coopers

chartered consulting engineers

Our ref: 8098_FCA

Flood Consequences Assessment

for

Land off Penmaenmawr Road

Llanfairfechan

Conwy

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

16 December 2022

Park House, Sandpiper Court,
Chester Business Park,
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Document Verification

Project Title	Land Off Penmaenmawr Road, Llanfairfechan, Conwy
Project Number	8098
Document Title	Flood Consequences Assessment
Document Number	8098_FCA_Issue 1
This document is not to be used for contractual or engineering purposes unless the document verification sheet is signed where indicated by the approver of the document.	

Prepared by

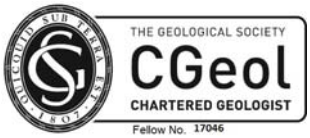
A Jones

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
8098_FCA	16/12//2022	Flood Consequences Assessment	A Jones	P R Sykes

This report has been prepared for and on behalf of our client, in accordance with the terms and conditions of the appointment agreement with Coopers. Other than where specifically allowed for in the said appointment agreement, any other party using this report for any purpose whatsoever does so at their own risk and any duty of care to that party is specifically excluded.

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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 and for a site off Penmaenmawr Road, Llanfairfechan. Castle Green Homes Ltd are proposing a new housing development, comprising of approximately 55 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 with regard 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 $100m^2$. 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.

2.0 Site Characteristics

2.1 Site Location

The site is a parcel of agricultural land in Llanfairfechan. The site is situated off Penmaenmawr Road at approximate grid reference SH686753.

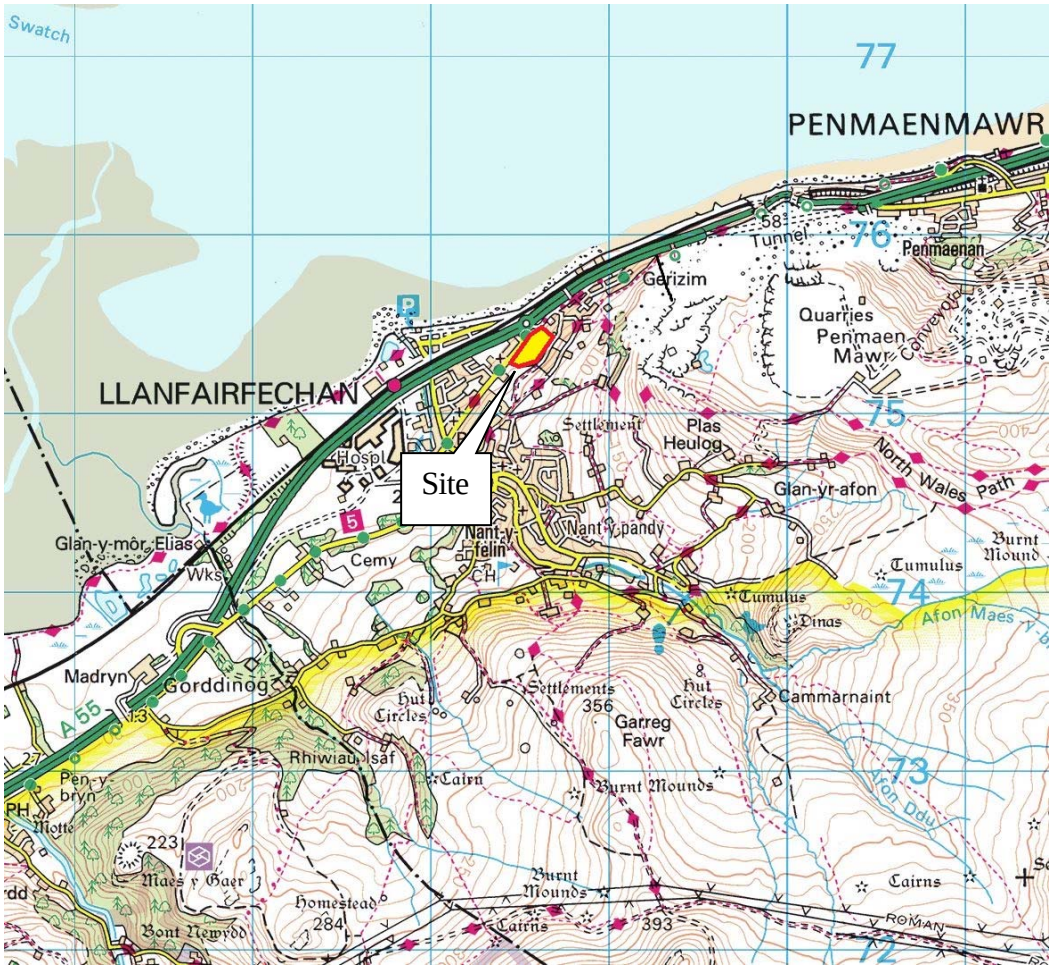

Figure 1 – Site Location

2.2 Site Description

The site covers an area of approximately 2.62 Hectares area of land in Llanfairfechan approximately 9.5km south west of Conwy Town Centre. The surrounding area is primarily a mixture of residential, agricultural land and coastline interrupted by infrastructure corridors just north of the site, namely the A55 North Wales Expressway.

The topography of the site falls very steeply from the southeast towards Penmaenmawr Road to the northwest. Levels vary from a highpoint of 38.0m AOD at the south to a low point of 13.0m AOD at the northern corner of the site with an average gradient of approximately 1in 6. Refer to topographical survey in Appendix 1.

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.

It should be noted that the Flood Map only covers flooding from rivers and the sea. 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.

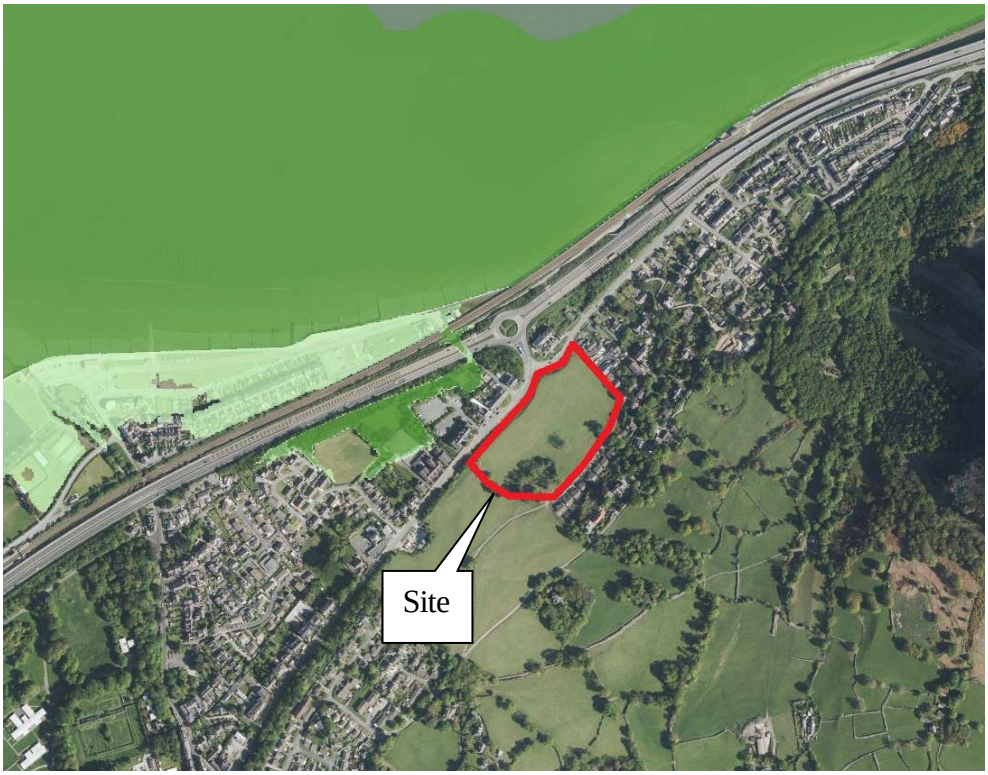

Figure 2 – Natural Resources Wales Flood Map for Planning (Sea)

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

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

Figure 4 – Natural Resources Wales Surface Water Flooding Map

3.3 Conwy LLFA

We have contacted Conwy Council for confirmation of any known historical flooding within the vicinity of the site. They have responded providing a map of historical flooding events stating:

These flood incidents were mainly caused by blockages within culverted sections of the watercourses or poor channel maintenance and generally affected single properties. However, blockages to the culvert by the Penmaenmawr Road caused by storm events washing debris into the trashscreen, causes flooding to the highway. Highway flooding due to excess water from the blocked culvert and from blocked gullies has caused internal flooding to one property. Clearing of the gullies and culvert trash screen caused the water to subside rapidly.

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. The risk of flooding is considered as very 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 location to another via local road networks. Due to the topography of the site sloping to the northern end of the site and the proposed road layout / public open space, overland flow is not considered a significant risk. Overland 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 that there is a 150mm Diameter foul sewer within Penmaen Park to the southeast of the site (higher elevation) and a 300mm Diameter sewer along the Penmaenmawr Road to the northwest of the site (lower elevation).

We are proposing to discharge all foul flows into the 300mm Diameter combined sewer 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.

The site investigation report has confirmed there was no standing groundwater table, only localised minor water seepage encountered within the gravels and clay during trial pit excavation.

The overall risk from groundwater flooding is considered as low.

4.6 Coastal Flooding

The development site is located approximately 200m south of the coastline. However, the lowest site elevation is approximately 13.0m AOD and is therefore not at risk from tidal inundation.

Refer to Figure 2 – NRW Flood Map for Planning (Sea).

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.

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 run-off to dispose of surface water flows. The flows will follow topography towards the northern end of the site towards Penmaenmawr Road.

5.3 Existing Site Runoff

The greenfield run-off rates for the site has been calculated using the HR Wallingford Greenfield runoff rate estimation tool. Calculations below are based on a 1.7ha developable site area.

1-year	= 7.53 l/s
100-year	= 18.64 l/s
QBAR	**= 8.55 l/s**

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

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 due to the cohesive underlying strata.

Refer to Appendix 3 infiltration test results.

Priority Level 3

There is an ordinary watercourse flowing through the western portion of the site which discharges into a piped network to the north which flows west along Penmaenmawr Road before heading north along Shore Road East and outfalling to sea.

Photographs 1 and 2: Showing the shallow watercourse channel within the site with fence defining the south western boundary beyond, and the paved headwall intercepting the watercourse directing it down and beneath Penmaenmawr Road adjacent the western corner.

A review of levels has determined the southern and western portion of the site can drain to the open watercourse and the northeast portion can drain into the piped section.

Priority Level 4

It is currently unclear where Penmaenmawr Road highway gullies discharge. These will either connect into the culverted watercourse or possibly the combined sewer.

There are no surface water sewers recorded on the Welsh Water sewer maps within the vicinity of the site. Refer to Appendix 1 for Welsh Water sewer map.

Priority Level 5

The Welsh Water sewer maps indicate the presence of a combined sewers within the surrounding highways and residential developments. Refer to Appendix 1 for Welsh Water sewer map.

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 100m^2. 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 have calculated approximately 720cu.m, of storage will be required based on a flow restriction of 8.5 l/s and an impermeable area of 1.03ha (60% PIMP). This can be accommodated within oversized pipes and SUDS features within POS areas. Incorporation of additional source control SuDS components such as water butts, permeable paving and bio retention (tree pits and rain gardens) will need to be considered further at detailed design stage to meet the 5mm interception design criteria.

5.6 Foul Drainage

We are proposing to discharge all foul flows into the existing 300mm Diameter combined sewer network within Penmaenmawr Road. This sewer is located within the northern portion of the site but will require a diversion subject to a S185 Agreement with Welsh Water.

Topography and proposed site levels design will allow for a gravity network to serve the entire development without any need for a pumping station.

Appendix 1

Reference Drawings

Drawing No.	Revision	Title
B472-01	-	Topographical Survey (Carl Williams Land Surveys Ltd)
-	-	Welsh Water Sewer Map
PRL-DSL-01	B	Proposed Drainage Strategy Layout (provided by Castle Green)

Station	Easting	Northing	Level
1	268468.861	375085.646	41.730
2	268467.977	375027.175	46.030
3	268480.777	375104.630	41.650
4	268606.112	375175.026	54.228
6	268379.082	375105.459	30.489
9000	268600.374	375250.988	36.918
9001	268608.579	375227.867	37.316
9002	268609.261	375253.946	37.559

Abbreviations/Symbols (Measured Building Surveys):

C:	Window Cill Height
H:	Window Head Height
BH:	Beam Height
DH:	Door Height
COL:	Column
SVP:	Soil Vent Pipe
FL:	Floor Level
TH:	Threshold Level
2.50	Floor to Ceiling Height
	Vaulted Ceiling

Line types

	Hedge Lines
	Drainage Runs
	Overhead Electricity Cables
	Overhead Telephone Cables

Symbols

	Tree/Bush		Glass House
	Control Station		Osbm
	Borehole		
	Trial Hole		

Abbreviations (Topographic Survey):

AB	AIR BRICK	OHC	OVERHEAD CABLE
AV	AIR VALVE	OS	ORDNANCE SURVEY
B	BOLLARD	OSR	OPEN STEEL RAILINGS
BB	BELISHA BEACON	P	PILE
BDY	BOUNDARY	PB	PILLAR BOX
BH	BOREHOLE	PM	PARKING METER
BL	BED LEVEL	PO	POST
BRK	BRICKWORK	PRF	POST & RAIL FENCE
BS	BUS STOP	PTM	PARKING TICKET MACHINE
BM	BENCH MARK	PWF	POST & WIRE FENCE
BW	BRICK WALL	RB	RIGHT BANK
BWF	BARBED WIRE FENCE	RE	RODDING EYE
CBF	CLOSE BOARDED FENCE	RS	ROAD SIGN
CIF	CORRUGATED IRON FENCE	RTW	RETAINING WALL
CL	COVER LEVEL	RWP	RAINWATER PIPE
CLF	CHAIN LINK FENCE	SC	STOP COCK
CONC	CONCRETE	SDP	STAND PIPE
CP	CONCRETE POST	SK	SOAKAWAY
CPF	CHESTNUT PALING FENCE	SL	SOFFIT LEVEL
CR	CYCLE RACK	SMH	SURFACE WATER MANHOLE
CTV	CABLE T.V. MANHOLE	SMP	SHEET METAL PILING
CUL	CULVERT	SP	SIGN POST
DK	DROP KERB	STN	STATION
DL	DECK LEVEL	SV	SLUICE VALVE
DP	DOWNPIPE	SVP	SOIL VENT PIPE
DPC	DAMP PROOF COURSE	SWF	SHEEP WIRE FENCE
DR	DRAIN	TBM	TEMPORARY BENCH MARK
DWB	DOG WASTE BIN	TCB/TCP	TELEPHONE BOX/POST
EA	ENVIRONMENT AGENCY	TC	TELECOM CABINET
EB	ELECTRICITY BOX	TMH	TELECOM MANHOLE
ECF	ELECTRIC CABLE FENCE	THL	THRESHOLD LEVEL
ECP	ELECTRICITY CABLE PIT	TL	TRAFFIC LIGHT
EMH	ELECTRICITY MANHOLE	TLB	TRAFFIC LIGHT BOX
EP	ELECTRICITY POLE	TP	TELEGRAPH POLE
ER	EARTHING ROD	TRS	TIMBER RUBBING STRIP
ETL	ELECT' TRANSMISSION LINE	TS	TREE STUMP
FB	FLOWER BED	TSR	TUBULAR STEEL RAILINGS
FBR	FOOTBRIDGE	VP	VENT PIPE
FH	FIRE HYDRANT	WB	WASTE BIN
FHM	FIRE HYDRANT MARKER	WL	WATER LEVEL/WATER LINE
FL	FLOOR LEVEL	WM	WATER METER
FP	FENCE POST	WMF	WIRE MESH FENCE
FWM	FOUL WATER MANHOLE	WP	WOODEN POST
G	GULLY	WPR	WOOD POST & RAIL FENCE
GL	GROUND LEVEL	WV	WATER VALVE
GP	GATE POST	YG	YARD GULLY
GM	GAS MARKER		
GV	GAS VALVE		
HW	HEAD WALL		
IC	INSPECTION CHAMBER		
IL	INVERT LEVEL		
IRF	IRON RAILING FENCE		
IWF	INTERWOVEN FENCE		
JB	JUNCTION BOX		
KIG	KERB INLET GULLY		
LB	LEFT BANK		
LFB	LIFEBUOY		
LP	LAMP POST		
MB	MOORING BOLLARD		
MF	MISCELANEOUS FENCING		
MH	MANHOLE		
MKR	MARKER		
MP	MOORING PILE		
MRF	METAL RAILING FENCE		
MS	MILE STONE		
NB	NOTICE BOARD		

Survey Notes:

Coordinates and Levels related to Ordnance Survey Datum - GPS OSGB36 NG

Revision	Date	Description
09.06.22	09.06.22	Trees re-surveyed as per BS5837 2012 - Sect 4.2.4

Carl Williams Land Surveys Ltd

The Studio
15 Millfield
Neston
Cheshire
CH64 3TF
www.cwlandsurveys.com e:info@cwlandsurveys.com

Client

Castle Green Homes Ltd

Project

Land off Penmaenmawr Road
Topographic Survey

Scale	Surveyed By	Date
1:500 A0	CW	09.06.22
Drawing No.	Checked By	Date
	VW	09.06.22
B472-01	Drawn By	Date
	CW	09.06.22

Dŵr Cymru
Welsh Water

Land at Plas Estate, Penmaenmawr Road

N
W E
S

LEGEND(Representative of most common features)

Waste network:

	Foul chamber		Outfall
	Surface water chamber	LH	Lamphole
	Combined chamber		Storm Overflow
C O	Combined sewer overflow		Rising main
SPC	Special purpose chamber		Gravity sewer
	Treatment works	P	Private sewer
	Pumping station	S 104 P	Private sewer subject to Sect. 104 adoption agreement
		T	Private Sewer Transfer
		L	Lateral Drain
			Inspection Chamber

