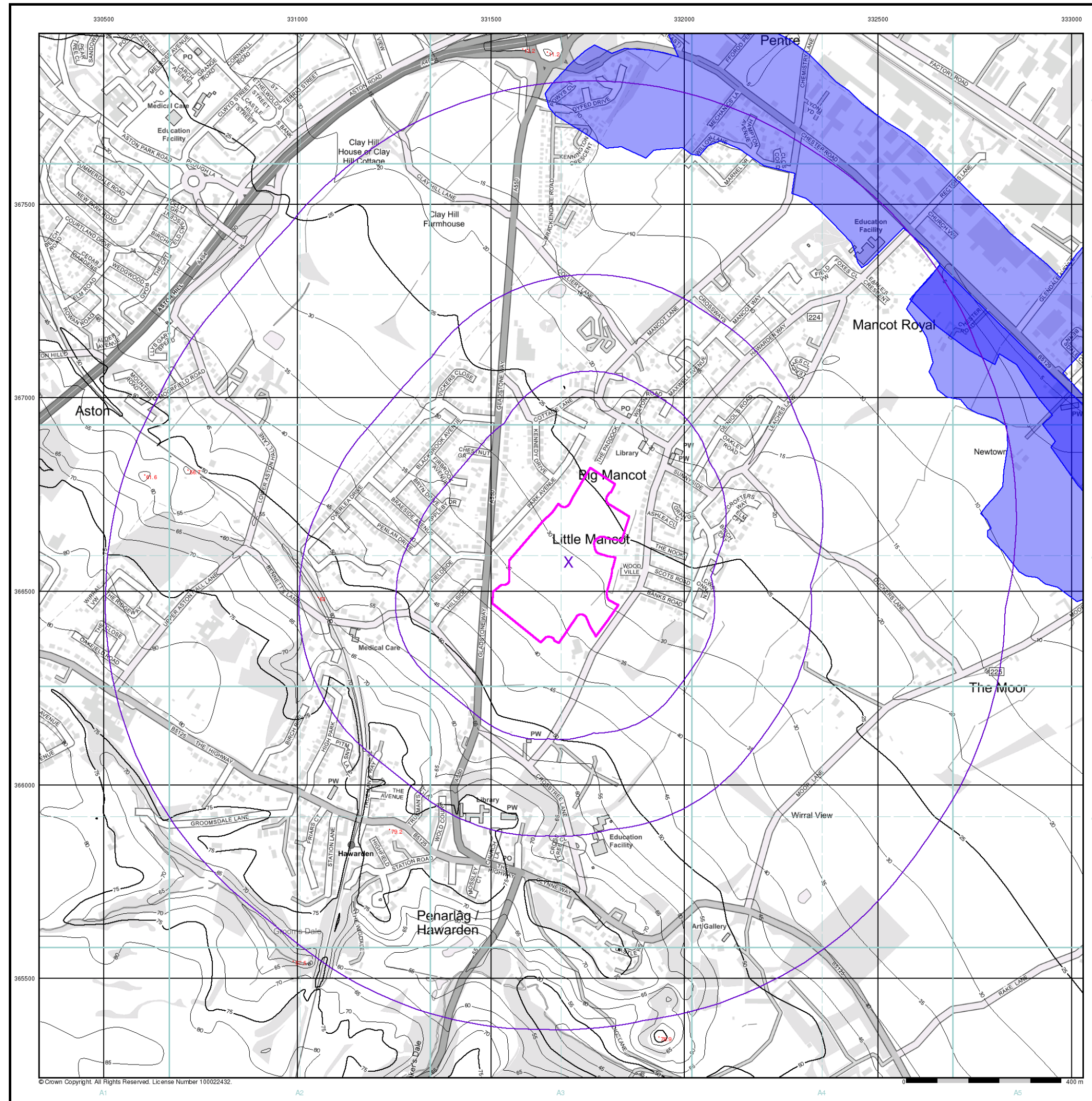
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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EANRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

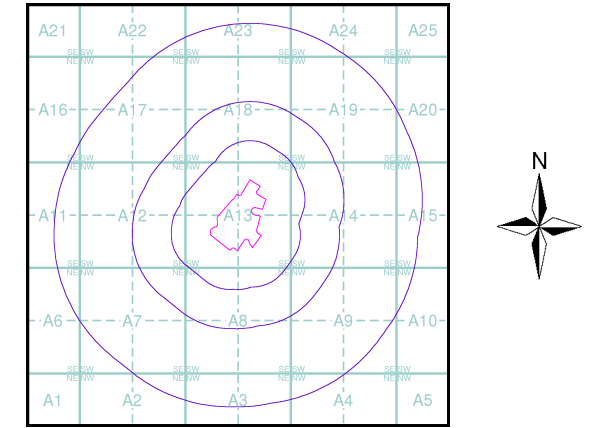
Historic Flood Events Data

- | | |
|--|---------------------------------------|
| Channel Capacity Exceeded (no raised defences) | Obstruction/Blockage - Culvert |
| Channel Capacity Exceeded /Surface Water | Obstruction/Blockage - Debris Screen |
| Groundwater/High Water Table | Operational Failure/Breach of Defence |
| Local Drainage/Surface Water | Other |
| Mechanical Failure | Overtopping of Defences |
| Obstruction/Blockage - Bridge | Surface Water |
| Obstruction/Blockage - Channel | Unknown |
| Historical Flood Liabilities | |

Contours (height in metres)

- Standard Contour 105
- Master Contour 100 95
- Spot Height 167.8
- MLW - Mean Low Water
- MHW - Mean High Water

EANRW Historic Flood Map - Slice A



Order Details

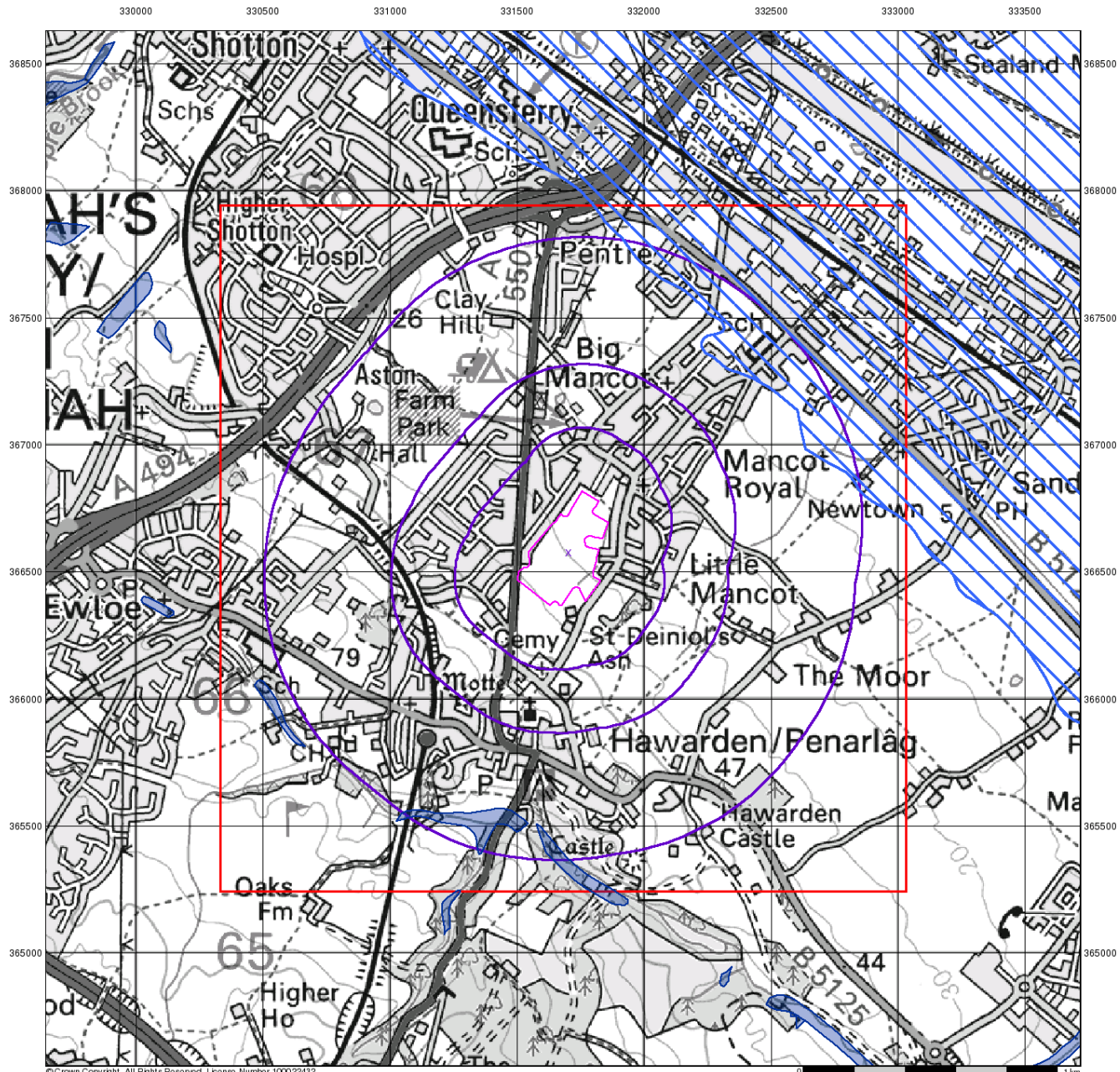
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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BGS Flood Data (1:50,000)

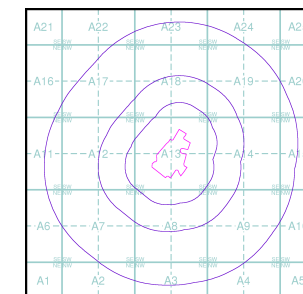
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

BGS Geological Indicators of Flooding

- Coastal
- Inland
- Bodies of Water

BGS Flood Data Map - Slice A



Order Details

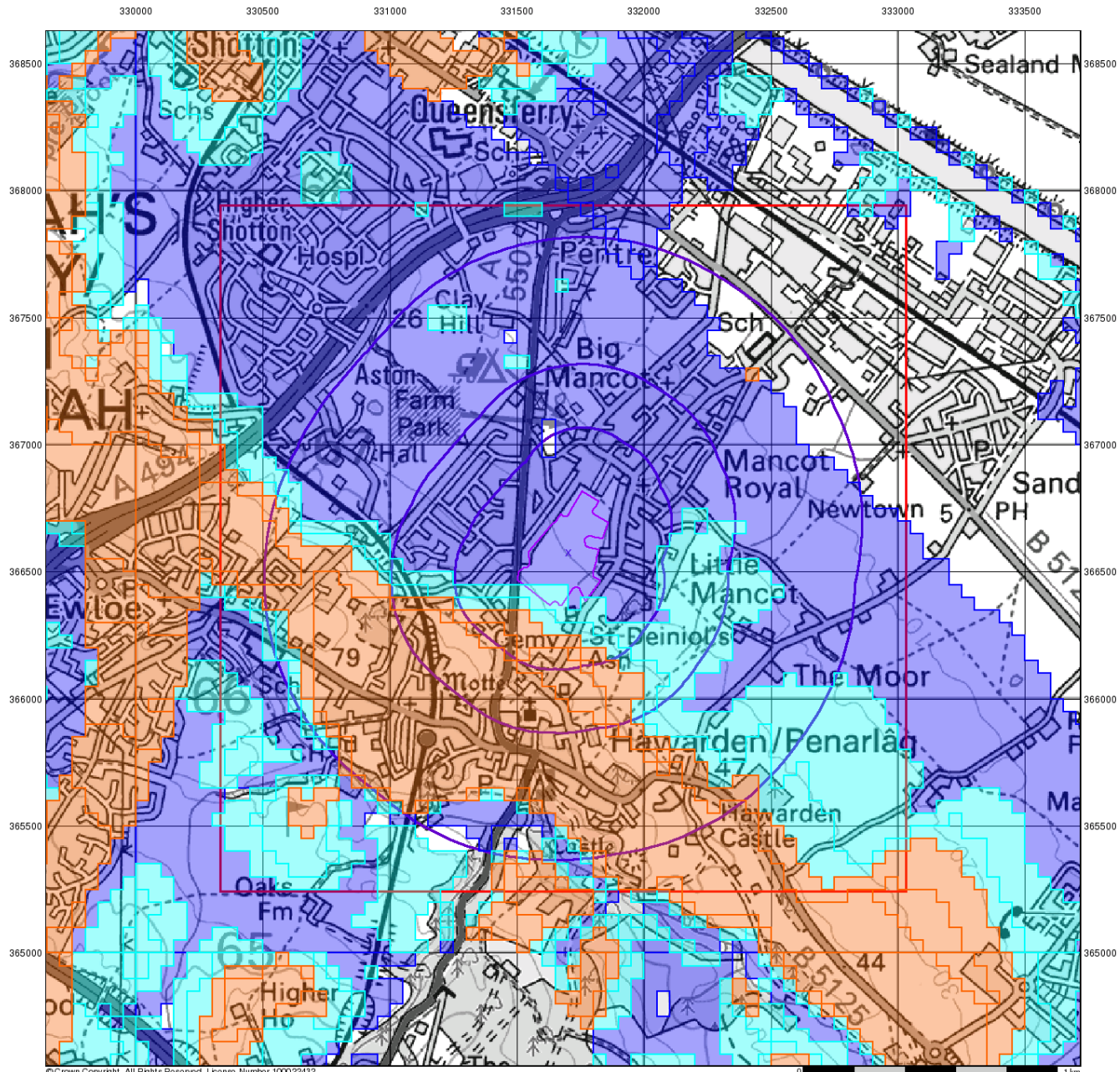
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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BGS Flood Data (1:50,000)

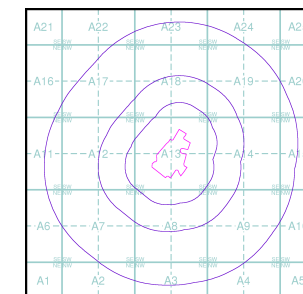
General

- ◇ Specified Site
- Specified Buffer(s)
- ✕ Bearing Reference Point
- Slice
- B Map ID

BGS Groundwater Flooding Susceptibility

- Potential for Groundwater Flooding to Occur at Surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to Occur

BGS Flood Data Map - Slice A



Order Details

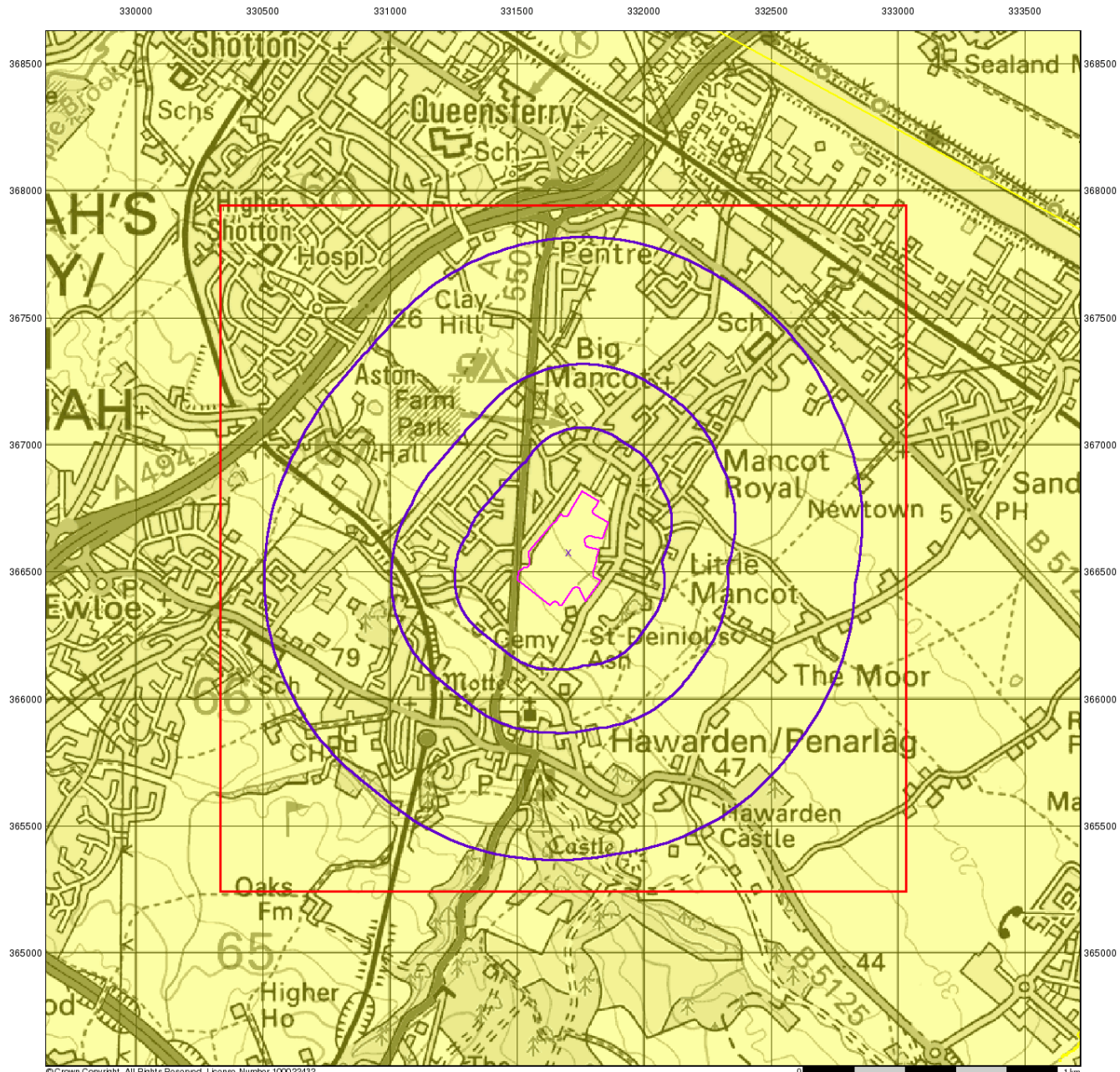
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 Slice: A
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Site Details

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0 1 km

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GeoSmart Information Groundwater Flood Map (1:50,000)

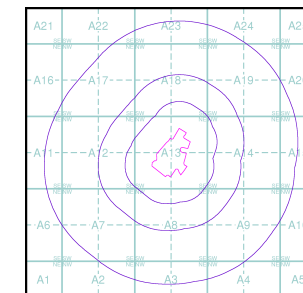
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice

GeoSmart Information Groundwater Flooding Risk

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

GeoSmart Information Groundwater Flood Map - Slice A



Order Details

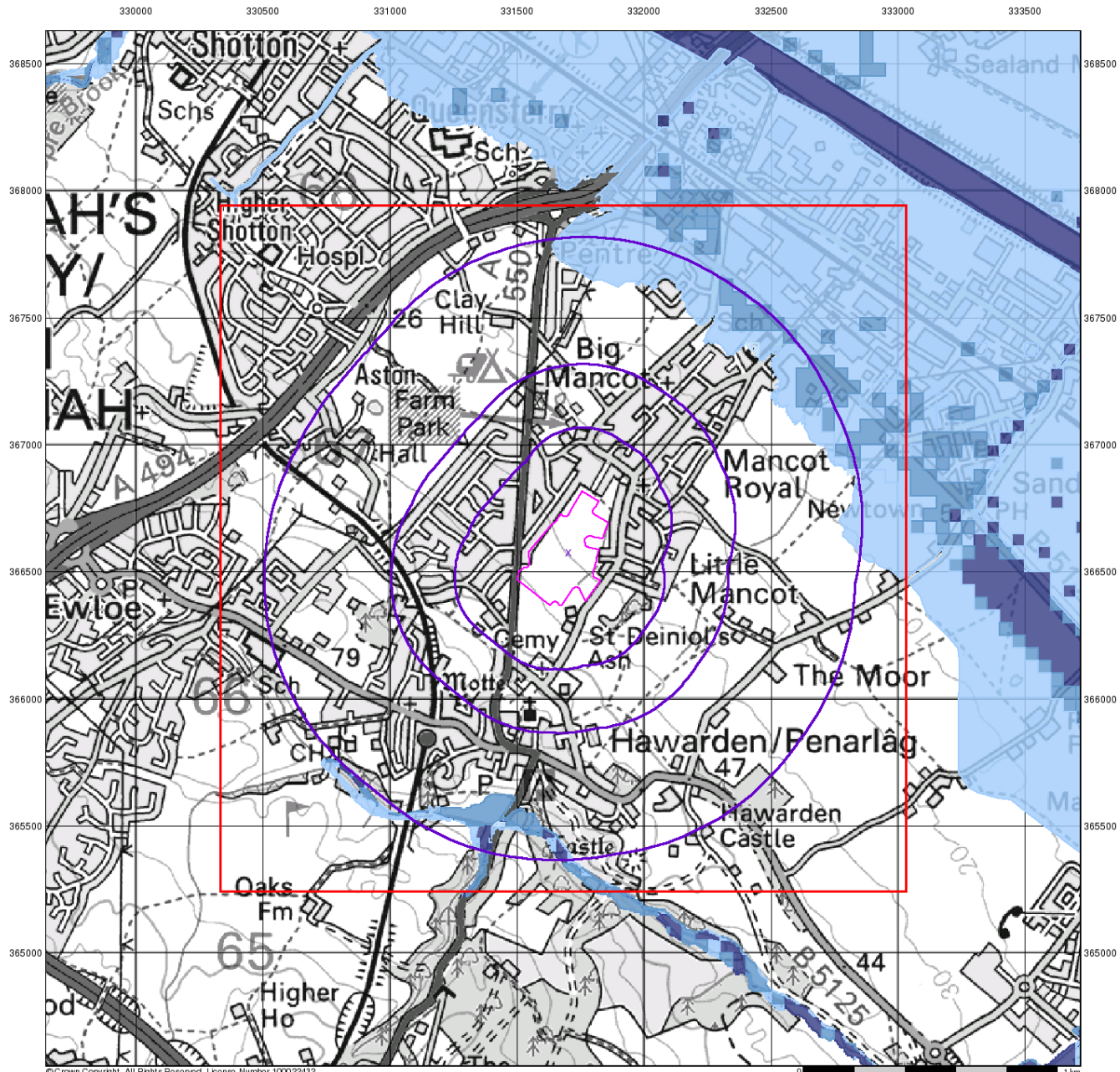
Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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EA/NRW RoFRS Data (1:50,000)

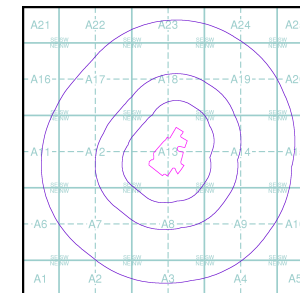
General

- ▭ Specified Site
- Specified Buffer(s)
- ✕ Bearing Reference Point
- ▭ Slice
- Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

EA/NRW RoFRS Data Map - Slice A



Order Details

Order Number: 317158724_1_1
 Customer Ref: 8271
 National Grid Reference: 331700, 366580
 Slice: A
 Site Area (Ha): 8.63
 Search Buffer (m): 1000

Site Details

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Flood Consequences Assessment
for Land off Gladstone Way, Mancot, Hawarden, Flintshire

Appendix 3

Infiltration Consideration

Trial Pit Information from E3P Site Investigation Report

Ref:13-673-R2-1 dated April 2021



- Location Symbols**
-  Approximate Window Sample Probehole Location
 -  Approximate Trial Pit Location
 -  Approximate Rotary Borehole Location
 -  Approximate Mineshaft Location
 -  Approximate Trial Trench Location

Notes:

Client:

William Hall & Co

Job No:

13-673

Date:

16.02.2021

Drawing No:

005

Scale:

NTS @ A3

Phase	Revision	Date	Issue	Drawn	Checked
P1	R3	16.02.2021	REVISION	HM	NS
P1	R2	12.02.2021	REVISION	HM	NS
P1	R1	09.02.2021	REVISION	HM	JS
P1	-	29.01.2021	DRAFT	HM	JS

Job Title:

Ash Lane, Mancot

Drawing Title:

Exploratory Hole Location Plan



Environmental Engineering Partnerships Ltd
 City Heliport & Business Centre
 Eccles, Manchester, M30 7RU
 Tel: 0161 707 9612
 E-mail: info@e3p.co.uk
 Website: www.e3p.co.uk


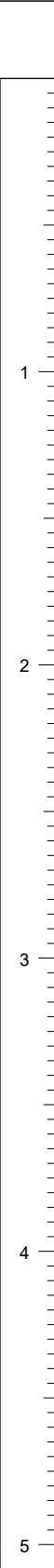
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Project Name: Ash Lane Project No. 13673 Co-ords: 331719.00 - 366762.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.50 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.30		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.50	ES					
	0.60	HVP	137.8				
	1.00	B					
	1.20	HVP	142.0				
				2.50		End of Pit at 2.50m	



Remarks: 1. Complete. 2. Final depth 2.50m bgl. 3. Clay friable sub 1.50m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331740.00 - 366724.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.50	HVP	93.3				
	1.00 1.00	ES+L HVP	142.0				
				3.20		End of Pit at 3.20m	


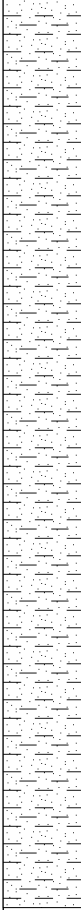
Remarks: 1. Complete. 2. Final depth 3.20m bgl. 3. Clay friable sub 1.20m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331768.00 - 366787.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.60	HVP	133.6					Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.10	HVP	142.0					
				3.20			End of Pit at 3.20m	



Remarks: 1. Complete. 2. Final depth 3.20m bgl. 3. Clay friable sub 1.50m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331795.00 - 366780.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES+L		0.30			MADE GROUND: Dark brown sandy very gravelly clay - reworked topsoil. Gravel is fine sub angular to rounded of mudstone and coal.
	0.60	ES					
	0.60	HVP	129.3				
	1.00	HVP	137.8				
	1.60	HVP	161.1				
	2.00	HVP	163.2				Stiff high strength to very stiff very high strength to very stiff mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
				2.80			End of Pit at 2.80m


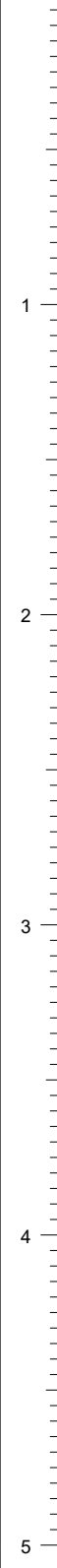

Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331799.00 - 366747.00 Date 30/11/2020


Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.		
	0.60	HVP	128.5					
	1.20	HVP	137.0					
	1.80	HVP	146.3					
	2.40	HVP	161.1					
	3.00	HVP	162.4			3.20		

Remarks: 1. Complete. 2. Final depth 3.20m bgl.

Stability: Stable.



Project Name: Ash Lane Project No. 13673 Co-ords: 331837.00 - 366711.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30	[Cross-hatched pattern]	MADE GROUND: Dark brown sandy very gravelly clay - reworked topsoil. Gravel is fine sub angular to rounded of mudstone and coal.	[Vertical scale bar with markings from 0 to 5]	
	0.50	HVP	89.9					[Dotted pattern]
	1.00	HVP	123.4			[Horizontal line pattern]		
	1.50	HVP	139.9					
				3.20		End of Pit at 3.20m		


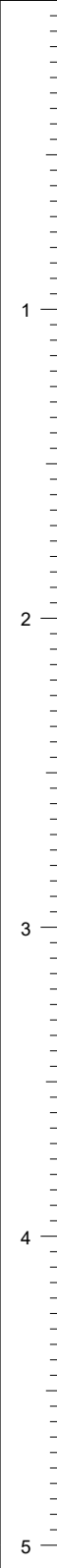

Remarks: 1. Complete. 2. Final depth 3.20m bgl. 3. Clay friable sub 1.80m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331821.00 - 366668.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.60 0.60	ES HVP	131.4				
	1.20	HVP	137.8				
	1.50	B					
	1.80	HVP	142.0				
	2.60	HVP	162.8	2.80		End of Pit at 2.80m	


Remarks: 1. Complete. 2. Final depth 2.80m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331833.00 - 366631.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	117.4				Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.20	HVP	137.0				
	1.60	HVP	142.0				
				2.80			End of Pit at 2.80m


Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Clay friable sub 1.80m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331769.00 - 366656.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	119.6				Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	0.80	ES					
	1.00	HVP	136.1				
	1.80	HVP	149.7				
				3.20			End of Pit at 3.20m



Remarks: 1. Complete. 2. Final depth 3.20m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331769.00 - 366611.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	114.5				Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.20	HVP	128.9				
	1.80	HVP	149.7				
				2.20			End of Pit at 2.20m


Remarks: 1. Complete. 2. Final depth 2.20m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331730.00 - 366605.00 Date 30/11/2020


Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.40 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.50	HVP	113.6				Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	0.80	ES					
	1.20	HVP	134.4				
	1.60	HVP	147.1				
				2.40			End of Pit at 2.40m

Remarks: 1. Complete. 2. Final depth 2.40m bgl.



Stability: Stable.