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

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

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only 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 and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of 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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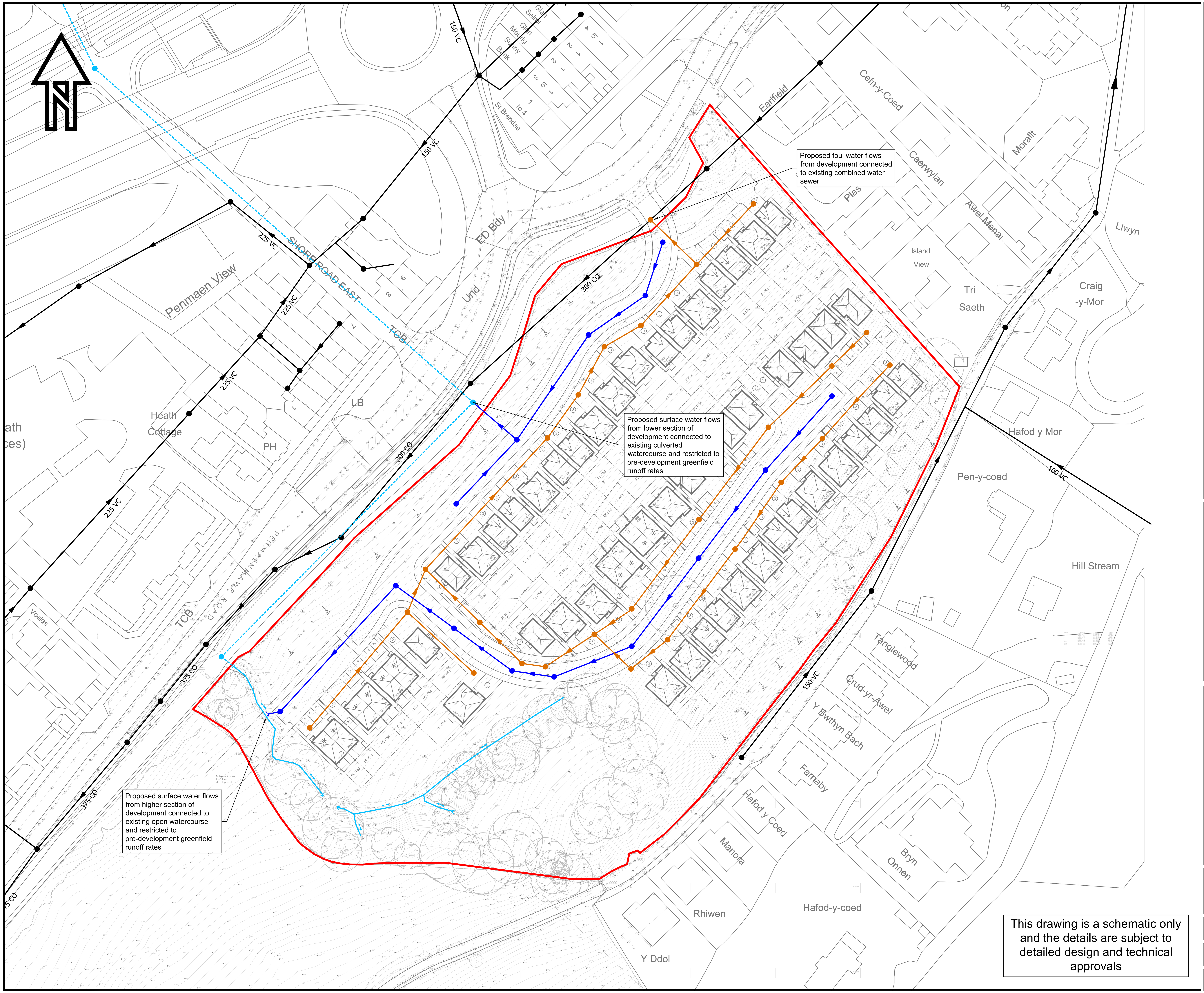
Map scale:	1:1,250
Printed by:	AK
Printed on:	12/05/2016



General Notes:

1. This drawing is to be read in conjunction with all Architects, Engineers and other relevant drawings.
2. The details on this drawing are preliminary and subject to change following detail design and technical approval.
3. Location of existing sewers taken from Welsh Water public sewer records.
4. This drawing is based on Castle Green Homes Proposed Site Plan Rev D and Carl Williams Land Surveys Ltd Topographical Survey Ref: B472-01 dated 09.06.22

Key:

- Site Boundary
- Existing Combined Water Public Sewer
- Existing Open Watercourse
- Existing Culverted Watercourse
- Proposd Foul Water Sewer
- Proposd Surface Water Sewer

Rev:	Description:	Date:
A	First Issue	25/11/22
B	Culverted watercourse route added and connection points amended to suit	15/12/22

Castle Green

Castle Green,
Unit 20,
St. Asaph Business Park,
St Asaph,
Denbighshire. LL17 0LJ.
Tel. 01745 536677

Site: Penmaenmawr Road, Llanfairfechan

Title: Proposed Drainage Strategy Layout

Scale: 1:500@A1

Date: 25.11.22

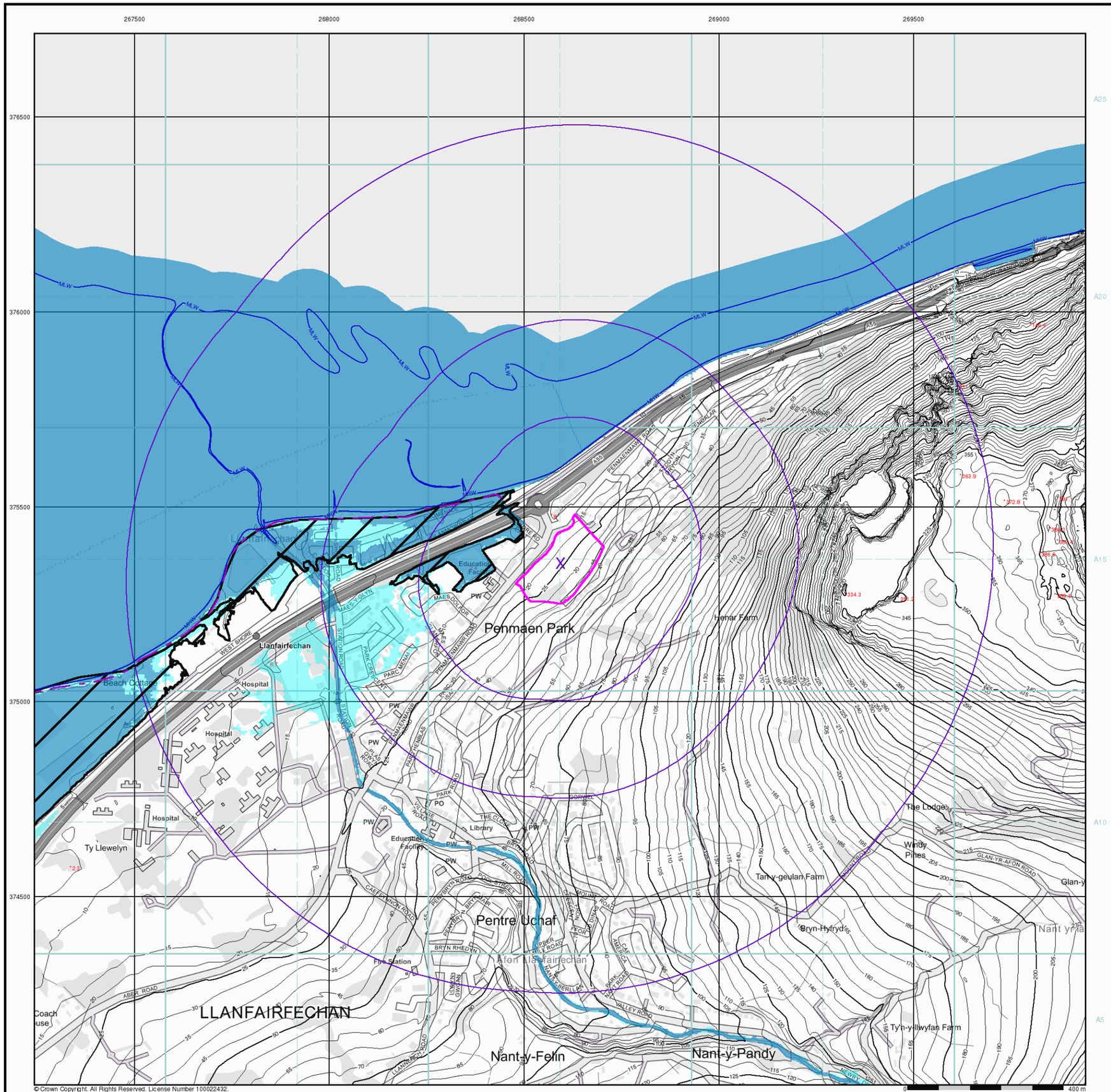
Ref: PRL-DSL-01

Rev: B

Appendix 2

Envirocheck Flood Screening Report

Order Number: 301707914_1_1



Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Flood Data Map (1:10,000)

General

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

Flood Data

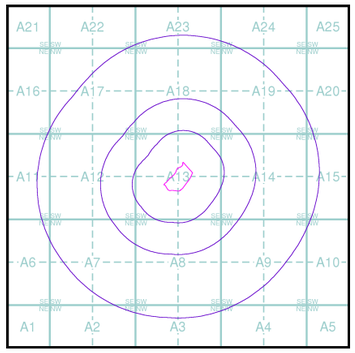
- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

Standard Contour 105
Master Contour 100 95
Spot Height *167.8

MLW Mean Low Water
MHW Mean High Water

EA/NRW Flood Data Map - Slice A



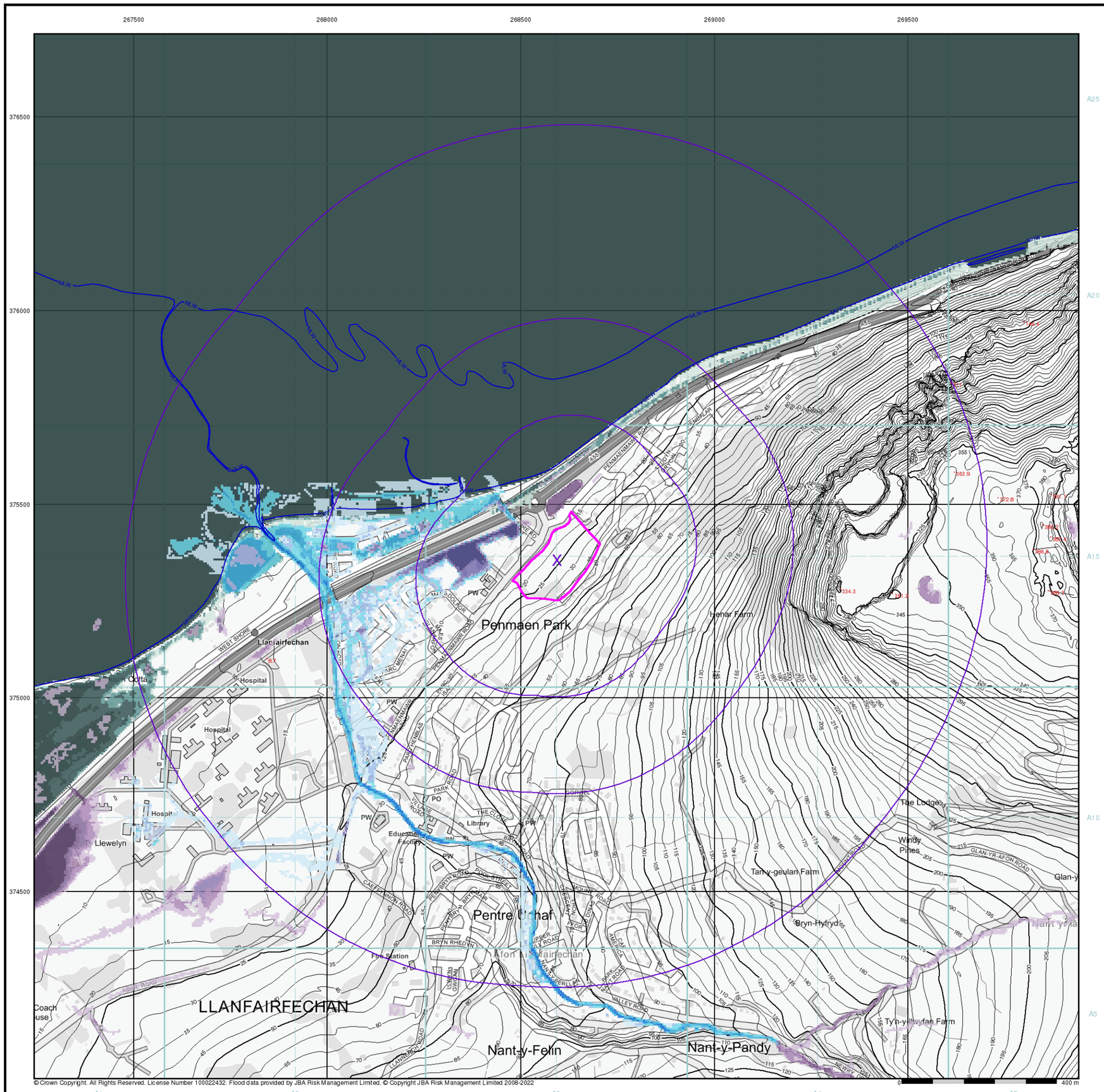
Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

Landmark® INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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

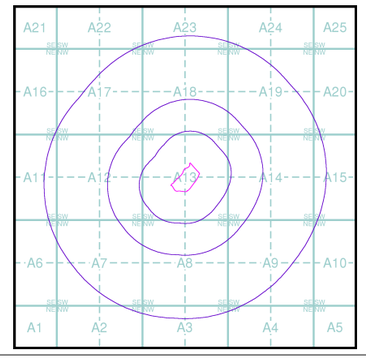
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 157.8

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



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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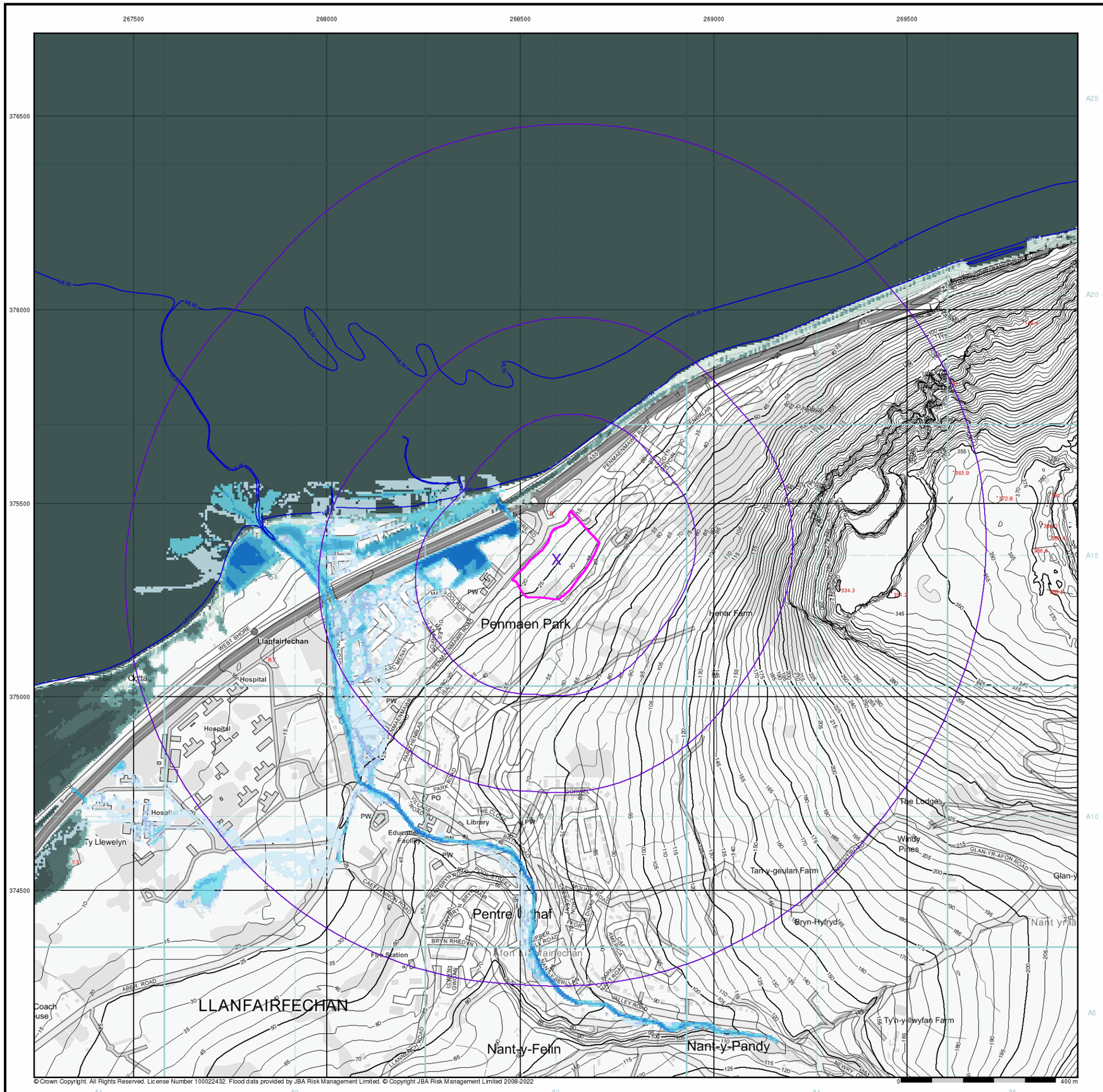
Web: www.envirocheck.co.uk