Project Name: Ash Lane Project No. 13673 Co-ords: 331832.00 - 366598.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.00 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 0.80	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	74.6				Firm medium strength to stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	0.80	ES					
	1.00	HVP	81.0				
	1.50	HVP	93.7				
	2.00	HVP	93.3				
	2.80	HVP	87.3	3.00			End of Pit at 3.00m

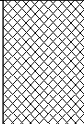
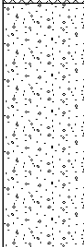
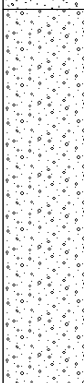
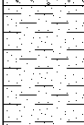
Remarks: 1. Complete. 2. Final depth 2.50m bgl. 3. Water strike at 0.80m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331789.00 - 366525.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES+L		0.40			MADE GROUND: Dark brown sandy very gravelly clay - reworked topsoil. Gravel is fine sub angular to rounded of mudstone and coal.
	0.80	ES		1.20			Brown grey mottled silty gravelly fine to coarse SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
	1.00	B					
	2.40	HVP	135.7	2.40			Reddish brown sandy very silty GRAVEL. Gravel is fine to coarse sub angular to rounded of mudstone.
				2.80			Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
							End of Pit at 2.80m


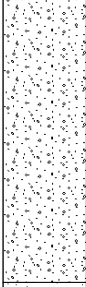



Remarks: 1. Complete. 2. Final depth 3.00m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331733.00 - 366533.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.50 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			MADE GROUND: Dark brown sandy very gravelly clay - reworked topsoil. Gravel is fine sub angular to rounded of mudstone and coal.
	1.00 1.00	B ES		1.20			Brown grey mottled silty gravelly fine to coarse SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
	1.40	HVP	117.0				Stiff high strength to very stiff very high strength to very stiff mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.90	HVP	142.9				
	2.30	HVP	151.4				
				2.50			End of Pit at 2.50m


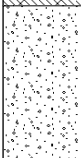

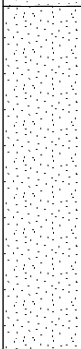
Remarks: 1. Complete. 2. Final depth 2.50m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331675.00 - 366537.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.90 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
				0.80			Brown silty very gravelly fine to coarse SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
	1.20	HVP	125.1	1.80			Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
				2.90			Dark greyish brown slightly silty finr to medium SAND.
							End of Pit at 2.90m



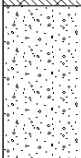

Remarks: 1. Complete. 2. Final depth 2.90m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331699.00 - 366497.00 Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 0.50				0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.50	ES		0.80			Brown silty gravelly fine to coarse SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
	1.00	HVP	117.0	2.00			Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.80	HVP	85.6	2.80			Firm mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal. With 5mm thick horizontal silty sand bands
							End of Pit at 2.80m



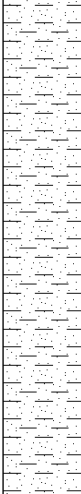
Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Water strike at 0.50m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331740.00 - 366470.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	ES					Brown grey slightly gravelly very clayey fine to medium SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
				1.20			Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.40	HVP	119.1				
	1.80	HVP	137.0				
	2.40	HVP	145.4				
				2.80			End of Pit at 2.80m




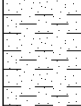
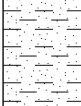

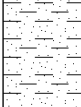
Remarks: 1. Complete. 2. Final depth 2.80m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331797.00 - 366467.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.00 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
							Brown grey slightly gravelly very clayey fine to medium SAND. Gravel is fine to coarse sub rounded to rounded of mudstone.
	1.20	ES+L		1.10			Firm medium strength to stiff high strength mottled grey brown slightly gravelly very sandy CLAY with organic components. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal. Organics are rootlets, roots and sticks.
	1.20	HVP	62.8				
	1.50	B					
	1.80	HVP	76.3				
	2.40	HVP	86.9				
				3.00			End of Pit at 3.00m


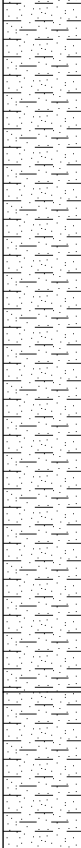
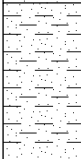
Remarks: 1. Complete. 2. Final depth 3.00m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331773.00 - 366416.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 3.00 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.50	HVP	66.6				Firm medium strength to stiff high strength to stiff grey brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub rounded to rounded of mudstone and rare coal.
	1.10	HVP	77.2				
	1.80	HVP	78.0				
	2.60	HVP	111.9		2.50		
				3.00			End of Pit at 3.00m


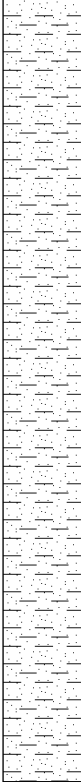
Remarks: 1. Complete. 2. Final depth 3.00m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331681.00 - 366406.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.60	HVP	101.8					Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.00	ES						
	1.20	HVP	120.0					
	1.80	HVP	123.8					
				2.80			End of Pit at 2.80m	


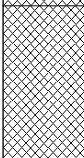
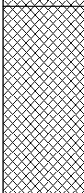

Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331622.00 - 366398.00 Level:	Date 01/12/2020
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Location: Mancot, Deeside	Dimensions (m):	Scale 1:24
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Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Depth 2.80	Logged J. Oliver
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Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 1.00	0.20	ES		0.30			MADE GROUND: Dark brown sandy very gravelly clay - reworked topsoil. Gravel is fine sub angular to rounded of mudstone, brick and coal. With fragments of rope
	0.50	ES+L		0.80			MADE GROUND: Dark brown gravelly sandy clay. Gravel is fine to coarse sub angular to rounded of mudstone, brick and timber.
	1.60	B		1.40			MADE GROUND: Light grey brown to black clayey sandy gravel. Gravel is fine to medium sub angular to sub rounded of mudstone, timber, coal, sticks and roots.
	1.60	ES		2.80			Firm grey gravelly sandy CLAY with frequent cobbles. Gravel is fine to coarse sub angular to rounded of mudstone. Cobbles are angular to sub rounded of weathered mudstone.
							End of Pit at 2.80m

Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Water strike at 1.00m bgl.


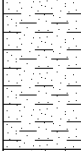
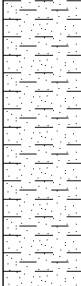
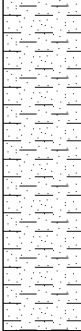
Stability: Unstable.



Project Name: Ash Lane Project No. 13673 Co-ords: 331645.00 - 366471.00 Date 01/12/2020


Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	91.6	0.80			Stiff high strength mottled grey brown slightly gravelly very sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.10	HVP	111.9				Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.80	HVP	90.7				
	2.40	HVP	83.1	2.80			
	End of Pit at 2.80m						

Remarks: 1. Complete. 2. Final depth 2.80m bgl.


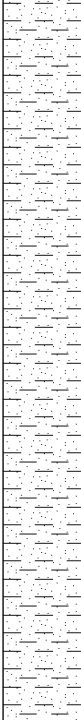
Stability: Unstable.



Project Name: Ash Lane Project No. 13673 Co-ords: 331578.00 - 366462.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.60 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
▼ 0.40	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	
	0.60	HVP	104.3					Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	0.80	ES+L						
	1.20 1.20	B HVP	118.3					
	1.80	HVP	131.4					
			2.60			End of Pit at 2.60m		


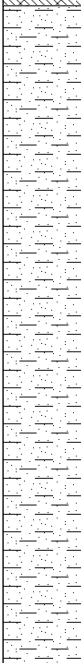
Remarks: 1. Complete. 2. Final depth 2.60m bgl. 3. Water strike at 0.40m bgl. 4. Clay friable sub 2.20m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331519.00 - 366469.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.40 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.50	HVP	102.6				Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.20	HVP	126.8				
	1.80	HVP	134.8				
				2.40			End of Pit at 2.40m








Remarks: 1. Complete. 2. Final depth 2.40m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331528.00 - 366522.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.80 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 1.60				0.30			Brown slightly gravelly sandy clay - TOPSOIL. Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.50	ES					Light brown slightly gravelly very clayey fine to medium SAND. Gravel is fine to medium sub angular to rounded of mudstone.
	0.60	B					
				1.20			Firm mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
				1.60			Light brown slightly gravelly very clayey fine to medium SAND. Gravel if fine to medium sub angular to rounded of mudstone.
				1.80			Stiff high strength mottled grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	2.00	HVP	104.7	2.00			
				2.40			Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	2.60	HVP	103.5	2.60			
				2.80			End of Pit at 2.80m


Remarks: 1. Complete. 2. Final depth 2.80m bgl. 3. Water strike at 1.60m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331548.00 - 366553.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.20 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOSPOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.80	ES					
				2.20			End of Pit at 2.20m


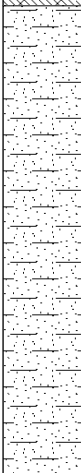
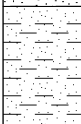

Remarks: 1. Incomplete. 2. Terminated at 2.20m bgl due to pit collapse.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331619.00 - 366531.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.90 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy clay - TOPSOIL. Gravel is fine sub angular to rounded of mudstone and sandstone.
							Grey brown slightly gravelly clayey SAND. Gravel is fine to coarse sub angular to rounded of mudstone.
	1.20	ES					Firm mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.40	B					Stiff grey brown sandy SILT. Silt is brittle and fractures under pressure.
				1.80			
				2.20			
				2.90			End of Pit at 2.90m


Remarks: 1. Complete. 2. Final depth 2.90m bgl.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331590.00 - 366616.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.40 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	HVP	89.0				2.40
	1.00	ES					
	1.10	HVP	99.2				
	1.70	HVP	124.7				End of Pit at 2.40m






Remarks: 1. Complete. 2. Final depth 2.40m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331664.00 - 366595.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.90 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.60	ES					Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	0.80	HVP	105.2				
	1.20	HVP	114.5				
	1.80	HVP	139.9				
				2.90			End of Pit at 2.90m


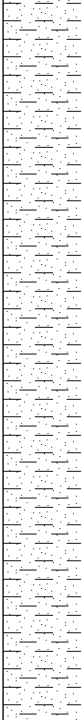

Remarks: 1. Complete. 2. Final depth 2.90m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331634.00 - 366660.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.60 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.
	0.70	HVP	75.5				
	0.80	ES					
	1.20	HVP	100.1				
	1.60	HVP	102.6				
	2.20	HVP	137.0	2.60			End of Pit at 2.60m



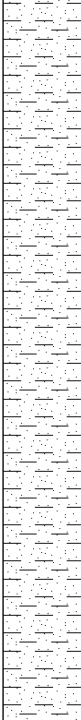
Remarks: 1. Complete. 2. Final depth 2.60m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331668.00 - 366719.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.60 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.			
	0.60 0.60	ES+L HVP	104.3						Stiff high strength mottled grey brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.
	1.20	HVP	131.4						
				2.60		End of Pit at 2.60m			


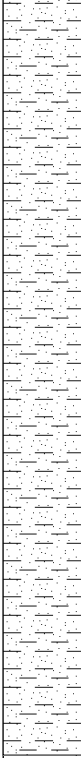
Remarks: 1. Complete. 2. Final depth 2.60m bgl. 3. Clay friable sub 1.50m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: 331736.00 - 366689.00 Date 01/12/2020

Location: Mancot, Deeside Dimensions (m): 1.20 x 4.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.70 Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.	1	
	0.60	HVP	78.9					
	1.10	HVP	89.0					
	1.50	HVP	105.2					
	1.80	HVP	106.8					
				2.70		End of Pit at 2.70m	3	
							4	
							5	

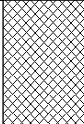
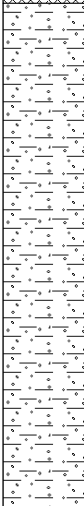
Remarks: 1. Complete. 2. Final depth 5.00m bgl. 3. Clay friable sub 2.00m bgl.

Stability: Stable.

Project Name: Ash Lane	Project No. 13673	Co-ords: - Level:	Date 30/11/2020
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Location: Mancot, Deeside	Dimensions (m):	<div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto;"></div>	Scale 1:24
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Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Depth 2.00		Logged M. Whittaker
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Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.40			MADE GROUND: Dark brown sandy clay (Topsoil) with rootlets.	
				2.00			Firm to stiff brown silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.	1
							End of Pit at 2.00m	2
								3
								4
								5


Remarks: 1. Complete.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.50 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 2.30				0.15			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
							MADE GROUND: Brown to black slightly clayey silty gravelly fine to medium. Gravel is fine to coarse angular to sub angular of limestone.
				0.80			MADE GROUND: Brown slightly silty sandy gravelly clay. Gravel is fine to coarse angular to sub angular of sandstone, mudstone, siltstone and coal. Wit relict infill material of wooden logs, limestone and colliery spoil.
				2.50			End of Pit at 2.50m


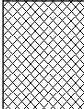


Remarks: 1. Complete 2. Pit terminated at 2.50 m bgl due to sidewall instability 3. Land drain encountered at 1.00 m bgl. 4. Water ingress at 2.30 m bgl. 5. Relict mining debris encountered but unable to confirm exact location of shaft 050.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 12.00 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.45 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				0.60			MADE GROUND: Grey slightly clayey silty gravel. Gravel is fine to coarse angular to sub angular of siltstone and coal.
				0.80			MADE GROUND: Dark brown slightly clayey fine to medium sand with rootlets (relict topsoil).
				1.45			Firm to stiff brown slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.
							End of Pit at 1.45m

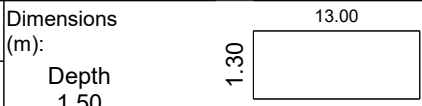
Remarks: 1. Complete 2. Land drain encountered at 1.15 m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level:

Date
30/11/2020


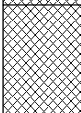


Location: Mancot, Deeside



Scale
1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Logged
M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			MADE GROUND: Black clayey topsoil with rootlets.
				0.60			MADE GROUND: Brown black grey slightly silty sandy gravelly clay. Gravel is fine to coarse angular to sub angular of mudstone, sandstone and coal.
				0.75			MADE GROUND: Black clay with rootlets (relict topsoil).
				1.50			Firm to stiff brown silty sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal. With pockets of coal.
							End of Pit at 1.50m




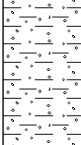
Remarks: 1. Complete 2. Land drain encountered at 1.10 m bgl. 3. Reworked siltstone shale and coal spoil in pit.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.40 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				0.70			MADE GROUND: Firm brown grey slightly silty sandy gravelly clay. Gravel is fine to coarse angular to sub angular of siltstone, shale, mudstone and coal.
				0.90			MADE GROUND: Dark brown slightly clayey fine to medium sand with rootlets (relict topsoil).
				1.40			Firm to stiff brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal. With pockets of coal.
							End of Pit at 1.40m

Remarks: 1. Complete 2. Relict made ground clearly overlying natural strata.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.40 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 0.90				0.25			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				0.45			MADE GROUND: Grey brown silty clayey gravel. Gravel is fine to coarse angular to sub angular of mudstone and rare coal.
				0.60			MADE GROUND: Dark brown slightly clayey fine to medium sand with rootlets (relict topsoil).
				1.40			Firm to stiff brown silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.
							End of Pit at 1.40m


Remarks: 1. Complete 2. Two land drains encountered at 0.90 m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.00 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 1.60				0.25		[Cross-hatch pattern]	MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				0.45		[Cross-hatch pattern]	MADE GROUND: Grey brown silty clayey gravel. Gravel is fine to coarse angular to subangular of mudstone with rare coal.
				0.65		[Cross-hatch pattern]	MADE GROUND: Dark brown slightly clayey fine to medium sand with rootlets (relict topsoil).
						[Cross-hatch pattern]	MADE GROUND: Brown gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of coal and mudstone. Cobbles are sub-angular of mudstone (saturated ground).
				2.00			End of Pit at 2.00m

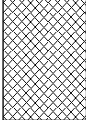
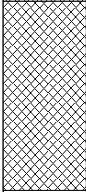
Remarks: 1. Complete 2. Water ingress at 1.60 m bgl. 3. Relict mining debris encountered but unable to confirm exact shaft location. Inferred shaft 019.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 30/11/2020

Location: Mancot, Deeside Dimensions (m): 3.80 x 3.50 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.00 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				1.00			MADE GROUND: Brown silty gravelly CLAY with coal spoil. Spoil gravel is fine to coarse angular to sub rounded of siltstone, mudstone and coal. Shaft located in base of pit.
							End of Pit at 1.00m

Remarks: 1. Complete 2. Circular shaft 1.85 m in diameter located in base of pit Inferred shaft 017 - (possible bell pit).

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level:


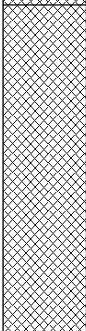
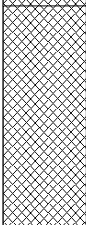
Date
02/12/2020

Location: Mancot, Deeside Dimensions (m):

Scale
1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 2.00

Logged
M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				1.30			MADE GROUND: Brown black grey slightly silty sandy very gravelly clay. Gravel is fine to coarse angular to sub angular of mudstone, shale and coal.
				2.00			MADE GROUND: Brown silty sandy silty gravelly clay with coal spoil. Gravel is fine to coarse angular to sub rounded of sandstone, mudstone and coal. Shaft located in base of pit.
							End of Pit at 2.00m

Remarks: 1. Complete 2. Circular shaft 2.4 m in diameter located in base of pit at 2.00 m bgl inferred shaft 014 - (possible bell pit filled with coal spoil material).

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 02/12/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.80 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 1.60				0.25		[Cross-hatch pattern]	MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
						[Cross-hatch pattern]	MADE GROUND: Firm black brown grey silty gravelly clay, Gravel is fine to coarse angular to sub-rounded of mudstone, coal and sandstone.
				1.80			End of Pit at 1.80m

Remarks: 1. Complete 2. Pit terminated at 1.80 due to water ingress.

Stability: Unstable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level:

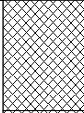
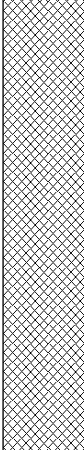
Date
02/12/2020

Location: Mancot, Deeside Dimensions (m):

Scale
1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.80

Logged
M. Whittaker

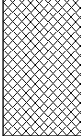
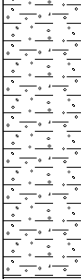
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.35			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				1.80			MADE GROUND: Firm black brown grey silty gravelly clay, Gravel is fine to coarse angular to sub-rounded of mudstone, coal and sandstone.
							End of Pit at 1.80m

Remarks: 1. Complete
Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 02/12/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.35 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.45			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				1.35			Firm to stiff brown silty sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal. With pockets of mudstone and sandstone gravel.
							End of Pit at 1.35m


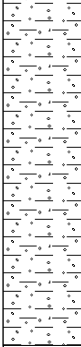
Remarks: 1. Complete.
Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level:

Date
02/12/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.40 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND: Black slightly clayey gravelly fine to medium sand (Topsoil) with rootlets. Gravel is fine to coarse angular to sub angular of coal and mudstone.
				1.40			Firm to stiff brown silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal. Mixed sands and gravel @ 0.60-0.90 north of trench.
							End of Pit at 1.40m




Remarks: 1. Complete 2. Tipped material to south of trial trench.


Stability: Stable.

Project Name: Ash Lane	Project No. 13673	Co-ords: - Level:	Date 02/12/2020
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Location: Mancot, Deeside	Dimensions (m):	<div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto;"></div>	Scale 1:24
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Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Depth 1.40		Logged M. Whittaker
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Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Black slightly clayey gravelly fine to medium sand (Topsoil) with rootlets. Gravel is fine to coarse angular to sub angular of coal and mudstone.
				0.80			MADE GROUND: Black slightly clayey gravel. Gravel is fine to coarse angular to sub angular of coal mudstone, ash, shale and siltstone.
				1.40			Firm to stiff brown silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.
							End of Pit at 1.40m

Remarks: 1. Complete.	
Stability: Stable.	

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level:


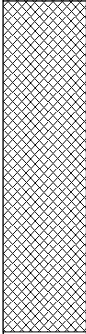
Date
03/12/2020

Location: Mancot, Deeside Dimensions (m):

Scale
1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.30

Logged
M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 0.80				0.25			MADE GROUND: Black slightly clayey gravelly fine to medium sand (Topsoil) with rootlets. Gravel is fine to coarse angular to sub angular of coal and mudstone.
							MADE GROUND: Brown silty gravelly clay. Gravel is fine to coarse angular to sub rounded of mudstone, siltstone, sandstone and coal.
				1.30			End of Pit at 1.30m

Remarks: 1. Complete 2. Made ground fill material located in pit. 3. Water strike at 0.80 m bgl.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 03/12/2020

Location: Mancot, Deeside Dimensions (m): Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.20 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼ 0.85				0.20			MADE GROUND: Black slightly clayey gravelly fine to medium sand (Topsoil) with rootlets. Gravel is fine to coarse angular to sub angular of coal and mudstone.
							MADE GROUND: Black silty gravel. Gravel is fine to coarse angular to sub rounded of mudstone, siltstone, sandstone and coal. Fill material is layered.
				1.00			Firm to stiff brown gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.
				1.20			End of Pit at 1.20m

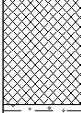

Remarks: 1. Complete 2. Land drain encountered at 0.85 m bgl. 3. Water strike from land drain 4. Signs of upfilling with spoil material visible in pit.

Stability: Stable.

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 03/12/2020

Location: Mancot, Deeside Dimensions (m): 30.00 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 1.40 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.35			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				1.40			Firm to stiff brown silty gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and rare coal.
							End of Pit at 1.40m

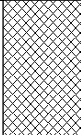
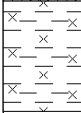
Remarks: 1. Complete.

Stability: Stable

Project Name: Ash Lane Project No. 13673 Co-ords: -
Level: Date 03/12/2020


Location: Mancot, Deeside Dimensions (m): 30.00 Scale 1:24

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Depth 0.80 Logged M. Whittaker

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.45			MADE GROUND: Dark brown slightly clayey fine to medium sand (Topsoil) with rootlets.
				0.80			Firm to stiff brown silty sandy CLAY.
							End of Pit at 0.80m

Remarks: 1. Complete.

Stability: Stable



Project Name: Ash Lane	Project No. 13673	Co-ords: 331754E - 366799N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 30/11/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.25		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.70	PP				Stiff medium strength light brown slightly gravelly CLAY with occasional silt bands typically 0.10m thick. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal. (Very stiff high strength at 3.0m bgl)	1	
		0.80	ES						
		1.00	D						
		1.00	PP						
		1.00	SPT	N=12 (2,3/3,2,3,4)					
		1.50	PP						
		2.00	D				Very stiff very high strength brown gravelly CLAY with silt band at 4.60-4.70m bgl. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.	2	
		2.00	SPT	N=14 (2,2/2,3,4,5)					
		2.50	PP						
		2.70	PP						
		3.00	D						
		3.00	PP				Medium dense black dull weathered COAL.	3	
		3.00	SPT	N=28 (2,3/5,5,9,9)					
		3.50	PP						
		3.90	PP						
		4.00	D		4.00				
		4.00	SPT	N=40 (6,10/10,10,9,11)			End of Borehole at 5.45m	4	
		4.50	PP						
		5.00	D		5.00				
		5.00	PP					5	
		5.00	SPT	N=30 (3,3/3,5,9,13)				6	
					5.45			7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Installation response zone 1.50-4.50m bgl

Project Name: Ash Lane

 Project No.
13673

Co-ords: 331716E - 366747N

 Hole Type
WS

Location: Mancot, Deeside

Level:

 Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2011




 Logged By
M. Dee


Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
Well	Water Strikes	0.20	ES		0.50			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP							
		1.00	D		N=6 (1,1/1,1,2,2)			Firm low strength light brown slightly gravelly CLAY with occasional silt bands from 3.00mbgl typically 0.10m thick. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. (Stiff medium strength at 2.0m bgl)	1	
		1.00	PP							
		1.00	SPT							
		1.50	ES		N=11 (2,2/3,2,3,3)					2
		1.50	PP							
		2.00	D		N=9 (2,2/3,2,2,2)					3
		2.00	PP							
		2.00	SPT							
		2.50	PP		N=14 (2,4/3,3,4,4)	4.00				4
		3.00	D							
		3.00	PP							
		3.00	SPT		N=14 (1,2/2,3,5,4)					5
		3.50	PP							
4.00	D		N=14 (1,2/2,3,5,4)	5.45				6		
4.00	PP									
4.00	SPT									
4.70	PP							7		
5.00	D							8		
5.00	PP							9		
5.00	SPT							10		
End of Borehole at 5.45m										

Remarks

1. Complete. 2. Final depth 5.45m bgl.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331822E - 366775N	Hole Type WS
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 30/11/2011		Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 1.20  3.40	0.41	ES		0.55		MADE GROUND: Brown slightly gravelly sandy clay - (topsoil). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.60	ES		0.80		MADE GROUND: Dark brown slightly clayey sandy gravel - colliery spoil. Gravel is fine to coarse angular to sub rounded of mudstone and coal.		
		1.00	D		1.00		MADE GROUND: Brown silty gravelly clay (-re worked top soil.) Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		1.00	PP		1.40		MADE GROUND: Blackish grey slightly clayey sandy gravel- colliery spoil. Gravel is fine to coarse angular to sub rounded of mudstone and coal.		
		1.00	SPT	N=8 (1,1/2,2,2,2)	2.00		Stiff medium strength light brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.	2	
		1.60	PP		3.00		Medium dense brown clayey gravelly fine to coarse SAND. Gravel is fine sub angular to sub rounded of mudstone and sandstone.	3	
		1.90	PP		3.70		Very stiff high strength light brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal. Stiff medium strength at 5.0mbgl.	4	
		2.00	D		4.00				
		2.00	SPT	N=12 (1,1/2,2,3,5)	4.90				
		2.80	PP		5.00				
3.00	SPT	N=19 (3,6/4,4,5,6)							
3.80	PP								
4.00	SPT	N=24 (4,4/5,5,6,8)							
4.90	PP								
5.00	SPT	N=18 (3,3/3,4,5,6)							
				5.45		End of Borehole at 5.45m			

Remarks 1. Complete. 2. Final depth 5.45m bgl. 3. Water strikes at 1.20 and 3.40m bgl.	
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Project Name: Ash Lane	Project No. 13673	Co-ords: 331779E - 366714N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 30/11/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.20		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP					Stiff medium strength light brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.	1
		1.00	D						
		1.00	PP						
		1.00	SPT	N=12 (2,2/3,2,3,4)					
		1.50	PP						
		2.00	D						2
		2.00	ES						
		2.00	PP						
		2.00	SPT	N=9 (1,2/2,2,2,3)					
		2.50	PP						
		3.00	D						3
		3.00	SPT	N=8 (1,1/2,2,2,2)	3.20		Firm to low strength light brown slightly gravelly silty CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.		
	3.40	3.80	PP						
		4.00	D						4
		4.00	SPT	N=10 (1,2/2,2,3,3)	4.20			Stiff medium strength light brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal. Very stiff high strength at 5.0m bgl.	
	4.20	4.20	PP						
		4.80	PP						5
	4.60	5.00	D						
		5.00	SPT	N=25 (4,4/5,5,7,8)	5.45			End of Borehole at 5.45m	
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strikes at 3.40, 4.20 and 4.60m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane

 Project No.
13673

Co-ords: 331843E - 366667N

 Hole Type
WS

Location: Mancot, Deeside

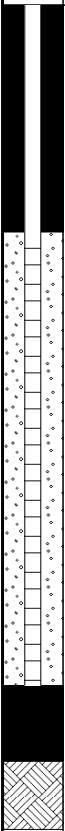







Level:

 Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2011




 Logged By
M. Dee


Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.40	ES						
		0.60	PP						
		1.00	D		N=8 (2,2/2,2,2,2)			Stiff medium strength light brown slightly gravelly CLAY with silt band at 3.10-3.20m bgl. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.	1
		1.00	PP						
		1.00	SPT						
		1.50	PP		N=10 (2,2/2,2,3,3)				2
		2.00	D						
		2.00	PP						
		2.00	SPT		N=15 (3,3/3,3,5,4)				3
		2.50	PP						
		3.00	D						
		3.00	PP		N=9 (2,2/2,2,2,3)				4
		3.00	SPT						
		3.50	PP						
	4.00	D		N=30 (4,8/8,7,6,9)	4.00		Firm low strength light brown sandy CLAY.	4	
	4.00	PP							
	4.00	SPT							
	4.60	PP		N=30 (4,8/8,7,6,9)	4.60		Very stiff high strength light brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and coal.	5	
	5.00	D							
	5.00	SPT							
					5.45		End of Borehole at 5.45m	6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strikes at 3.10 and 4.60m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331807E - 366642N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 30/11/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1 2 3 4 5 6 7 8 9 10
		0.50	PP						
		0.90	PP						
		1.00	D						
		1.00	ES						
		1.00	SPT	N=8 (1,2/2,2,2,2)					
		1.50	PP						
		1.90	PP						
		2.00	D						
		2.00	SPT	N=10 (2,2/2,3,3,2)					
		2.20							
		2.50	PP						
		2.50							
		2.60							
		2.80	PP						
3.00	D								
3.00	SPT	N=13 (3,3/3,4,3,3)							
3.50									
3.70	PP								
3.80									
4.00	D								
4.00	SPT	N=9 (2,3/3,2,2,2)							
5.00	SPT	N=8 (2,1/2,2,2,2)							
5.45			End of Borehole at 5.45m						

Remarks 1. Complete. 2. Final depth 5.45m bgl. 3. Water strikes at 3.00 and 3.80m bgl.	
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Project Name: Ash Lane

 Project No.
13673

Co-ords: 331757E - 366600N

 Hole Type
WS

Location: Mancot, Deeside

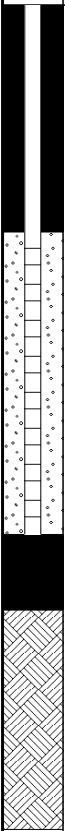








Level:

 Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2011




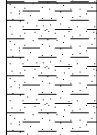
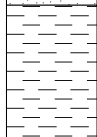

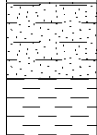
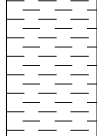
 Logged By
M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.40		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		0.50	ES						
		0.80	PP		1.30		Firm low strength light brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		1.00	D						
		1.00	SPT	N=4 (2,2/1,1,1,1)					
		1.50	PP		2		Firm low strength brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. Stiff medium strength at 3.0m bgl. Firm Low strength at 4.0m bgl.	2	
		2.00	D						
		2.00	PP		3			3	
		2.00	SPT	N=7 (1,1/1,2,2,2)					
		2.50	PP		4			4	
		3.00	D						
		3.00	PP		5			5	
		3.00	SPT	N=12 (2,2/2,2,4,4)					
	3.50	PP		4.40			4		
	4.00	PP							
	4.00	SPT	N=6 (1,2/3,1,1,1)						
	4.50	PP		5.45		Stiff medium strength light brown slightly gravelly silty CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	5		
	5.00	SPT	N=10 (0,2/2,2,3,3)						
							End of Borehole at 5.45m	6	
								7	
								8	
								9	
								10	


Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 4.60m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331789E - 366533N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 01/12/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.10	ES					Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.40								
		0.60	ES							Stiff medium strength light brown slightly gravelly sandy CLAY with sand band from 1.40-1.50m bgl. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.
		1.00	D							
		1.00	PP							
		1.00	SPT	N=11 (1,2/2,3,3,3)						
		1.50	PP							Stiff medium strength brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.
		1.70								
		2.00	D							
		2.00	PP							
		2.00	SPT	N=10 (2,2/2,2,3,3)						
		2.50	PP							Medium dense brown clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular of sandstone.
		3.10	D							
		3.00	PP							
		3.00	SPT	N=14 (2,2/3,3,4,4)						
	3.70	PP						Stiff medium strength brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
	4.00	D								
	4.00	PP								
	4.00	SPT	N=14 (1,1/3,3,3,5)							
	4.60	PP								
	5.00	PP								
	5.00	SPT	N=17 (2,2/3,4,4,6)							
	5.45									
							End of Borehole at 5.45m			

▼
3.10

Remarks 1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 3.10m bgl.	
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Project Name: Ash Lane

 Project No.
13673

Co-ords: 331739E - 366498N

 Hole Type
WS

Location: Mancot, Deeside


Level:

 Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2011

 Logged By
M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
 3.10		0.30	ES		0.50		Brown slightly gravelly sandy CLAY - (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		0.70	PP						Firm low strength light brown sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.
		1.00	D		N=5 (1,2/2,1,1,1)	2.00		2	
		1.00	PP						
		1.00	SPT						
		1.20	ES						
		2.00	D		N=10 (2,2/2,2,3,3)	2.00		2	
		2.00	SPT						
		2.50	PP						
		3.00	D		N=12 (2,2/2,3,3,4)	3.00		3	
	3.00	PP							
	3.00	SPT							
	3.70	PP							
	4.00	D		N=18 (2,3/3,5,5,5)	4.50		4		
	4.00	PP							
	4.00	SPT							
	4.50	PP							
	5.00	PP		N=11 (2,2/3,2,3,3)	5.45		5		
	5.00	SPT							
							End of Borehole at 5.45m	6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 3.10m bgl.