Envirocheck®

LANDMARK INFORMATION GROUP®

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

General

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

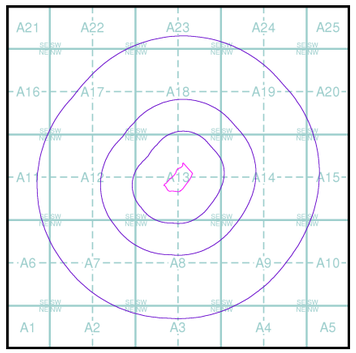
Modelled Flood Depth

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

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



Order Details

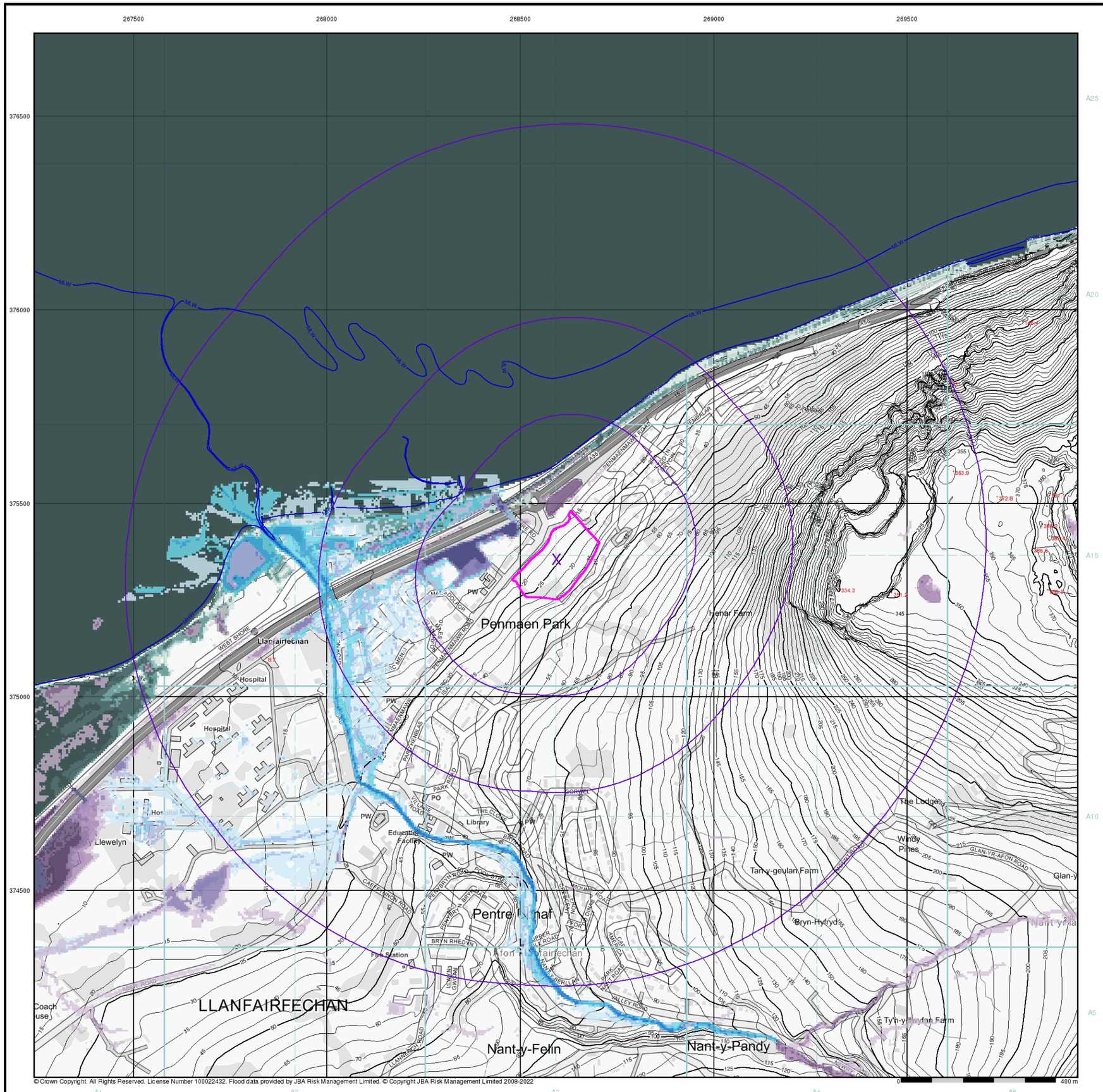
Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

Landmark® INFORMATION GROUP

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



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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

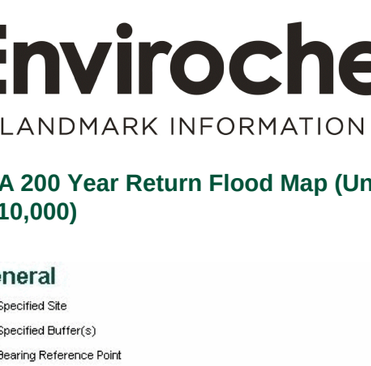
Contours (height in metres)

Standard Contour — Master Contour — Spot Height (157.8)

MLW Mean Low Water

MHW Mean High Water

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



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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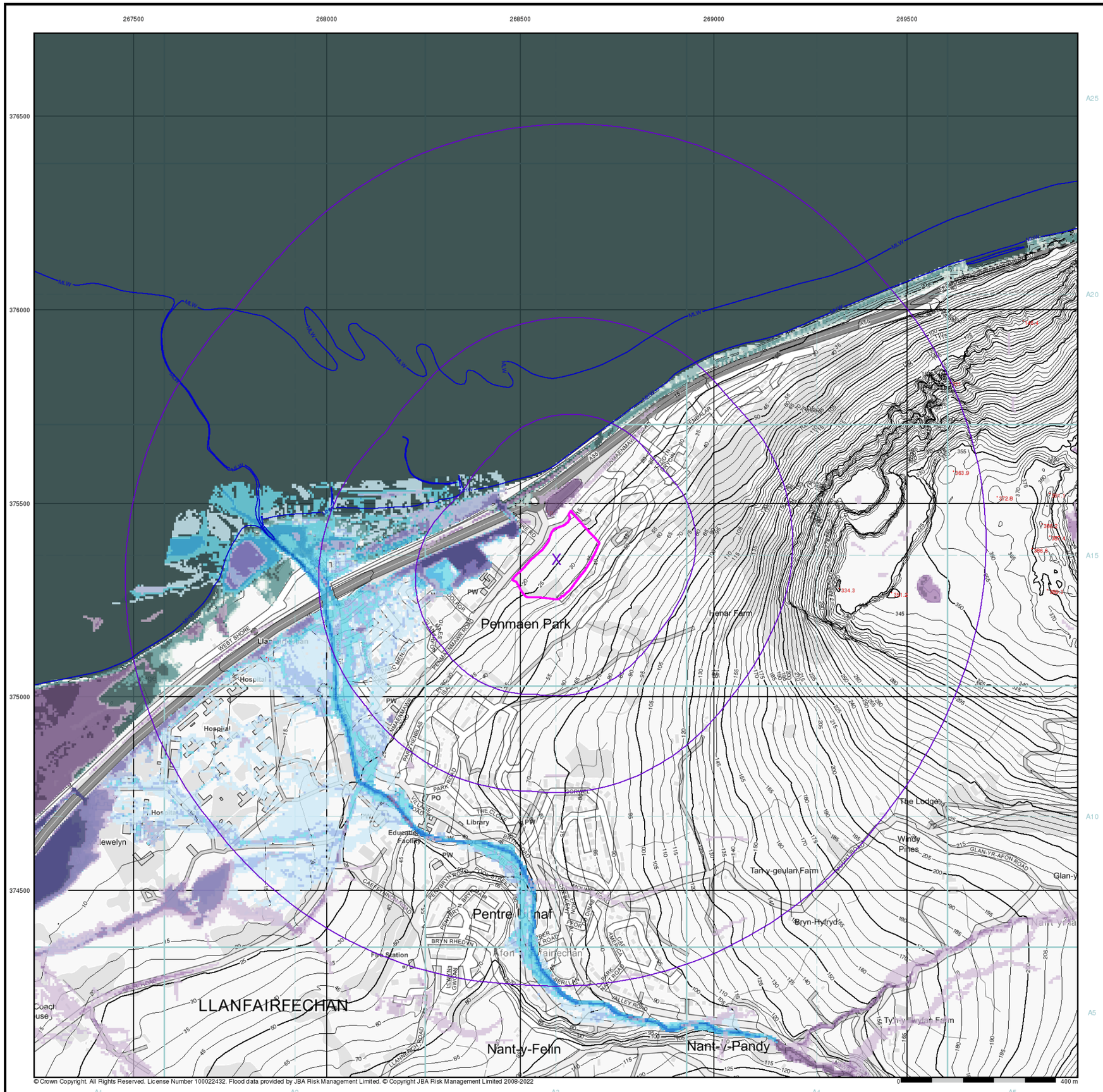

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LANDMARK INFORMATION GROUP®

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

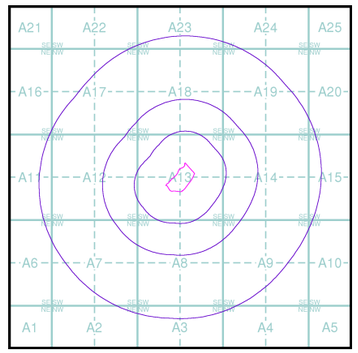
Master Contour

Spot Height 157.8

MLW Mean Low Water

MHW Mean High Water

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



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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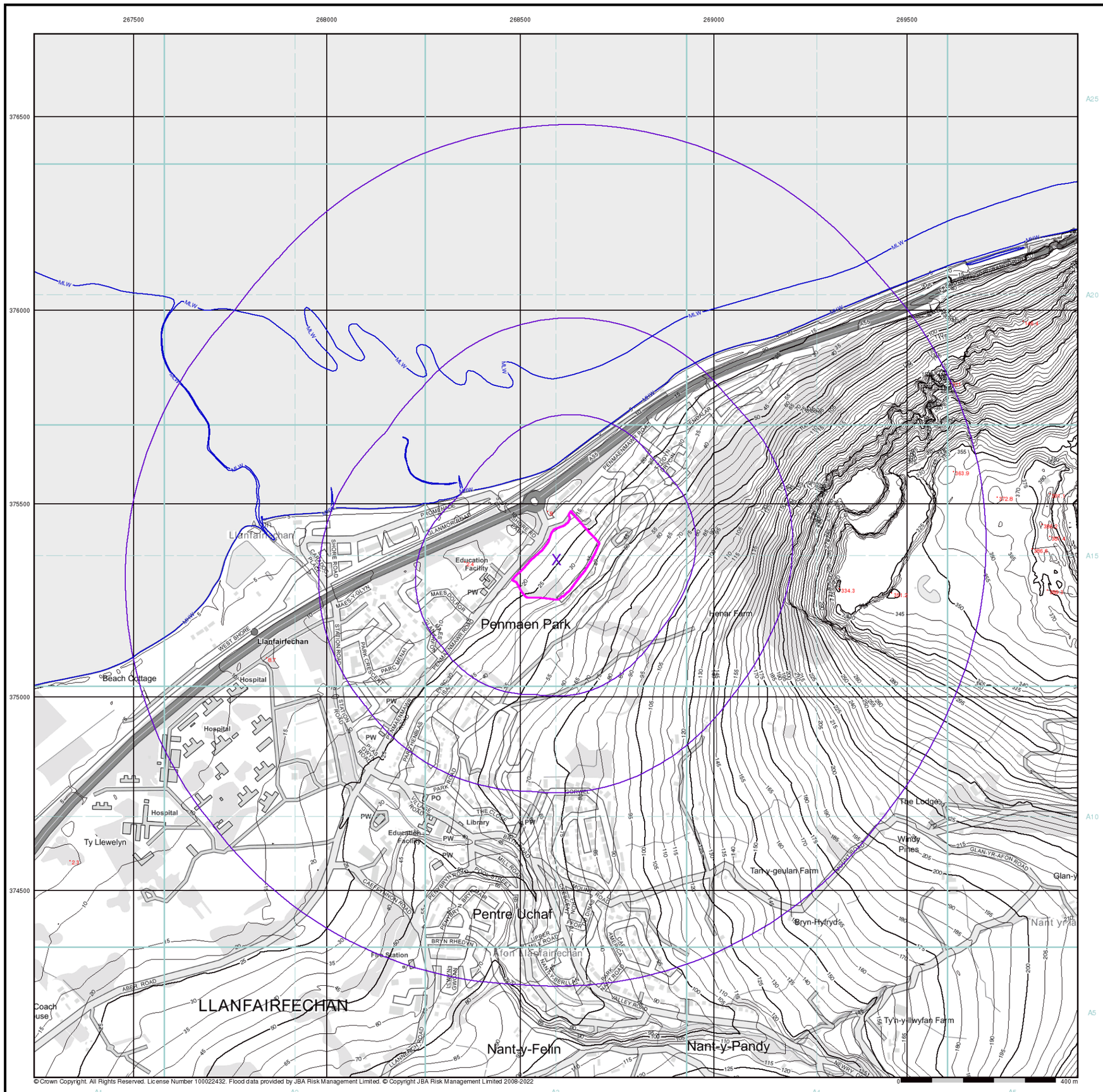

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JBA Canal Failure Map (1:10,000)

General

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

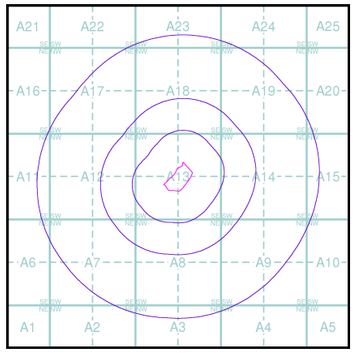
Flood Data

- Canal Failure
- Coverage

Contours (height in metres)

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

JBA Canal Failure Flood Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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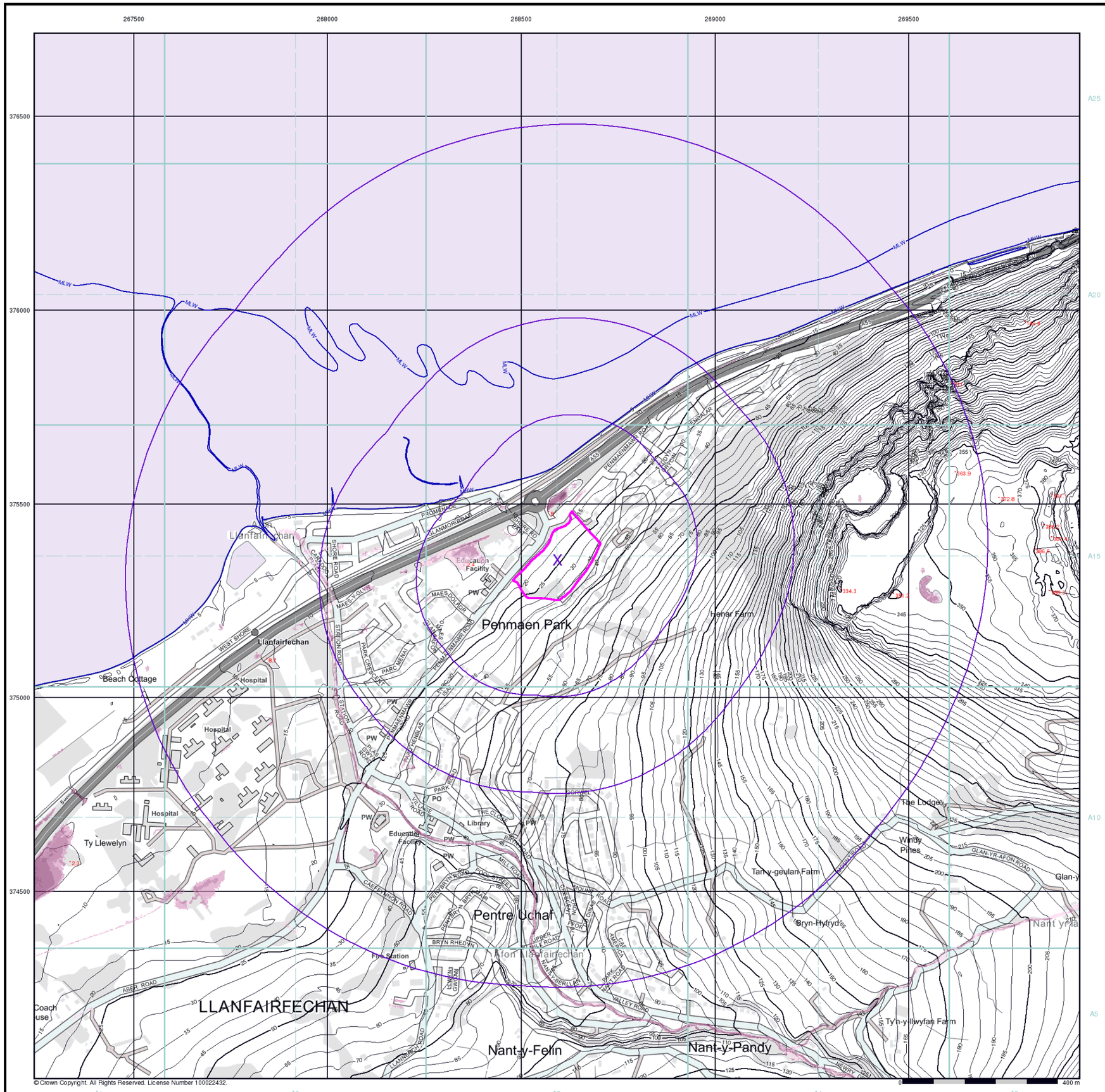

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

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 | Master Contour | Spot Height *167.8

MLW Mean Low Water

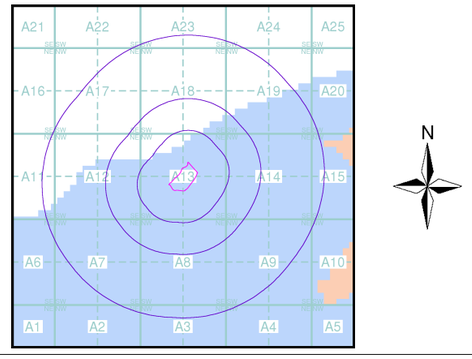
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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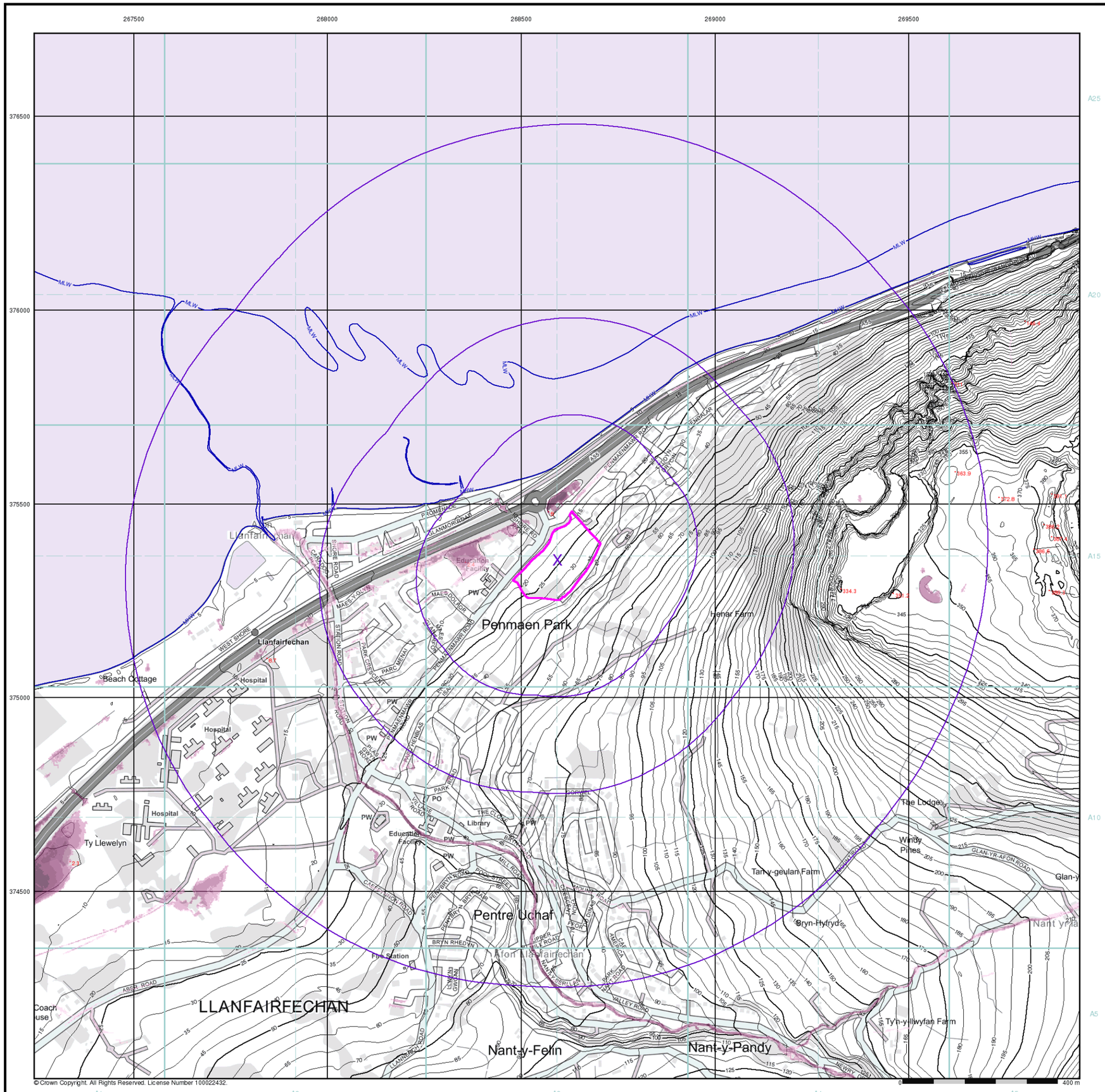


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Depth Map

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

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 | Master Contour | Spot Height *167.8

MLW Mean Low Water

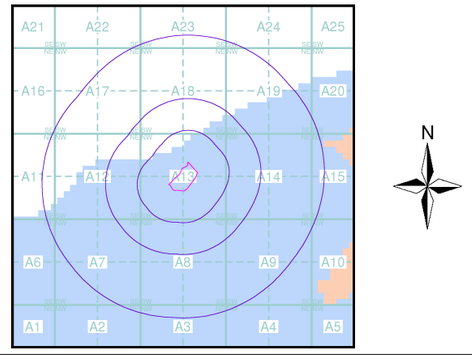
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
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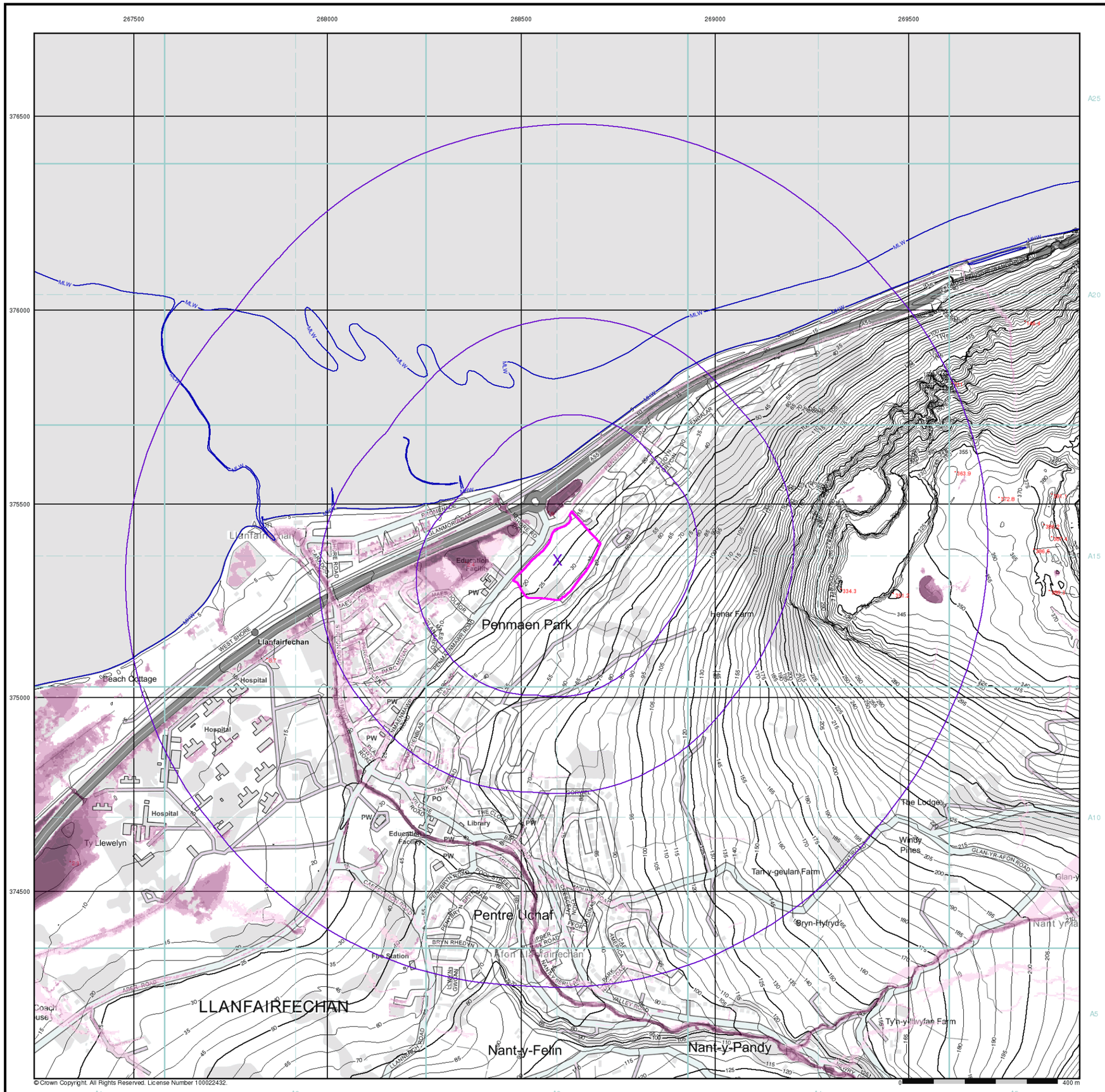

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LANDMARK INFORMATION GROUP®

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

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

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 | Master Contour | Spot Height *167.8

MLW Mean Low Water

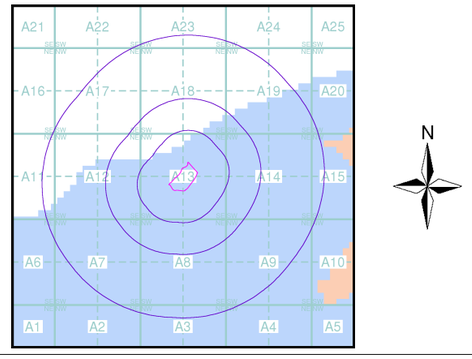
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



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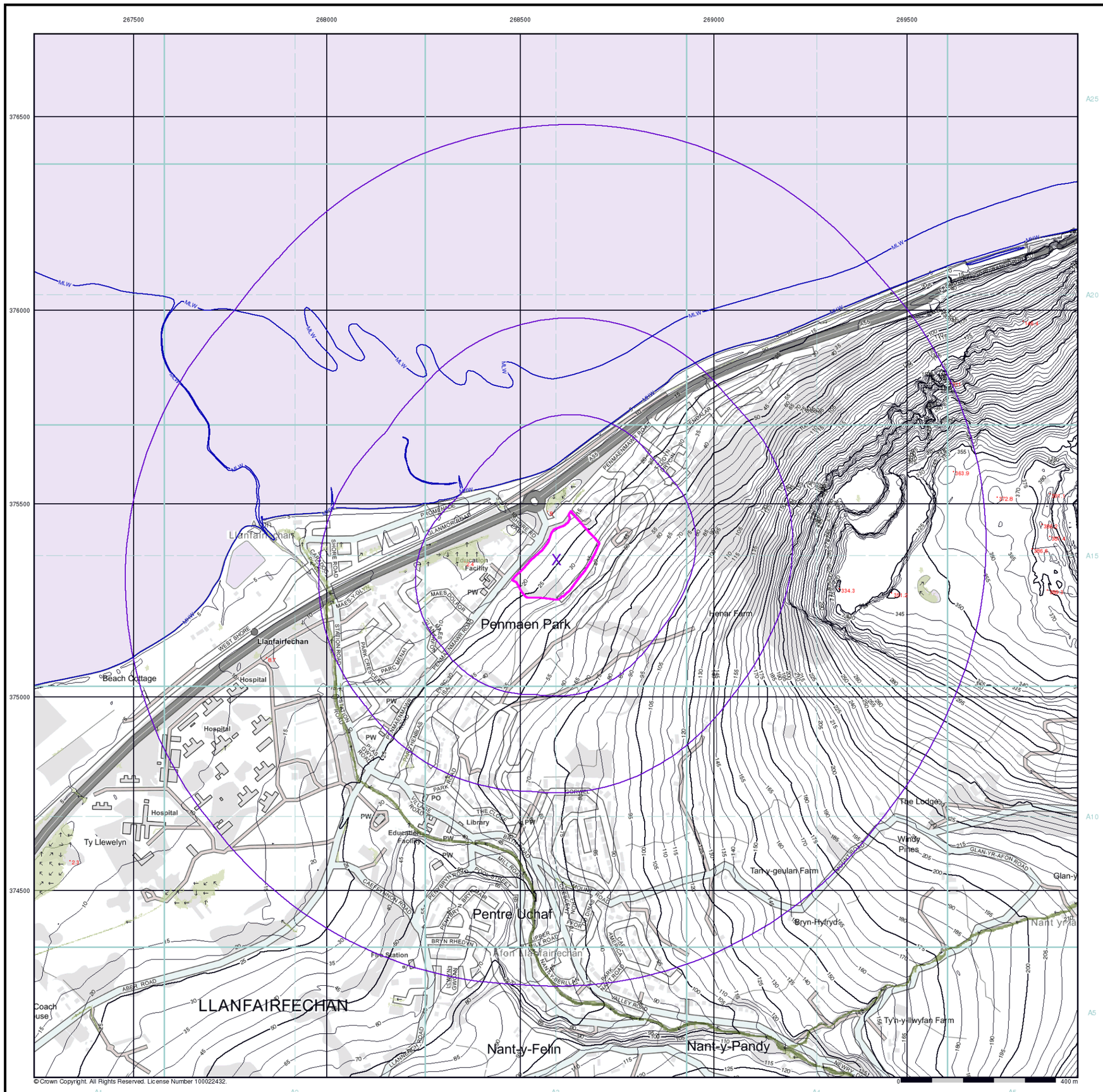

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 Year Return Velocity and Flow Direction Map (1:10,000)

General

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

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

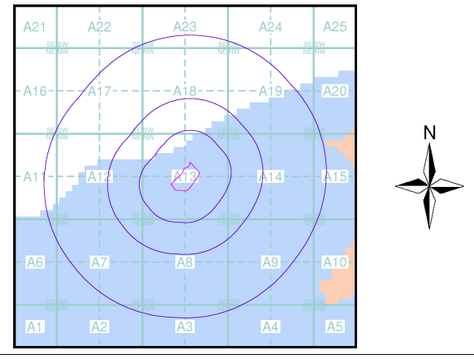
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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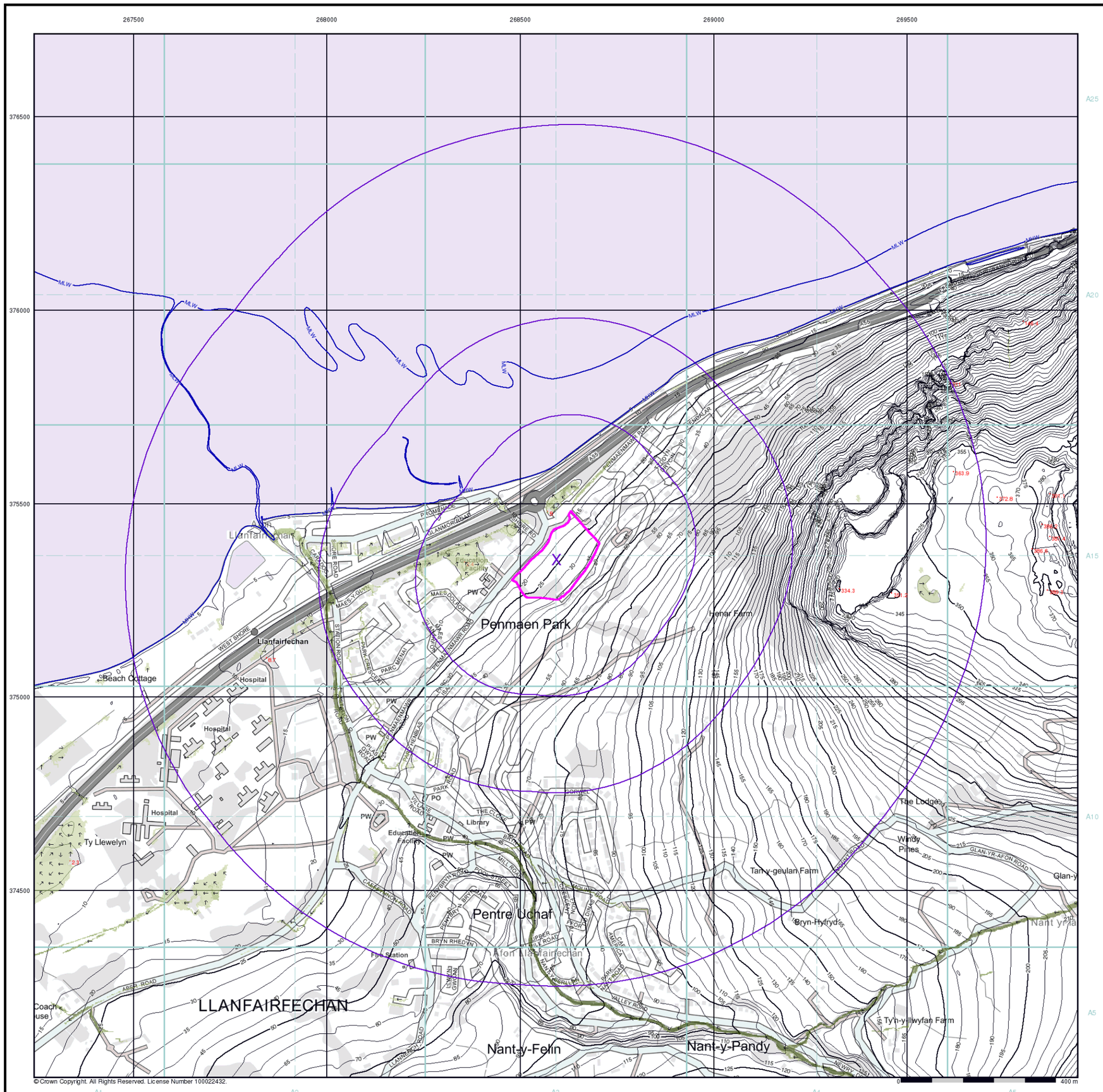


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Velocity and Flow Direction Map (1:10,000)