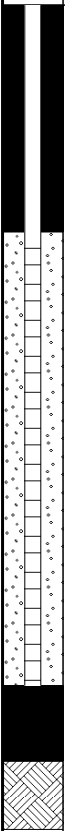

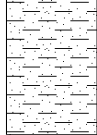
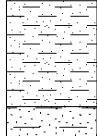
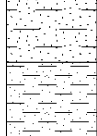
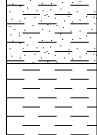
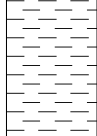
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Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 01/12/2011		Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES				Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP		0.30		Light brown sandy slightly gravelly CLAY. . Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		1.00	D		0.70		Stiff medium strength reddish brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. Very stiff high strength at 4.00m bgl. Stiff medium strength at circa 5.00m bgl.	1	
		1.00	PP						
		1.00	SPT	N=11 (1,2/2,3,3,3)					
		1.50	PP						
		1.80	ES						
		2.00	D					2	
		2.00	PP						
		2.00	SPT	N=12 (2,2/3,3,3,3)					
		2.50	PP						
		2.90	PP						
		3.00	D					3	
		3.00	SPT	N=15 (2,3/3,3,4,5)					
		3.50	PP						
		4.00	D					4	
		4.00	PP						
		4.00	SPT	N=18 (3,3/4,4,4,6)					
		4.50	PP						
		5.00	D					5	
		5.00	PP						
		5.00	SPT	N=17 (3,5/4,3,4,6)	5.45				
End of Borehole at 5.45m								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331656E - 366526N	Hole Type WS
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 02/12/2011		Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.40		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP						
		1.00	D		1.30		Firm light brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		1.00	PP						
		1.00	SPT	N=10 (2,2/2,2,3,3)					
		1.50	PP		2.00		Stiff medium strength brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	2	
		2.00	D						
		2.00	SPT	N=11 (2,2/3,3,2,3)					
		2.10	ES		2.60		Medium dense brown clayey fine to coarse SAND.		
		2.90	PP						
	3.00	SPT	N=8 (2,2/2,2,2,2)						
	3.60	PP		3.50		Firm low strength brown sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	3		
	4.00	PP							
	4.00	SPT	N=15 (3,3/3,4,4,4)						
	4.60	PP		5.45		Stiff medium strength slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	4		
	5.00	SPT	N=15 (2,2/4,4,3,4)						
							End of Borehole at 5.45m	5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 2.30m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane

 Project No.
13673

Co-ords: 331708E - 366674N

 Hole Type
WS

Location: Mancot, Deeside


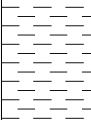
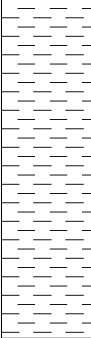



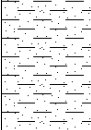
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 Scale
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Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2011

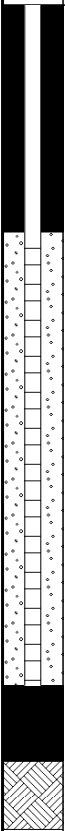
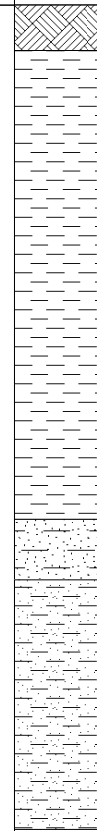
 Logged By
M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30		Brown slightly gravelly sandy clay - TOPSOIL. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP				Stiff medium strength reddish brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. (Very stiff high strength at 2.00m. Stiff medium strength at 3.00m bgl.	1	
		1.00	D		3.40				
		1.00	PP						
		1.00	SPT	N=14 (2,2/3,3,4,4)					
		1.50	PP						
		1.90	PP		3.70				
		2.00	D						
		2.00	SPT	N=19 (2,3/4,4,5,6)				2	
		2.50	PP		4.20				
		3.00	D						
		3.00	PP						
		3.00	SPT	N=14 (3,4/3,3,4,4)				3	
		3.70	PP		4.40				
		4.00	D						
		4.00	SPT	N=9 (2,2/2,2,2,3)				4	
		4.40			5.45				
		5.00	SPT	N=13 (2,2/2,3,4,4)					
		End of Borehole at 5.45m							5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Final depth 5.4m bgl. 3. Water strikes at 3.30 and 4.20m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.


Project Name: Ash Lane	Project No. 13673	Co-ords: 331642E - 366691N	Hole Type WS
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 02/12/2011		Logged By M. Dee


Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		0.50	PP						Stiff medium strength reddish brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. Very stiff high strength at 2.00m. Stiff medium strength at circa 3.00m bgl.
		0.90	PP						
		1.00	D						
		1.00	SPT	N=13 (1,2/3,3,3,4)					
		1.50	PP						
		1.90	PP						
		2.00	D						
		2.00	SPT	N=22 (2,3/4,5,5,8)					
		3.00	D						
	3.00	SPT	N=17 (4,3/3,4,5,5)						
	3.40				3.40		Light brown slightly gravelly clayey fine to coarse SAND. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
	3.90	ES			3.80		Firm low strength slightly sandy CLAY. (Stiff medium strength at circa 5.00m bgl).	4	
	3.90	PP							
	4.00	SPT	N=9 (2,2/3,2,2,2)						
	5.00	SPT	N=12 (2,2/2,3,3,4)		5.45		End of Borehole at 5.45m	5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 3.40m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.

Project Name: Ash Lane	Project No. 13673	Co-ords: 331653E - 366613N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 02/12/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
 3.20		0.10	ES		0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1			
		0.50	PP								
		0.70	ES								
		0.90	PP								
		1.00	D								
		1.00	SPT	N=12 (1,2/2,3,3,4)							
		1.50	PP								
		1.90	PP								
		2.00	D								
		2.00	SPT	N=14 (2,2/2,4,4,4)							
	2.60	PP		2.90		Stiff medium strength reddish brown slightly gravelly CLAY with sand bands at 1.80-1/90m bgl and 2.4-2.50m bgl. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	2				
	3.00	D									
	3.00	SPT	N=7 (1,2/2,1,2,2)								
	4.00	D									
	4.00	SPT	N=17 (2,2/3,4,5,5)								
	5.00	SPT	N=11 (1,1/2,2,3,4)								
	5.45							5.45		Loose brown clayey gravelly fine to coarse SAND. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. (Medium dense at circa 4.00m bgl. Loose at circa 5.00m bgl).	3
				End of Borehole at 5.45m			4				
								End of Borehole at 5.45m			5
				End of Borehole at 5.45m			6				
								End of Borehole at 5.45m			7
				End of Borehole at 5.45m			8				
								End of Borehole at 5.45m			9
				End of Borehole at 5.45m			10				

Remarks 1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 3.20m bgl.	
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Project Name: Ash Lane

 Project No.
13673

Co-ords: 331571E - 366591N

 Hole Type
WS

Location: Mancot, Deeside

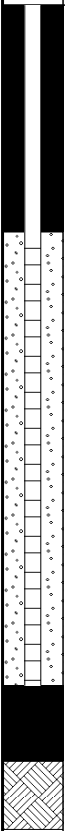

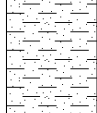
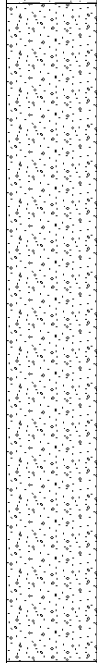
Level:

 Scale
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Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2011

 Logged By
M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	ES						
		0.50	PP		1.10		Light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		1.00	D						
		1.00	PP						
		1.00	SPT	N=6 (1,1/1,1,2,2)		5.45		Loose brown slightly gravelly clayey fine to coarse SAND. Gravel is fine to coarse angular to subrounded sandstone and mudstone. (Medium dense at 2.00m and 3.00m bgl. Very loose at circa 4.00m bgl).	
		2.00	D						
		2.00	SPT	N=12 (2,2/2,3,3,4)					
		3.00	D						
		3.00	SPT	N=20 (2,4/4,5,5,6)					
	4.00	SPT	N=4 (1,1/1,1,1,1)		5				
	5.00	SPT	N=7 (1,2/2,1,2,2)						
							End of Borehole at 5.45m	6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 3.10m bgl. 4. Installation response zone 1.50-3.50m bgl with pipe 0.50m proud at surface.



Borehole Log

Borehole No.

WS116

Sheet 1 of 1

Project Name: Ash Lane	Project No. 13673	Co-ords: 331541E - 366511N	Hole Type WS
Location: Mancot, Deeside		Level:	Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents		Dates: 02/12/2011	Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.40		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		0.60	PP						
		1.00	D	N=4 (1,1/1,1,1,1)	1.00		Light brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	1	
		1.00	SPT						
		1.20	ES						
		1.90	PP	N=11 (2,2/2,2,3,4)	2.00		Loose brown clayey slightly gravelly clayey fine to coarse SAND. Gravel is fine to coarse angular to subrounded sandstone and mudstone. Medium dense at 2.00m and 4.00m bgl.	2	
		2.00	D						
		2.00	SPT						
		3.00	SPT	N=8 (1,2/2,2,2,2)	3.00				3
		4.00	D	N=26 (3,4/7,6,6,7)	4.00		Stiff medium strength brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	5	
	4.00	SPT							
	5.00	SPT	N=17 (3,3/3,4,4,6)	5.00				5	
				5.45			End of Borehole at 5.45m	6	
								7	
								8	
								9	
								10	

Remarks
 1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 4.10m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.



Borehole Log

Borehole No.


WS117

Sheet 1 of 1

Project Name: Ash Lane	Project No. 13673	Co-ords: 331593E - 366413N	Hole Type WS
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 01/12/2011		Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Well	Water Strikes	0.20	ES		0.40		Legend	Stratum Description	1
		0.40	ES						
		0.50	PP						
		1.00	D		0.80				
		1.00	PP						
		1.00	SPT	N=19 (2,3/4,4,5,6)					
		1.50	PP						
		2.00	PP		3.20				
		2.00	SPT	N=25 (3,3/6,6,6,7)					
		2.50	PP						
3.00	PP								
3.00	SPT	N=13 (2,2/3,3,3,4)							
4.00	SPT	N=17 (2,4/4,4,4,5)	4.45						
End of Borehole at 4.45m								5	
								6	
								7	
								8	
								9	
								10	

Remarks
 1. Complete. 2. Final depth 4.45m bgl.



Project Name: Ash Lane	Project No. 13673	Co-ords: 331716E - 366438N	Hole Type WS
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 01/12/2011		Logged By M. Dee

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES				Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		0.50	PP		0.30		Light brown sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.		
		1.00	PP					1	
		1.00	SPT	N=8 (1,1/2,2,2,2)	1.10		Stiff medium strength light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal. Firm low strength at 2.00m bgl.		
		1.50	ES						
		1.50	PP						
		2.00	D					2	
		2.00	PP						
		2.00	SPT	N=7 (2,1/2,1,2,2)					
		2.50	PP						
		3.00	D		3.00			3	
		3.00	PP				Loose brown clayey fine to coarse SAND.		
		3.00	SPT	N=9 (2,2/2,3,2,2)					
		3.70	PP		3.70				
		4.00	SPT	N=17 (3,3/4,4,5,4)	4.10		Reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone and coal.	4	
							Medium dense slightly gravelly clayey fine to coarse SAND. Gravel is fine to coarse angular to subrounded sandstone and mudstone. Loose at circa 5.00m bgl.		
		5.00	SPT	N=10 (2,3/2,2,3,3)				5	
					5.45		End of Borehole at 5.45m		
								6	
								7	
								8	
								9	
								10	


 4.10

Remarks

1. Complete. 2. Final depth 5.45m bgl. 3. Water strike at 4.10m bgl. 4. Installation response zone 1.50-4.50m bgl with pipe 0.50m proud at surface.



Borehole Log

Borehole No.

RB101

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331808E - 366793N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone. Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
					6.00		Grey hard SANDSTONE.	6	
					7.30		COAL.	8	
					8.40		Light grey MUDSTONE.	9	
					9.30		Grey MUDSTONE with occasional hard sandstone bands.	10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.3-8.4, 16.5-17.7, 36.2-37.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB101

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331808E - 366793N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with occasional hard sandstone bands.		
					13.00		Very hard light grey SANDSTONE with occasional mudstone bands.		
					16.50		COAL.		
					17.70		Grey MUDSTONE.		
					20.00				

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.3-8.4, 16.5-17.7, 36.2-37.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB101

Sheet 3 of 4

Project Name: Ash Lane	Project No. 13673	Co-ords: 331808E - 366793N	Hole Type BH
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 30/11/2020		Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Light grey SANDSTONE.		21
					22.30		Dark grey MUDSTONE.		22
					23.30		Very hard light grey SANDSTONE with occasional mudstone bands.		23
					26.50		Dark grey MUDSTONE.		24
					27.70		Light grey MUDSTONE.		25
									26
									27
									28
									29
									30

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.3-8.4, 16.5-17.7, 36.2-37.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB101

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331808E - 366793N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Light grey MUDSTONE.		31
									32
									33
									34
					34.60		Grey MUDSTONE		35
									36
					36.20		COAL.		37
									38
					37.70		Grey MUDSTONE.		39
									40
					40.00		End of Borehole at 40.00m		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.3-8.4, 16.5-17.7, 36.2-37.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB102

Sheet 1 of 4

Project Name: Ash Lane Project No. 13673 Co-ords: 331731E - 366731N Hole Type BH

Location: Mancot, Deeside Level: Scale 1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Dates: 30/11/2020 Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone. Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
					7.00		Grey MUDSTONE.	7	
								8	
					8.30		Very hard grey SANDSTONE.	9	
								10	

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.6-14.2 m bgl. 4. Possible workings encountered 18.3-20.0 m bgl.





Borehole Log

Borehole No.

RB102

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331731E - 366731N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Very hard grey SANDSTONE.		
					12.40		Grey MUDSTONE.		
					13.60		COAL.		
					14.20		Grey MUDSTONE with occasional sandstone bands.		
					16.40		Very hard light grey SANDSTONE with occasional mudstone bands.		
					18.30		Loss of flush very soft drilling. Possible workings.		
					20.00				

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.6-14.2 m bgl. 4. Possible workings encountered 18.3-20.0 m bgl.





Borehole Log

Borehole No.

RB102

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331731E - 366731N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Hard drilling, No flush. Inferred to be sandstone with fractures.		
								21	
								22	
								23	
								24	
								25	
								26	
								27	
								28	
								29	
								30	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.6-14.2 m bgl. 4. Possible workings encountered 18.3-20.0 m bgl.





Borehole Log

Borehole No.

RB102

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331731E - 366731N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 30/11/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Hard drilling, No flush. Inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
					40.00			40	
								End of Borehole at 40.00m	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.6-14.2 m bgl. 4. Possible workings encountered 18.3-20.0 m bgl.





Borehole Log

Borehole No.

RB103

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331845E - 366691N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
					6.50		SAND and GRAVEL.	6	
								7	
					7.80		COAL.	8	
					8.10		Grey MUDSTONE.	9	
								10	
					9.70		Shalley black MUDSTONE with coal traces.		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.8-8.1, 15.9-16.9 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB103

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331845E - 366691N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.30		Shalley black MUDSTONE with coal traces.		
							Grey MUDSTONE with occasional sandstone bands.	11	
								12	
								13	
								14	
								15	
					15.90		COAL with slight loss of flush, no voids, coal intact.	16	
					16.90		Dark grey MUDSTONE.	17	
					17.40		Grey MUDSTONE occasional sandstone bands.	18	
								19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.8-8.1, 15.9-16.9 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB103

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331845E - 366691N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE occasional sandstone bands.		21
					24.00		Hard drilling, lack of flush inferred to be sandstone with fractures.		22
									23
									24
									25
									26
									27
									28
									29
									30

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.8-8.1, 15.9-16.9 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB103

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331845E - 366691N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Hard drilling, lack of flush inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
				40.00			End of Borehole at 40.00m	40	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 7.8-8.1, 15.9-16.9 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB104

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331798E - 366574N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 17.8-19.7, 25.9-27.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB104

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331798E - 366574N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					11.00		Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	11	
					12.10		Light grey MUDSTONE.	12	
					14.00		Hard light grey SANDSTONE.	13	
					17.80		Grey MUDSTONE with occasional sandstone bands.	14	
					19.70		COAL.	15	
							Grey MUDSTONE.	16	
								17	
								18	
								19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 17.8-19.7, 25.9-27.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB104

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331798E - 366574N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.20		Grey MUDSTONE.		
					20.40		Shalley black MUDSTONE.		
							Light grey SANDSTONE with occasional mudstone bands.	21	
								22	
								23	
					24.20		Grey MUDSTONE.	24	
								25	
					25.90		COAL.	26	
								27	
					27.80		Grey MUDSTONE with sandstone bands.	28	
								29	
								30	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 17.8-19.7, 25.9-27.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB104

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331798E - 366574N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 01/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with sandstone bands.		
					32.30		Dark grey MUDSTONE.		
					33.40		Grey MUDSTONE with occasional sandstone bands.		
					40.00		End of Borehole at 40.00m		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 17.8-19.7, 25.9-27.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB105

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331742E - 366633N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
					9.20		Grey MUDSTONE with occasional sandstone bands.	9	
								10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 11.8-13.6, 31.0-34.0 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB105

Sheet 2 of 4

Project Name: Ash Lane	Project No. 13673	Co-ords: 331742E - 366633N	Hole Type BH
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 02/12/2020		Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with occasional sandstone bands.		
					11.80		COAL.		
					13.60		Light grey MUDSTONE.		
					14.30		Grey MUDSTONE with occasional hard sandstone bands.		
					18.60		Dark grey MUDSTONE with coal traces.		
					19.10		Grey MUDSTONE.		
					20.00				

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 11.8-13.6, 31.0-34.0 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB105

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331742E - 366633N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Light grey hard SANDSTONE with occasional mudstone bands.		21
					23.90		Grey MUDSTONE.		22
									23
									24
									25
					27.00		Very hard grey SANDSTONE.		26
									27
					28.30		Dark grey MUDSTONE with coal traces.		28
									29
					29.00		Grey MUDSTONE.		30

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 11.8-13.6, 31.0-34.0 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB105

Sheet 4 of 4

Project Name: Ash Lane	Project No. 13673	Co-ords: 331742E - 366633N	Hole Type BH
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 02/12/2020		Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					30.20		Grey MUDSTONE.		
							Hard grey SANDSTONE with mudstone bands.		
					31.00		COAL.	31	
								32	
								33	
					34.00		Black MUDSTONE with coal traces.	34	
					34.70		Hard light grey SANDSTONE with mudstone bands.		
					34.90		Black shaley MUDSTONE with coal traces.	35	
								36	
					36.00		Grey MUDSTONE.	36	
								37	
								38	
								39	
					40.00		End of Borehole at 40.00m	40	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 11.8-13.6, 31.0-34.0 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB106

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331698E - 366528N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
					9.50		Brown medium SAND with gravel bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.	9	
								10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.8-13.3, 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB106

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331698E - 366528N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown medium SAND with gravel bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.	11	
				11.90			Dark grey MUDSTONE with coal traces.	12	
				12.50			Grey MUDSTONE.		
				12.80			COAL.	13	
				13.30			Dark grey MUDSTONE with coal traces.		
				14.00			Hard grey SANDSTONE with mudstone bands.	14	
								15	
								16	
								17	
								18	
								19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.8-13.3, 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB106

Sheet 3 of 4

Project Name: Ash Lane Project No. 13673 Co-ords: 331698E - 366528N Hole Type BH

Location: Mancot, Deeside Level: Scale 1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Dates: 02/12/2020 Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Hard grey SANDSTONE with mudstone bands.		
					20.70		Dark grey MUDSTONE with coal traces.	21	
					21.30		Black shaley MUDSTONE with coal traces.		
					21.90		Very hard grey brown SANDSTONE with mudstone bands.	22	
								23	
								24	
								25	
								26	
								27	
								28	
								29	
					30.00			30	

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.8-13.3, 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB106

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331698E - 366528N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 02/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Loosing flush, hard drilling, no voids. Inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
					40.00			40	
								End of Borehole at 40.00m	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.8-13.3, 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB107

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331670E - 366678N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
					9.10		Grey MUDSTONE with coal traces.	9	
					10.00			10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB107

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331670E - 366678N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					11.60		Very hard grey SANDSTONE.	11	
							Grey MUDSTONE.	12	
								13	
								14	
								15	
								16	
								17	
								18	
								19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB107

Sheet 3 of 4

Project Name: Ash Lane	Project No. 13673	Co-ords: 331670E - 366678N	Hole Type BH
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 03/12/2020		Logged By E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
							Grey MUDSTONE.	
				20.30			COAL.	
				23.20			Black shaley MUDSTONE with coal traces.	
				23.90			Grey MUDSTONE with occasional sandstone bands.	
				29.00			Dark grey MUDSTONE with sandstone bands.	



Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB107

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331670E - 366678N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					30.80		Dark grey MUDSTONE with sandstone bands.		
							Grey MUDSTONE with sandstone bands.	31	
								32	
								33	
								34	
					36.40		Dark grey MUDSTONE.	37	
								38	
					38.00		Grey MUDSTONE with sandstone bands.	39	
								40	
					40.00		End of Borehole at 40.00m		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 20.3-23.2 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB108

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331621E - 366603N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
					9.00		Brown medium SAND with occasional gravel bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.	9	
								10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. No Coal encountered 4. Possible workings encountered 19.3-20.5m bgl.





Borehole Log

Borehole No.

RB108

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331621E - 366603N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown medium SAND with occasional gravel bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.	11	
					13.00		Grey MUDSTONE with sandstone bands.	12	
								13	
								14	
								15	
					17.60		Black SHALE with coal.	16	
								17	
								18	
					19.30		Loss of flush, soft drilling. Possible workings.	19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. No Coal encountered 4. Possible workings encountered 19.3-20.5m bgl.





Borehole Log

Borehole No.

RB108

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331621E - 366603N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					20.50		Loss of flush, soft drilling. Possible workings.	
							No flush, hard drilling, no voids. Inferred to be sandstone with fractures.	21
								22
								23
								24
								25
								26
								27
								28
								29
								30

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. No Coal encountered 4. Possible workings encountered 19.3-20.5m bgl.





Borehole Log

Borehole No.

RB108

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331621E - 366603N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							No flush, hard drilling, no voids. Inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
					40.00			40	
								End of Borehole at 40.00m	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. No Coal encountered 4. Possible workings encountered 19.3-20.5m bgl.





Borehole Log

Borehole No.

RB109

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331567E - 366531N

Hole Type
BH

Location: Mancot, Deeside


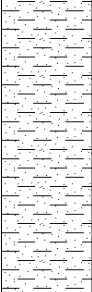
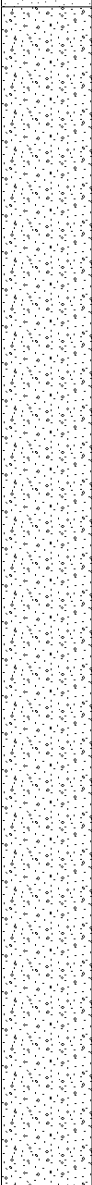
Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20		 <p>Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.</p>		1
					2.20		 <p>Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.</p>		2
							 <p>Brown medium gravelly fine to coarse SAND with clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.</p>		3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 24.2-25.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB109

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331567E - 366531N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown medium gravelly fine to coarse SAND with clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.		
					14.80		Grey SANDTONE.		
					16.60		Grey MUDSTONE with coal TRACES.		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 24.2-25.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB109

Sheet 3 of 4

Project Name: Ash Lane Project No. 13673 Co-ords: 331567E - 366531N Hole Type BH

Location: Mancot, Deeside Level: Scale 1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Dates: 03/12/2020 Logged By D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with coal TRACES.		21
					24.20		COAL with black shale.		22
					25.80		Grey SANDSTONE.		23
					27.00		No flush, hard drilling, no voids. Inferred to be sandstone with fractures.		24
									25
									26
									27
									28
									29
									30

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 24.2-25.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB109

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331567E - 366531N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							No flush, hard drilling, no voids. Inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
					40.00			40	
								End of Borehole at 40.00m	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 24.2-25.8 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB110

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331654E - 366444N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20		Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone. Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
					2.40		Brown gravelly medium SAND with occasional clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.	2 3 4 5 6 7 8 9 10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.1-13.6, 27.6-28.6, 31.0-33.5, 36.1-36.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB110

Sheet 2 of 4

Project Name: Ash Lane	Project No. 13673	Co-ords: 331654E - 366444N	Hole Type BH
Location: Mancot, Deeside	Level:		Scale 1:50
Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents	Dates: 03/12/2020		Logged By D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.40		Brown gravelly medium SAND with occasional clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal. Grey SANDSTONE.		
					13.10		COAL with shale.		
					13.60		Grey MUDSTONE with sandstone bands.		
					19.20		Dark grey SANDSTONE.		

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.1-13.6, 27.6-28.6, 31.0-33.5, 36.1-36.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB110

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331654E - 366444N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
							Dark grey SANDSTONE.	21
								22
								23
								24
								25
								26
								27
					27.60		COAL.	28
					28.60		Grey SANDSTONE with dark bands.	29
					30.00			30

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.1-13.6, 27.6-28.6, 31.0-33.5, 36.1-36.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB110

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331654E - 366444N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 03/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Strong grey SANDSTONE.		
				30.60			Dark grey MUDSTONE.		
				31.00			Possible COAL - inferred from drill speed and torque of drilling.	31	
								32	
								33	
				33.50			Grey MUDSTONE.		
				33.80			Grey SANDSTONE.	34	
				34.80			Dark grey black MUDSTONE.	35	
				36.10			COAL.	36	
				36.70			Grey MUDSTONE with sandstone bands.	37	
								38	
								39	
				40.00			End of Borehole at 40.00m	40	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 13.1-13.6, 27.6-28.6, 31.0-33.5, 36.1-36.7 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB111

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331515E - 366504N

Hole Type
BH

Location: Mancot, Deeside




Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20		 <p>Brown slightly gravelly sandy CLAY (TOPSOIL). Gravel is fine sub angular to rounded of mudstone and sandstone.</p>  <p>Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.</p>		1
					2.30		 <p>Brown gravelly medium SAND with occasional clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.</p>		2 3 4 5 6 7 8 9 10

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 26.0-27.3 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB111

Sheet 2 of 4

Project Name: Ash Lane Project No. 13673 Co-ords: 331515E - 366504N Hole Type BH

Location: Mancot, Deeside Level: Scale 1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents Dates: 04/12/2020 Logged By D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown gravelly medium SAND with occasional clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.		
					15.10		Grey SANDSTONE.		
					17.20		Grey MUDSTONE with coal traces.		

Remarks
 1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 26.0-27.3 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB111

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331515E - 366504N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with coal traces.		
								21	
								22	
								23	
								24	
								25	
					26.00		Black shaley COAL.	26	
								27	
					27.30		Grey SANDSTONE with strong bands and fissures.	28	
								29	
					29.00		Loosing flush, hard drilling, no voids. Inferred to be sandstone with fractures.	29	
								30	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 26.0-27.3 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB111

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331515E - 366504N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
D. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Loosing flush, hard drilling, no voids. Inferred to be sandstone with fractures.		
								31	
								32	
								33	
								34	
								35	
								36	
								37	
								38	
								39	
					40.00			40	
								End of Borehole at 40.00m	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 26.0-27.3 m bgl. 4. No voids encountered.





Borehole Log

Borehole No.

RB112

Sheet 1 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331770E - 366461N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		MADE GROUND: Brown gravelly sandy clay. Gravel is fine to coarse sub angular to subrounded of mudstone and brick.		
							Grey brown slightly silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub angular to rounded of mudstone and rare coal.	1	
								2	
								3	
					4.00		Brown medium SAND.	4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.0-12.5, 33.8-36.0 m bgl. 4. Small voids in coal encountered 33.8-36.0m bgl.





Borehole Log

Borehole No.

RB112

Sheet 2 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331770E - 366461N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Brown medium SAND.		
					10.40				
					10.90		Brown gravelly medium SAND with occasional clay bands. Gravel is fine to coarse subangular to subrounded of mudstone, sandstone and rare coal.		
							Grey MUDSTONE.	11	
					11.60				
					12.00		Dark grey MUDSTONE with coal traces.		
							COAL.	12	
					12.50		Black shaley MUDSTONE with coal traces.		
					13.00		Very hard light grey SANDSTONE.	13	
								14	
								15	
								16	
								17	
								18	
					19.00		Dark grey MUDSTONE.	19	
								20	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.0-12.5, 33.8-36.0 m bgl. 4. Small voids in coal encountered 33.8-36.0m bgl.





Borehole Log

Borehole No.

RB112

Sheet 3 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331770E - 366461N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.30		Dark grey MUDSTONE.		
							Grey MUDSTONE with occasional sandstone bands.		
								21	
								22	
								23	
								24	
								25	
								26	
								27	
								28	
								29	
								30	

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.0-12.5, 33.8-36.0 m bgl. 4. Small voids in coal encountered 33.8-36.0m bgl.





Borehole Log

Borehole No.

RB112

Sheet 4 of 4

Project Name: Ash Lane

Project No.
13673

Co-ords: 331770E - 366461N

Hole Type
BH

Location: Mancot, Deeside

Level:

Scale
1:50

Client: William Hall & Co. Chartered Surveyors, Land & Estate Agents

Dates: 04/12/2020

Logged By
E. Pennington

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Grey MUDSTONE with occasional sandstone bands.		
					33.80		COAL with small voids from drops in drill head.		
					36.00		Grey MUDSTONE with sandstone bands.		
					40.00		End of Borehole at 40.00m		

Remarks

1. Complete. 2. Final depth 40.00m bgl. 3. Coal encountered 12.0-12.5, 33.8-36.0 m bgl. 4. Small voids in coal encountered 33.8-36.0m bgl.



Flood Consequences Assessment
for Land off Gladstone Way, Mancot, Hawarden, Flintshire

Appendix 4

Correspondence

Dwr Cymru Welsh Water Historical Flooding

Flintshire County Council Historical Flooding

Natural Resources Wales Historical Flooding

Dee Tidal Flood Report Summary 2020

Broughton Brook and Queensferry Drain Flood Risk Study 2020

Andy Jones

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 12 October 2023 14:38
To: Andy Jones
Subject: RE: FCA Historical Flood Information

Our Reference: **EIR/1606/2023**

Dear Andy Jones,

Request for information

RE: 8271 Land off Gladstone Way, Mancot, Hawarden, SJ317666

We write further to your request for information dated 26th September 2023, which we have been considering under the Environmental Information Regulations 2004.

We can confirm that we have reviewed our flooding database and we have no flood risks due to hydraulic incapacity directly linked to the specified postcode. There were historic flooding issues immediately downstream which were resolved through a capital scheme in 2015, however we are aware of further active flooding issues in the downstream catchment, which may be impacted by the connection of additional flows, from this proposed site.

Turning to your query on specific drainage requirements, we have a dedicated Planning Team within our Developer Services function that can provide advice on the capacity in our infrastructure to accommodate new development.

Our pre-planning service will review the capacity available in our sewerage network, wastewater treatment works and clean water network to accommodate the flows/demand from a proposed development. It will also raise awareness of any of our assets crossing the site which will need to be factored into the layout of your development and provide general advice on surface water drainage.

An application for pre-planning advice can be submitted online via the following address <https://developers.dwrcymru.com/en/applications/planning/pre-planning>. If you wish to discuss in more detail our Planning Team are contactable on 08009172652 or alternatively by email developer.services@dwrcymru.com.

We hope that this response is clear. Should you have any questions, please contact us by email at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Linea, Fortran Road, St Mellons, Cardiff CF3 0LT.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

Yours faithfully,

Dŵr Cymru Welsh Water

From: Andy Jones <ajones@coopers.co.uk>
Sent: Tuesday, September 26, 2023 9:21 AM
To: Services Developer <developer.services@dwrcymru.com>
Subject: FCA Historical Flood Information

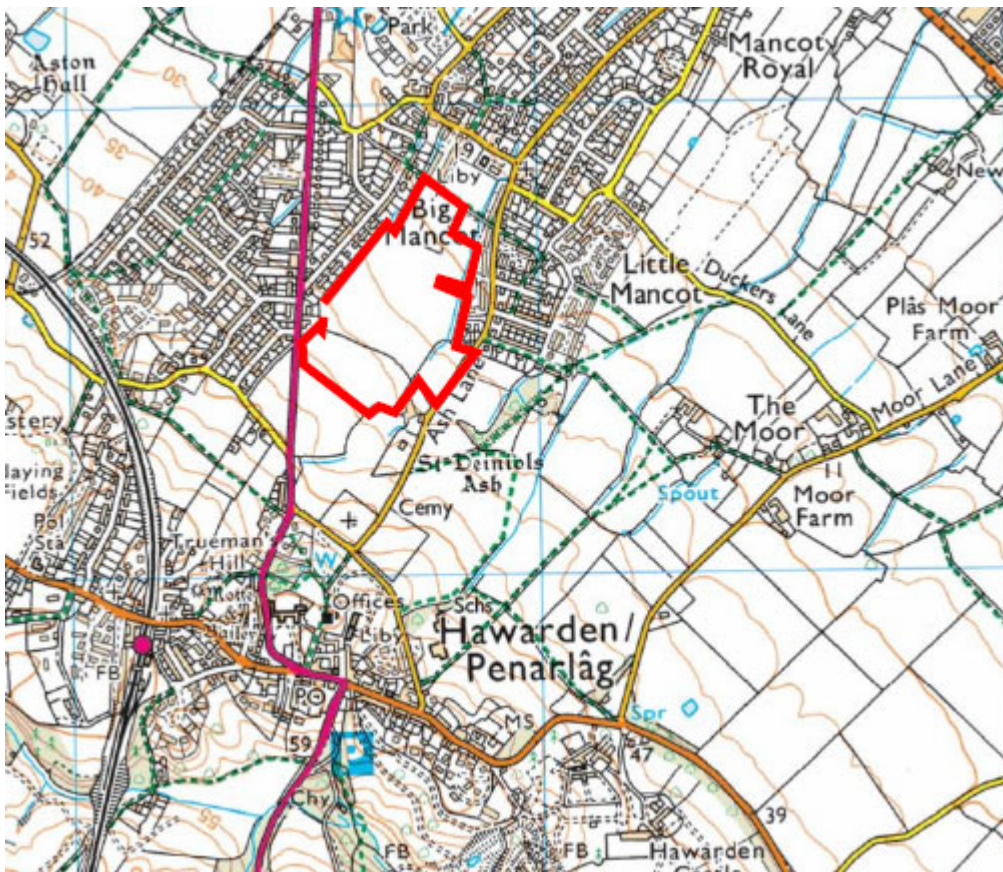
***** External Mail *****

**8271 Land off Gladstone Way, Mancot, Hawarden
SJ317666
FCA Historical Flood Information**

To whom it may concern

We are undertaking a Flood Consequences Assessment for a proposed residential development on greenfield agricultural land forming part of St Deiniols Ash Farm at Mancot, Deeside, CH5 2BR. (see Location Plan below) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.



Regards

Andy Jones
Senior Infrastructure Engineer
COOPERS
Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

Andy Jones

From: Neil L Parry (S&T - Drainage) <Neil.L.Parry@Flintshire.Gov.UK>
Sent: 06 November 2023 15:13
To: Andy Jones
Cc: Paul Reeves
Subject: RE: EXTERNAL RE: FCA Historical Flood Information

Hi Andy

I refer to your e-mail below and respond accordingly :-

Due regard should be made to Flood Risk Maps to identify potential flow routes which may flow through the development site.

FCC are aware of important surface water drainage systems in close proximity to this site any alteration to these systems should be discussed with Paul Reeves, FCCs Flood Risk Manager and may require formal consent under LDA legislation.

The proposed development must not increase flood risk off site and appropriate SuDS / SAB applications will be required with restricted discharge and drainage arrangements should be implemented to help mitigate the impact of the development. Your drainage strategy should be discussed with the LLFA.

FCC is aware of a number of off site locations which are / have been susceptible to surface water flooding as recently demonstrated by Storm Babet. Recent local impacts will be subject to ongoing formal S19 Flood investigations. Areas impacted previously have included Ash Lane, Mancot Lane, Hawarden Way, Earles Crescent, Leaches Lane, Chester Road & Church View.

Please do not hesitate to contact me should you have any queries regarding the above.

Regards

Neil.

From: Andy Jones <ajones@coopers.co.uk>
Sent: 28 October 2023 10:43
To: Neil L Parry (S&T - Drainage) <Neil.L.Parry@Flintshire.Gov.UK>
Cc: Flood Risk Management <FloodRiskManagement@flintshire.gov.uk>
Subject: EXTERNAL RE: FCA Historical Flood Information

CAUTION: This email has reached Flintshire County Council from an external source. Please be extra cautious prior to opening any links or attachments, particularly if you weren't expecting the email or don't recognise the sender.

Hi Neil

Are you able to assist with the below enquiry re: historical flooding?

Regards

Andy Jones

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 12 October 2023 14:20
To: Andy Jones
Subject: RE: ATI-26068a -: FCA Historical Flood Information
Attachments: ATI_26068a_Flood Flows Estimate.pdf

Good afternoon Andy,

Thanks for signing and returning the Section 3 Agreement.

Please see the finalised licence attached. The links to access the data are below,

Self Service Open Data:

You can now make the most of open data provided **free online**:

- Please see the [Flooding](#) pages on the NRW website for the NRW Flood Risk Map Viewer and the Development Advice Map/Flood Map for Planning. You will find many spatial risk layers including the Flood Risk Assessment Wales (FRAW) maps, reservoir hazard data, Recorded Flood Extents, flood defences and more.
- [DataMapWales](#): Spatial data is free to download, view and use within your own GIS system. The flood datasets include: Flood Risk Assessment Wales (FRAW) Maps, Flood Map for Planning (FMfP), Recorded Flood Extents, Flood Defences, Areas Benefitting from Flood Defences, FMfP TAN 15 Defences Zones and LIDAR data.
- Please note that you can find a GIS layer of our flood models in the Flood Map for Planning viewer. This is not an exhaustive list but does give a good idea as to the most relevant models for an area. This can be accessed via the following link: <https://flood-map-for-planning.naturalresources.wales/>. Select the 'Detailed Map' tab and the layer in question is called 'NRW Local Model Manager'.

FRM Products:

- **Model Reports and Output (Free):**

DeeTidal_2_V4.1_2020

<https://cyfoethnaturiolcymru.sharefile.eu/d-s3ab399a4e8004322b628ca34b2c41d97>

QueensferryHFerry_5_V3.0_2020

<https://cyfoethnaturiolcymru.sharefile.eu/d-s2ea4e11679ab47239c499aeff135c097>

- **Model Build Information (£150+VAT):** if required after reviewing model report and output

Please Note the Following:

- Extreme Sea Level Information around the Welsh coastline is available from the Coastal Flood Boundaries (2018) dataset. This can be accessed from the following location: [Coastal Flood Boundaries \(CFB\) | DataMapWales \(gov.wales\)](#).
- All information supplied will need to be verified by the recipient **PRIOR** to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-

channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA. Please see our website for further information on [Modelling for Flood Consequence Assessments](#) and [Developing hydraulic models for flood risk](#).

- Climate change allowances will need to be applied carefully to ensure compliance with [Flood and coastal erosion risk management: adapting to climate change | GOV.WALES](#).
- For Coastal and Estuarine sites NRW will require assessment of wave overtopping. It is up to the developer to justify why an assessment *isn't* required.
- Shoreline Management Plan (SMP) information is available on our website via our [Flood Risk Viewer Map](#) and also on Welsh Government's [DataMapWales Portal](#). You may need to consider the policy implications of the SMP when assessing the suitability and sustainability of new development on your site of interest. For proposed development sites in Gwynedd & Anglesey a Local Development Plan Policy (POLICY ARNA 1: Coastal Change Management) sets out how the Local Planning Authority will consider new development proposals within a Coastal Change Management Area. We recommend that you contact the relevant Planning Authority for further information and guidance in relation to this.
- **Pre-application Advice:** As part of our advice service to developers, NRW offer a free initial opinion on your proposal. However, in cases where you would like to access any extra advice that falls outside of our statutory duties, we can only offer this as part of our Discretionary Planning Advice Service (DPA Service). For more information regarding free service and our discretionary planning can be found in the following links: [Welsh Version](#) / [English version](#).

Your request for our free or charged discretionary advice service needs to be accompanied by the relevant 'Request Form' which is available to download from our website. You will then need to send the form to northplanning@cyfoethnaturiolcymru.gov.uk who will coordinate our response.

Please find a link to our Open Government Licence (OGL) here -

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Please also include the attribution statement: "Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved."

Kind Regards

Owen Jones

Swyddog Trwyddedu Data / Data Licensing Officer

Cyswllt Cyfoeth / Customer Hub

Cwsmeriaid, Cyfathrebu a Masnach / Customer, Communications and Commercial Directorate



Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.

PROJECT	Updating tidal boundaries to current climate change allowances for DeeTidal_2_V4.0_2020 – Development and Flood Risk
PURPOSE OF NOTE	Document Climate Change uplift calculations and resulting model outputs.
WATERCOURSE	River Dee
MODEL TYPE	FMP – TUFLOW (1D – 2D)
MODELLER	Tomas Jonathan
FILE NOTE PRODUCED BY	Tomas Jonathan
DATE	09/11/2022

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1 Introduction

This file note outlines the optioneering update carried out for the Development and Flood Risk team on the Inner Dee Tidal model, DeeTidal_2_V4.0_2020. Specifically, the updates concentrate on a wider range of return periods, and reflects the latest [climate change guidance](#)¹, published by the Welsh Government. This work and subsequent report provides details of the modelling carried out to meet this DFR request, building upon the previous work of JBA and NRW². Fundamentally, the baseline FMP-TUFLOW model is unchanged with only updated downstream boundary conditions considered. In addition, no new breach locations are considered².

2 Hydraulic Modelling

2.1 Extreme Sea Levels

The *Coastal Design Sea Level – Coastal Flood Boundary Extreme Sea Levels (2018)*³ and its guidance was used to generate extreme tidal boundary conditions for use in the model. Extreme tide levels were taken from Hilbre Island (chainage 1152), key tide levels are provided in Table 1.

Table 1: Tide Levels

Tide condition	Tide Level (m AOD)
MHWS	4.03
HAT	5.26
3.33% AEP	5.64
0.5% AEP	5.91
0.1% AEP	6.12

The subsequent tidal curve shape is derived from predicted tide level data for the nearest Primary Port, in this case Gladstone Dock, Liverpool. Data is used for the period 6th to 13th of April 2020, containing a highest peak tide of 5.18m AOD, just below the HAT. The surge shape for Liverpool is then applied to the tidal data so that the peak of the surge and the highest tide coincide. DFR require the 0.5% AEP and 0.1% AEP tides to be assessed, providing a surge height of 0.73m and 0.93m, to obtain the 0.5% and 0.1% AEP tidal peaks respectively. Tidal boundary data and calculations can be found here⁴.

2.2 Climate Change

Sea level rise resulting from climate change has been calculated in line with the latest climate change guidance¹. The relevant uplift for both 70th and 95th percentile scenarios are calculated using UKCP Portal RCP 8.5 sea-level anomaly data^{4,5} and applied to the whole tidal curve. Final uplift values calculated⁴ for each individual scenario are summarised in Table 2. We assume the baseline year of our model is 2020. **Error! Reference source not found.** Breach analysis was required for both 75 years (2095) and 100 years (2120) of climate change.

¹ Flood Consequences Assessments: Climate change allowances – Welsh Government (Sept. 2021)

² RIVER DEE MODEL UPDATE - BREACHES.pdf – NRW Report (TP, July 2020)

³ [Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels \(2018\) - data.gov.uk](#)

⁴ TJ_UpliftCalc_01112022.xlsx – Excel Workbook

⁵ [UKCP data - Met Office](#) – Annual time-mean sea level anomaly

Table 2: Uplift

Year	Total Uplift (m)		Peak (m AOD)			
	70 th	95 th	0.5% AEP		0.1% AEP	
			70 th	95 th	70 th	95 th
2020	0.014	0.017	5.92	5.93	6.13	6.14
2095	0.640	0.869	6.55	6.78	6.76	6.99
2120	0.933	1.293	6.84	7.20	7.05	7.41

3 Breaches

3.1 Details

Following the NRW guidance note⁶ on simulating breaches, two methods of breach modelling are described; (a) where the breach can be assumed to be present for the whole event, (b) where the breach can be timed to coincide with peak water levels or at the point of overtopping (whichever occurs first). For the current work, only method A is considered.

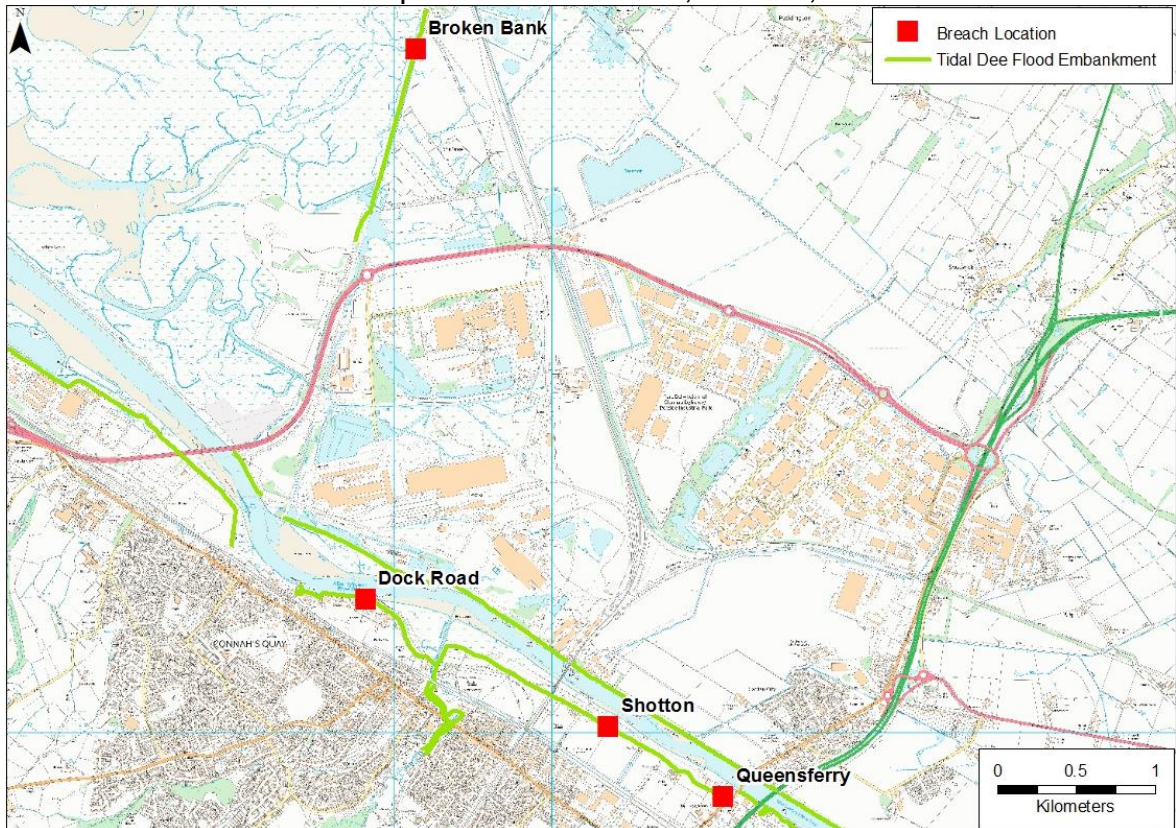
The duration of the breach is modelled over 3 tidal cycles. Whilst the presence of the breach from the start of the flood event would be expected to provide the greatest flood extents and flood depths, the sudden failure of a flood defence at the peak of an event may provide higher velocities. As required by the guidance for an earthen flood embankment on a tidal river reach, all breaches are modelled as 50m wide and the breach erodes to ground level on the landward side of the defence. The peak of the first tidal cycle applied to the model reaches the 0.5% AEP (and 0.1% AEP) tide level followed by two smaller peaks.

For scenario A, a gap in the raised defence is created using a 2d zsh layer, lowering the land to that of natural ground levels lying behind the defences.

⁶ Flood Risk Management: Modelling Blockage and Breach Scenarios (GN043), NRW (Sept 2020)

3.2 Location

Breaches are considered for 12 locations, shown in Figure 3-1 and Figure 3-2, further details of the breach scenarios and filenames are provided² in Table 3, Table 4, **Error! Reference source**



not found..

Figure 3-1 - Breach Locations (West), reproduced² and details in Table 3.

Table 3: Western Breach Locations

Location	NGR Grid Reference	Reasoning
Broken Bank	330131, 373337	Low spots being recorded from past bank top survey.
Dock Road	329816, 369826	Breach where earth embankment ties into the walled embankment as it may be the weakest part in the system in this location.
Shotton	331346, 369026	Known defects in the bank. Badgers create holes and sets within the bank and dense vegetation results in a lack of grass cover on the

		landward face of the embankment.
Queensferry	332077, 368603	Known issues with badgers burrowing and making sets in the banks. Vegetation cover on banks can be variable and access is restricted, making maintenance very difficult.

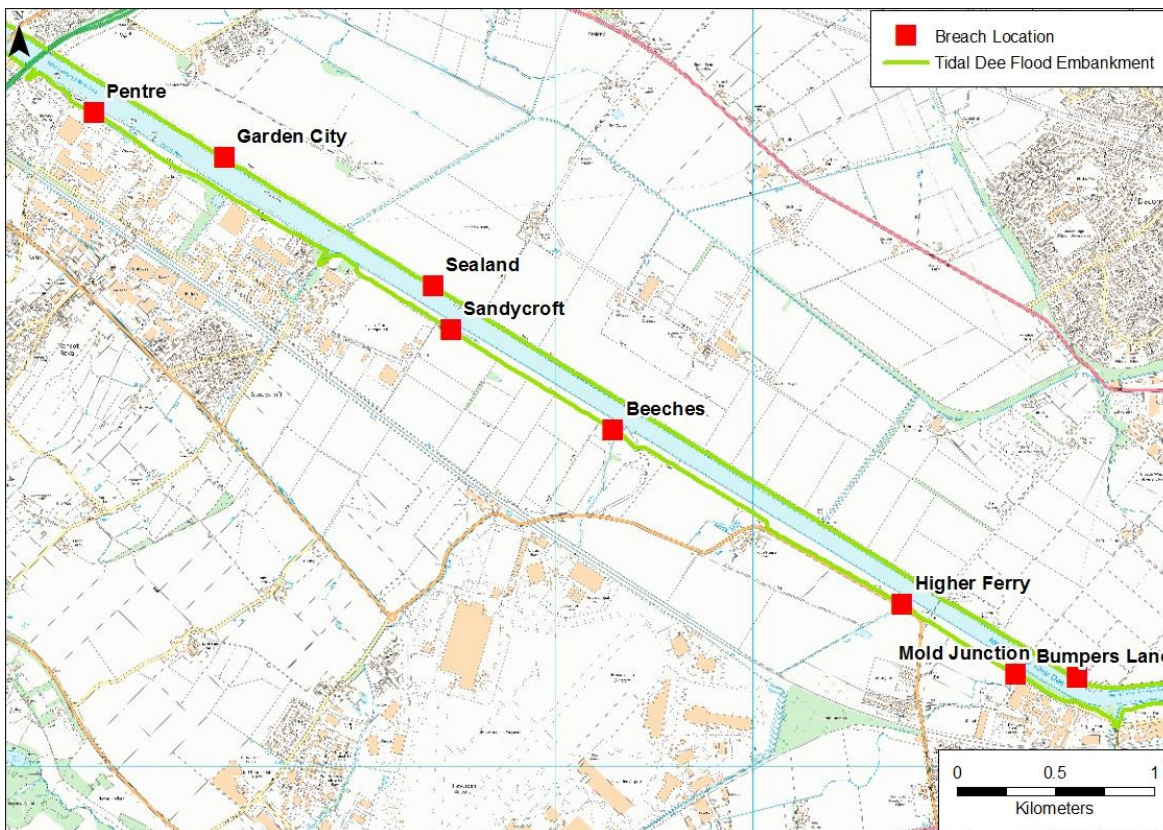


Figure 3-2 - Breach Locations (East), reproduced² and details in Table 1Table 4.

Table 4: Eastern Breach Locations

Location	NGR Grid Reference	Reasoning
Beeches	335304, 366379	Presence of Beeches drain outfall flap. Defect on flap or structure could lead to a possible breach. Also, the interface between soft and hard structures such as the location of a large outfall in

		an earth embankment may be the weakest part in the system.
Bumpers Lane	337668, 365434	Known issue with badgers burrowing and making sets in the banks.
Garden City	333330, 368072	Known problems on Northern Embankment, breach location chosen based on previously recorded low surveyed bank levels in this location.
Higher Ferry	336747, 365832	Known defects in outfall flap
Mold Junction	337310, 365482	Outfall flap on Mold Junction Drain has failed previously, potential problem.
Pentre	332676, 368307	Known low spots created on the embankment by illegal motorbike activity in the past.
Sandycroft	334462, 367198	Large areas of embankment covered by hedge on the landward side, lack of grass cover and localized scouring.
Sealand	334388, 367424	There are no known visible problems on Northern Embankment, breach location chosen based on previously known low surveyed bank levels in the area.

3.3 Outputs

Data outputs are in the format of:

TIDALDEE_ "location" _A_ "CCyear" _ "Percentile" _T"Return Period" _003.

For each breach location, climate change year, percentile and return period combination, outputs available are peak velocity (v), maximum water depth (d) and peak water height (h). For 0.1% AEP runs the 70th percentile scenario is not considered.

Table 5: Breach Scenario Details

Breach Location	Breach TUFLOW Layer	Results Filename Example
Broken Bank	2d_zsh_BB_Breach_001	TIDALDEE_BROKENBANK_A_2095_70_T200_003
Beeches	2d_zsh_Beeches_Breach_002	TIDALDEE_BEECHES_A_2095_70_T200_003
Bumpers Lane	2d_zsh_Bumpers_Breach_002	TIDALDEE_BUMPERS_A_2095_95_T200_003
Dock Road	2d_zsh_DockRD_Breach_002	TIDALDEE_DOCKRD_A_2120_95_T200_003
Garden City	2d_zsh_GC_Breach_001	TIDALDEE_GC_A_2095_95_T200_003
High Ferry	2d_zsh_HFerry_Breach_001	TIDALDEE_HFERRY_A_2120_95_T1000_003
Mold Junction	2d_zsh_MoldJnt_Breach_002	TIDALDEE_MOLDINT_A_2120_95_T1000_003
Pentre	2d_zsh_Pentre_Breach_001	TIDALDEE_PENTRE_A_2120_95_T200_003
Queensferry	2d_zsh_Qferry_Breach_002	TIDALDEE_QUEENSFERRY_A_2095_70_T200_003
Sandycroft	2d_zsh_SANDYCO1_Breach_001	TIDALDEE_SANDYCROFT_A_2095_95_T1000_003
Sealand	2d_zsh_Sealand_Breach_002	TIDALDEE_SEALAND_A_2120_95_T1000_003
Shotton	2d_zsh_Shotton_Breach_001	TIDALDEE_SHOTTON_A_2120_95_T200_003

4 Summary

The Inner Dee Tidal model has been updated to reflect the latest climate change allowances and guidance¹. The updates have also incorporated both 0.1% AEP and 0.5% AEP scenarios in addition to the 70th and 95th percentile sea level rise scenarios as documented⁵ by UK Climate Projections. The relevant uplift is calculated for each scenario and applied to the respective tidal curve. The updated downstream boundaries are considered for 12 breach locations along the western and eastern embankments of the Dee for 75 years (2095) and 100 years (2120) of sea level rise. The breach scenarios tested assume breach is present from the start of the event.

5 General Model Limitations

This modelling is essentially broad scale, across an extensive area. Although there is some detailed information in places much of the area covered has come from desktop studies only and is based on the best available data at the time. Previous modelling² work has added more detail to the model, however, there is still a likelihood that not all information which influences flood risk has been accounted for. For example, secondary defences and potential flood flow routes may not be accurately represented due to the broad scale nature of this modelling work.

For more site-specific use of this model additional local edits may be required. The railway embankment and the secondary bank that sits in the rifle range are not designed to act as flood defences, however within these model runs it is assumed they would not breach/fail.

There are ponds, pools, and reservoirs within this study area, these have been represented using LiDAR only. For more site-specific use of this model, better ways to represent these bodies of water maybe required.

We note high Peak Cumulative Mass Error is present for 0.5% AEP 100-year climate change and 0.1% AEP 100-year climate change runs at 13-14hr run-time. This can be explained by the model being started at 13hrs and numerous grid-cells being wetted initially (since breach is present from the start). This causes higher than expected initial Mass Error, however, the value quickly reduces to within acceptable values (+/- 1% Cumulative Mass Error). We note for the Beeches breach scenario, cumulative mass error values are higher than desirable, however, given they are within +/- 2% and the flood outlines are reasonable we have decided these results are acceptable.



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Broughton Brook & Queensferry Drain Flood Risk Study

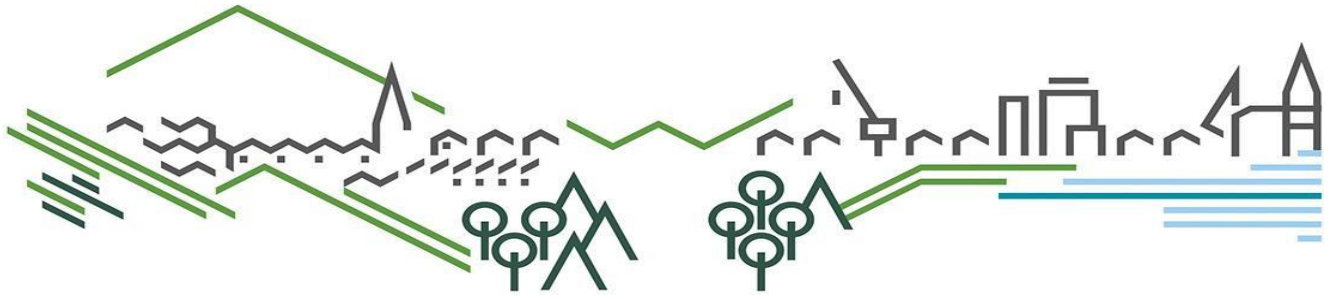
Final Report

November 2020

Revision History

Revision Ref	Description	Prepared by	Reviewed by
Draft V1	First draft	Joe Pierce	Jenny Jones
Final Report	Addressed review comments and added more detail to the report	Joe Pierce	Jenny Jones
Final Report v2	Re-ran the undefended model with 2d_zsh_drain_Bro (was incorrectly reading 2d_zln_drain_Bro). Updated Table 1 of the report. Negligible impact on outlines therefore have not amended the figures in the report.	Lois Evans	

Model reviewed by: Jenny Jones



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1 Introduction

1.1 Purpose and scope of study

As part of updating the Flood Risk Assessment Wales (FRAW) outputs, the existing detailed models for tributaries draining the Tidal Dee catchment were reviewed to assess their suitability for use in FRAW. This technical note focuses on the models for the Broughton Brook and Queensferry Drain area. An overview of the fluvial system can be seen below in Figure 1.

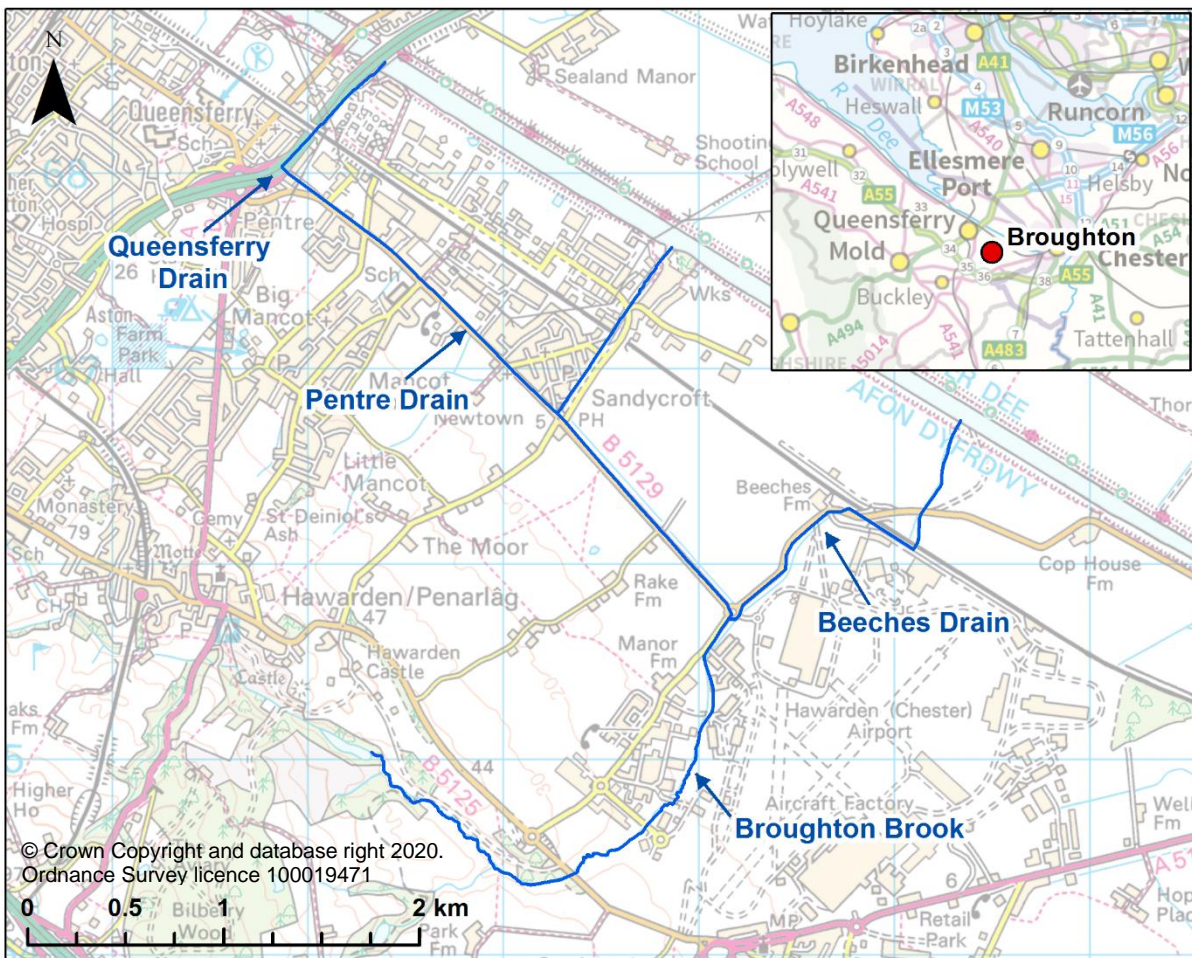


Figure 1 - Overview of the watercourses in the Broughton/Queensferry area

Following a review of the existing models, it was agreed that the most recently updated models for Broughton Brook and Queensferry Drain would be merged together to produce a model covering the full fluvial system. This approach enables a consistent set of outputs for the area and provides a single model which can be developed upon moving forward.