General

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

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

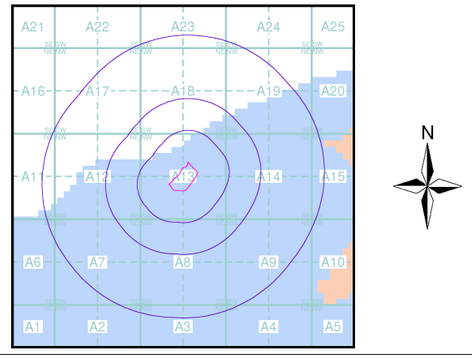
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
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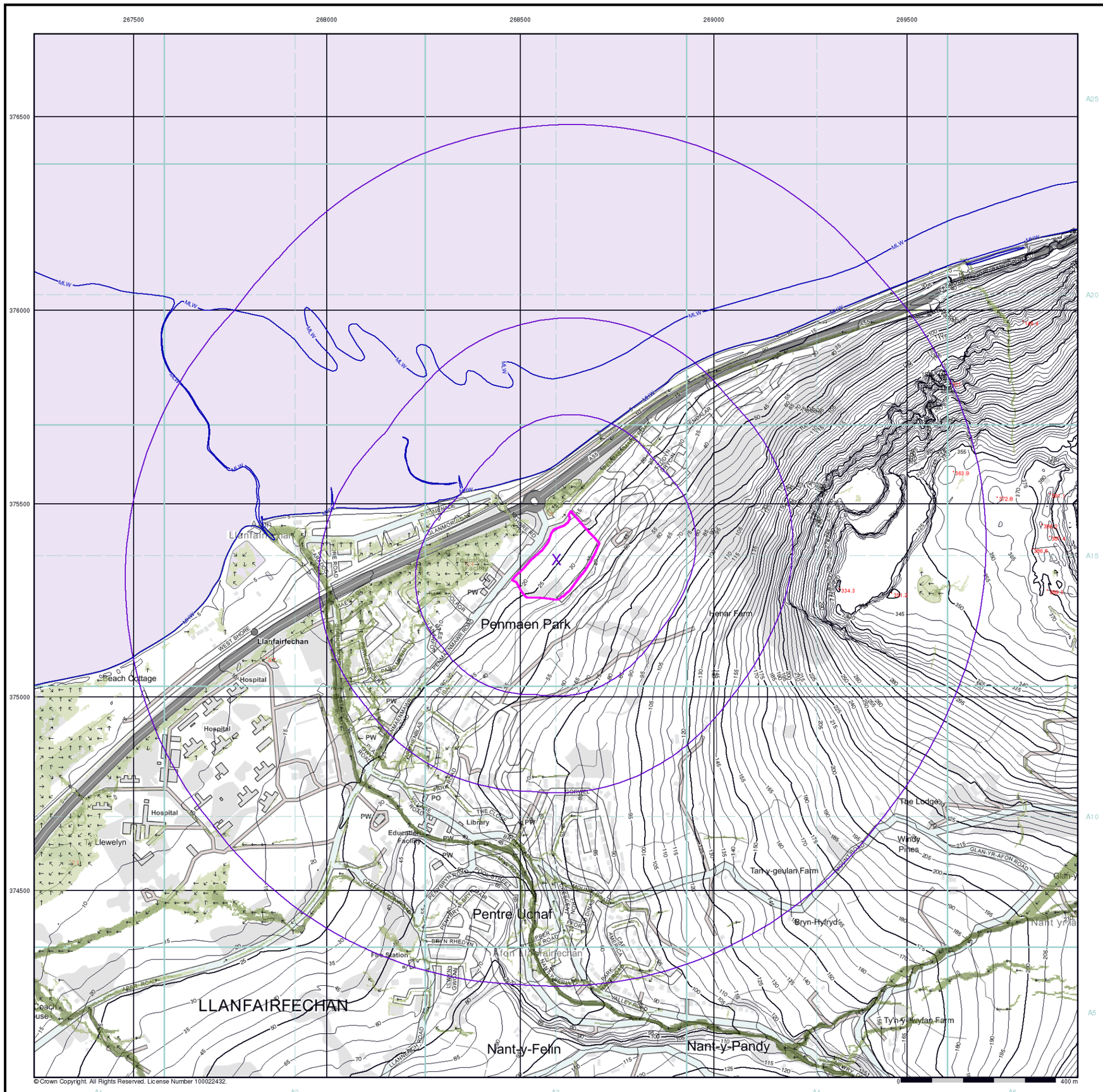

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LANDMARK INFORMATION GROUP®

EA/NRW 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

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

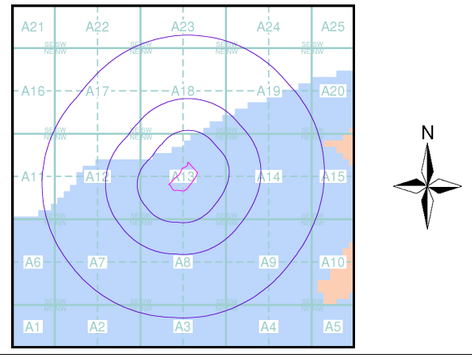
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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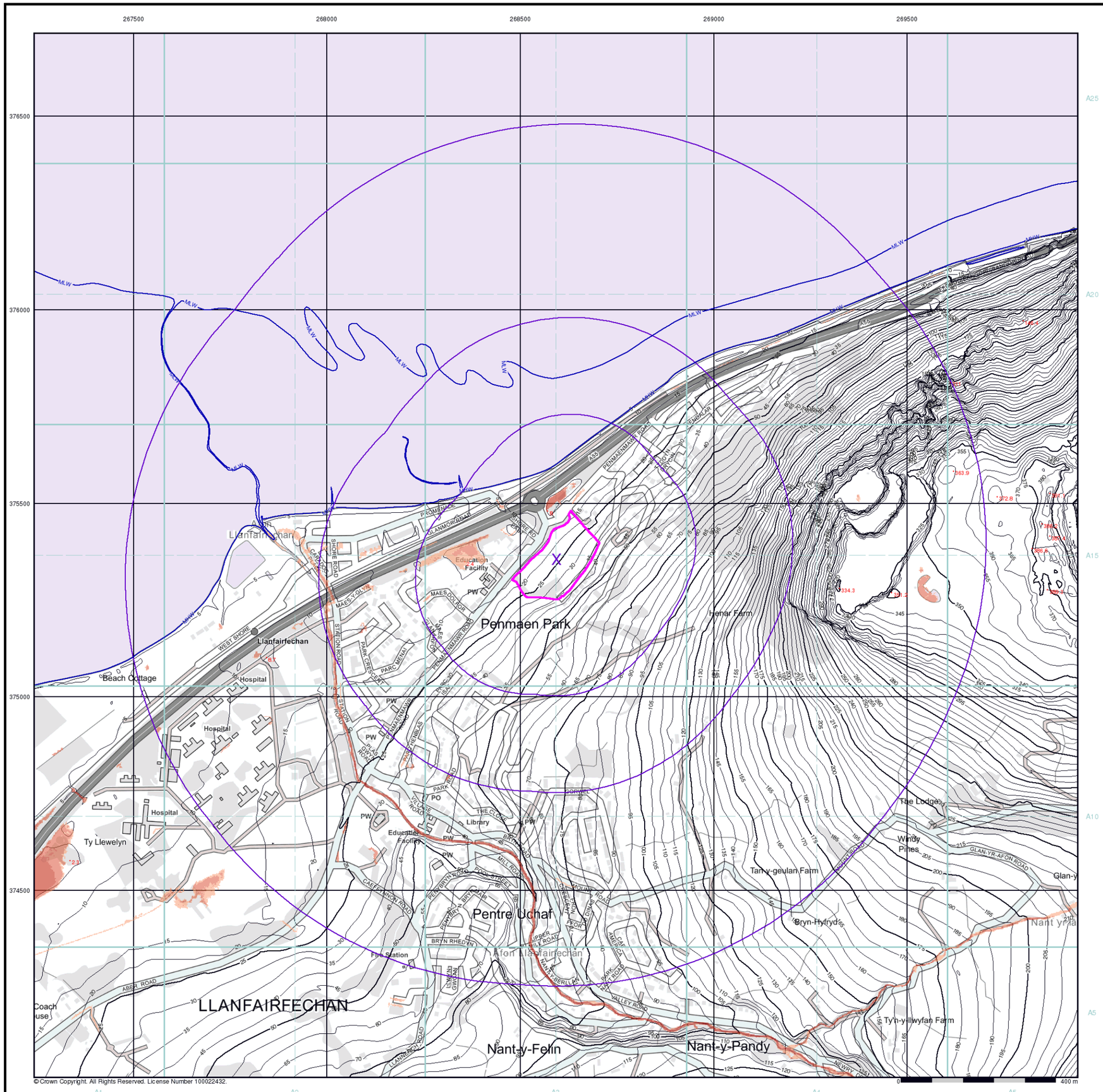

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 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 | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

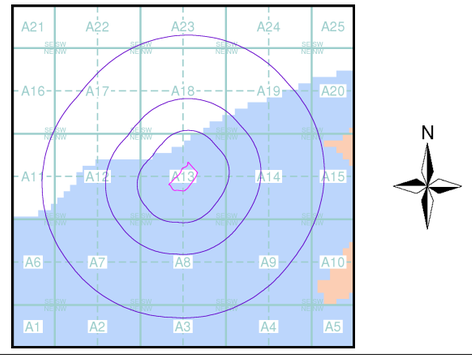
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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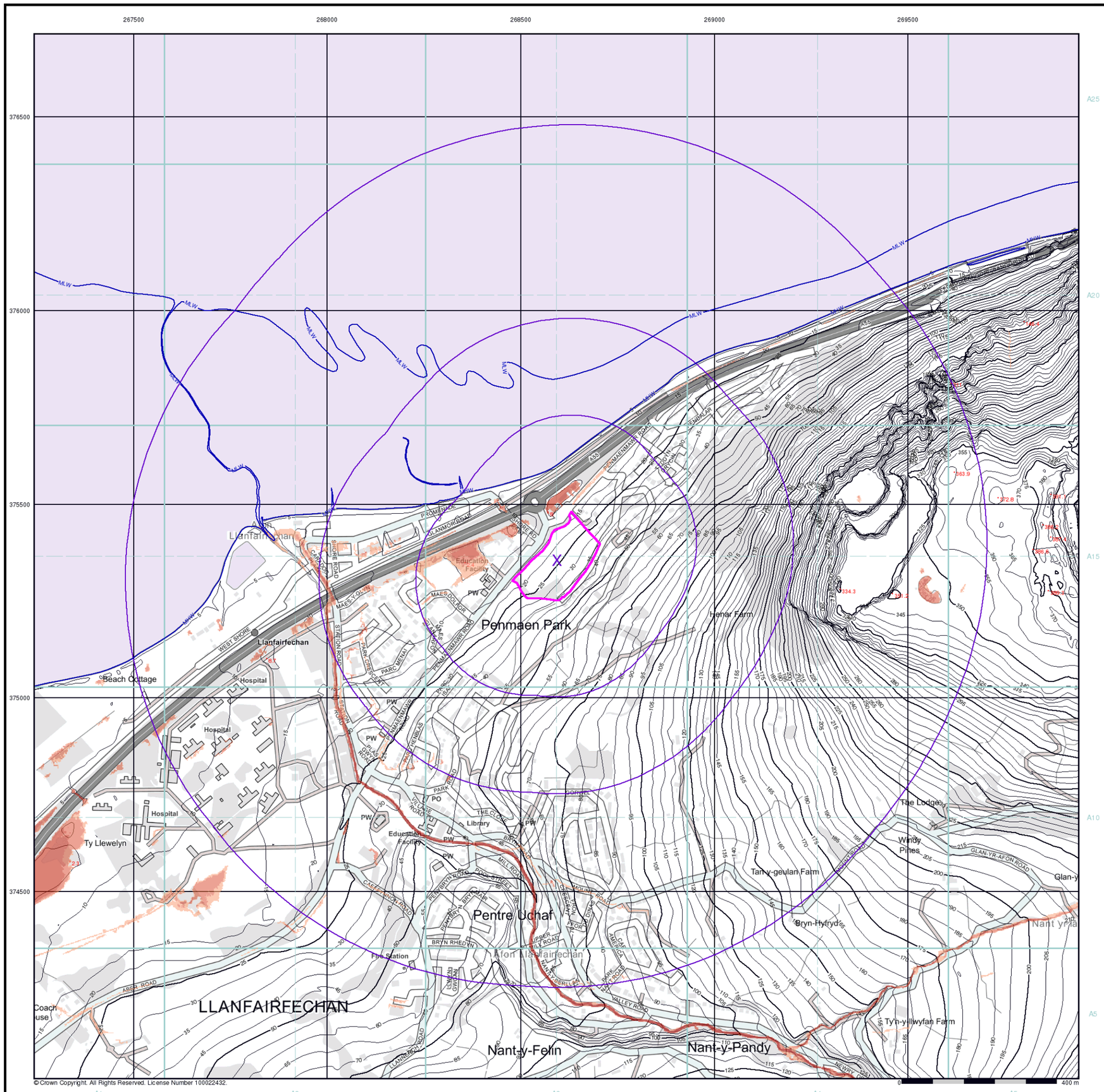


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 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 | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

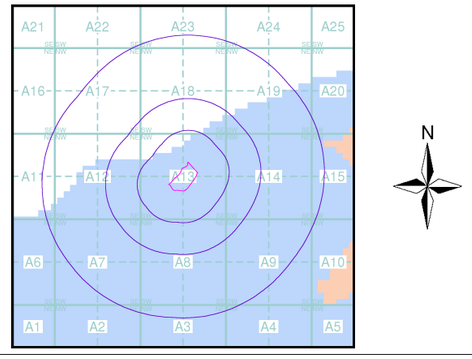
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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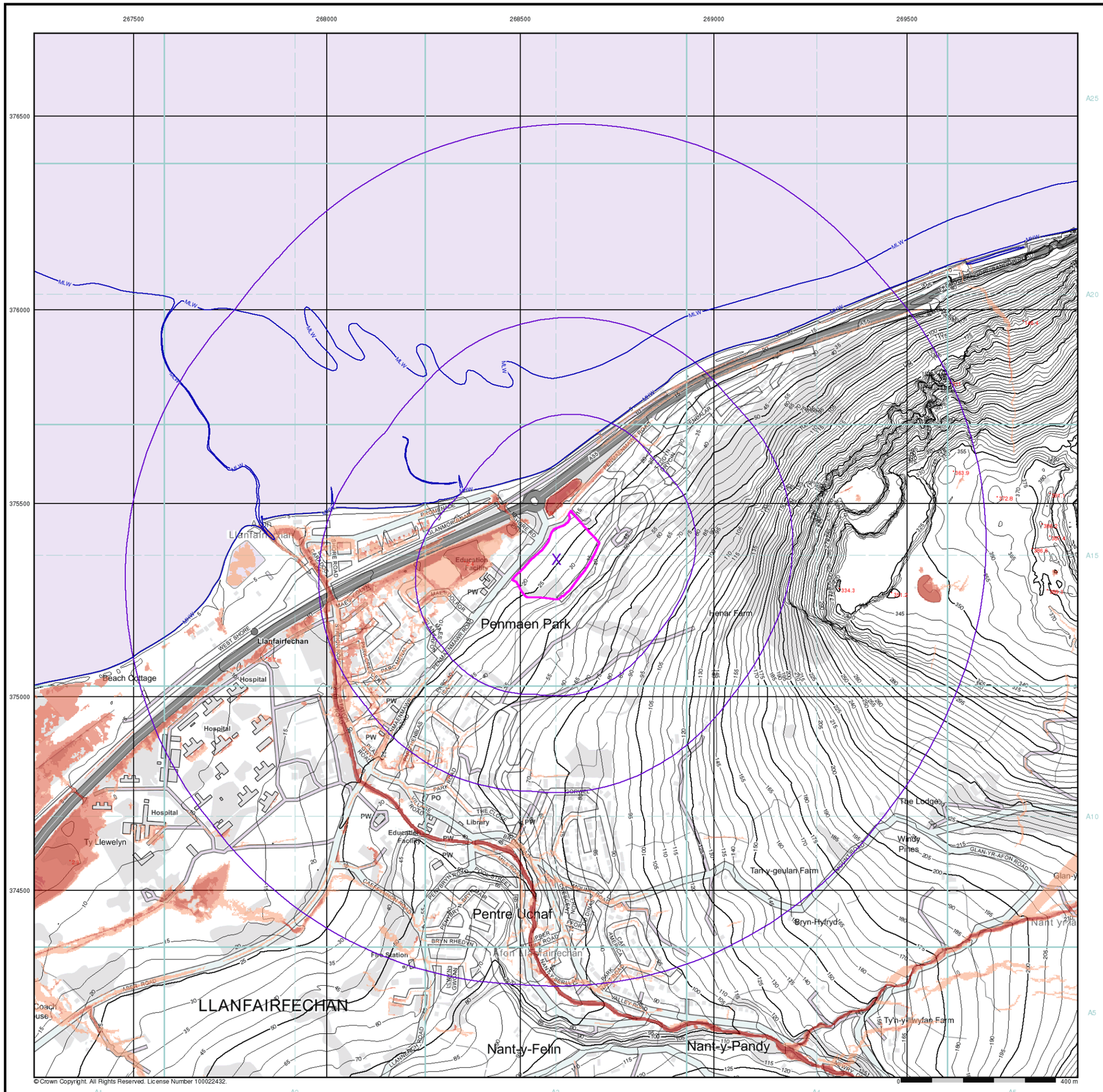


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/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 | Master Contour | Spot Height (* 167.8)