The information in this technical report provides a concise overview of the previous hydraulic models, the updates made as part of merging the models, and some recommendations on areas for improvement.

1.2 Previous Modelling

There have been several modelling studies in the area as summarised below:

- 2001 – 1D (ISIS) flood mapping study (JBA)
- 2008 – 1D/2D (ISIS-TUFLOW) scheme pre-feasibility and viability study (Halcrow)
- 2010 – 1D/2D (ISIS-TUFLOW) Project Appraisal Report (PAR) study (Jacobs)
- 2014 – 1D/2D (ISIS-TUFLOW) Broughton Brook Model Updates & Flood Consequence Assessment (FCA) for Hawarden Business Park (JBA)
- 2015 – 1D/2D (ISIS-TUFLOW) Topographic updates to JBA model (NRW)
- 2019 – 1D/2D (ISIS-TUFLOW) A494 - Queensferry Drain Hydraulic Modelling (Mott Macdonald)

The two most recent of these studies are built from two different models, and as such cover a different extent and have been updated for specific FCA purposes. The 2014 modelling for Broughton Brook was focused on the Hawarden Business Park development and was trimmed to focus on Broughton Brook and extended the modelled channel further upstream. In 2015 this model was updated by NRW to include some more recent bank survey, most notably raising a historic low spot on the right bank which previously demonstrated flood risk to properties on Brook Lane and Manor Crescent.

In 2019, as part of an FCA looking at improvement works to the A494 crossing of the River Dee, the 2010 Queensferry Drain model was updated by Mott Macdonald in order to assess the flood risk impact of the proposed scheme. This update included a new hydrological study as well as using more recent LiDAR data.

This has led to two separately updated models in the area which cover different spatial extents and have been updated focussing on two discrete locations. Figure 2 below shows the extent of the two different models.

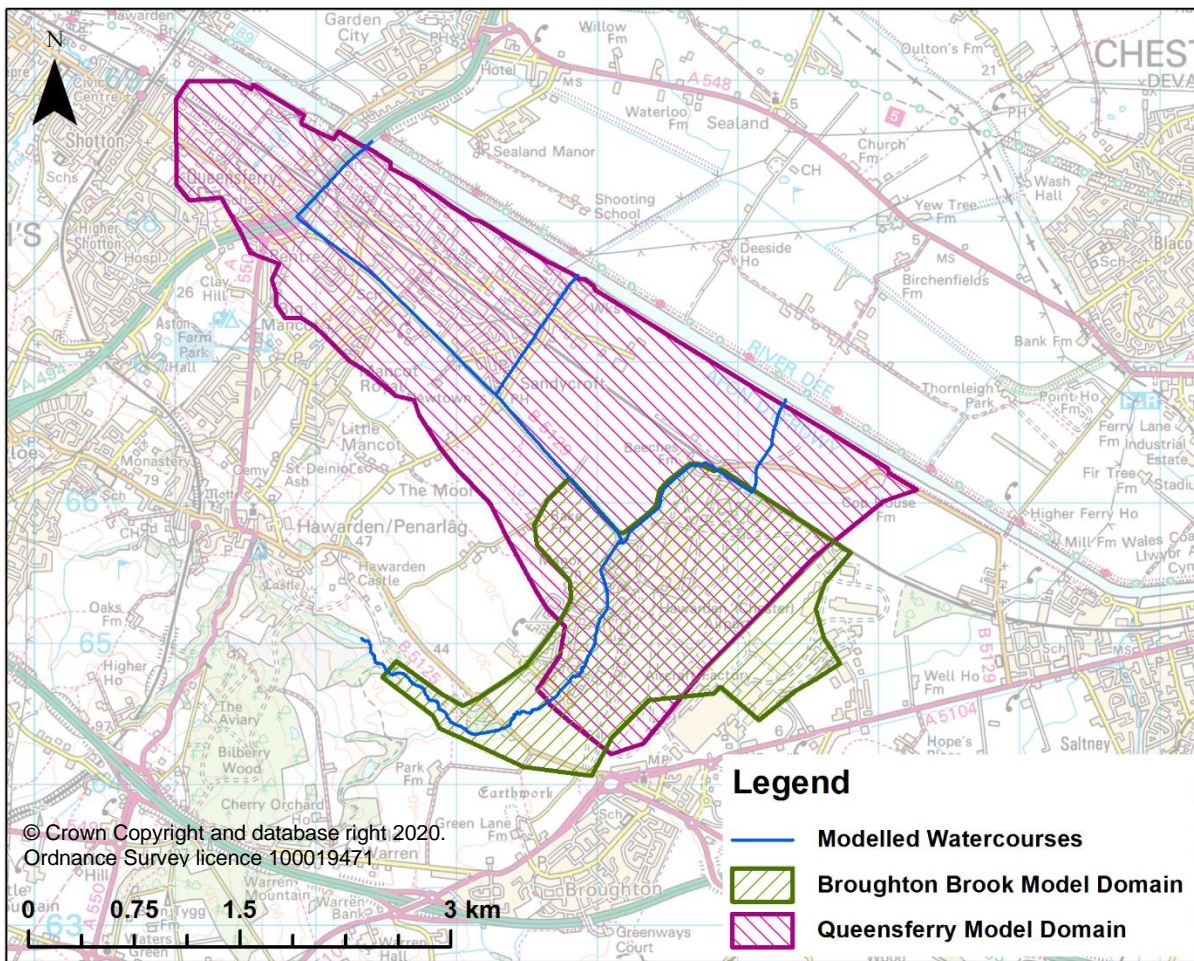


Figure 2 - Model extents from previous Broughton Brook and Queensferry modelling

Merging these models was necessary to provide a full understanding of flood risk in the area and to provide a consistent basis for future studies.

2 Merging of models

This section outlines the steps and decisions taken in combining the two previous models from 2015 and 2019 to create one model to be taken forward as the primary model for flood risk for this area.

2.1 Hydrology

The hydrology undertaken as part of the 2019 Queensferry Drain study has been adopted for the merged model. This analysis is the most recent hydrological study for the area and follows the latest industry standards. The hydrology was reviewed by NRW previously in 2019 and accepted to be fit for purpose. Additionally, this study incorporates all the hydrological inflows required for the merged model, and therefore can be adopted without any changes to the flows.

Peak flows for each catchment have been estimated using the FEH Statistical Method which have then been used to scale hydrographs produced in ReFH2. Due to the rarity of large magnitude gauged events there is less certainty in the statistical method above the 100yr event, therefore the relative growth factors in ReFH2 (1000yr/100yr) are used to scale the 1000yr peaks.

The critical storm duration of 10.25 hours has been retained in the design flows. The 2019 hydrology assessed the impact shorter durations which were shown to produce less flooding. Longer storm durations were not assessed as the catchments were all relatively small. No further testing of storm durations has been undertaken in the merged model.

In integrating the hydrology into the new model, the only change necessary was to move the main inflow on Broughton Brook (BRO01) up to the top of the Broughton Brook reach, and the lateral inflows from BRO02 were re-linked to the new sections.

2.2 1D Model Domain

Based on the scopes of the two previous models, the Manor Lane/B5129 roundabout (334174 E, 365759 N) was chosen as a suitable point to merge the models. As a starting point, the Queensferry Drain model network was copied and the sections upstream of BB_2375u were replaced with those from the Broughton Brook model.

An initial test run lead to results diverging at $t=0$, therefore new initial conditions were derived and imported into the network. The model was then simulated in 1D-only for the Q25, Q100 and Q1000 events with the Q25 and Q100 both completing successfully and the Q1000 crashing just after the peak at 57% progress. Rather than trying to stabilise at this stage, it was assumed that the Q1000 run would likely be more stable when linked to the 2D domain.

For clarity, a new model identifier – **BRQF** – was adopted for the merged model.

Once successfully merged, the 1D model was checked to ensure structures and reaches were represented appropriately and with appropriate spill mechanisms. Any changes are detailed in section 3.

2.3 2D Model Domain

As with the 1D components, the Queensferry model was used as the starting point for the 2D domain, with the relevant layers from the Broughton Brook model superseding layers from the Queensferry model.

Table 1 below outlines the GIS layers which were updated in order to merge the models.

Table 1 – GIS layers adopted in new model

Layer	Purpose	Action	Comments
1d_nwk_culvert_Bro.MIF	Defines culvert beneath Rake Lane	<i>Maintained</i>	Kept from 2019 Queensferry Drain model
2d_iwl_iic_Bro.MIF	Sets initial water levels in 2D domain	<i>Maintained</i>	
2d_bc_SX_culvert_Bro.MIF	Defined SX connections between 1D and 2D components	<i>Maintained</i>	
2d_zln_embank_Bro.MIF	Reinforces railway embankment	<i>Maintained</i>	
2d_zln_roadpara_Bro.MIF	Defines structure parapets	<i>Maintained</i>	
2d_zsh_Unsurveyed_P_001.shp	Reinforces banktop levels along Beeches Drain from LiDAR	<i>Maintained</i>	
2d_zln_chester_rd_Bro.MIF	Reinforces levels along B5129 (Chester Road)	<i>Maintained</i>	
2d_zln_drain_Bro.MIF	Reinforces drain along Chester Road in 2D domain. Changed to zsh layer to better define rules.	<i>Updated</i>	
Mastermap_001.shp	Defines landuse type in 2D domain	<i>Maintained</i>	
2d_zsh_underpass_Li2008_Bro.MIF	Defines underpasses beneath railway embankment.	<i>Maintained</i>	
2d_zln_Brook_Lane_ramp_001.MIF	Road hump along Brook Lane (Defence)	<i>Maintained</i>	Kept from 2015 Broughton Brook model
2d_zln_roundabout_scheme_001.MIF	Small bund near roundabout downstream of Brook Lane (Defence)	<i>Maintained</i>	
2d_zpt_decks.MIF	Defines bridge decks along Broughton Brook	<i>Maintained</i>	
2d_zsh_Plot5_001.MIF	Defines ground levels in Hawarden Business Park	<i>Maintained</i>	
2d_bc_HQ_Bro.MIF		<i>Removed</i>	
1d_isis_nodes_BRQF_001.MIF	Connection between Flood Modeller sections and TUFLOW	<i>Updated</i>	Updated 1D node layer to contain correct nodes
2d_bc_hxe_BRQF_001.MIF	2D domain boundary	<i>Updated</i>	Updated 2D code boundary to cover full area for both models
2d_bc_hxi_BRQF_001.MIF	Links between 1D and 2D domain	<i>Updated</i>	Updated 2D hx and cn lines taken from both models

2d_loc_BRQF.MIF	Defines TUFLOW grid location and orientation	<i>Updated</i>	Updated 2d_loc line to cover full model domain
2d_zln_banktop_BRQF_001.MIF	Reinforces banktop levels	<i>Updated</i>	Updated banktop survey layer taken from both models
2d_zln_Halcrow_banktop_BRQF_001.MIF	Reinforces banktop levels	<i>Updated</i>	Updated to remove points superseded by Broughton Brook model
1d_nwk_BRQF_001.MIF	New 1d_nwk layer created for river channel to allow 1d outputs to be mapped in 2d results	<i>New</i>	
1d_WLL_BRQF_001.MIF	New water level lines created to map 1d outputs in 2d results	<i>New</i>	
2d_zsh_Stubby_Building_001.MIF	Zshape created from mastermap to raise building footprints by 300mm	<i>New</i>	

Initial simulations were set up using 4m grid size, 2s 2D timestep and 1s 1D timestep, these simulations all completed in full (including Q1000) without any major issues with stability or convergence. Simulations were run using TUFLOW version 2018-03-AE and Flood Modeller Pro version 4.5.1.

3 Hydraulic modelling updates

3.1 Defended model

Once the merged model was running successfully, the model was reviewed at a high level to establish key areas which could benefit from being updated.

In the 1D Flood Modeller network, there were some fairly significant differences in in-channel Manning's n values between different sections of the watercourse, for example the less urbanised reaches upstream on Broughton Brook had lower values than some of the artificial drains around the Queensferry area. A site visit was undertaken on 17th March 2020 to get an understanding of the current channel condition and to check the existing assumptions of channel roughness in the model. During the visit it was observed that generally the existing assumptions in the model were representative of the channel condition, and the differences in roughness were justified. There were two sections of the model where the in-channel Manning's n values were adjusted, these are both detailed in the model log. Some other minor updates were made to include panel markers in the sections where necessary.

In addition to the 1D network, the 2D model components were also checked to identify any potential updates or fixes. Firstly, the 2D model extent was reduced as to only cover the area necessary based on the initial 1000yr extent, improving model start up time and storage requirements. A review of the 1D/2D links in the model revealed that there were numerous areas where the HX lines and banklines were not snapped which, although less of a concern at a 4m grid size, led to activated HX cells not being reinforced by the banklines when using a 2m grid resolution. New versions of the bankline and HX connection layers were created that snapped along the river banks ensuring that all activated HX cells were modified by the relevant banklines thus avoiding erroneous low spots on the banks. It was observed that the '2d_zsh_Unsurveyed_(L&P)_001.shp' bankline layers were incorrectly read into the tgc as a Z shape with the width set to zero and therefore implemented into the model as a 'thin' breakline raising individual zpts but not entire cells. For consistency with the rest of the model, these layers were translated into .MIF format and read into the TGC explicitly as a 'thick' Z line.

Initially when running the model with a 2m grid, it was crashing at t=0 in the 1D domain. Investigating further established that this instability in Flood Modeller was directly related to the grid size being set to 2m rather than an issue with the timestep or initial conditions. Some more examination highlighted the issue as being related to how the 2d initial water levels (IWL) were set for the SX point connections as polygons, presumably based on a previous model grid. With the 2m grid, the size and orientation of the cells failed to intercept the IWL layer, causing the model to crash in 1D. This was fixed by setting the IWL in TUFLOW using points and snapping to the SX points, which applies the correct initial levels irrespective of model grid size or orientation.

At the 2m grid size, the model then started successfully however began to go unstable in all events before the peak model inflow (approx. 40%). Initial troubleshooting indicated the instability was due to the reduced 1D timestep of 0.5 seconds used with the higher grid resolution. This instability would inherently be present in simulations using a larger timestep, although it may not cause the model to fail. With the updated model reverted to using a 4m grid, the model simulations still exhibited instability focused in the downstream reaches of the 1D network, although most simulations completed with only the 25yr Undefended and 100yr Defended scenarios crashing.

The instability present in the 1D network was found to be a legacy issue from the Queensferry model and was causing large fluctuations in the 1D levels around the downstream boundary of Queensferry Drain. As part of stabilising the model in this location, the downstream boundary was updated to use a MHWS boundary extracted from the Tidal Dee defended model used in FRAW. This model uses MHWS conditions for Hilbre Island at the mouth of the estuary and applies a constant baseflow of 30 m³/s. The model is a FMP-TUFLOW (1d-2d) linked model but has been run as 1d only in FMP because there is not out-of-bank flows to be accounted for in this scenario. This boundary was applied temporally such that the peak flow in Queensferry Drain coincides with the peak level in the River Dee. In order to improve stability, a minimum base level was applied to the downstream boundary in the model with values of 1.20mAOD, 1.40mAOD and 1.6mAOD at the outfalls for Queensferry Drain, Broughton Brook and Beeches Drain respectively. As an additional measure for stability, a 0.5m topslot was added to the culvert at model node QD_708D to improve the in-channel results as the culvert surcharges.

The final model is set to use a 4m grid size and has a simulation time of approximately 4 hours.

Sensitivity testing had been undertaken previously in both models. The Broughton Brook model tested typical assumptions of flow, roughness, cell size and downstream boundary slope, concluding that the model was most sensitive to flow and roughness. Additional confidence has been gained for both of these assumptions in the merged model by using the more up to date hydrology and undertaking a site walkover to confirm channel conditions. The 2019 Queensferry model undertook sensitivity testing focussed on the hydraulic system around Queensferry Drain and Pentre Drain, demonstrating that any deviations in the channels or structures would be unlikely to significantly impact results. Although the updated model results have been compared against the two previous models in section 4.4, no further sensitivity testing has been undertaken on the merged model, though this should be considered in future studies.

3.2 Undefended model

In setting up an undefended model scenario, several changes were made to the baseline model. Firstly, the pumping station at the outfall of Queensferry Drain was removed, and all flapped outfalls into the Dee were set to remain open. This would mean that when the Dee was high, not only would Queensferry drain be unable to discharge, but also that water could backup through the three outfalls.

In addition to the changes at the outfalls, the road hump on Brook Lane and small bund at the roundabout have also been removed in the undefended scenario.

3.3 Climate Change

To account for the increase in peak river flows expected with climate change, model simulations have also been run with a 20% uplift to flows for the 100yr and 1000yr events in both the defended and undefended scenarios. This uplift reflects the central allowance for total anticipated change for 2070-2115, in line with the latest climate change guidance¹.

¹ Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales, December 2017

4 Results

This section summarises the results from the merged and updated Broughton-Queensferry model. To provide the results needed to update the FRAW map, the model was run for the 25yr, 100yr, 100yr+CC, 1000yr and 1000yr+CC events for both the defended and undefended scenarios. The results presented in this report have been processed to remove any dry islands and ponds less than 200m², however uncleaned raw results are also provided in the model package as these are required for input into FRAW.

4.1 Defended scenario

The results from the defended scenario are shown in Figure 3. As with the previous modelling, there is little flooding in the upstream reaches of Broughton Brook and the main out of bank flooding spills from the right bank of the river opposite the Hawarden Industrial Park. In the area around the Sandycroft/Queensferry drains, the flood extents are largely consistent with the previous Queensferry modelling, with the most flooding occurring in the field along the south-western edge of Chester Road. There is no flooding present on the Dee side of the railway embankment in any event.

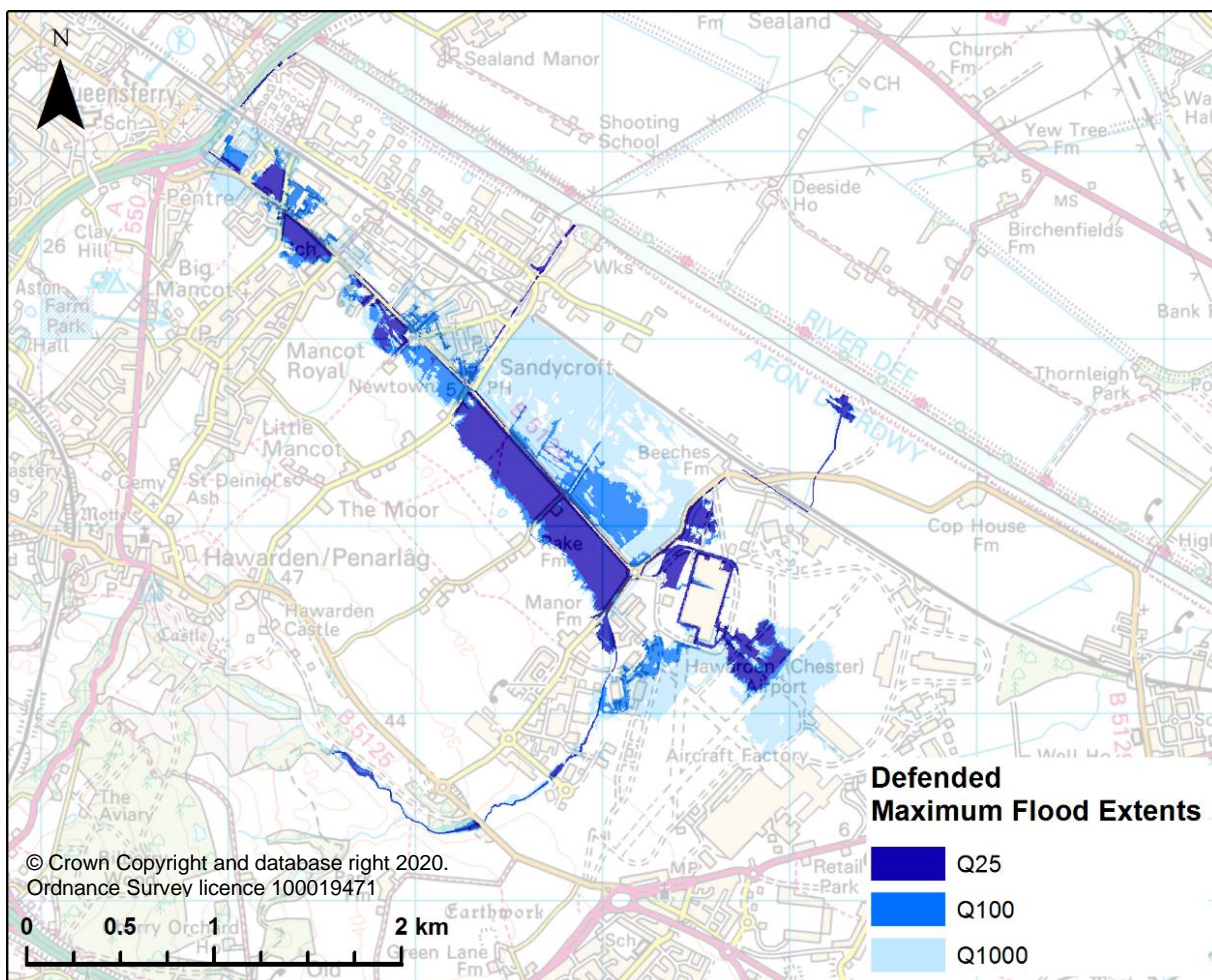


Figure 3 – Maximum modelled flood extents for the defended scenario in the merged model

4.2 Undefended scenario

Overall, there is little difference in the results between the defended and undefended scenarios, except for in the residential area around Brook Lane where the ramp is removed in the undefended scenario. Figure 4 shows the Brook Lane area in more detail as an inset.

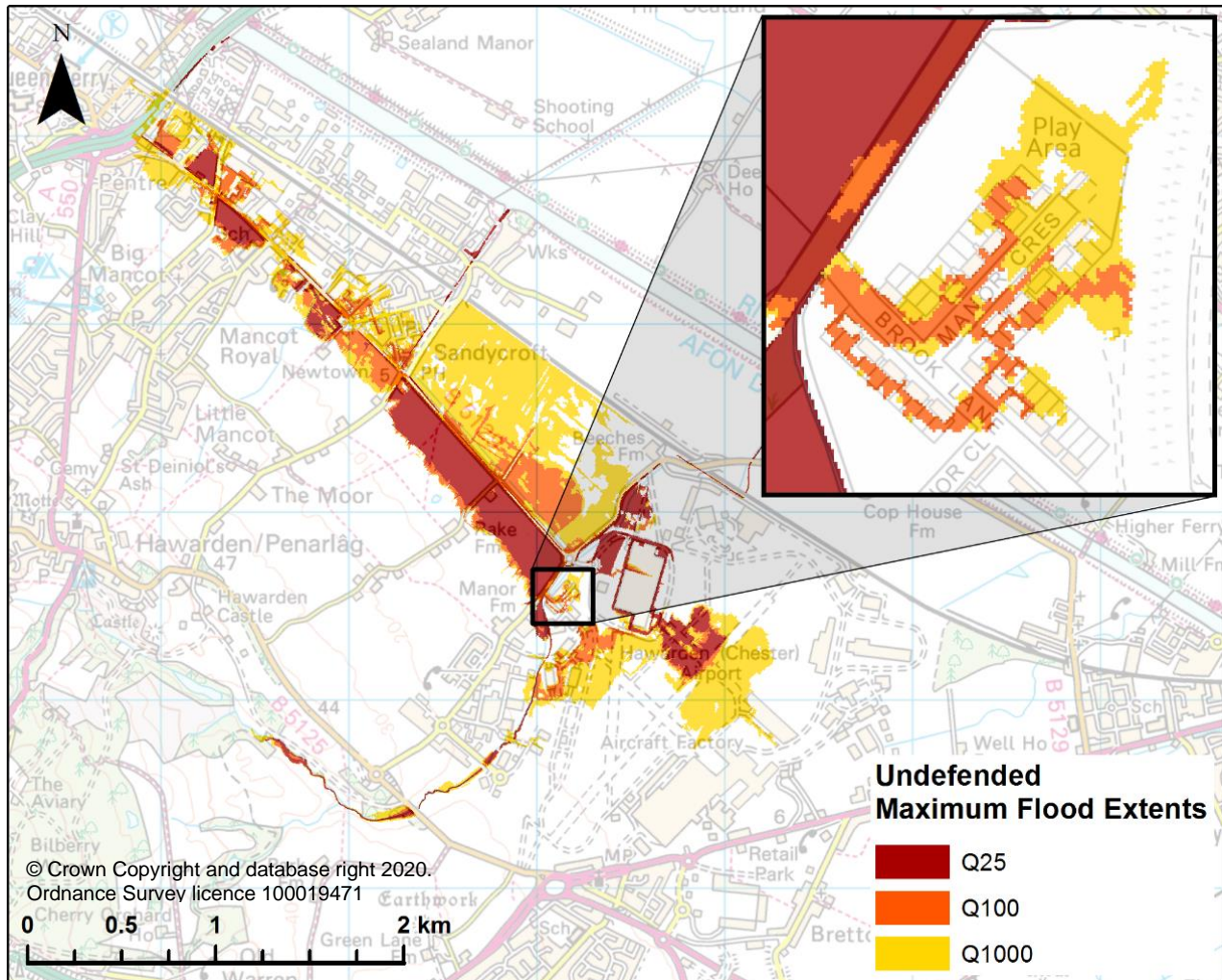


Figure 4 - Maximum modelled flood extents for the undefended scenario in the merged model. The inset shows greater detail around Brook Lane.

4.3 Climate change

The potential impact of climate change within the model is shown in Figure 5. These results present the potential increase in fluvial flood risk due to climate change. Generally, there is not much change in flood extents along the left bank of both Broughton Brook and Queensferry Drain in the climate change runs. There is an increase in flooding in the Sandycroft area, particularly in the fields between Chester Road and the railway line. The only new flow route, which appears in the 1000yr plus climate change event, emerges off the right bank of Broughton Brook just upstream of the Hawarden Business Park and eventually reconnects with existing areas of flood risk around Hawarden Airport.

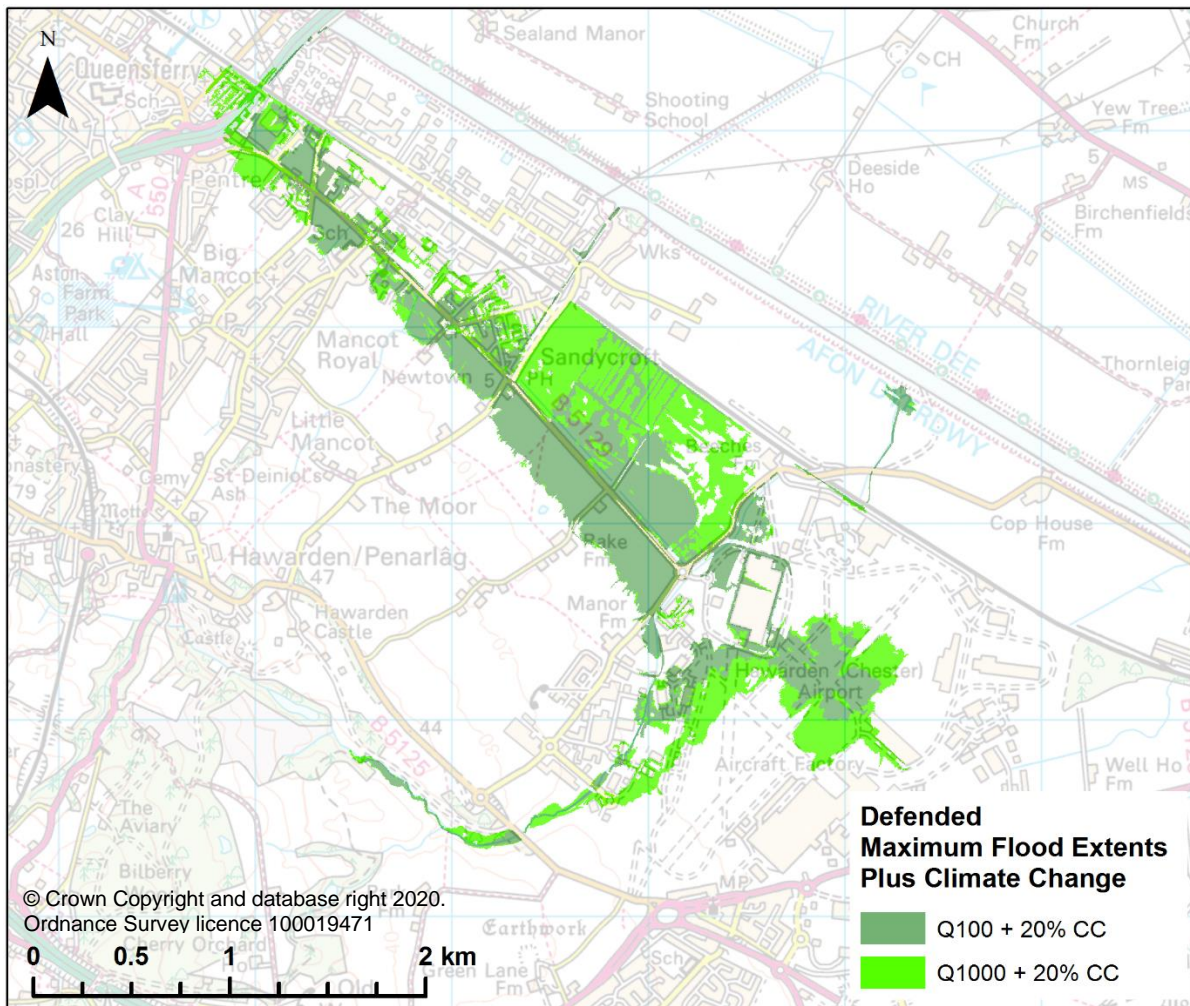


Figure 5 – Maximum modelled flood extents for the defended scenario with climate change

4.4 Comparison with previous models

A visual comparison between the merged model and previous model 100yr results is shown in Figure 6. These show that although the results are generally fairly consistent between the modelled versions, there is slightly less flooding around the industrial park area on Broughton Brook (shown in green) and slightly more flooding in the Sandycroft area (shown in red). The reduction in flooding on Broughton Brook is mostly in comparison with the Queensferry model, and since the same hydrology has been adopted, this is due to the improved representation of the channel and bank levels in the updated Broughton Brook modelling. Since there is less flooding in this area, it can be inferred that the additional flow conveyed in this area leads to the increase observed on the right bank in the Sandycroft area. As with the undefended model, the Brook Lane residential area is also shown to have been removed from flood risk when compared with the previous Queensferry modelling as this model did not represent the road ramp on Brook Lane.

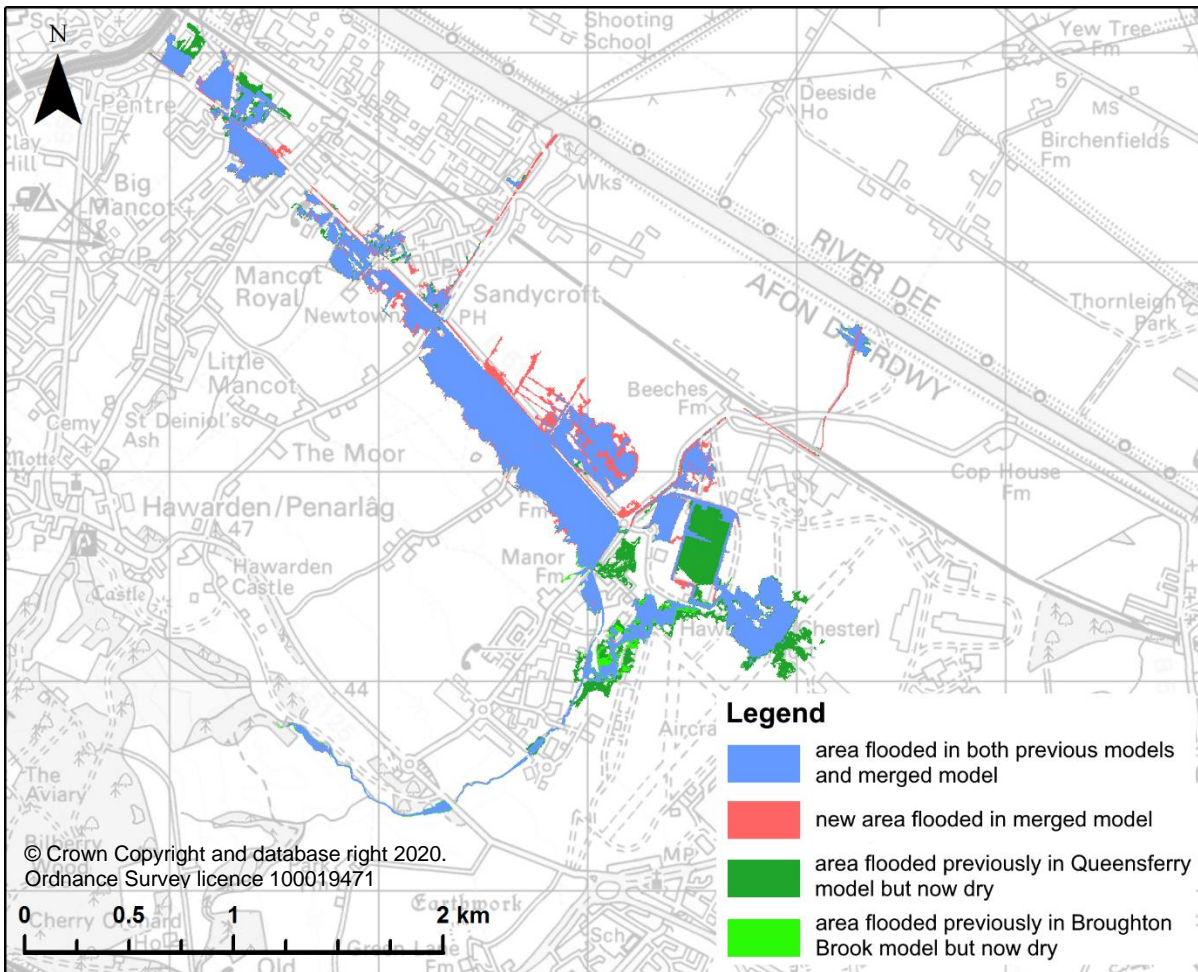


Figure 6 – Comparison between merged model and previous model results, for the 100yr event. The blue area shows where flooding has been maintained between models, the red area where new flooding is present in the merged model, and the green area where flooding has been removed in the merged model.

5 Conclusion

In producing modelled flood outlines for input into FRAW, it was noted that the most up to date modelling for Broughton Brook and Queensferry Drain was in separate, overlapping models. In order to provide a single, consistent understanding of flood risk, these two models were merged, and several updates were made to improve performance and representation of some features. The model has been run for the events required for FRAW for defended and undefended scenarios, including an allowance for climate change.

5.1 Limitations & Recommendations

It is important to note that the work undertaken in this study was primarily to provide a single, consistent set of flood mapping results by merging two models which had been developed separately. The models were reviewed and updated from a high-level perspective, and therefore any future modelling for proposed FCAs should review the model in detail and specifically focus on the area of interest. There are several limitations in the merged model which should be considered in any further use of this model and results, these include but are not limited to:

- Although the channel survey along Broughton Brook is relatively recent, the channels from the Queensferry model are represented based on survey from 2006 and 2009. The 2019 study does state that there were concerns with this previous survey and some work was undertaken to address them through sensitivity testing - although this was focused solely on impact at the A494 site of interest. It is therefore recommended that future use of this model ideally incorporates new channel survey, or at a minimum a robust review of the previous survey.
- Throughout the lower reaches of the model, there are inherent instabilities in the 1D network, most likely related to the flat, complex channel system where backflow is common. This should be taken into consideration, and it may be appropriate to represent this system entirely in ESTRY instead as this will likely improve stability and confidence in complex channels in low-flow.
- During the site walkover as part of this study, it was noted that there are many structures along Pentre and Queensferry Drains which appear to have a high risk of blockages during a storm event as the channels are very overgrown and structures are small. This risk should be considered as it may bring new areas into flood risk.

Flood Consequences Assessment
for Land off Gladstone Way, Mancot, Hawarden, Flintshire

Appendix 5

Calculations

Source Control Greenfield Run-off Calculation

Surface Water Design - MicroDrainage Calculations

Network 1

Network 2

Network 3

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	<input type="text" value="2"/>	<input type="text" value="3"/>
HOST class:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
SPR/SPRHOST:	<input type="text" value="0.3"/>	<input type="text" value="0.37"/>

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	<input type="text" value="719"/>	<input type="text" value="719"/>
Hydrological region:	<input type="text" value="9"/>	<input type="text" value="9"/>
Growth curve factor 1 year:	<input type="text" value="0.88"/>	<input type="text" value="0.88"/>
Growth curve factor 30 years:	<input type="text" value="1.78"/>	<input type="text" value="1.78"/>
Growth curve factor 100 years:	<input type="text" value="2.18"/>	<input type="text" value="2.18"/>
Growth curve factor 200 years:	<input type="text" value="2.46"/>	<input type="text" value="2.46"/>

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited

Q_{BAR} (l/s):	15.48	24.4
1 in 1 year (l/s):	13.62	21.47
1 in 30 years (l/s):	27.55	43.42
1 in 100 year (l/s):	33.74	53.18
1 in 200 years (l/s):	38.07	60.01

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology FSR Return Period (years) 100 Additional Flow (%) 0 FSR Region England and Wales M5-60 (mm) 17.000 Ratio-R 0.300 CV 0.750 Time of Entry (mins) 5.00	Maximum Time of Concentration (mins) 30.00 Maximum Rainfall (mm/hr) 50.0 Minimum Velocity (m/s) 1.00 Connection Type Level Soffits Minimum Backdrop Height (m) 0.200 Preferred Cover Depth (m) 1.200 Include Intermediate Ground ✓ Enforce best practice design rules x
---	--

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
101	0.090	5.00	36.064	1500	331574.422	366523.140	1.350
102	0.014	5.00	35.725	1500	331568.956	366535.360	1.350
103	0.067	5.00	35.376	1500	331566.228	366546.365	1.425
104	0.056	5.00	34.532	1500	331565.290	366568.445	1.425
105	0.000		34.198	1500	331567.008	366576.142	1.425
106	0.071	5.00	33.840	1500	331571.562	366583.342	1.425
107	0.165	5.00	31.675	1500	331606.553	366624.637	1.500
108	0.160	5.00	30.511	1500	331629.170	366651.234	1.500
109	0.194	5.00	29.218	1500	331659.511	366680.782	1.750
110	0.045	5.00	27.118	1500	331678.130	366729.105	2.862
111	0.078	5.00	27.337	1500	331692.927	366719.510	3.200
112	0.065	5.00	27.350	1500	331720.483	366702.480	3.294
113	0.180	5.00	32.458	1500	331631.719	366569.211	1.425
114	0.182	5.00	30.216	1500	331675.731	366620.507	1.500
115	0.188	5.00	28.575	1500	331707.541	366658.047	1.575
116	0.057	5.00	27.112	1500	331737.845	366694.186	3.104
117	0.048	5.00	26.929	2100	331750.024	366686.512	3.257
118	0.180	5.00	29.289	1500	331834.297	366467.387	1.500
119	0.029	5.00	29.863	1500	331812.291	366483.182	2.233
120	0.084	5.00	30.116	1500	331800.971	366489.349	2.562
121	0.119	5.00	30.481	1500	331780.310	366495.968	3.055
122	0.084	5.00	30.401	1500	331744.573	366533.603	1.425
123	0.029	5.00	30.195	1500	331759.332	366526.269	1.425
124	0.010	5.00	30.054	1500	331769.677	366522.256	1.425
125	0.062	5.00	29.888	1500	331785.795	366519.057	2.636
126	0.087	5.00	29.153	1500	331792.587	366547.649	1.999
127	0.132	5.00	28.524	1500	331798.399	366572.113	1.575
128	0.046	5.00	28.528	1500	331790.237	366574.491	1.682
129	0.015	5.00	28.746	1500	331777.228	366578.511	1.934
130	0.086	5.00	28.981	1500	331764.525	366585.875	2.206
131	0.221	5.00	31.082	1500	331701.083	366559.140	1.425
132	0.150	5.00	29.533	1500	331740.634	366605.992	2.911
133	0.037	5.00	28.780	1500	331752.146	366619.678	2.398
134	0.009	5.00	28.316	2100	331755.433	366628.331	4.623
135	0.089	5.00	27.703	2100	331762.441	366638.665	4.041
136	0.013	5.00	27.020	2100	331773.490	366647.082	3.392
137	0.064	5.00	26.582	2100	331780.164	366652.102	2.975
138	0.128	5.00	25.533	2400	331793.150	366668.250	1.978
139	0.000		25.250	2400	331807.944	366672.735	1.734
140	0.000		25.250	2700	331857.108	366692.226	1.866
141			23.500	1200	331872.120	366694.169	0.400

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	101	102	13.387	0.600	34.714	34.375	0.339	39.5	150	5.14	50.0
1.001	102	103	11.338	0.600	34.375	34.026	0.349	32.5	150	5.25	50.0
1.002	103	104	22.100	0.600	33.951	33.182	0.769	28.7	150	5.44	50.0
1.003	104	105	7.886	0.600	33.107	32.773	0.334	23.6	225	5.49	50.0
1.004	105	106	8.519	0.600	32.773	32.415	0.358	23.8	225	5.54	50.0
1.005	106	107	54.126	0.600	32.415	30.250	2.165	25.0	225	5.89	50.0
1.006	107	108	34.913	0.600	30.175	29.011	1.164	30.0	300	6.09	50.0
1.007	108	109	42.352	0.600	29.011	27.543	1.468	28.8	300	6.33	50.0
1.008	109	111	51.152	0.600	27.468	25.337	2.131	24.0	375	6.56	50.0
2.000	110	111	17.636	0.600	24.256	24.212	0.044	400.8	525	5.26	50.0
1.009	111	112	32.394	0.600	24.137	24.056	0.081	399.9	600	7.00	50.0
1.010	112	116	19.241	0.600	24.056	24.008	0.048	400.9	600	7.27	50.0
3.000	113	114	67.589	0.600	31.033	28.791	2.242	30.1	225	5.47	50.0
3.001	114	115	49.205	0.600	28.716	27.075	1.641	30.0	300	5.76	50.0
3.002	115	116	47.163	0.600	27.000	25.208	1.792	26.3	375	5.98	50.0
1.011	116	117	14.395	0.600	24.008	23.972	0.036	399.9	600	7.47	50.0
1.012	117	138	46.833	0.600	23.672	23.555	0.117	400.3	900	7.97	50.0
5.000	118	119	27.088	0.600	27.789	27.630	0.159	170.0	300	5.38	50.0
5.001	119	120	12.891	0.600	27.630	27.554	0.076	170.0	300	5.55	50.0
5.002	120	121	21.695	0.600	27.554	27.426	0.128	170.0	300	5.85	50.0
4.002	121	125	23.732	0.600	27.426	27.327	0.099	240.0	300	6.25	50.0
6.000	122	123	16.481	0.600	28.976	28.770	0.206	80.0	225	5.19	50.0
6.001	123	124	11.096	0.600	28.770	28.629	0.141	78.7	225	5.31	50.0
6.002	124	125	16.432	0.600	28.629	28.463	0.166	99.0	225	5.52	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.606	28.4	12.2	1.200	1.200	0.090	0.0	69	1.548
1.001	1.772	31.3	14.1	1.200	1.200	0.104	0.0	71	1.727
1.002	1.885	33.3	23.2	1.275	1.200	0.171	0.0	92	2.034
1.003	2.704	107.5	30.8	1.200	1.200	0.227	0.0	82	2.342
1.004	2.693	107.1	30.8	1.200	1.200	0.227	0.0	82	2.333
1.005	2.627	104.5	40.4	1.200	1.200	0.298	0.0	97	2.465
1.006	2.881	203.6	62.7	1.200	1.200	0.463	0.0	114	2.547
1.007	2.938	207.7	84.4	1.200	1.375	0.623	0.0	133	2.788
1.008	3.711	409.9	110.7	1.375	1.625	0.817	0.0	133	3.175
2.000	1.112	240.8	6.1	2.337	2.600	0.045	0.0	57	0.481
1.009	1.211	342.5	127.4	2.600	2.694	0.940	0.0	253	1.126
1.010	1.210	342.1	136.2	2.694	2.504	1.005	0.0	263	1.144
3.000	2.391	95.1	24.4	1.200	1.200	0.180	0.0	78	2.015
3.001	2.881	203.7	49.1	1.200	1.200	0.362	0.0	100	2.386
3.002	3.543	391.4	74.5	1.200	1.529	0.550	0.0	110	2.754
1.011	1.211	342.5	218.5	2.504	2.357	1.612	0.0	349	1.281
1.012	1.560	992.1	225.0	2.357	1.078	1.660	0.0	290	1.275
5.000	1.203	85.0	24.4	1.200	1.933	0.180	0.0	110	1.044
5.001	1.203	85.0	28.3	1.933	2.262	0.209	0.0	119	1.086
5.002	1.203	85.0	39.7	2.262	2.755	0.293	0.0	144	1.182
4.002	1.010	71.4	55.8	2.755	2.261	0.412	0.0	200	1.114
6.000	1.463	58.2	11.4	1.200	1.200	0.084	0.0	67	1.141
6.001	1.475	58.7	15.3	1.200	1.200	0.113	0.0	79	1.249
6.002	1.314	52.2	16.7	1.200	1.200	0.123	0.0	87	1.173

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.003	125	126	29.388	0.600	27.252	27.154	0.098	300.0	375	6.72	50.0
4.004	126	127	25.145	0.600	27.154	26.949	0.205	122.7	375	6.97	50.0
4.005	127	128	8.501	0.600	26.949	26.921	0.028	300.0	375	7.11	50.0
4.006	128	129	13.616	0.600	26.846	26.812	0.034	400.0	450	7.33	50.0
4.007	129	130	14.683	0.600	26.812	26.775	0.037	400.0	450	7.58	50.0
4.008	130	132	31.233	0.600	26.775	26.622	0.153	204.1	450	7.94	50.0
7.000	131	132	61.314	0.600	29.657	28.128	1.529	40.1	225	5.49	50.0
4.009	132	133	17.884	0.600	26.622	26.382	0.240	74.5	450	8.07	50.0
4.010	133	134	9.256	0.600	26.382	26.093	0.289	32.0	450	8.11	50.0
4.011	134	135	12.486	0.600	23.693	23.662	0.031	402.8	900	8.25	50.0
4.012	135	136	13.890	0.600	23.662	23.628	0.034	408.5	900	8.40	50.0
4.013	136	137	8.351	0.600	23.628	23.607	0.021	400.0	900	8.49	50.0
4.014	137	138	20.722	0.600	23.607	23.555	0.052	398.5	900	8.71	50.0
1.013	138	139	15.459	0.600	23.555	23.516	0.039	396.4	900	8.87	50.0
1.014	139	140	52.887	0.600	23.516	23.384	0.132	400.7	900	9.44	50.0
1.016	140	141	15.137	0.600	23.384	23.100	0.284	53.3	300	9.55	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.003	1.041	114.9	80.9	2.261	1.624	0.597	0.0	233	1.124
4.004	1.634	180.5	92.7	1.624	1.200	0.684	0.0	191	1.646
4.005	1.041	114.9	110.6	1.200	1.232	0.816	0.0	297	1.178
4.006	1.010	160.7	116.8	1.232	1.484	0.862	0.0	285	1.097
4.007	1.010	160.7	118.9	1.484	1.756	0.877	0.0	289	1.101
4.008	1.419	225.7	130.5	1.756	2.461	0.963	0.0	246	1.468
7.000	2.072	82.4	30.0	1.200	1.180	0.221	0.0	94	1.911
4.009	2.357	374.8	180.8	2.461	1.948	1.334	0.0	220	2.336
4.010	3.603	573.1	185.8	1.948	1.773	1.371	0.0	175	3.229
4.011	1.555	989.0	187.0	3.723	3.141	1.380	0.0	263	1.210
4.012	1.544	982.0	199.1	3.141	2.492	1.469	0.0	273	1.224
4.013	1.560	992.5	200.8	2.492	2.075	1.482	0.0	272	1.235
4.014	1.563	994.4	209.5	2.075	1.078	1.546	0.0	278	1.252
1.013	1.567	997.1	451.8	1.078	0.834	3.334	0.0	425	1.531
1.014	1.559	991.7	451.8	0.834	0.966	3.334	0.0	426	1.524
1.016	2.158	152.5	451.8	1.566	0.100	3.334	0.0	300	2.186

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	13.387	39.5	150	Circular_Default Sewer Type	36.064	34.714	1.200	35.725	34.375	1.200
1.001	11.338	32.5	150	Circular_Default Sewer Type	35.725	34.375	1.200	35.376	34.026	1.200
1.002	22.100	28.7	150	Circular_Default Sewer Type	35.376	33.951	1.275	34.532	33.182	1.200
1.003	7.886	23.6	225	Circular_Default Sewer Type	34.532	33.107	1.200	34.198	32.773	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	101	1500	Manhole	Adoptable	102	1500	Manhole	Adoptable
1.001	102	1500	Manhole	Adoptable	103	1500	Manhole	Adoptable
1.002	103	1500	Manhole	Adoptable	104	1500	Manhole	Adoptable
1.003	104	1500	Manhole	Adoptable	105	1500	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	8.519	23.8	225	Circular_Default Sewer Type	34.198	32.773	1.200	33.840	32.415	1.200
1.005	54.126	25.0	225	Circular_Default Sewer Type	33.840	32.415	1.200	31.675	30.250	1.200
1.006	34.913	30.0	300	Circular_Default Sewer Type	31.675	30.175	1.200	30.511	29.011	1.200
1.007	42.352	28.8	300	Circular_Default Sewer Type	30.511	29.011	1.200	29.218	27.543	1.375
1.008	51.152	24.0	375	Circular_Default Sewer Type	29.218	27.468	1.375	27.337	25.337	1.625
2.000	17.636	400.8	525	Circular_Default Sewer Type	27.118	24.256	2.337	27.337	24.212	2.600
1.009	32.394	399.9	600	Circular_Default Sewer Type	27.337	24.137	2.600	27.350	24.056	2.694
1.010	19.241	400.9	600	Circular_Default Sewer Type	27.350	24.056	2.694	27.112	24.008	2.504
3.000	67.589	30.1	225	Circular_Default Sewer Type	32.458	31.033	1.200	30.216	28.791	1.200
3.001	49.205	30.0	300	Circular_Default Sewer Type	30.216	28.716	1.200	28.575	27.075	1.200
3.002	47.163	26.3	375	Circular_Default Sewer Type	28.575	27.000	1.200	27.112	25.208	1.529
1.011	14.395	399.9	600	Circular_Default Sewer Type	27.112	24.008	2.504	26.929	23.972	2.357
1.012	46.833	400.3	900	Circular_Default Sewer Type	26.929	23.672	2.357	25.533	23.555	1.078
5.000	27.088	170.0	300	Circular_Default Sewer Type	29.289	27.789	1.200	29.863	27.630	1.933
5.001	12.891	170.0	300	Circular_Default Sewer Type	29.863	27.630	1.933	30.116	27.554	2.262
5.002	21.695	170.0	300	Circular_Default Sewer Type	30.116	27.554	2.262	30.481	27.426	2.755
4.002	23.732	240.0	300	Circular_Default Sewer Type	30.481	27.426	2.755	29.888	27.327	2.261
6.000	16.481	80.0	225	Circular_Default Sewer Type	30.401	28.976	1.200	30.195	28.770	1.200
6.001	11.096	78.7	225	Circular_Default Sewer Type	30.195	28.770	1.200	30.054	28.629	1.200
6.002	16.432	99.0	225	Circular_Default Sewer Type	30.054	28.629	1.200	29.888	28.463	1.200
4.003	29.388	300.0	375	Circular_Default Sewer Type	29.888	27.252	2.261	29.153	27.154	1.624
4.004	25.145	122.7	375	Circular_Default Sewer Type	29.153	27.154	1.624	28.524	26.949	1.200
4.005	8.501	300.0	375	Circular_Default Sewer Type	28.524	26.949	1.200	28.528	26.921	1.232
4.006	13.616	400.0	450	Circular_Default Sewer Type	28.528	26.846	1.232	28.746	26.812	1.484
4.007	14.683	400.0	450	Circular_Default Sewer Type	28.746	26.812	1.484	28.981	26.775	1.756

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	105	1500	Manhole	Adoptable	106	1500	Manhole	Adoptable
1.005	106	1500	Manhole	Adoptable	107	1500	Manhole	Adoptable
1.006	107	1500	Manhole	Adoptable	108	1500	Manhole	Adoptable
1.007	108	1500	Manhole	Adoptable	109	1500	Manhole	Adoptable
1.008	109	1500	Manhole	Adoptable	111	1500	Manhole	Adoptable
2.000	110	1500	Manhole	Adoptable	111	1500	Manhole	Adoptable
1.009	111	1500	Manhole	Adoptable	112	1500	Manhole	Adoptable
1.010	112	1500	Manhole	Adoptable	116	1500	Manhole	Adoptable
3.000	113	1500	Manhole	Adoptable	114	1500	Manhole	Adoptable
3.001	114	1500	Manhole	Adoptable	115	1500	Manhole	Adoptable
3.002	115	1500	Manhole	Adoptable	116	1500	Manhole	Adoptable
1.011	116	1500	Manhole	Adoptable	117	2100	Manhole	Adoptable
1.012	117	2100	Manhole	Adoptable	138	2400	Manhole	Adoptable
5.000	118	1500	Manhole	Adoptable	119	1500	Manhole	Adoptable
5.001	119	1500	Manhole	Adoptable	120	1500	Manhole	Adoptable
5.002	120	1500	Manhole	Adoptable	121	1500	Manhole	Adoptable
4.002	121	1500	Manhole	Adoptable	125	1500	Manhole	Adoptable
6.000	122	1500	Manhole	Adoptable	123	1500	Manhole	Adoptable
6.001	123	1500	Manhole	Adoptable	124	1500	Manhole	Adoptable
6.002	124	1500	Manhole	Adoptable	125	1500	Manhole	Adoptable
4.003	125	1500	Manhole	Adoptable	126	1500	Manhole	Adoptable
4.004	126	1500	Manhole	Adoptable	127	1500	Manhole	Adoptable
4.005	127	1500	Manhole	Adoptable	128	1500	Manhole	Adoptable
4.006	128	1500	Manhole	Adoptable	129	1500	Manhole	Adoptable
4.007	129	1500	Manhole	Adoptable	130	1500	Manhole	Adoptable

Pipeline Schedule


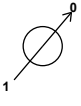
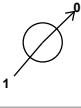
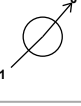

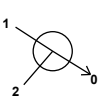
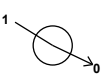


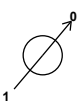
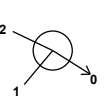
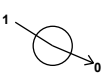

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.008	31.233	204.1	450	Circular_Default Sewer Type	28.981	26.775	1.756	29.533	26.622	2.461
7.000	61.314	40.1	225	Circular_Default Sewer Type	31.082	29.657	1.200	29.533	28.128	1.180
4.009	17.884	74.5	450	Circular_Default Sewer Type	29.533	26.622	2.461	28.780	26.382	1.948
4.010	9.256	32.0	450	Circular_Default Sewer Type	28.780	26.382	1.948	28.316	26.093	1.773
4.011	12.486	402.8	900	Circular_Default Sewer Type	28.316	23.693	3.723	27.703	23.662	3.141
4.012	13.890	408.5	900	Circular_Default Sewer Type	27.703	23.662	3.141	27.020	23.628	2.492
4.013	8.351	400.0	900	Circular_Default Sewer Type	27.020	23.628	2.492	26.582	23.607	2.075
4.014	20.722	398.5	900	Circular_Default Sewer Type	26.582	23.607	2.075	25.533	23.555	1.078
1.013	15.459	396.4	900	Circular_Default Sewer Type	25.533	23.555	1.078	25.250	23.516	0.834
1.014	52.887	400.7	900	Circular_Default Sewer Type	25.250	23.516	0.834	25.250	23.384	0.966
1.016	15.137	53.3	300	Circular_Default Sewer Type	25.250	23.384	1.566	23.500	23.100	0.100

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.008	130	1500	Manhole	Adoptable	132	1500	Manhole	Adoptable
7.000	131	1500	Manhole	Adoptable	132	1500	Manhole	Adoptable
4.009	132	1500	Manhole	Adoptable	133	1500	Manhole	Adoptable
4.010	133	1500	Manhole	Adoptable	134	2100	Manhole	Adoptable
4.011	134	2100	Manhole	Adoptable	135	2100	Manhole	Adoptable
4.012	135	2100	Manhole	Adoptable	136	2100	Manhole	Adoptable
4.013	136	2100	Manhole	Adoptable	137	2100	Manhole	Adoptable
4.014	137	2100	Manhole	Adoptable	138	2400	Manhole	Adoptable
1.013	138	2400	Manhole	Adoptable	139	2400	Manhole	Adoptable
1.014	139	2400	Manhole	Adoptable	140	2700	Manhole	Adoptable
1.016	140	2700	Manhole	Adoptable	141	1200	Manhole	Adoptable

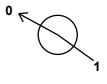
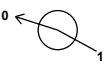


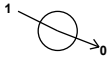
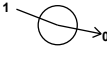
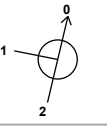


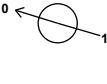
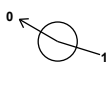
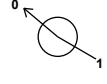

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
101	331574.422	366523.140	36.064	1.350	1500				
						0	1.000	34.714	150
102	331568.956	366535.360	35.725	1.350	1500				
						0	1.001	34.375	150
103	331566.228	366546.365	35.376	1.425	1500				
						0	1.002	33.951	150
104	331565.290	366568.445	34.532	1.425	1500				
						0	1.003	33.107	225
105	331567.008	366576.142	34.198	1.425	1500				
						0	1.004	32.773	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
106	331571.562	366583.342	33.840	1.425	1500		1	1.004	32.415	225
							0	1.005	32.415	225
107	331606.553	366624.637	31.675	1.500	1500		1	1.005	30.250	225
							0	1.006	30.175	300
108	331629.170	366651.234	30.511	1.500	1500		1	1.006	29.011	300
							0	1.007	29.011	300
109	331659.511	366680.782	29.218	1.750	1500		1	1.007	27.543	300
							0	1.008	27.468	375
110	331678.130	366729.105	27.118	2.862	1500		0	2.000	24.256	525
111	331692.927	366719.510	27.337	3.200	1500		1	2.000	24.212	525
							2	1.008	25.337	375
							0	1.009	24.137	600
112	331720.483	366702.480	27.350	3.294	1500		1	1.009	24.056	600
							0	1.010	24.056	600
113	331631.719	366569.211	32.458	1.425	1500		0	3.000	31.033	225
114	331675.731	366620.507	30.216	1.500	1500		1	3.000	28.791	225
							0	3.001	28.716	300
115	331707.541	366658.047	28.575	1.575	1500		1	3.001	27.075	300
							0	3.002	27.000	375
116	331737.845	366694.186	27.112	3.104	1500		1	3.002	25.208	375
							2	1.010	24.008	600
							0	1.011	24.008	600
117	331750.024	366686.512	26.929	3.257	2100		1	1.011	23.972	600
							0	1.012	23.672	900
118	331834.297	366467.387	29.289	1.500	1500		0	5.000	27.789	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
119	331812.291	366483.182	29.863	2.233	1500	 1	5.000	27.630	300
						0	5.001	27.630	300
120	331800.971	366489.349	30.116	2.562	1500	 1	5.001	27.554	300
						0	5.002	27.554	300
121	331780.310	366495.968	30.481	3.055	1500	 1	5.002	27.426	300
						0	4.002	27.426	300
122	331744.573	366533.603	30.401	1.425	1500	 0	6.000	28.976	225
						1	6.000	28.770	225
123	331759.332	366526.269	30.195	1.425	1500	 0	6.001	28.770	225
						1	6.001	28.629	225
124	331769.677	366522.256	30.054	1.425	1500	 0	6.002	28.629	225
						1	6.002	28.463	225
125	331785.795	366519.057	29.888	2.636	1500	 2	4.002	27.327	300
						0	4.003	27.252	375
126	331792.587	366547.649	29.153	1.999	1500	 1	4.003	27.154	375
						0	4.004	27.154	375
127	331798.399	366572.113	28.524	1.575	1500	 1	4.004	26.949	375
						0	4.005	26.949	375
128	331790.237	366574.491	28.528	1.682	1500	 1	4.005	26.921	375
						0	4.006	26.846	450
129	331777.228	366578.511	28.746	1.934	1500	 1	4.006	26.812	450
						0	4.007	26.812	450
130	331764.525	366585.875	28.981	2.206	1500	 1	4.007	26.775	450
						0	4.008	26.775	450
131	331701.083	366559.140	31.082	1.425	1500	 0	7.000	29.657	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
132	331740.634	366605.992	29.533	2.911	1500		1	7.000	28.128	225
							2	4.008	26.622	450
							0	4.009	26.622	450
133	331752.146	366619.678	28.780	2.398	1500		1	4.009	26.382	450
							0	4.010	26.382	450
134	331755.433	366628.331	28.316	4.623	2100		1	4.010	26.093	450
							0	4.011	23.693	900
135	331762.441	366638.665	27.703	4.041	2100		1	4.011	23.662	900
							0	4.012	23.662	900
136	331773.490	366647.082	27.020	3.392	2100		1	4.012	23.628	900
							0	4.013	23.628	900
137	331780.164	366652.102	26.582	2.975	2100		1	4.013	23.607	900
							0	4.014	23.607	900
138	331793.150	366668.250	25.533	1.978	2400		1	4.014	23.555	900
							2	1.012	23.555	900
							0	1.013	23.555	900
139	331807.944	366672.735	25.250	1.734	2400		1	1.013	23.516	900
							0	1.014	23.516	900
140	331857.108	366692.226	25.250	1.866	2700		1	1.014	23.384	900
							0	1.016	23.384	300
141	331872.120	366694.169	23.500	0.400	1200		1	1.016	23.100	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m ³ /ha)	20.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m ³)	
Analysis Speed	Detailed		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 | 2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	50	0	0