MLW Mean Low Water

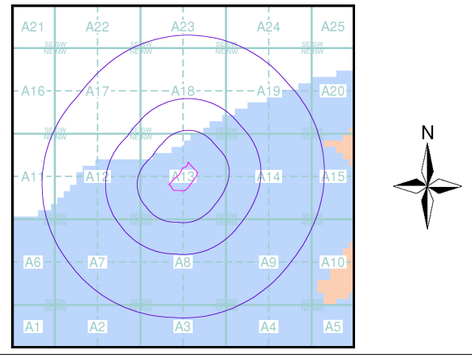
MHW Mean High Water

Suitability

See the suitability map below

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

EA/NRW Suitability Map - Slice A



Order Details

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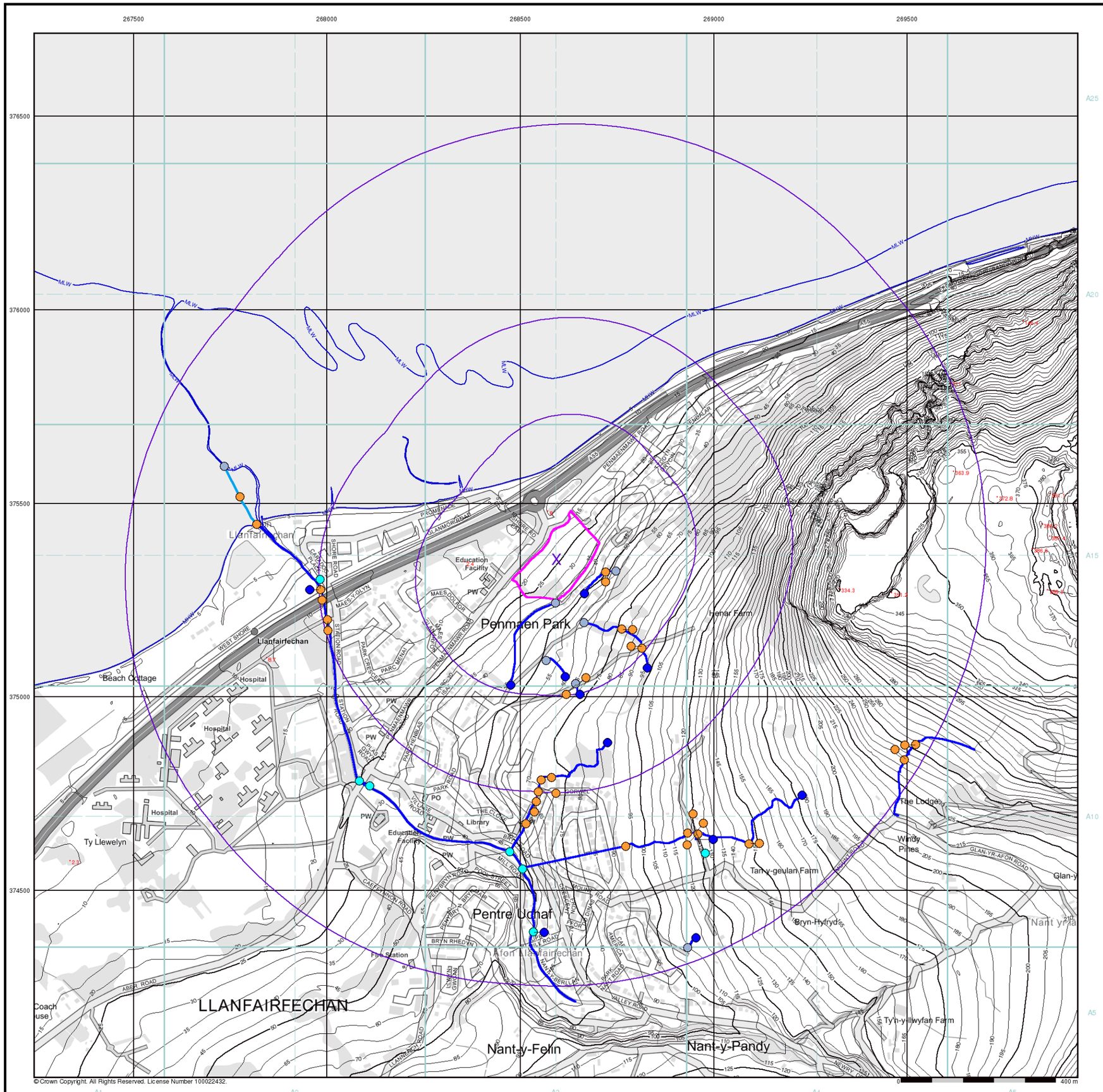

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OS Water Network Lines Map (1:10,000)

General

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

OS Water Network Data

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

Contours (height in meters)

Standard Contour 105 100 95

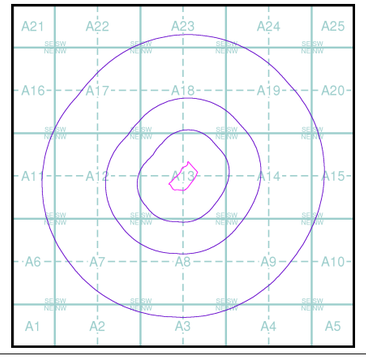
Master Contour

Spot Height *167.3

MLW Mean Low Water

MHW Mean High Water

OS Water Network Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Plas Estate, Llanfairfechan, LL33 0RN

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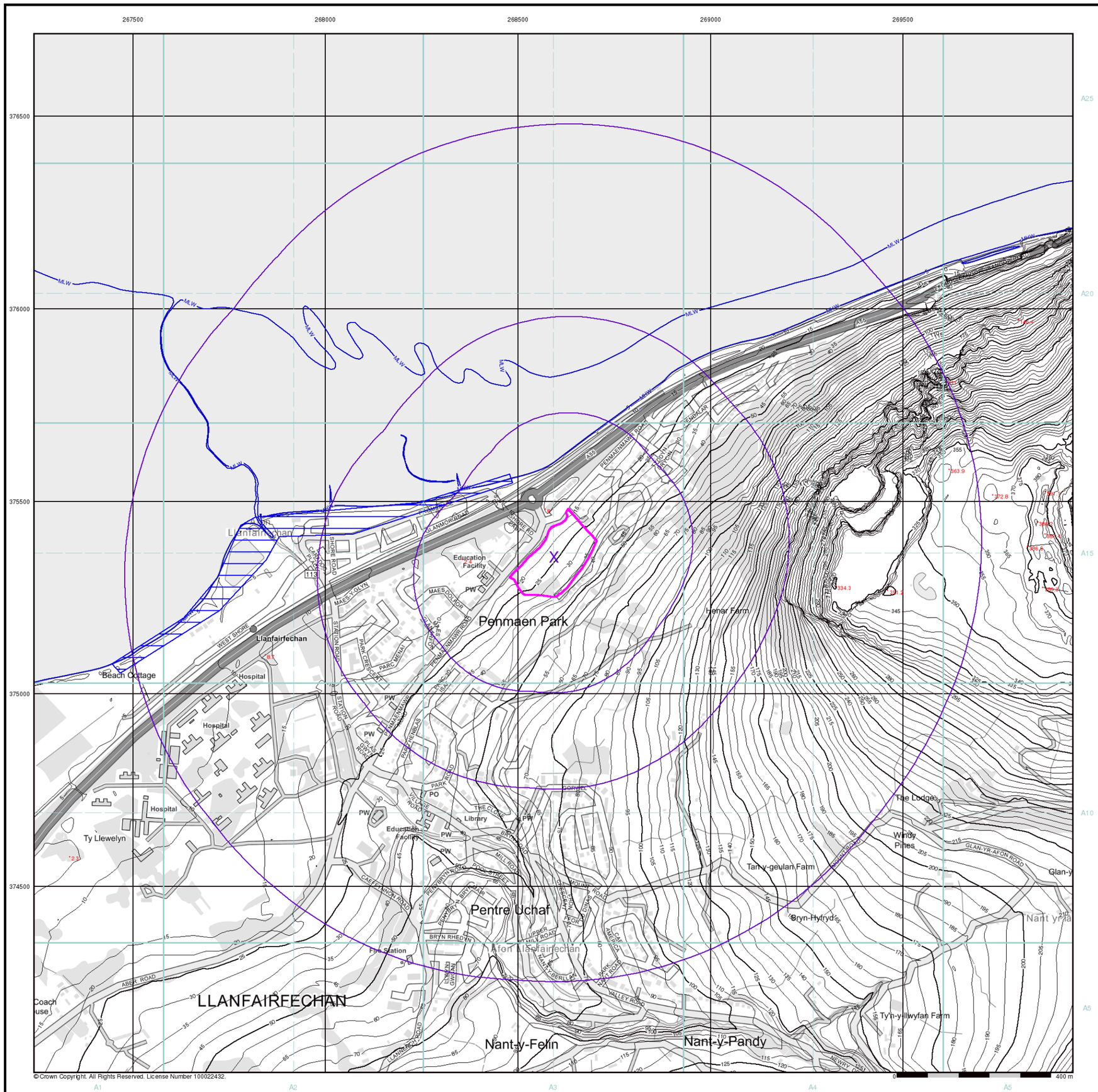
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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EA/NRW Historic Flood Map (1:10,000)

General

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

Historic Flood Events Data

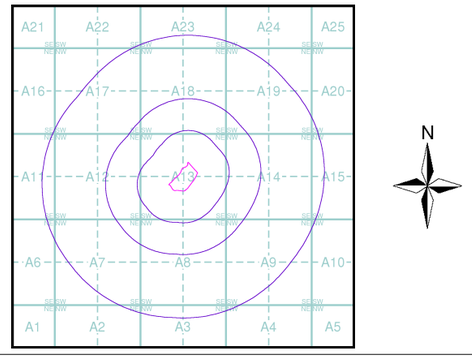
- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded /Surface Water
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert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

Contours (height in metres)

Standard Contour 105
Master Contour 100 95
Spot Height *167.8

- MLW Mean Low Water
- MHW Mean High Water

EA/NRW Historic Flood Map - Slice A



Order Details

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Customer Ref:	8098 - Plas Estate, Llanfairfechan
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Slice:	A
Site Area (Ha):	2.62
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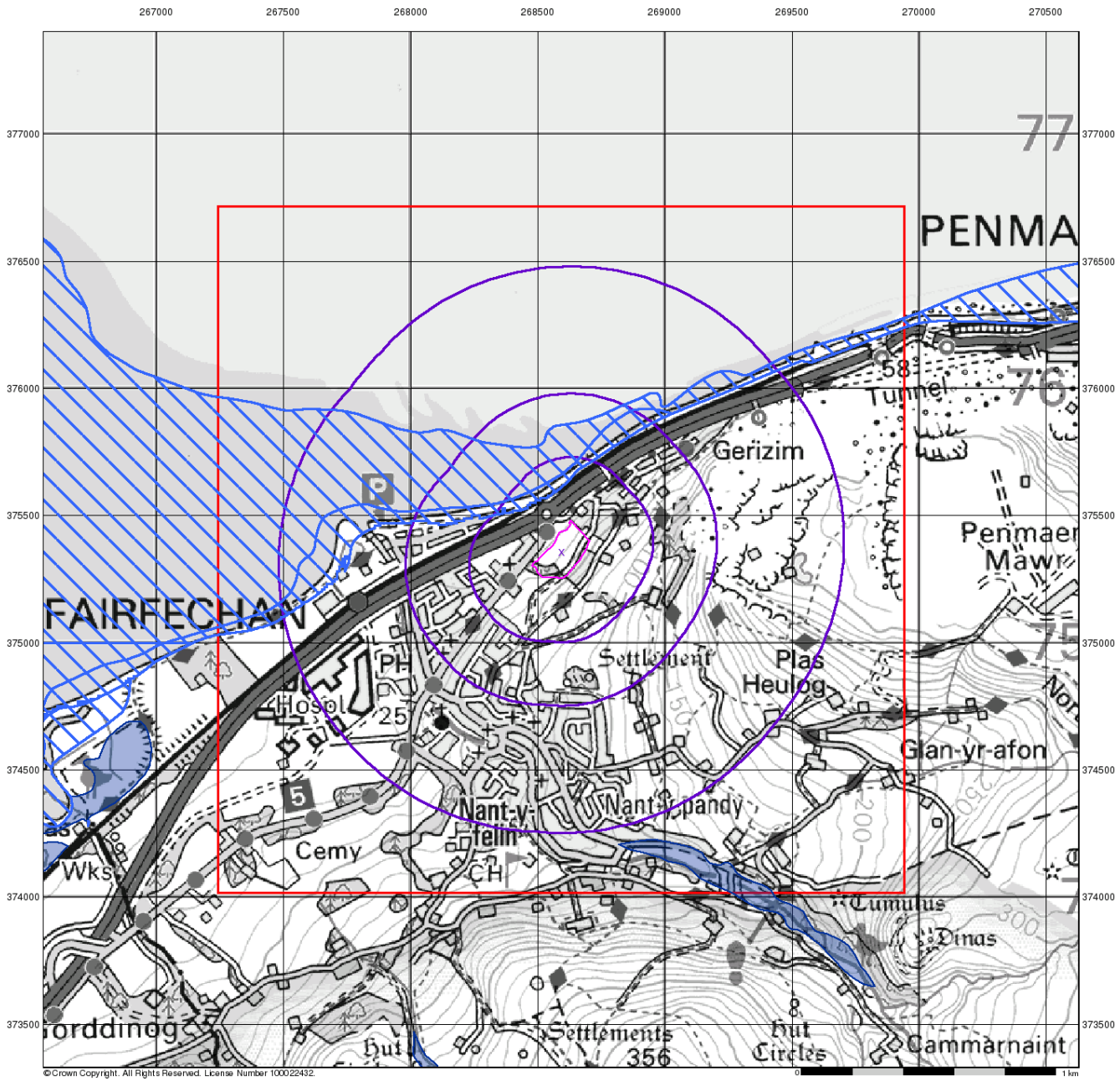

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BGS Flood Data (1:50,000)

General

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

Slice | Map ID

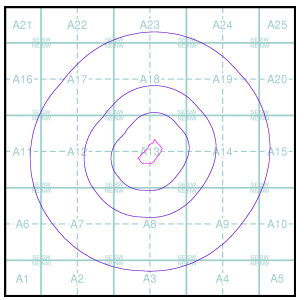
BGS Geological Indicators of Flooding

Coastal

Inland

Bodies of Water

BGS Flood Data Map - Slice A



Order Details

Order Number:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

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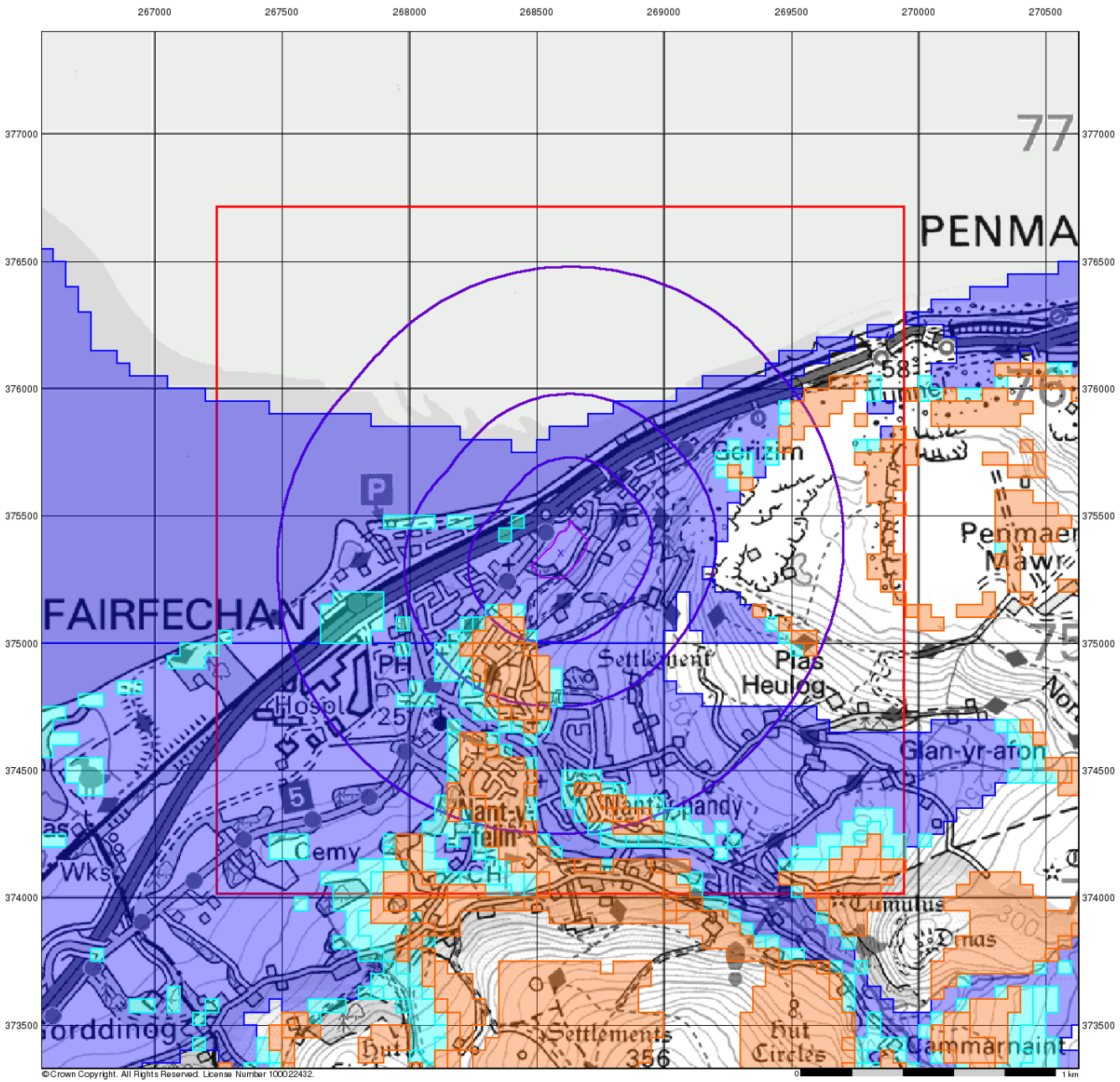

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BGS Flood Data (1:50,000)