Pre-development Discharge Rate

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

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m ³)	

Node 140 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	23.384	Product Number	CTL-SHE-0174-1640-1550-1640
Design Depth (m)	1.550	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	16.4	Min Node Diameter (mm)	1500

Node 140 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.384
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1210.0	0.0	0.600	1475.0	0.0	1.200	1764.0	0.0
0.200	1295.0	0.0	0.800	1568.0	0.0	1.400	1866.0	0.0
0.400	1383.0	0.0	1.000	1665.0	0.0	1.500	1919.0	0.0

Node 134 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.693
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	7

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	104.0	0.0	1.200	104.0	0.0	1.201	0.0	0.0

Node 118 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.789
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	8

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	35.0	0.0	0.800	35.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	101	10	34.777	0.063	9.8	0.1943	0.0000	OK
15 minute winter	102	10	34.440	0.065	11.2	0.1286	0.0000	OK
15 minute winter	103	11	34.033	0.082	18.2	0.2217	0.0000	OK
15 minute winter	104	10	33.186	0.079	23.9	0.2005	0.0000	OK
15 minute winter	105	11	32.850	0.077	23.8	0.1362	0.0000	OK
15 minute winter	106	11	32.501	0.086	31.2	0.2375	0.0000	OK
15 minute winter	107	11	30.274	0.099	48.3	0.3929	0.0000	OK
15 minute winter	108	11	29.130	0.119	64.8	0.4632	0.0000	OK
15 minute winter	109	11	27.586	0.118	84.8	0.4714	0.0000	OK
15 minute winter	110	11	24.379	0.123	4.9	0.2570	0.0000	OK
15 minute winter	111	11	24.378	0.241	97.5	0.5444	0.0000	OK
15 minute winter	112	12	24.335	0.279	100.9	0.6033	0.0000	OK
15 minute winter	113	11	31.101	0.068	19.5	0.2935	0.0000	OK
15 minute winter	114	11	28.805	0.089	38.3	0.3732	0.0000	OK
15 minute winter	115	11	27.099	0.099	57.6	0.4105	0.0000	OK
15 minute winter	116	12	24.308	0.300	160.4	0.6412	0.0000	OK
15 minute winter	117	15	24.093	0.421	165.4	1.5803	0.0000	OK
15 minute winter	118	12	27.877	0.088	19.5	3.4493	0.0000	OK
15 minute winter	119	12	27.730	0.100	17.8	0.2036	0.0000	OK
15 minute winter	120	12	27.667	0.113	24.8	0.2738	0.0000	OK
15 minute winter	121	12	27.583	0.157	35.9	0.3999	0.0000	OK
15 minute winter	122	10	29.037	0.061	9.1	0.1783	0.0000	OK
15 minute winter	123	10	28.843	0.073	12.1	0.1577	0.0000	OK
15 minute winter	124	11	28.709	0.080	13.0	0.1525	0.0000	OK
15 minute winter	125	11	27.436	0.184	53.6	0.4114	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	101	1.000	102	9.7	1.351	0.340	0.0957	
15 minute winter	102	1.001	103	11.0	1.559	0.350	0.0798	
15 minute winter	103	1.002	104	18.0	1.878	0.540	0.2118	
15 minute winter	104	1.003	105	23.8	1.961	0.222	0.0958	
15 minute winter	105	1.004	106	23.9	1.850	0.224	0.1105	
15 minute winter	106	1.005	107	31.4	2.289	0.301	0.7433	
15 minute winter	107	1.006	108	48.5	2.102	0.238	0.8066	
15 minute winter	108	1.007	109	65.1	2.572	0.313	1.0712	
15 minute winter	109	1.008	111	85.0	2.920	0.207	1.4888	
15 minute winter	110	2.000	111	4.9	0.323	0.020	0.8581	
15 minute winter	111	1.009	112	94.3	0.814	0.275	3.7795	
15 minute winter	112	1.010	116	101.5	0.758	0.297	2.5924	
15 minute winter	113	3.000	114	18.8	1.865	0.198	0.6824	
15 minute winter	114	3.001	115	37.9	2.203	0.186	0.8463	
15 minute winter	115	3.002	116	57.6	2.537	0.147	1.0708	
15 minute winter	116	1.011	117	161.3	1.254	0.471	1.8518	
15 minute winter	117	1.012	138	151.2	0.889	0.152	16.0786	
15 minute winter	118	5.000	119	15.3	0.810	0.180	0.5131	
15 minute winter	119	5.001	120	17.7	0.801	0.208	0.2895	
15 minute winter	120	5.002	121	24.9	0.810	0.293	0.6681	
15 minute winter	121	4.002	125	35.6	1.002	0.499	0.8444	
15 minute winter	122	6.000	123	9.0	0.915	0.154	0.1617	
15 minute winter	123	6.001	124	11.9	1.015	0.203	0.1310	
15 minute winter	124	6.002	125	13.1	1.068	0.250	0.2008	
15 minute winter	125	4.003	126	53.8	1.105	0.468	1.4324	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	126	12	27.312	0.158	61.8	0.4156	0.0000	OK
15 minute winter	127	12	27.182	0.233	73.8	0.8010	0.0000	OK
15 minute winter	128	12	27.094	0.248	77.8	0.5740	0.0000	OK
15 minute winter	129	12	27.047	0.235	79.3	0.4510	0.0000	OK
15 minute winter	130	12	26.980	0.205	86.9	0.5218	0.0000	OK
15 minute winter	131	11	29.739	0.082	24.0	0.4014	0.0000	OK
15 minute winter	132	12	26.817	0.195	120.6	0.5453	0.0000	OK
15 minute winter	133	12	26.551	0.169	124.6	0.3501	0.0000	OK
15 minute winter	134	16	24.106	0.413	158.9	44.3825	0.0000	OK
15 minute winter	135	16	24.097	0.435	153.1	1.6987	0.0000	OK
15 minute winter	136	15	24.090	0.462	163.4	1.6362	0.0000	OK
15 minute winter	137	15	24.092	0.485	173.0	1.8892	0.0000	OK
15 minute winter	138	15	24.094	0.539	258.6	3.1351	0.0000	OK
15 minute winter	139	15	24.089	0.573	298.6	2.5911	0.0000	OK
720 minute winter	140	525	23.699	0.315	44.0	403.7724	0.0000	SURCHARGED
15 minute summer	141	1	23.100	0.000	6.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	126	4.004	127	61.9	1.069	0.343	1.4548	
15 minute winter	127	4.005	128	73.9	1.127	0.643	0.5570	
15 minute winter	128	4.006	129	78.0	0.902	0.486	1.1786	
15 minute winter	129	4.007	130	79.6	1.038	0.495	1.1290	
15 minute winter	130	4.008	132	87.2	1.306	0.386	2.1234	
15 minute winter	131	7.000	132	23.2	1.778	0.281	0.7986	
15 minute winter	132	4.009	133	121.5	2.027	0.324	1.0727	
15 minute winter	133	4.010	134	124.9	2.593	0.218	0.4464	
15 minute winter	134	4.011	135	152.0	0.685	0.154	3.6657	
15 minute winter	135	4.012	136	163.2	0.698	0.166	4.3631	
15 minute winter	136	4.013	137	172.2	0.724	0.174	2.8240	
15 minute winter	137	4.014	138	185.5	0.741	0.187	7.7150	
15 minute winter	138	1.013	139	298.6	1.103	0.300	6.3527	
15 minute winter	139	1.014	140	332.2	2.589	0.335	11.3213	
720 minute winter	140	Hydro-Brake®	141	16.0				603.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	101	11	34.834	0.120	23.8	0.3732	0.0000	OK
15 minute winter	102	12	34.660	0.285	27.2	0.5630	0.0000	SURCHARGED
15 minute winter	103	12	34.415	0.464	40.9	1.2555	0.0000	SURCHARGED
15 minute winter	104	11	33.232	0.125	50.4	0.3181	0.0000	OK
15 minute winter	105	11	32.895	0.122	50.4	0.2163	0.0000	OK
15 minute winter	106	11	32.551	0.136	68.0	0.3768	0.0000	OK
15 minute winter	107	11	30.333	0.158	109.2	0.6265	0.0000	OK
15 minute winter	108	11	29.212	0.201	150.2	0.7833	0.0000	OK
15 minute winter	109	11	27.661	0.193	198.6	0.7673	0.0000	OK
15 minute winter	110	11	24.613	0.357	11.9	0.7430	0.0000	OK
15 minute winter	111	11	24.614	0.477	228.5	1.0759	0.0000	OK
15 minute winter	112	13	24.570	0.514	241.5	1.1105	0.0000	OK
15 minute winter	113	10	31.146	0.113	47.5	0.4832	0.0000	OK
15 minute winter	114	10	28.863	0.147	94.0	0.6155	0.0000	OK
15 minute winter	115	11	27.161	0.161	141.6	0.6682	0.0000	OK
15 minute winter	116	13	24.552	0.544	392.4	1.1615	0.0000	OK
15 minute winter	117	13	24.509	0.837	402.2	3.1468	0.0000	OK
15 minute winter	118	13	27.965	0.176	47.5	6.9017	0.0000	OK
15 minute summer	119	12	27.945	0.315	46.1	0.6384	0.0000	SURCHARGED
15 minute winter	120	12	27.924	0.370	61.4	0.8962	0.0000	SURCHARGED
15 minute winter	121	12	27.872	0.446	83.8	1.1355	0.0000	SURCHARGED
15 minute winter	122	10	29.077	0.101	22.2	0.2972	0.0000	OK
15 minute winter	123	10	28.896	0.126	29.6	0.2729	0.0000	OK
15 minute winter	124	11	28.765	0.136	31.7	0.2599	0.0000	OK
15 minute winter	125	12	27.733	0.481	126.8	1.0768	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	101	1.000	102	23.5	1.583	0.827	0.2192	
15 minute winter	102	1.001	103	24.2	1.751	0.772	0.1996	
15 minute winter	103	1.002	104	37.0	2.102	1.111	0.3889	
15 minute winter	104	1.003	105	50.4	2.259	0.469	0.1759	
15 minute winter	105	1.004	106	50.4	2.143	0.470	0.2011	
15 minute winter	106	1.005	107	68.1	2.765	0.652	1.3323	
15 minute winter	107	1.006	108	109.4	2.490	0.537	1.5313	
15 minute winter	108	1.007	109	150.4	3.122	0.724	2.0402	
15 minute winter	109	1.008	111	199.6	3.630	0.487	2.8130	
15 minute winter	110	2.000	111	15.1	0.320	0.063	2.9435	
15 minute winter	111	1.009	112	225.3	0.909	0.658	8.0233	
15 minute winter	112	1.010	116	237.6	0.928	0.695	5.0556	
15 minute winter	113	3.000	114	46.0	2.361	0.483	1.3193	
15 minute winter	114	3.001	115	92.4	2.783	0.454	1.6357	
15 minute winter	115	3.002	116	140.6	3.215	0.359	2.0627	
15 minute winter	116	1.011	117	390.3	1.675	1.140	3.8494	
15 minute winter	117	1.012	138	338.6	0.986	0.341	29.2340	
15 minute winter	118	5.000	119	44.3	0.945	0.521	1.5358	
15 minute summer	119	5.001	120	45.8	0.886	0.538	0.9078	
15 minute winter	120	5.002	121	66.2	0.956	0.779	1.5277	
15 minute winter	121	4.002	125	81.8	1.247	1.145	1.6712	
15 minute winter	122	6.000	123	21.9	1.095	0.377	0.3295	
15 minute winter	123	6.001	124	29.1	1.224	0.497	0.2641	
15 minute winter	124	6.002	125	31.8	1.328	0.609	0.3939	
15 minute winter	125	4.003	126	120.4	1.205	1.048	3.2414	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	126	12	27.600	0.446	143.4	1.1765	0.0000	SURCHARGED
15 minute winter	127	12	27.434	0.485	169.1	1.6714	0.0000	SURCHARGED
15 minute winter	128	12	27.314	0.468	179.0	1.0822	0.0000	SURCHARGED
15 minute winter	129	12	27.241	0.429	182.6	0.8251	0.0000	OK
15 minute winter	130	12	27.149	0.374	201.0	0.9515	0.0000	OK
15 minute winter	131	10	29.798	0.141	58.4	0.6851	0.0000	OK
15 minute winter	132	11	26.974	0.352	291.5	0.9845	0.0000	OK
15 minute winter	133	11	26.680	0.298	298.2	0.6177	0.0000	OK
15 minute winter	134	13	24.559	0.866	330.5	93.1339	0.0000	OK
15 minute winter	135	13	24.551	0.889	431.3	3.4700	0.0000	OK
15 minute winter	136	13	24.538	0.910	456.1	3.2229	0.0000	SURCHARGED
15 minute winter	137	13	24.530	0.923	480.8	3.5929	0.0000	SURCHARGED
15 minute winter	138	13	24.509	0.954	817.9	5.5522	0.0000	SURCHARGED
15 minute winter	139	13	24.484	0.968	875.7	4.3772	0.0000	SURCHARGED
600 minute winter	140	570	24.104	0.720	97.7	988.0188	0.0000	SURCHARGED
15 minute summer	141	1	23.100	0.000	15.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	126	4.004	127	140.9	1.278	0.781	2.7734	
15 minute winter	127	4.005	128	169.5	1.537	1.475	0.9376	
15 minute winter	128	4.006	129	179.5	1.134	1.117	2.1398	
15 minute winter	129	4.007	130	182.9	1.235	1.138	2.1771	
15 minute winter	130	4.008	132	201.9	1.558	0.895	4.2722	
15 minute winter	131	7.000	132	56.4	2.215	0.684	1.5660	
15 minute winter	132	4.009	133	289.0	2.368	0.771	2.1836	
15 minute winter	133	4.010	134	296.9	3.113	0.518	0.8828	
15 minute winter	134	4.011	135	425.0	0.792	0.430	7.8577	
15 minute winter	135	4.012	136	455.2	0.843	0.464	8.7933	
15 minute winter	136	4.013	137	476.3	0.893	0.480	5.2926	
15 minute winter	137	4.014	138	505.4	0.951	0.508	13.1331	
15 minute winter	138	1.013	139	875.7	1.654	0.878	9.7975	
15 minute winter	139	1.014	140	953.5	3.461	0.961	16.9835	
600 minute winter	140	Hydro-Brake®	141	16.3				640.8

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	101	12	35.212	0.498	30.5	1.5433	0.0000	SURCHARGED
15 minute winter	102	13	34.952	0.577	28.8	1.1396	0.0000	SURCHARGED
15 minute winter	103	12	34.672	0.721	44.6	1.9509	0.0000	SURCHARGED
15 minute winter	104	11	33.245	0.138	58.1	0.3513	0.0000	OK
15 minute winter	105	11	32.908	0.135	58.1	0.2388	0.0000	OK
15 minute winter	106	11	32.569	0.154	80.8	0.4258	0.0000	OK
15 minute winter	107	10	30.356	0.181	134.9	0.7185	0.0000	OK
15 minute winter	108	11	29.253	0.242	188.1	0.9445	0.0000	OK
15 minute winter	109	11	27.691	0.223	249.0	0.8884	0.0000	OK
15 minute winter	110	12	24.931	0.675	15.3	1.4053	0.0000	SURCHARGED
15 minute winter	111	12	24.933	0.796	289.6	1.7948	0.0000	SURCHARGED
15 minute winter	112	13	24.870	0.814	312.0	1.7591	0.0000	SURCHARGED
15 minute winter	113	10	31.165	0.132	61.1	0.5659	0.0000	OK
15 minute winter	114	10	28.888	0.172	120.9	0.7210	0.0000	OK
15 minute winter	115	10	27.187	0.187	182.2	0.7773	0.0000	OK
15 minute winter	116	13	24.821	0.813	508.6	1.7342	0.0000	SURCHARGED
15 minute winter	117	13	24.720	1.048	511.0	3.9400	0.0000	SURCHARGED
15 minute winter	118	13	28.176	0.387	62.9	15.1669	0.0000	SURCHARGED
15 minute winter	119	13	28.138	0.508	66.2	1.0292	0.0000	SURCHARGED
15 minute winter	120	12	28.124	0.570	73.8	1.3820	0.0000	SURCHARGED
15 minute winter	121	12	28.079	0.653	86.9	1.6636	0.0000	SURCHARGED
15 minute winter	122	10	29.095	0.119	28.5	0.3504	0.0000	OK
15 minute winter	123	10	28.920	0.150	37.9	0.3269	0.0000	OK
15 minute winter	124	11	28.792	0.163	40.7	0.3108	0.0000	OK
15 minute winter	125	12	27.947	0.695	133.5	1.5555	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	101	1.000	102	24.3	1.595	0.857	0.2357	
15 minute winter	102	1.001	103	25.5	1.738	0.814	0.1996	
15 minute winter	103	1.002	104	41.1	2.335	1.234	0.3887	
15 minute winter	104	1.003	105	58.1	2.308	0.540	0.1985	
15 minute winter	105	1.004	106	58.0	2.185	0.542	0.2294	
15 minute winter	106	1.005	107	80.9	2.861	0.775	1.5309	
15 minute winter	107	1.006	108	134.1	2.544	0.659	1.8335	
15 minute winter	108	1.007	109	187.1	3.216	0.901	2.4611	
15 minute winter	109	1.008	111	250.5	3.818	0.611	3.3554	
15 minute winter	110	2.000	111	19.8	0.323	0.082	3.8100	
15 minute winter	111	1.009	112	291.2	1.034	0.850	9.1247	
15 minute winter	112	1.010	116	309.7	1.100	0.905	5.4198	
15 minute winter	113	3.000	114	59.2	2.505	0.623	1.6021	
15 minute winter	114	3.001	115	118.8	2.949	0.583	1.9862	
15 minute winter	115	3.002	116	180.7	3.418	0.462	2.4942	
15 minute winter	116	1.011	117	495.7	1.779	1.447	4.0547	
15 minute winter	117	1.012	138	476.9	1.005	0.481	29.6815	
15 minute winter	118	5.000	119	64.5	0.987	0.759	1.9075	
15 minute winter	119	5.001	120	68.8	0.983	0.809	0.9078	
15 minute winter	120	5.002	121	75.7	1.075	0.891	1.5277	
15 minute winter	121	4.002	125	90.6	1.287	1.269	1.6712	
15 minute winter	122	6.000	123	28.1	1.134	0.483	0.4078	
15 minute winter	123	6.001	124	37.3	1.272	0.635	0.3259	
15 minute winter	124	6.002	125	40.8	1.395	0.781	0.4806	
15 minute winter	125	4.003	126	128.1	1.248	1.115	3.2414	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	126	11	27.797	0.643	152.9	1.6974	0.0000	SURCHARGED
15 minute winter	127	11	27.622	0.673	190.3	2.3157	0.0000	SURCHARGED
15 minute winter	128	11	27.473	0.627	201.8	1.4514	0.0000	SURCHARGED
15 minute winter	129	11	27.378	0.566	207.2	1.0884	0.0000	SURCHARGED
15 minute winter	130	11	27.274	0.499	233.5	1.2707	0.0000	SURCHARGED
15 minute winter	131	10	29.827	0.170	75.0	0.8272	0.0000	OK
15 minute winter	132	11	27.057	0.435	353.6	1.2176	0.0000	OK
15 minute winter	133	11	26.728	0.346	363.5	0.7192	0.0000	OK
15 minute winter	134	13	24.821	1.128	411.8	121.2498	0.0000	SURCHARGED
15 minute winter	135	13	24.789	1.127	629.9	4.3986	0.0000	SURCHARGED
15 minute winter	136	13	24.760	1.132	644.3	4.0060	0.0000	SURCHARGED
15 minute winter	137	13	24.737	1.130	663.9	4.4006	0.0000	SURCHARGED
15 minute winter	138	13	24.688	1.133	1054.4	6.5935	0.0000	SURCHARGED
15 minute winter	139	12	24.627	1.111	1071.9	5.0281	0.0000	SURCHARGED
960 minute winter	140	915	24.338	0.954	85.2	1361.3620	0.0000	SURCHARGED
15 minute summer	141	1	23.100	0.000	16.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	126	4.004	127	150.6	1.366	0.834	2.7734	
15 minute winter	127	4.005	128	188.7	1.711	1.642	0.9376	
15 minute winter	128	4.006	129	203.2	1.283	1.265	2.1574	
15 minute winter	129	4.007	130	209.1	1.320	1.301	2.3264	
15 minute winter	130	4.008	132	234.8	1.580	1.041	4.9250	
15 minute winter	131	7.000	132	72.5	2.314	0.880	1.9214	
15 minute winter	132	4.009	133	351.7	2.423	0.938	2.5744	
15 minute winter	133	4.010	134	362.7	3.224	0.633	1.0347	
15 minute winter	134	4.011	135	617.9	0.975	0.625	7.9133	
15 minute winter	135	4.012	136	642.5	1.014	0.654	8.8031	
15 minute winter	136	4.013	137	655.2	1.034	0.660	5.2926	
15 minute winter	137	4.014	138	675.8	1.066	0.680	13.1331	
15 minute winter	138	1.013	139	1071.9	1.825	1.075	9.7975	
15 minute winter	139	1.014	140	1145.9	3.649	1.155	17.8550	
960 minute winter	140	Hydro-Brake®	141	16.3				875.4

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	101	12	36.064	1.350	45.8	4.1850	0.6832	FLOOD
15 minute winter	102	13	35.725	1.350	34.6	2.6663	0.0995	FLOOD
15 minute winter	103	13	35.367	1.416	57.9	3.8328	0.0000	FLOOD RISK
15 minute winter	104	12	33.344	0.237	75.3	0.6054	0.0000	SURCHARGED
15 minute winter	105	12	33.129	0.356	74.2	0.6283	0.0000	SURCHARGED
15 minute winter	106	12	32.909	0.494	108.6	1.3664	0.0000	SURCHARGED
15 minute winter	107	12	30.893	0.718	189.4	2.8481	0.0000	SURCHARGED
15 minute winter	108	12	29.953	0.942	242.6	3.6756	0.0000	SURCHARGED
15 minute winter	109	11	27.739	0.271	325.1	1.0781	0.0000	OK
15 minute winter	110	12	25.979	1.723	43.0	3.5877	0.0000	SURCHARGED
15 minute winter	111	12	26.049	1.912	372.0	4.3120	0.0000	SURCHARGED
15 minute winter	112	12	25.912	1.856	411.3	4.0123	0.0000	SURCHARGED
15 minute winter	113	10	31.212	0.179	91.6	0.7680	0.0000	OK
15 minute winter	114	10	28.948	0.232	180.8	0.9736	0.0000	OK
15 minute winter	115	10	27.244	0.244	272.3	1.0149	0.0000	OK
15 minute winter	116	12	25.800	1.792	653.6	3.8242	0.0000	SURCHARGED
15 minute winter	117	12	25.529	1.857	708.8	6.9801	0.0000	SURCHARGED
15 minute winter	118	13	29.280	1.491	143.6	34.2307	0.0000	FLOOD RISK
15 minute winter	119	13	29.217	1.587	85.2	3.2171	0.0000	SURCHARGED
15 minute winter	120	13	29.175	1.621	92.2	3.9267	0.0000	SURCHARGED
15 minute winter	121	13	29.049	1.623	105.6	4.1333	0.0000	SURCHARGED
15 minute winter	122	11	29.172	0.196	42.7	0.5765	0.0000	OK
15 minute winter	123	11	29.073	0.303	54.2	0.6593	0.0000	SURCHARGED
15 minute winter	124	13	28.915	0.286	57.5	0.5453	0.0000	SURCHARGED
15 minute winter	125	13	28.768	1.516	167.5	3.3934	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	101	1.000	102	27.9	1.611	0.984	0.2357	
15 minute winter	102	1.001	103	30.7	1.743	0.980	0.1996	
15 minute winter	103	1.002	104	49.7	2.824	1.492	0.3891	
15 minute winter	104	1.003	105	74.2	2.362	0.690	0.3136	
15 minute winter	105	1.004	106	77.1	2.263	0.720	0.3388	
15 minute winter	106	1.005	107	105.4	2.906	1.009	2.1526	
15 minute winter	107	1.006	108	168.9	2.562	0.829	2.4585	
15 minute winter	108	1.007	109	233.1	3.310	1.122	2.9823	
15 minute winter	109	1.008	111	324.8	3.999	0.793	4.8961	
15 minute winter	110	2.000	111	47.3	0.324	0.197	3.8100	
15 minute winter	111	1.009	112	392.3	1.393	1.145	9.1247	
15 minute winter	112	1.010	116	434.0	1.541	1.269	5.4198	
15 minute winter	113	3.000	114	88.5	2.688	0.931	2.2294	
15 minute winter	114	3.001	115	178.3	3.171	0.876	2.7649	
15 minute winter	115	3.002	116	271.6	3.703	0.694	4.0832	
15 minute winter	116	1.011	117	694.8	2.467	2.029	4.0547	
15 minute winter	117	1.012	138	751.1	1.185	0.757	29.6815	
15 minute winter	118	5.000	119	84.2	1.196	0.990	1.9075	
15 minute winter	119	5.001	120	89.3	1.268	1.050	0.9078	
15 minute winter	120	5.002	121	96.9	1.377	1.140	1.5277	
15 minute winter	121	4.002	125	116.7	1.657	1.634	1.6712	
15 minute winter	122	6.000	123	39.4	1.184	0.678	0.6300	
15 minute winter	123	6.001	124	52.7	1.330	0.899	0.4413	
15 minute winter	124	6.002	125	57.4	1.448	1.099	0.6535	
15 minute winter	125	4.003	126	173.4	1.572	1.508	3.2414	

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	126	13	28.498	1.344	192.4	3.5448	0.0000	SURCHARGED
15 minute winter	127	12	28.186	1.237	232.9	4.2600	0.0000	SURCHARGED
15 minute winter	128	12	27.978	1.132	249.9	2.6195	0.0000	SURCHARGED
15 minute winter	129	12	27.842	1.030	256.6	1.9801	0.0000	SURCHARGED
15 minute winter	130	12	27.691	0.916	283.6	2.3338	0.0000	SURCHARGED
15 minute winter	131	12	30.483	0.826	112.4	4.0225	0.0000	SURCHARGED
15 minute winter	132	12	27.363	0.741	444.9	2.0746	0.0000	SURCHARGED
15 minute winter	133	12	26.841	0.459	459.6	0.9539	0.0000	SURCHARGED
15 minute winter	134	11	25.576	1.883	829.2	131.4467	0.0000	SURCHARGED
15 minute winter	135	11	25.499	1.837	746.6	7.1725	0.0000	SURCHARGED
15 minute winter	136	12	25.466	1.838	760.1	6.5071	0.0000	SURCHARGED
15 minute winter	137	12	25.449	1.842	788.6	7.1723	0.0000	SURCHARGED
15 minute winter	138	12	25.407	1.852	1403.8	10.7743	0.0000	FLOOD RISK
15 minute winter	139	12	25.224	1.708	1459.3	7.7256	0.0000	FLOOD RISK
1440 minute winter	140	1380	24.866	1.482	93.4	2301.4560	0.0000	SURCHARGED
15 minute summer	141	1	23.100	0.000	16.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	126	4.004	127	198.0	1.795	1.097	2.7734	
15 minute winter	127	4.005	128	236.5	2.144	2.058	0.9376	
15 minute winter	128	4.006	129	252.2	1.592	1.570	2.1574	
15 minute winter	129	4.007	130	258.5	1.631	1.609	2.3264	
15 minute winter	130	4.008	132	286.2	1.806	1.268	4.9487	
15 minute winter	131	7.000	132	94.4	2.374	1.146	2.4357	
15 minute winter	132	4.009	133	441.9	2.790	1.179	2.8336	
15 minute winter	133	4.010	134	456.4	3.310	0.796	1.2466	
15 minute winter	134	4.011	135	728.4	1.150	0.737	7.9133	
15 minute winter	135	4.012	136	757.5	1.195	0.771	8.8031	
15 minute winter	136	4.013	137	775.6	1.224	0.781	5.2926	
15 minute winter	137	4.014	138	807.6	1.274	0.812	13.1331	
15 minute winter	138	1.013	139	1459.3	2.303	1.464	9.7975	
15 minute winter	139	1.014	140	1597.4	3.762	1.611	19.6529	
1440 minute winter	140	Hydro-Brake®	141	16.3				1343.6

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
201	0.147	5.00	38.741	2100	331518.840	366478.905	4.684
202	0.019	5.00	38.143	2100	331536.893	366477.976	4.281
203	0.057	5.00	37.551	2100	331556.399	366481.047	3.738
204	0.087	5.00	36.908	2400	331580.753	366487.095	3.308
205	0.019	5.00	36.431	2400	331599.533	366489.542	2.878
206	0.110	5.00	35.753	2700	331619.483	366490.553	2.250
207	0.051	5.00	34.542	1500	331644.340	366491.306	1.500
208	0.066	5.00	33.735	1500	331662.680	366490.165	1.800
209	0.061	5.00	33.236	2400	331681.863	366487.125	3.992
210	0.095	5.00	32.759	2400	331704.720	366480.904	3.604
211	0.085	5.00	34.393	2400	331695.012	366429.675	5.059
212	0.041	5.00	33.664	2400	331704.779	366445.077	4.406
213	0.007	5.00	33.311	2400	331709.059	366452.663	4.089
214	0.035	5.00	32.464	2400	331718.421	366475.712	3.346
215	0.058	5.00	32.146	2400	331732.709	366469.007	3.067
216	0.145	5.00	31.690	2700	331756.686	366454.343	2.721
217	0.000		31.693	1200	331759.395	366452.501	2.743

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	201	202	18.077	0.600	34.057	34.012	0.045	401.7	750	5.22	50.0
1.001	202	203	19.746	0.600	33.862	33.813	0.049	403.0	900	5.43	50.0
1.002	203	204	25.094	0.600	33.813	33.750	0.063	398.3	900	5.70	50.0
1.003	204	205	18.939	0.600	33.600	33.553	0.047	403.0	1050	5.88	50.0
1.004	205	206	19.976	0.600	33.553	33.503	0.050	399.5	1050	6.07	50.0
1.005	206	207	24.868	0.600	33.503	33.042	0.461	53.9	300	6.27	50.0
1.006	207	208	18.375	0.600	33.042	31.935	1.107	16.6	300	6.35	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.390	614.0	19.9	3.934	3.381	0.147	0.0	91	0.654
1.001	1.554	988.8	22.5	3.381	2.838	0.166	0.0	92	0.660
1.002	1.563	994.6	30.2	2.838	2.258	0.223	0.0	106	0.724
1.003	1.710	1480.8	42.0	2.258	1.828	0.310	0.0	119	0.776
1.004	1.718	1487.2	44.6	1.828	1.200	0.329	0.0	122	0.794
1.005	2.145	151.6	59.5	1.950	1.200	0.439	0.0	130	2.020
1.006	3.877	274.1	66.4	1.200	1.500	0.490	0.0	100	3.211