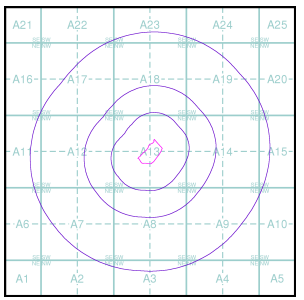
General

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



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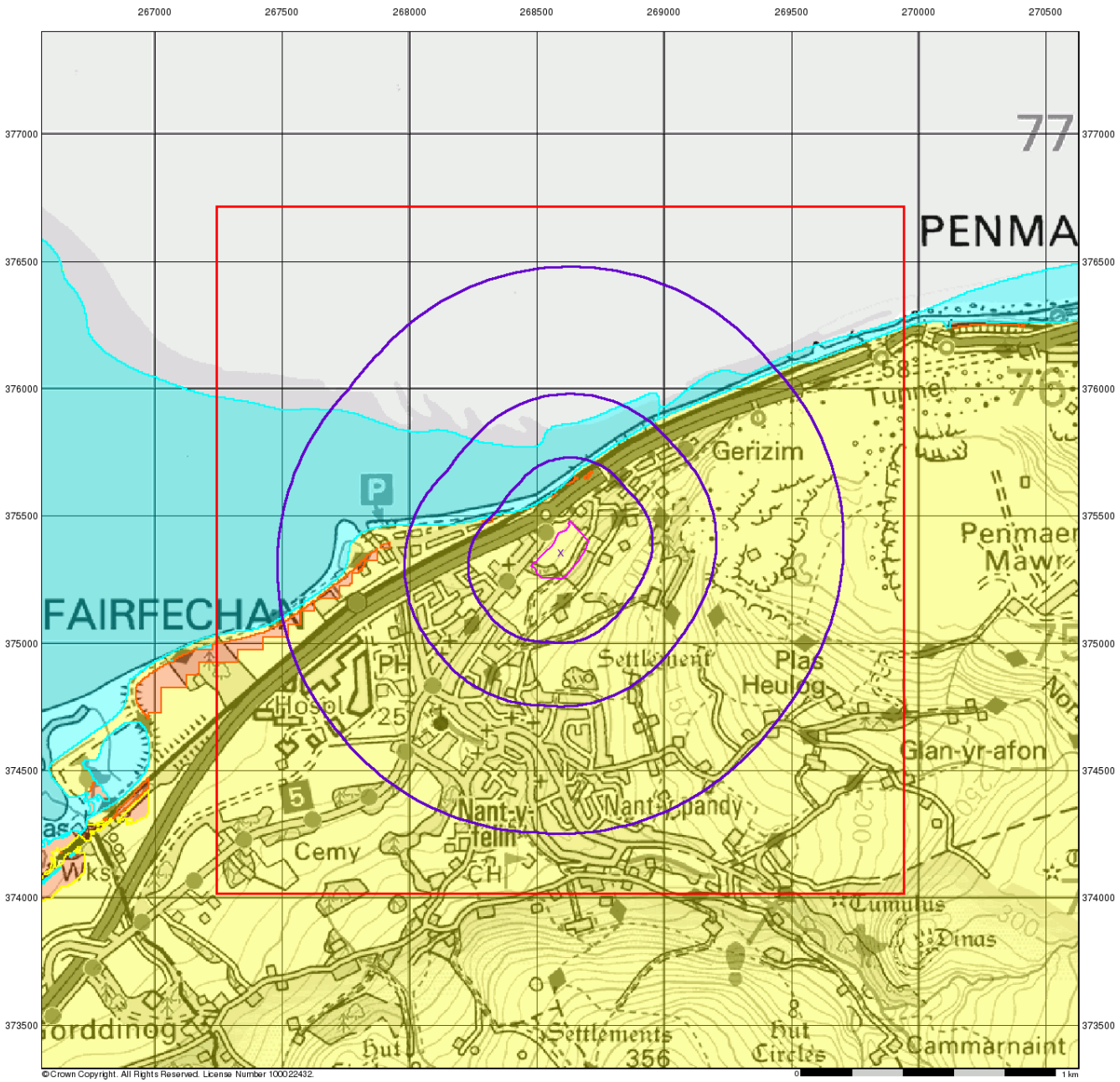

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GeoSmart Information Groundwater Flood Map (1:50,000)

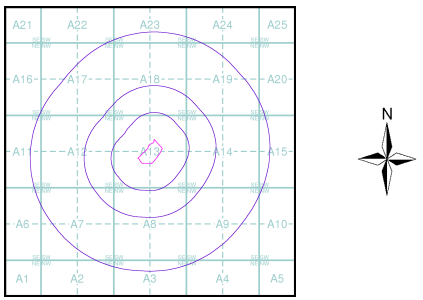
General

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:	301707914_1_1
Customer Ref:	8098 - Plas Estate, Llanfairfechan
National Grid Reference:	268590, 375360
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

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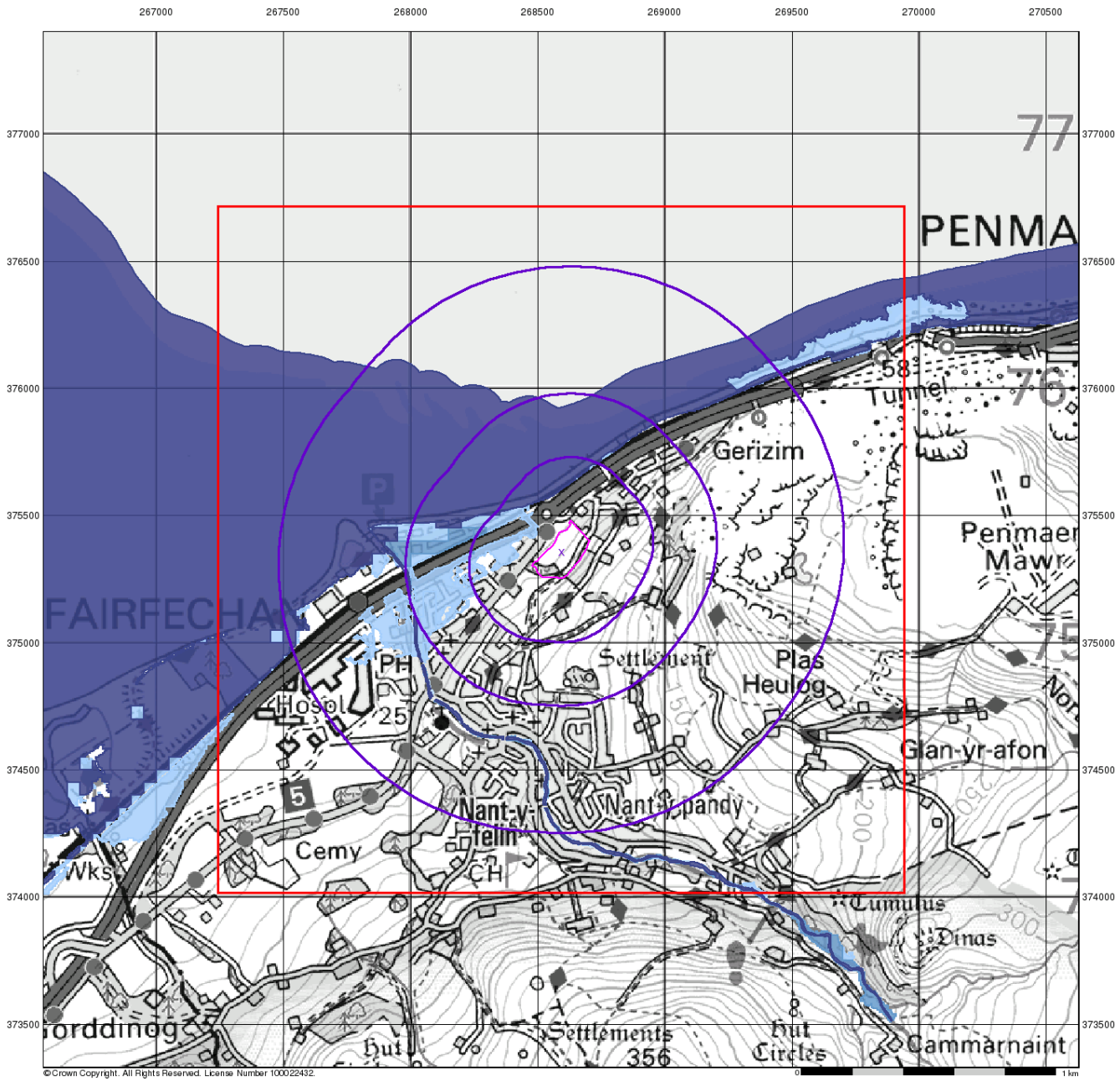

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EA/NRW RoFRS Data (1:50,000)

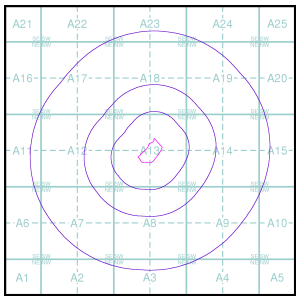
General

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:	301707914_1_1
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National Grid Reference:	268590, 375360
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Site Area (Ha):	2.62
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Appendix 3

Infiltration Consideration

Trial Pit Information

and

Infiltration Test Results

DO NOT SCALE

NORTH

KEY TO EXPLORATORY HOLES

(All positions are approximate unless otherwise stated)

- Trial pits TP01 - TP11 excavated by Coopers on 27 September 2022
- Infiltration pits ITP01 - ITP03 excavated by Coopers on 12 October 2022
- BGS boreholes SK2 & SKP1 drilled for Norwest Holst Soil Engineering Ltd between 15 & 20 September 1984 (taken from ref. c)

KEY TO EXISTING FEATURES

(All positions are approximate unless otherwise stated)

- Surveyed tree (taken from ref. a)
- Surveyed hedge (taken from ref. a)
- Surveyed fence (taken from ref. a)
- Surveyed drainage channel (taken from ref. a)
- Surveyed bottom of bank (taken from ref. a)
- Surveyed top of bank (taken from ref. a)
- Topographical contours (taken from ref. a)
- Site boundary (taken from ref. b)

KEY TO FORMER FEATURES

(All positions are approximate unless otherwise stated)

- Former buildings (taken from ref. c)
- Former fence line / hedgeline (taken from ref. c)

KEY TO GEOLOGICAL FEATURES

(All positions are approximate unless otherwise stated)

- Geological Fault (taken from ref. c)

KEY TO CONJECTURED SERVICES

(All positions are approximate unless otherwise stated)

- BT lines (taken from ref. d)
- High voltage electricity lines (taken from ref. e)
- Low voltage electricity lines (taken from ref. e)
- Gas lines (taken from ref. f)
- Potable water lines (taken from ref. g)
- Foul (combined) water (taken from ref. g)
- Zayo (taken from ref. h)
- Surveyed overhead cables (taken from ref. a)

This drawing is to be read in conjunction with the following:-

a) Carl Williams Land Surveys Ltd, Land off Penmaenmawr Road, Topographical Survey, ref. B472-01, dated 09 June 22.

b) Castle Green, Penmaenmawr Road, Llanfairfechan, Proposed Site Plan, ref. PRL-SP-01, rev. D, dated 16 September 2022.

c) Groundsure, Penmaenmawr Road, Llanfairfechan, ref. GS-9069565, dated 21 September 2022.

d) BT Openreach utilities map, ref. WTQ03497Q, dated 21 September 2022.

e) SP Energy Networks, ref. 26996083, dated 21 September 2022.

f) Wales and West, Penmaenmawr Road, ref. 26996083, dated 21 September 2022.

g) Welsh Water, map ref. 268619, 375358, dated 12 May 2016.

h) Zayo Group, 8095 - Penmaenmawr Road, ref. 26996083, dated 21 September 2022.

THIS DRAWING SHOULD ONLY BE PRINTED IN COLOUR

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CH4 9QU
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Web: http://coopers.co.uk

Client

CASTLE GREEN HOMES LTD

Project

Penmaenmawr Road, Llanfairfechan

Title

SITE PLAN

DRAWING NUMBER	SCALE at A1	1:500	
8095 / 01	DATE	02.11.22	REVISION
	DRAWN	AH	-
	CHECKED	AW	

SCALE BAR (m) 0 5 10 15 20 25 30 35 40 45 50

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP01

Machine : 8 Tonne Tracked Excavtaor

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.50m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, gravelly, silty, sandy TOPSOIL. Sand is fine to medium, Gravel is Gravel is sub-angular to sub-rounded, fine to coarse of natural stone. With rootlets to a maximum depth of 0.20m.		
0.40	B					Light brown, slightly clayey, silty, sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. Sand is fine to coarse. With a frequent cobble content and occasional boulder content. *Assumed as medium dense.		
1.40	B				(2.30)	From 2.00m: Becoming very silty, slightly clayey, sandy gravel		
2.40	B				2.50	Complete at 2.50m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.40m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP02

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.00m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, gravelly, silty, sandy TOPSOIL. Sand is fine to medium, Gravel is sub-angular to sub-rounded, fine to coarse of natural stone, with rootlets to a maximum depth of 0.20m.		
0.40	B				(1.80)	Brown, slightly clayey, silty, sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. Sand is fine to coarse. With a frequent cobble content and occasional boulder content. *Assumed as loose to medium dense.		
1.40	B					From 1.40m: Becoming very sandy		
					2.00	Complete at 2.00m		

Remarks

Location CAT scanned prior to excavation.
Stable. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.40m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP03

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.90m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Grass over dark brown, slightly gravelly, slightly sandy, silty, clayey TOPSOIL. Sand fine to medium, Gravel is sub-angular to sub-rounded, fine to coarse of natural stone, with rootlets to a maximum depth of 0.20m.		
0.10	B				0.20			
0.30	SV *80kPa					Stiff, high strength, light grey mottled orangish brown, slightly gravelly, slightly sandy, very silty CLAY. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone. Sand is fine to coarse. With a frequent cobble and occasional boulder content.		
0.40	B					At 0.70m: Boulder measuring 0.80 x 0.30 x 0.20m		
					(1.60)			
1.40	B					At 1.60m: Boulder measuring 0.70 x 0.40 x 0.20m		
					1.80			
1.90	SV *90kPa					Stiff, high strength, orangish-reddish brown, slightly sandy, gravelly, silty CLAY. Sand is fine to coarse. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone. With frequent cobble and occasional boulder content.		
1.90	B					At 2.10m: Boulder measuring 0.70 x 0.40 x 0.20m		
					(1.00)			▽1
			Small seepage(1) at 2.50m.					
2.60	B							
					2.80 (0.10)			
2.90	B				2.90	Weak, thinly bedded, grey MUDSTONE, partially weathered, possibly highly fractured, recovered as angular, coarse gravel. Strata excavated for 1 minute with toothed bucket, progressing 100mm.		
						Complete at 2.90m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
Small seepage at 2.50m during excavation.
*Spurious result due to gravel content.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.40m higher than toe.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP04

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.10m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, gravelly, silty, sandy TOPSOIL. Sand is fine to medium. Gravel is some sub-angular to sub-rounded, fine to coarse gravel of natural stone. With rootlets to a maximum depth of 0.20m.		
0.30	B					Brown, slightly clayey, silty, sub-angular to sub-rounded, fine to coarse SAND and GRAVEL of natural stone. Sand is fine to coarse. With a frequent cobble and occasional boulder content. *Assumed as medium dense.		
						From 0.80m: Becoming slightly clayey, very silty		
						At 1.00m: Boulder measuring 0.50 x 0.40 x 0.25m		
					(1.90)	At 1.20m: Boulder measuring 0.45 x 0.40 x 0.20m		
1.30	B					At 1.30m: Large Boulder obstruction in centre of trial pit		
2.00	B				2.10	Complete at 2.10m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP05

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.20m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL. Sand is fine to medium, Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.20m.		
0.40	B		Steady seepage(1) at 0.80m.		(2.00)	Brown, slightly clayey, silty, sub-angular to sub-rounded, fine to coarse SAND and GRAVEL of natural stone. Sand is fine to coarse. With frequent cobbles and boulders. *Assumed as medium dense. At 0.50m: Large Boulder measuring 0.80 x 0.40 x 0.25m		▽1
1.40	B							
2.10	B				2.20	At 2.00m: Small pockets of soft grey, slightly silty, gravelly, very sandy clay. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to medium of natural stone		
						Complete at 2.20m		

Remarks

Location CAT scanned prior to excavation.
Stable. Slight spalling from extraction of oversized inclusions.
Steady seepage at 0.80m during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP06

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 1.70m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL. Sand fine to medium, Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.20m.		
0.40	B				(1.50)	Light brown, slightly clayey, very silty, sub-angular to sub-rounded, fine to coarse SAND and GRAVEL of natural stone. Sand is fine to coarse. With frequent cobbles and boulders. *Assumed as medium dense.		
1.40	B				1.70	At 1.10m: Becoming brown Complete at 1.70m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP07

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 1.80m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL. Sand is fine to medium, Gravel is Sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.30m.		
					0.30			
0.50	B					Light brown, slightly clayey, very silty, sub-angular to sub-rounded, fine to coarse SAND and GRAVEL of natural stone. Sand is fine to coarse. With frequent cobble content and occasional boulders. * Assumed as loose to medium dense.		
					(1.50)	At 1.00m: Boulder measuring 0.40 x 0.25 x 0.10m		
1.40	B					From 1.40m: Becoming brown		
					1.80	Complete at 1.80m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
	1:25	LP	PRS

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Site PENMAENMAWR ROAD, LLANFAIRFECHAN			**Trial Pit Number** TP08
Machine : 8 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 2.50 x 0.60 x 1.70m	**Ground Level (mOD)**	**Client** Castle Green Homes Ltd	**Job Number** 8095
	Location (Observed measurements)	**Dates** 27/09/2022	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.30m.		
0.40	B				0.30	Light brown, slightly clayey, sandy, very silty, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. Sand is fine to coarse. With frequent cobble and boulder content. *Assumed as loose to medium dense.		
1.40	B				(1.40)			
					1.70	Complete at 1.70m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP09

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.40m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets and tree roots to a maximum depth of 0.30m.		
					0.30			
0.50	B					Light brown, slightly clayey, sandy, very silty, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. Sand is fine to coarse. With frequent cobble and boulder content. *Assumed as medium dense.		
						From 1.00m: Small pockets of soft light grey, mottled orange, silty, slightly gravelly, sandy clay. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to medium of natural stone		
					(2.10)			
1.50	B					At 1.80m: Becoming brown and slightly clayey, sandy, very silty gravel		
2.30	B				2.40			
						Complete at 2.40m		

Remarks

Location CAT scanned prior to excavation.
Stable. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.20m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP10

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.20m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, silty, gravelly, sandy TOPSOIL. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.20m.		
0.30	B				(0.70) 0.90	Light brown, slightly clayey, sandy, silty, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. Sand is fine to coarse. With frequent cobble and occasional boulder content. *Assumed as medium dense		
1.00	B				(1.30) 2.20	Brown, slightly silty, clayey, gravelly, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with frequent cobble and occasional boulder content. *Assumed as medium dense At 0.90m: Becoming slightly clayey, sandy, very silty gravel From 1.60m: Small pockets of soft, light grey mottled orange, slightly gravelly, sandy, silty clay. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone		
2.00	B					Complete at 2.20m		

Remarks

Location CAT scanned prior to excavation.
Stable. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.40m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
↗	1:25	LP	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
TP11

Machine : 8 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 1.80m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
27/09/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.20) 0.20	Grass over dark brown, slightly clayey, silty, gravelly, sandy TOPSOIL. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of natural stone with rootlets to a maximum depth of 0.20m.		
0.40	B					Light brown, slightly clayey, sandy, very silty, sub-angular to sub-rounded, fine to coarse GRAVEL of natural stone. With frequent cobble and occasional boulder content. *Assumed as medium dense.		
					(1.60)			
1.40	B					At 1.50m: 2No. boulders measuring 0.55 x 0.45 x 0.25m and 0.45 x 0.35 x 0.15m		
					1.80	Complete at 1.80m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation. Slight spalling from extraction of oversized inclusions.
No groundwater encountered during excavation.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated on steep gradient, depth measurement taken from centre, crest approximately 0.40m higher than toe.
Depth of trial pit limited due to density and boulder content.
Backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
	1:25	LP	PRS

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Site PENMAENMAWR ROAD, LLANFAIRFECHAN			**Trial Pit Number** ITP01
Machine : 13 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 2.00 x 0.60 x 2.50m	**Ground Level (mOD)**	**Client** Castle Green Homes Ltd	**Job Number** 8095
	Location (Observed measurements)	**Dates** 12/10/2022	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Turf over dark brown, silty, sandy TOPSOIL with occasional fine to coarse, angular to sub-angular natural stone. Frequent fine rootlets.		
0.20	B				0.25			
0.40	B					Brown/grey, slightly silty, clayey, gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to sub-rounded natural stone with some large cobbles and boulders. With pockets of grey mottled brown, firm, silty CLAY. *Assumed as medium dense.		
						At 0.60m: 1No. Boulder measuring 1.00 x 0.80 x 0.80m		
						At 0.80m: 1No. Boulder measuring 0.70 x 0.70 x 0.60m		
						At 1.30m: 1No. Boulder measuring 0.50 x 0.60 x 0.50m		▽1
1.40	B		Minor seepage in south east corner(1) at 1.30m.		(2.25)			
						At 1.60m: 1No. Boulder measuring 0.40 x 0.50 x 0.50m		▽2
			Minor seepage in south east corner(2) at 1.70m.					
						At 1.90m: 1No. Boulder measuring 0.70 x 0.75 x 0.60m		
						At 2.30m: 1No. Boulder measuring 0.60 x 0.60 x 0.40m		
2.40	B				2.50			
						Complete at 2.50m		

Remarks

Location CAT scanned prior to excavation.
Stable during excavation and construction of infiltration test pit.
Minor seepage at 1.30 and 1.70m on south east corner.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Backfilled with single sized 20mm stone for infiltration testing. Stone filled to base of topsoil. Topsoil and turf to be placed upon completion of infiltration testing on 13/10/2022.
Subsoil arising to be placed in a location of landowners choice.
At time of finished construction base of pit dry.
50mm diameter pipe cut flush with ground level 2.50m length. 1mm slotted.
Pit dug on a 1 in 4 slope once stone placed crest of slope 0.40m, base 0.25m above stone.
Depth measurement taken from centre of trial pit.