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	208	209	19.422	0.600	31.935	31.736	0.199	97.6	300	6.55	50.0
1.008	209	210	23.688	0.600	29.244	29.155	0.089	266.2	1350	6.71	50.0
1.009	210	214	14.652	0.600	29.155	29.118	0.037	396.0	1350	6.83	50.0
2.000	211	212	18.238	0.600	29.334	29.258	0.076	240.0	1350	5.12	50.0
2.001	212	213	8.710	0.600	29.258	29.222	0.036	241.9	1350	5.17	50.0
2.002	213	214	24.878	0.600	29.222	29.118	0.104	239.2	1350	5.33	50.0
1.010	214	215	15.783	0.600	29.118	29.079	0.039	404.7	1350	6.96	50.0
1.011	215	216	28.106	0.600	29.079	28.969	0.110	255.5	1350	7.15	50.0
1.012	216	217	3.276	0.600	28.969	28.950	0.019	172.4	225	7.21	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	1.591	112.5	75.4	1.500	1.200	0.556	0.0	180	1.702
1.008	2.460	3521.0	83.6	2.642	2.254	0.617	0.0	140	1.068
1.009	2.014	2883.3	96.5	2.254	1.996	0.712	0.0	165	0.964
2.000	2.591	3709.1	11.5	3.709	3.056	0.085	0.0	53	0.612
2.001	2.581	3693.9	17.1	3.056	2.739	0.126	0.0	64	0.690
2.002	2.595	3715.1	18.0	2.739	1.996	0.133	0.0	66	0.703
1.010	1.992	2852.0	119.3	1.996	1.717	0.880	0.0	184	1.018
1.011	2.511	3594.0	127.1	1.717	1.371	0.938	0.0	170	1.223
1.012	0.993	39.5	146.8	2.496	2.518	1.083	0.0	225	1.011

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.077	401.7	750	Circular_Default Sewer Type	38.741	34.057	3.934	38.143	34.012	3.381
1.001	19.746	403.0	900	Circular_Default Sewer Type	38.143	33.862	3.381	37.551	33.813	2.838
1.002	25.094	398.3	900	Circular_Default Sewer Type	37.551	33.813	2.838	36.908	33.750	2.258
1.003	18.939	403.0	1050	Circular_Default Sewer Type	36.908	33.600	2.258	36.431	33.553	1.828
1.004	19.976	399.5	1050	Circular_Default Sewer Type	36.431	33.553	1.828	35.753	33.503	1.200
1.005	24.868	53.9	300	Circular_Default Sewer Type	35.753	33.503	1.950	34.542	33.042	1.200
1.006	18.375	16.6	300	Circular_Default Sewer Type	34.542	33.042	1.200	33.735	31.935	1.500
1.007	19.422	97.6	300	Circular_Default Sewer Type	33.735	31.935	1.500	33.236	31.736	1.200
1.008	23.688	266.2	1350	Circular_Default Sewer Type	33.236	29.244	2.642	32.759	29.155	2.254
1.009	14.652	396.0	1350	Circular_Default Sewer Type	32.759	29.155	2.254	32.464	29.118	1.996
2.000	18.238	240.0	1350	Circular_Default Sewer Type	34.393	29.334	3.709	33.664	29.258	3.056

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	201	2100	Manhole	Adoptable	202	2100	Manhole	Adoptable
1.001	202	2100	Manhole	Adoptable	203	2100	Manhole	Adoptable
1.002	203	2100	Manhole	Adoptable	204	2400	Manhole	Adoptable
1.003	204	2400	Manhole	Adoptable	205	2400	Manhole	Adoptable
1.004	205	2400	Manhole	Adoptable	206	2700	Manhole	Adoptable
1.005	206	2700	Manhole	Adoptable	207	1500	Manhole	Adoptable
1.006	207	1500	Manhole	Adoptable	208	1500	Manhole	Adoptable
1.007	208	1500	Manhole	Adoptable	209	2400	Manhole	Adoptable
1.008	209	2400	Manhole	Adoptable	210	2400	Manhole	Adoptable
1.009	210	2400	Manhole	Adoptable	214	2400	Manhole	Adoptable
2.000	211	2400	Manhole	Adoptable	212	2400	Manhole	Adoptable

Pipeline Schedule






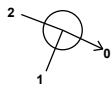

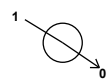

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.001	8.710	241.9	1350	Circular_Default Sewer Type	33.664	29.258	3.056	33.311	29.222	2.739
2.002	24.878	239.2	1350	Circular_Default Sewer Type	33.311	29.222	2.739	32.464	29.118	1.996
1.010	15.783	404.7	1350	Circular_Default Sewer Type	32.464	29.118	1.996	32.146	29.079	1.717
1.011	28.106	255.5	1350	Circular_Default Sewer Type	32.146	29.079	1.717	31.690	28.969	1.371
1.012	3.276	172.4	225	Circular_Default Sewer Type	31.690	28.969	2.496	31.693	28.950	2.518

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.001	212	2400	Manhole	Adoptable	213	2400	Manhole	Adoptable
2.002	213	2400	Manhole	Adoptable	214	2400	Manhole	Adoptable
1.010	214	2400	Manhole	Adoptable	215	2400	Manhole	Adoptable
1.011	215	2400	Manhole	Adoptable	216	2700	Manhole	Adoptable
1.012	216	2700	Manhole	Adoptable	217	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
201	331518.840	366478.905	38.741	4.684	2100				
						0	1.000	34.057	750
202	331536.893	366477.976	38.143	4.281	2100				
						0	1.001	33.862	900
203	331556.399	366481.047	37.551	3.738	2100				
						0	1.002	33.813	900
204	331580.753	366487.095	36.908	3.308	2400				
						0	1.003	33.600	1050
205	331599.533	366489.542	36.431	2.878	2400				
						0	1.004	33.553	1050
206	331619.483	366490.553	35.753	2.250	2700				
						0	1.005	33.503	1050
207	331644.340	366491.306	34.542	1.500	1500				
						0	1.006	33.042	300
208	331662.680	366490.165	33.735	1.800	1500				
						0	1.007	31.935	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
209	331681.863	366487.125	33.236	3.992	2400		1	1.007	31.736	300
							0	1.008	29.244	1350
210	331704.720	366480.904	32.759	3.604	2400		1	1.008	29.155	1350
							0	1.009	29.155	1350
211	331695.012	366429.675	34.393	5.059	2400					
							0	2.000	29.334	1350
212	331704.779	366445.077	33.664	4.406	2400		1	2.000	29.258	1350
							0	2.001	29.258	1350
213	331709.059	366452.663	33.311	4.089	2400		1	2.001	29.222	1350
							0	2.002	29.222	1350
214	331718.421	366475.712	32.464	3.346	2400		1	2.002	29.118	1350
							2	1.009	29.118	1350
							0	1.010	29.118	1350
215	331732.709	366469.007	32.146	3.067	2400		1	1.010	29.079	1350
							0	1.011	29.079	1350
216	331756.686	366454.343	31.690	2.721	2700		1	1.011	28.969	1350
							0	1.012	28.969	225
217	331759.395	366452.501	31.693	2.743	1200		1	1.012	28.950	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m ³ /ha)	20.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m ³)	
Analysis Speed	Detailed		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 | 2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	50	0	0

Pre-development Discharge Rate

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

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m ³)	

Node 216 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	28.969	Product Number	CTL-SHE-0091-5500-2500-5500
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.5	Min Node Diameter (mm)	1200

Node 206 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	33.503	Product Number	CTL-SHE-0091-5000-2100-5000
Design Depth (m)	2.100	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 206 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	33.503
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	170.0	0.0	0.800	170.0	0.0	0.801	0.0	0.0

Node 214 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.118
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	171.0	0.0	2.000	171.0	0.0	2.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	201	10	34.141	0.084	16.0	0.3421	0.0000	OK
15 minute winter	202	11	33.947	0.085	17.5	0.3006	0.0000	OK
15 minute winter	203	11	33.909	0.096	23.5	0.3614	0.0000	OK
15 minute winter	204	11	33.710	0.110	31.8	0.5540	0.0000	OK
240 minute winter	205	176	33.703	0.150	8.7	0.7006	0.0000	OK
240 minute winter	206	176	33.703	0.200	11.0	35.4172	0.0000	OK
30 minute summer	207	19	33.073	0.031	6.2	0.0761	0.0000	OK
15 minute winter	208	11	32.006	0.071	13.1	0.1772	0.0000	OK
600 minute winter	209	570	29.461	0.217	6.1	1.0467	0.0000	OK
600 minute winter	210	570	29.461	0.306	7.4	1.5440	0.0000	OK
600 minute winter	211	570	29.461	0.127	1.3	0.6152	0.0000	OK
600 minute winter	212	570	29.461	0.203	1.9	0.9544	0.0000	OK
600 minute winter	213	570	29.461	0.239	2.0	1.0878	0.0000	OK
600 minute winter	214	570	29.461	0.343	8.7	60.2233	0.0000	OK
600 minute winter	215	570	29.461	0.382	4.3	1.8707	0.0000	OK
600 minute winter	216	570	29.461	0.492	4.9	3.3394	0.0000	SURCHARGED
15 minute summer	217	1	28.950	0.000	3.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	201	1.000	202	15.5	0.645	0.025	0.4368	
15 minute winter	202	1.001	203	17.7	0.538	0.018	0.6503	
15 minute winter	203	1.002	204	22.9	0.699	0.023	0.8269	
15 minute winter	204	1.003	205	31.4	0.680	0.021	0.8792	
240 minute winter	205	1.004	206	8.1	0.509	0.005	1.9011	
240 minute winter	206	Hydro-Brake®	207	3.7				
30 minute summer	207	1.006	208	6.2	0.924	0.023	0.1464	
15 minute winter	208	1.007	209	13.0	1.049	0.115	0.2398	
600 minute winter	209	1.008	210	6.0	0.370	0.002	4.6117	
600 minute winter	210	1.009	214	6.8	0.336	0.002	3.8555	
600 minute winter	211	2.000	212	1.3	0.275	0.000	1.8311	
600 minute winter	212	2.001	213	1.9	0.325	0.001	1.3207	
600 minute winter	213	2.002	214	1.8	0.208	0.000	5.6463	
600 minute winter	214	1.010	215	3.9	0.348	0.001	4.8551	
600 minute winter	215	1.011	216	4.0	0.108	0.001	11.2462	
600 minute winter	216	Hydro-Brake®	217	4.1				171.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	201	10	34.187	0.130	38.8	0.5314	0.0000	OK
360 minute winter	202	288	34.005	0.143	7.7	0.5066	0.0000	OK
360 minute winter	203	288	34.005	0.192	10.3	0.7222	0.0000	OK
360 minute winter	204	288	34.005	0.405	14.3	2.0433	0.0000	OK
360 minute winter	205	288	34.005	0.452	14.5	2.1027	0.0000	OK
360 minute winter	206	288	34.005	0.502	18.0	88.6375	0.0000	SURCHARGED
15 minute winter	207	11	33.091	0.049	16.2	0.1199	0.0000	OK
15 minute winter	208	11	32.052	0.117	33.4	0.2934	0.0000	OK
1440 minute winter	209	1440	30.067	0.823	6.9	3.9774	0.0000	OK
1440 minute winter	210	1440	30.067	0.912	7.9	4.6090	0.0000	OK
1440 minute winter	211	1440	30.067	0.733	1.4	3.5647	0.0000	OK
1440 minute winter	212	1440	30.067	0.809	1.8	3.8127	0.0000	OK
1440 minute winter	213	1440	30.067	0.845	1.4	3.8537	0.0000	OK
1440 minute winter	214	1440	30.067	0.949	8.3	166.8562	0.0000	OK
1440 minute winter	215	1440	30.067	0.988	3.7	4.8456	0.0000	OK
1440 minute winter	216	1440	30.067	1.098	4.8	7.4598	0.0000	SURCHARGED
15 minute summer	217	1	28.950	0.000	4.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	201	1.000	202	37.9	0.818	0.062	0.8420	
360 minute winter	202	1.001	203	7.7	0.432	0.008	1.6073	
360 minute winter	203	1.002	204	10.3	0.574	0.010	3.0822	
360 minute winter	204	1.003	205	13.6	0.401	0.009	6.2617	
360 minute winter	205	1.004	206	12.9	0.571	0.009	7.6077	
360 minute winter	206	Hydro-Brake®	207	4.0				
15 minute winter	207	1.006	208	16.1	1.010	0.059	0.3032	
15 minute winter	208	1.007	209	32.9	1.346	0.293	0.4752	
1440 minute winter	209	1.008	210	6.3	0.350	0.002	22.9478	
1440 minute winter	210	1.009	214	7.1	0.319	0.002	15.3735	
1440 minute winter	211	2.000	212	1.1	0.245	0.000	15.3623	
1440 minute winter	212	2.001	213	1.3	0.287	0.000	7.9829	
1440 minute winter	213	2.002	214	1.2	0.175	0.000	25.0329	
1440 minute winter	214	1.010	215	3.6	0.345	0.001	17.2969	
1440 minute winter	215	1.011	216	3.7	0.112	0.001	33.2040	
1440 minute winter	216	Hydro-Brake®	217	4.1				335.6

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute winter	201	448	35.744	1.687	10.6	6.9023	0.0000	SURCHARGED
480 minute winter	202	448	35.745	1.883	12.1	6.6877	0.0000	SURCHARGED
480 minute winter	203	448	35.746	1.933	14.7	7.2839	0.0000	SURCHARGED
480 minute winter	204	448	35.747	2.147	18.6	10.8417	0.0000	SURCHARGED
480 minute winter	205	448	35.748	2.195	17.5	10.2177	0.0000	SURCHARGED
480 minute winter	206	448	35.748	2.245	23.2	151.1332	0.0000	FLOOD RISK
15 minute winter	207	10	33.108	0.066	29.6	0.1615	0.0000	OK
15 minute winter	208	10	32.108	0.173	63.0	0.4324	0.0000	OK
1440 minute winter	209	1410	31.601	2.357	9.6	11.3826	0.0000	SURCHARGED
1440 minute winter	210	1410	31.601	2.446	11.6	12.3530	0.0000	SURCHARGED
1440 minute winter	211	1410	31.601	2.267	2.7	11.0159	0.0000	SURCHARGED
1440 minute winter	212	1410	31.601	2.343	3.1	11.0338	0.0000	SURCHARGED
1440 minute winter	213	1410	31.601	2.379	2.1	10.8418	0.0000	SURCHARGED
1440 minute winter	214	1410	31.601	2.483	11.8	353.8358	0.0000	SURCHARGED
1440 minute winter	215	1410	31.601	2.522	5.2	12.3611	0.0000	SURCHARGED
1440 minute winter	216	1410	31.601	2.632	5.8	17.8715	0.0000	FLOOD RISK
15 minute summer	217	1	28.950	0.000	4.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
480 minute winter	201	1.000	202	10.7	0.580	0.017	7.9561	
480 minute winter	202	1.001	203	10.6	0.454	0.011	12.5145	
480 minute winter	203	1.002	204	12.5	0.574	0.013	15.9039	
480 minute winter	204	1.003	205	16.1	0.376	0.011	16.3375	
480 minute winter	205	1.004	206	15.2	0.625	0.010	17.2320	
480 minute winter	206	Hydro-Brake®	207	5.2				
15 minute winter	207	1.006	208	29.4	1.127	0.107	0.4916	
15 minute winter	208	1.007	209	61.8	1.564	0.549	0.7700	
1440 minute winter	209	1.008	210	8.5	0.354	0.002	33.7789	
1440 minute winter	210	1.009	214	9.9	0.367	0.003	20.8936	
1440 minute winter	211	2.000	212	1.8	0.219	0.000	26.0072	
1440 minute winter	212	2.001	213	1.9	0.275	0.001	12.4204	
1440 minute winter	213	2.002	214	1.5	0.230	0.000	35.4758	
1440 minute winter	214	1.010	215	5.1	0.341	0.002	22.5064	
1440 minute winter	215	1.011	216	5.2	0.102	0.001	40.0789	
1440 minute winter	216	Hydro-Brake®	217	5.6				430.4

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
301	0.111	5.00	39.135	1500	331588.291	366399.591	1.350
302	0.011	5.00	38.381	1500	331597.533	366411.612	1.350
303	0.088	5.00	37.916	1500	331601.827	366420.028	1.425
304	0.059	5.00	37.599	1500	331616.325	366418.401	1.425
305	0.010	5.00	37.260	1500	331629.828	366420.185	1.425
306	0.011	5.00	36.794	1500	331643.110	366423.946	1.425
307	0.044	5.00	36.366	1500	331655.501	366423.081	1.425
308	0.009	5.00	35.990	1500	331665.538	366418.670	1.425
309	0.022	5.00	35.400	1500	331680.508	366409.234	1.500
310	0.000		35.186	1500	331684.549	366398.135	1.335
311	0.000		35.029	1500	331689.559	366388.012	1.225
312	0.000		35.208	1800	331693.805	366385.366	1.425
313	0.000		35.000	1200	331701.386	366380.463	1.270

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	301	302	15.163	0.600	37.785	37.031	0.754	20.1	150	5.11	50.0
1.001	302	303	9.448	0.600	37.031	36.566	0.465	20.3	150	5.18	50.0
1.002	303	304	14.589	0.600	36.491	36.174	0.317	46.0	225	5.31	50.0
1.003	304	305	13.620	0.600	36.174	35.835	0.339	40.2	225	5.42	50.0
1.004	305	306	13.804	0.600	35.835	35.369	0.466	29.6	225	5.51	50.0
1.005	306	307	12.421	0.600	35.369	34.941	0.428	29.0	225	5.60	50.0
1.006	307	308	10.963	0.600	34.941	34.565	0.376	29.2	225	5.67	50.0
1.007	308	309	17.696	0.600	34.565	33.975	0.590	30.0	225	5.80	50.0
1.008	309	310	11.812	0.600	33.900	33.851	0.049	240.0	300	5.99	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.256	39.9	15.0	1.200	1.200	0.111	0.0	64	2.097
1.001	2.244	39.7	16.5	1.200	1.200	0.122	0.0	68	2.147
1.002	1.933	76.9	28.5	1.200	1.200	0.210	0.0	94	1.790
1.003	2.070	82.3	36.5	1.200	1.200	0.269	0.0	105	2.011
1.004	2.412	95.9	37.8	1.200	1.200	0.279	0.0	98	2.273
1.005	2.437	96.9	39.3	1.200	1.200	0.290	0.0	100	2.315
1.006	2.432	96.7	45.3	1.200	1.200	0.334	0.0	109	2.396
1.007	2.397	95.3	46.5	1.200	1.200	0.343	0.0	111	2.386
1.008	1.010	71.4	49.5	1.200	1.035	0.365	0.0	184	1.088

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.009	310	311	11.295	0.600	33.851	33.804	0.047	240.0	300	6.18	50.0
1.010	311	312	5.003	0.600	33.804	33.783	0.021	240.0	300	6.26	50.0
1.011	312	313	9.028	0.600	33.783	33.730	0.053	170.3	225	6.41	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.009	1.010	71.4	49.5	1.035	0.925	0.365	0.0	184	1.088
1.010	1.010	71.4	49.5	0.925	1.125	0.365	0.0	184	1.088
1.011	0.999	39.7	49.5	1.200	1.045	0.365	0.0	225	1.017

Pipeline Schedule



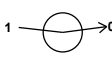
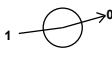
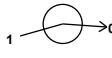







Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.163	20.1	150	Circular_Default Sewer Type	39.135	37.785	1.200	38.381	37.031	1.200
1.001	9.448	20.3	150	Circular_Default Sewer Type	38.381	37.031	1.200	37.916	36.566	1.200
1.002	14.589	46.0	225	Circular_Default Sewer Type	37.916	36.491	1.200	37.599	36.174	1.200
1.003	13.620	40.2	225	Circular_Default Sewer Type	37.599	36.174	1.200	37.260	35.835	1.200
1.004	13.804	29.6	225	Circular_Default Sewer Type	37.260	35.835	1.200	36.794	35.369	1.200
1.005	12.421	29.0	225	Circular_Default Sewer Type	36.794	35.369	1.200	36.366	34.941	1.200
1.006	10.963	29.2	225	Circular_Default Sewer Type	36.366	34.941	1.200	35.990	34.565	1.200
1.007	17.696	30.0	225	Circular_Default Sewer Type	35.990	34.565	1.200	35.400	33.975	1.200
1.008	11.812	240.0	300	Circular_Default Sewer Type	35.400	33.900	1.200	35.186	33.851	1.035
1.009	11.295	240.0	300	Circular_Default Sewer Type	35.186	33.851	1.035	35.029	33.804	0.925
1.010	5.003	240.0	300	Circular_Default Sewer Type	35.029	33.804	0.925	35.208	33.783	1.125
1.011	9.028	170.3	225	Circular_Default Sewer Type	35.208	33.783	1.200	35.000	33.730	1.045

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	301	1500	Manhole	Adoptable	302	1500	Manhole	Adoptable
1.001	302	1500	Manhole	Adoptable	303	1500	Manhole	Adoptable
1.002	303	1500	Manhole	Adoptable	304	1500	Manhole	Adoptable
1.003	304	1500	Manhole	Adoptable	305	1500	Manhole	Adoptable
1.004	305	1500	Manhole	Adoptable	306	1500	Manhole	Adoptable
1.005	306	1500	Manhole	Adoptable	307	1500	Manhole	Adoptable
1.006	307	1500	Manhole	Adoptable	308	1500	Manhole	Adoptable
1.007	308	1500	Manhole	Adoptable	309	1500	Manhole	Adoptable
1.008	309	1500	Manhole	Adoptable	310	1500	Manhole	Adoptable
1.009	310	1500	Manhole	Adoptable	311	1500	Manhole	Adoptable
1.010	311	1500	Manhole	Adoptable	312	1800	Manhole	Adoptable
1.011	312	1800	Manhole	Adoptable	313	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
301	331588.291	366399.591	39.135	1.350	1500		0	1.000	37.785	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
302	331597.533	366411.612	38.381	1.350	1500		1	1.000	37.031	150
303	331601.827	366420.028	37.916	1.425	1500		1	1.001	36.566	150
304	331616.325	366418.401	37.599	1.425	1500		1	1.002	36.174	225
305	331629.828	366420.185	37.260	1.425	1500		1	1.003	35.835	225
306	331643.110	366423.946	36.794	1.425	1500		1	1.004	35.369	225
307	331655.501	366423.081	36.366	1.425	1500		1	1.005	34.941	225
308	331665.538	366418.670	35.990	1.425	1500		1	1.006	34.565	225
309	331680.508	366409.234	35.400	1.500	1500		1	1.007	33.975	225
310	331684.549	366398.135	35.186	1.335	1500		1	1.008	33.851	300
311	331689.559	366388.012	35.029	1.225	1500		1	1.009	33.804	300
312	331693.805	366385.366	35.208	1.425	1800		1	1.010	33.783	300
313	331701.386	366380.463	35.000	1.270	1200		1	1.011	33.730	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m ³ /ha)	20.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m ³)	
Analysis Speed	Normal		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	50	0	0

Pre-development Discharge Rate

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

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m ³)	

Node 312 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	33.783	Product Number	CTL-SHE-0070-2500-1350-2500
Design Depth (m)	1.350	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node 311 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	33.804
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	125.0	0.0	1.500	367.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	301	10	37.842	0.057	12.0	0.1953	0.0000	OK
15 minute winter	302	10	37.094	0.063	13.1	0.1219	0.0000	OK
15 minute winter	303	10	36.577	0.086	22.4	0.2589	0.0000	OK
15 minute winter	304	10	36.272	0.098	28.6	0.2545	0.0000	OK
15 minute winter	305	11	35.926	0.091	29.3	0.1726	0.0000	OK
15 minute winter	306	11	35.461	0.092	30.6	0.1763	0.0000	OK
15 minute winter	307	11	35.044	0.103	35.2	0.2446	0.0000	OK
15 minute winter	308	11	34.667	0.102	36.3	0.1927	0.0000	OK
15 minute winter	309	9	34.173	0.273	38.5	0.5616	0.0000	OK
15 minute winter	310	9	34.154	0.303	40.8	0.5346	0.0000	SURCHARGED
360 minute winter	311	272	34.033	0.229	7.3	33.2136	0.0000	OK
360 minute winter	312	272	34.033	0.250	2.2	0.6354	0.0000	SURCHARGED
15 minute summer	313	1	33.730	0.000	1.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	301	1.000	302	11.9	1.797	0.298	0.1002	
15 minute winter	302	1.001	303	12.9	1.918	0.325	0.0635	
15 minute winter	303	1.002	304	22.2	1.451	0.289	0.2232	
15 minute winter	304	1.003	305	28.2	1.798	0.343	0.2143	
15 minute winter	305	1.004	306	29.5	1.957	0.307	0.2079	
15 minute winter	306	1.005	307	30.7	1.875	0.317	0.2037	
15 minute winter	307	1.006	308	35.4	2.062	0.366	0.1920	
15 minute winter	308	1.007	309	36.3	2.129	0.381	0.4481	
15 minute winter	309	1.008	310	40.8	0.977	0.571	0.8129	
15 minute winter	310	1.009	311	49.5	1.924	0.693	0.4027	
360 minute winter	311	1.010	312	2.2	0.208	0.031	0.3009	
360 minute winter	312	Hydro-Brake®	313	2.2				59.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	301	10	37.884	0.099	29.3	0.3391	0.0000	OK
15 minute winter	302	10	37.147	0.116	31.9	0.2245	0.0000	OK
15 minute winter	303	10	36.646	0.155	54.6	0.4668	0.0000	OK
15 minute winter	304	10	36.356	0.182	69.7	0.4735	0.0000	OK
15 minute winter	305	11	35.998	0.163	71.6	0.3118	0.0000	OK
15 minute winter	306	11	35.540	0.171	74.7	0.3286	0.0000	OK
15 minute winter	307	12	35.174	0.233	85.9	0.5561	0.0000	SURCHARGED
15 minute winter	308	12	34.803	0.238	87.3	0.4496	0.0000	SURCHARGED
480 minute winter	309	464	34.396	0.496	13.5	1.0212	0.0000	SURCHARGED
480 minute winter	310	464	34.396	0.545	13.2	0.9625	0.0000	SURCHARGED
480 minute winter	311	464	34.396	0.592	13.1	103.2533	0.0000	SURCHARGED
480 minute winter	312	464	34.396	0.613	2.3	1.5593	0.0000	SURCHARGED
15 minute summer	313	1	33.730	0.000	2.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	301	1.000	302	29.0	2.139	0.727	0.2051	
15 minute winter	302	1.001	303	31.5	2.307	0.793	0.1287	
15 minute winter	303	1.002	304	54.1	1.691	0.704	0.4652	
15 minute winter	304	1.003	305	69.1	2.112	0.839	0.4447	
15 minute winter	305	1.004	306	72.0	2.276	0.751	0.4367	
15 minute winter	306	1.005	307	75.0	2.119	0.774	0.4407	
15 minute winter	307	1.006	308	85.1	2.308	0.881	0.4360	
15 minute winter	308	1.007	309	83.3	2.119	0.874	0.7038	
480 minute winter	309	1.008	310	13.2	0.578	0.185	0.8318	
480 minute winter	310	1.009	311	13.1	0.766	0.183	0.7954	
480 minute winter	311	1.010	312	2.3	0.241	0.033	0.3523	
480 minute winter	312	Hydro-Brake®	313	2.2				76.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	301	12	37.941	0.156	37.7	0.5307	0.0000	SURCHARGED
15 minute winter	302	12	37.333	0.302	39.9	0.5824	0.0000	SURCHARGED
15 minute winter	303	12	36.841	0.350	66.8	1.0514	0.0000	SURCHARGED
15 minute winter	304	12	36.594	0.420	80.4	1.0907	0.0000	SURCHARGED
15 minute winter	305	12	36.221	0.386	83.4	0.7353	0.0000	SURCHARGED
15 minute winter	306	12	35.822	0.453	81.3	0.8711	0.0000	SURCHARGED
15 minute winter	307	12	35.433	0.492	92.7	1.1738	0.0000	SURCHARGED
15 minute winter	308	13	34.979	0.414	91.2	0.7837	0.0000	SURCHARGED
720 minute winter	309	690	34.576	0.676	13.2	1.3931	0.0000	SURCHARGED
720 minute winter	310	690	34.576	0.725	13.0	1.2815	0.0000	SURCHARGED
720 minute winter	311	690	34.576	0.772	12.9	145.9823	0.0000	SURCHARGED
720 minute winter	312	690	34.576	0.793	2.3	2.0185	0.0000	SURCHARGED
15 minute summer	313	1	33.730	0.000	2.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	301	1.000	302	36.2	2.175	0.908	0.2669	
15 minute winter	302	1.001	303	37.0	2.301	0.932	0.1663	
15 minute winter	303	1.002	304	61.6	1.688	0.801	0.5802	
15 minute winter	304	1.003	305	80.0	2.093	0.972	0.5417	
15 minute winter	305	1.004	306	77.8	2.280	0.811	0.5490	
15 minute winter	306	1.005	307	78.7	2.086	0.812	0.4940	
15 minute winter	307	1.006	308	88.8	2.272	0.918	0.4360	
15 minute winter	308	1.007	309	90.7	2.281	0.951	0.7038	
720 minute winter	309	1.008	310	13.0	0.515	0.183	0.8318	
720 minute winter	310	1.009	311	12.9	0.705	0.181	0.7954	
720 minute winter	311	1.010	312	2.3	0.207	0.032	0.3523	
720 minute winter	312	Hydro-Brake®	313	2.2				101.7

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	301	13	39.032	1.247	56.5	4.2561	0.0000	FLOOD RISK
15 minute winter	302	13	38.274	1.243	42.9	2.3992	0.0000	FLOOD RISK
15 minute winter	303	13	37.687	1.196	78.0	3.5905	0.0000	FLOOD RISK
15 minute winter	304	13	37.381	1.207	93.6	3.1326	0.0000	FLOOD RISK
15 minute winter	305	13	36.912	1.077	88.8	2.0532	0.0000	SURCHARGED
15 minute winter	306	13	36.408	1.039	88.8	1.9964	0.0000	SURCHARGED
15 minute winter	307	13	35.912	0.971	103.4	2.3166	0.0000	SURCHARGED
30 minute winter	308	22	35.330	0.765	99.2	1.4490	0.0000	SURCHARGED
960 minute winter	309	915	34.930	1.030	15.9	2.1208	0.0000	SURCHARGED
960 minute winter	310	915	34.929	1.078	15.7	1.9056	0.0000	FLOOD RISK
960 minute winter	311	915	34.929	1.125	15.6	244.8065	0.0000	FLOOD RISK
960 minute winter	312	915	34.929	1.146	2.3	2.9173	0.0000	FLOOD RISK
15 minute summer	313	1	33.730	0.000	2.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	301	1.000	302	37.6	2.178	0.944	0.2669	
15 minute winter	302	1.001	303	39.4	2.288	0.993	0.1663	
15 minute winter	303	1.002	304	65.6	1.686	0.854	0.5802	
15 minute winter	304	1.003	305	84.2	2.118	1.023	0.5417	
15 minute winter	305	1.004	306	85.1	2.255	0.887	0.5490	
15 minute winter	306	1.005	307	88.3	2.219	0.911	0.4940	
15 minute winter	307	1.006	308	100.5	2.526	1.039	0.4360	
30 minute winter	308	1.007	309	98.1	2.467	1.029	0.7038	
960 minute winter	309	1.008	310	15.7	0.497	0.220	0.8318	
960 minute winter	310	1.009	311	15.6	0.712	0.219	0.7954	
960 minute winter	311	1.010	312	2.3	0.209	0.033	0.3523	
960 minute winter	312	Hydro-Brake®	313	2.3				144.6