North	Scale (approx)	Logged By	Checked By
↑	1:25	MW	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
ITP02

Machine : 13 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.60 x 0.60 x 2.40m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
12/10/2022

Engineer
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Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Turf over dark brown, silty, sandy TOPSOIL with some fine to coarse, angular to sub-angular gravel. Rare cobbles. Frequent fine rootlets.		
					0.30	Firm to stiff, high strength, grey mottled brown, silty CLAY with some gravel of fine to coarse cobbles and boulder of angular to sub-rounded natural stone.		
0.50 0.50	SV **88kPa B				(1.00)			
					1.30	Brown/grey, slightly silty, clayey, gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to sub-rounded natural stone. Some large cobbles and boulder of sub-rounded natural stone. *Assumed as medium dense. At 1.50m: 1No. Boulder measuring 1.00 x 0.70 x 0.40m		
1.50	B				(0.70)			
					2.00	Firm, grey mottled brown, very silty, gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded natural stone.		
2.10	B				(0.20)			
					2.20	Weak, thinly bedded, dark grey MUDSTONE, distinctly weathered, recovered as a gravelly clay. With 1 No. angular boulder of Mudstone At 2.20m: 1No. Boulder measuring 0.80 x 0.50 x 0.10m		
2.30	B				(0.20)			
					2.40	Complete at 2.40m		

Remarks

Location CAT scanned prior to excavation.
Stable during excavation and construction of infiltration test pit.
No groundwater encountered.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
50mm diameter pipe cut flush with ground level 2.40m length, 1mm slotted. Backfilled with single sized 20mm stone for infiltration testing. Topsoil and turf to be reinstated upon completion of infiltration testing on 13/10/2022.
Subsoil arising to be placed in a location of landowners choice. Topsoil 0.30m at toe of pit, 0.20m at crest of pit.
**Spurious shear vane reading at 0.50m due to gravel content.
No shear vane reading able to be taken between 2.00 and 2.20m due to gravel content.
Depth measurement taken from centre of trial pit.

North	Scale (approx)	Logged By	Checked By
↑	1:25	MW	PRS

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Site
PENMAENMAWR ROAD, LLANFAIRFECHAN

Trial Pit Number
ITP03

Machine : 13 Tonne Tracked Excavator

Method : Mechanical Excavation

Dimensions
2.60 x 0.60 x 1.95m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8095

Location (Observed measurements)

Dates
12/10/2022

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Turf over dark brown, silty, sandy TOPSOIL with some fine to coarse, angular gravel of natural stone. Frequent rootlets.		
					0.30			
0.50 0.50	SV **60kPa B				(0.50)	Firm, medium strength, grey mottled brown, slightly silty, gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded natural stone. Occasional cobbles. At 0.50m: 1No. Boulder measuring 0.90 x 0.70 x 0.50m		
					0.80			
1.10	B				(1.15)	Medium strong, thinly bedded, grey, distinctly weathered MUDSTONE recovered as a gravelly clay. Occassional angular, boulder sized blocks. At 1.00m: 1 No. angular boulder of Mudstone measuring 0.70 x 0.70 x 0.20m At 1.50m: 1No. angular boulder of Mudstone measuring 0.60 x 0.70 x 0.20m		
					1.95	Complete at 1.95m		

Remarks

Location CAT scanned prior to excavation.
Stable during excavation and construction of infiltration test pit.
No groundwater encountered.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
50mm diameter pipe cut flush with ground level 1.95m length, 1mm slotted.
Backfilled with single sized 20mm stone for infiltration testing.
Subsoil arising to be places in a location of landowners choice.
Approximately 0.30m change in depth from toe to crest of slope.
**Spurious shear vane reading at 0.50m due to gravel content.
Tracked excavator timed for 2 minutes. 13 tonne, 2 foot toothed bucket from 1.80 to 1.95m.
Depth measurement taken from centre of trial pit.

North	Scale (approx)	Logged By	Checked By
↑	1:25	MW	

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Date of Test: 13th October 2022

Produced by: M Wall

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Consulting Engineers

PENMAENMAWR ROAD, LLANFAIRFECHAN

INFILTRATION TEST PIT No 1 (Test 1)

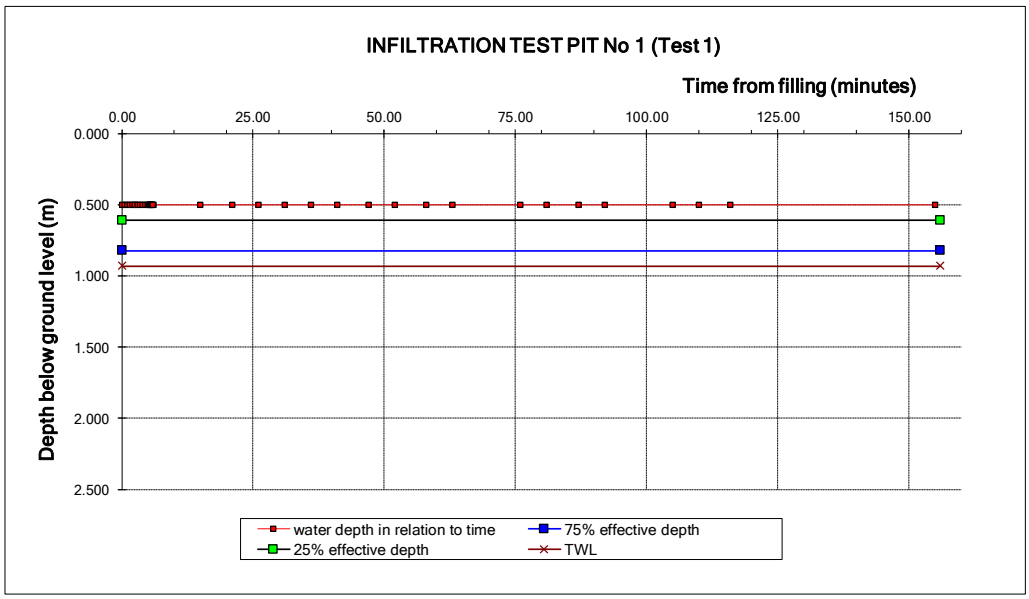
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.500
0	00	30	0.50	0.500
0	01	00	1.00	0.500
0	01	30	1.50	0.500
0	02	00	2.00	0.500
0	02	30	2.50	0.500
0	02	30	2.50	0.500
0	03	00	3.00	0.500
0	03	30	3.50	0.500
0	04	00	4.00	0.500
0	04	30	4.50	0.500
0	05	00	5.00	0.500
0	06	00	6.00	0.500
0	05	00	5.20	0.500
0	05	00	5.30	0.500
0	05	00	5.40	0.500
0	06	00	5.50	0.500
0	06	00	5.60	0.500
0	06	00	5.70	0.500
0	06	00	5.80	0.500
0	06	00	5.90	0.500
0	15	00	15.00	0.500
0	21	00	21.00	0.500
0	26	00	26.00	0.500
0	31	00	31.00	0.500
0	36	00	36.00	0.500
0	41	00	41.00	0.500
0	47	00	47.00	0.500
0	52	00	52.00	0.500
0	58	00	58.00	0.500
1	03	00	63.00	0.500
1	16	00	76.00	0.500
1	21	00	81.00	0.500
1	27	00	87.00	0.500
1	32	00	92.00	0.500
1	45	00	105.00	0.500
1	50	00	110.00	0.500
1	56	00	116.00	0.500
2	35	00	155.00	0.500

Test Pit Dimensions

Test Pit Length	2.50 m
Test Pit Width	0.60 m
Test Pit Depth	2.50 m
Standing Water Level	0.93 m

Infiltration Parameters

Total Depth	2.000 m
Total Effective Depth	0.430 m
25% Depth	0.608 m
75% Depth	0.823 m
25% Time	FAIL min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Date of Test: 13th October 2022

Produced by: M Wall

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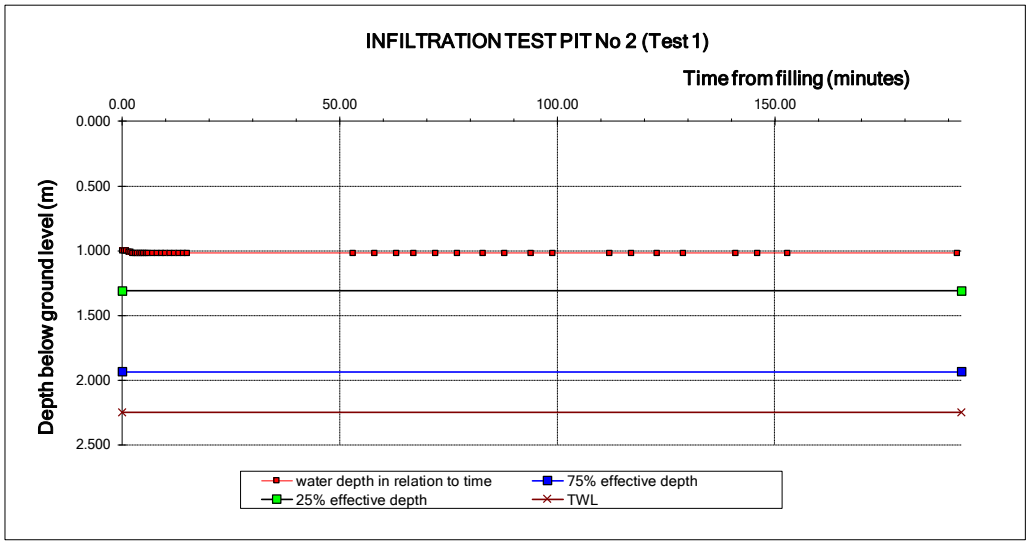
PENMAENMAWR ROAD, LLANFAIRFECHAN
INFILTRATION TEST PIT No 2 (Test 1)

Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	1.000
0	00	30	0.50	1.000
0	01	00	1.00	1.000
0	01	30	1.50	1.010
0	02	00	2.00	1.010
0	02	30	2.50	1.020
0	03	00	3.00	1.020
0	03	30	3.50	1.020
0	04	00	4.00	1.020
0	04	30	4.50	1.020
0	05	00	5.00	1.020
0	05	30	5.50	1.020
0	06	00	6.00	1.020
0	07	00	7.00	1.020
0	08	00	8.00	1.020
0	09	00	9.00	1.020
0	10	00	10.00	1.020
0	11	00	11.00	1.020
0	12	00	12.00	1.020
0	13	00	13.00	1.020
0	14	00	14.00	1.020
0	15	00	15.00	1.020
0	53	00	53.00	1.020
0	58	00	58.00	1.020
1	03	00	63.00	1.020
1	07	00	67.00	1.020
1	12	00	72.00	1.020
1	17	00	77.00	1.020
1	23	00	83.00	1.020
1	28	00	88.00	1.020
1	34	00	94.00	1.020
1	39	00	99.00	1.020
1	52	00	112.00	1.020
1	57	00	117.00	1.020
2	03	00	123.00	1.020
2	09	00	129.00	1.020
2	21	00	141.00	1.020
2	26	00	146.00	1.020
2	33	00	153.00	1.020
3	12	00	192.00	1.020

Test Pit Dimensions		
Test Pit Length	2.50	m
Test Pit Width	0.60	m
Test Pit Depth	2.50	m
Standing Water Level	2.25	m

Infiltration Parameters		
Total Depth	1.500	m
Total Effective Depth	1.250	m
25% Depth	1.313	m
75% Depth	1.938	m
25% Time	FAIL	min
75% Time	FAIL	min
Free Volume	FAIL	cu.m
Surface Area	FAIL	sq.m
Time of Outflow	FAIL	min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Date of Test: 13th October 2022

Produced by: M Wall

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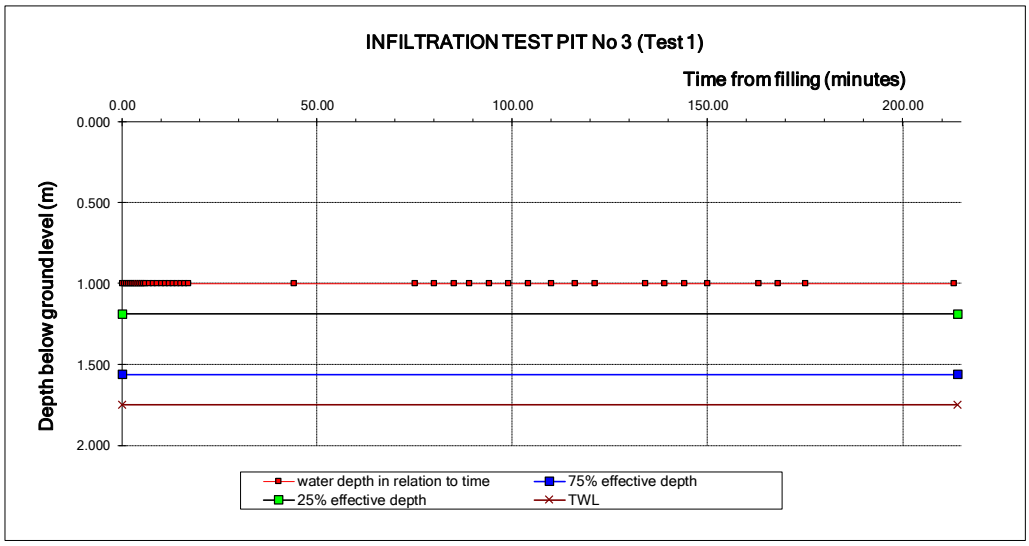
PENMAENMAWR ROAD, LLANFAIRFECHAN
INFILTRATION TEST PIT No 3 (Test 1)

Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	1.000
0	00	30	0.50	1.000
0	01	00	1.00	1.000
0	01	30	1.50	1.000
0	02	00	2.00	1.000
0	02	30	2.50	1.000
0	03	00	3.00	1.000
0	03	30	3.50	1.000
0	04	00	4.00	1.000
0	04	30	4.50	1.000
0	05	00	5.00	1.000
0	05	30	5.50	1.000
0	06	00	6.00	1.000
0	07	00	7.00	1.000
0	08	00	8.00	1.000
0	09	00	9.00	1.000
0	10	00	10.00	1.000
0	11	00	11.00	1.000
0	12	00	12.00	1.000
0	13	00	13.00	1.000
0	14	00	14.00	1.000
0	15	00	15.00	1.000
0	16	00	16.00	1.000
0	17	00	17.00	1.000
0	44	00	44.00	1.000
1	15	00	75.00	1.000
1	20	00	80.00	1.000
1	25	00	85.00	1.000
1	29	00	89.00	1.000
1	34	00	94.00	1.000
1	39	00	99.00	1.000
1	44	00	104.00	1.000
1	50	00	110.00	1.000
1	56	00	116.00	1.000
2	01	00	121.00	1.000
2	14	00	134.00	1.000
2	19	00	139.00	1.000
2	24	00	144.00	1.000
2	30	00	150.00	1.000
2	43	00	163.00	1.000
2	48	00	168.00	1.000
2	55	00	175.00	1.000
3	33	00	213.00	1.000

Test Pit Dimensions	
Test Pit Length	2.60 m
Test Pit Width	0.60 m
Test Pit Depth	1.95 m
Standing Water Level	1.75 m

Infiltration Parameters	
Total Depth	0.950 m
Total Effective Depth	0.750 m
25% Depth	1.188 m
75% Depth	1.563 m
25% Time	FAIL min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Appendix 4

Correspondence

Dwr Cymru Welsh Water Historical Flooding

Conwy County Council Historical Flooding

Natural Resources Wales Historical Flooding

Andy Jones

From: Andy Jones
Sent: 08 December 2022 12:33
To: 'sewerage.services@dwrcymru.com'
Subject: FCA Historical Flood Information
Attachments: 8095_L1.pdf

8098 Land Off Penmaenmawr Road, Llanfairfechan, Conwy
SH686753

FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment for the above site (see attached Site Location Plan) 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

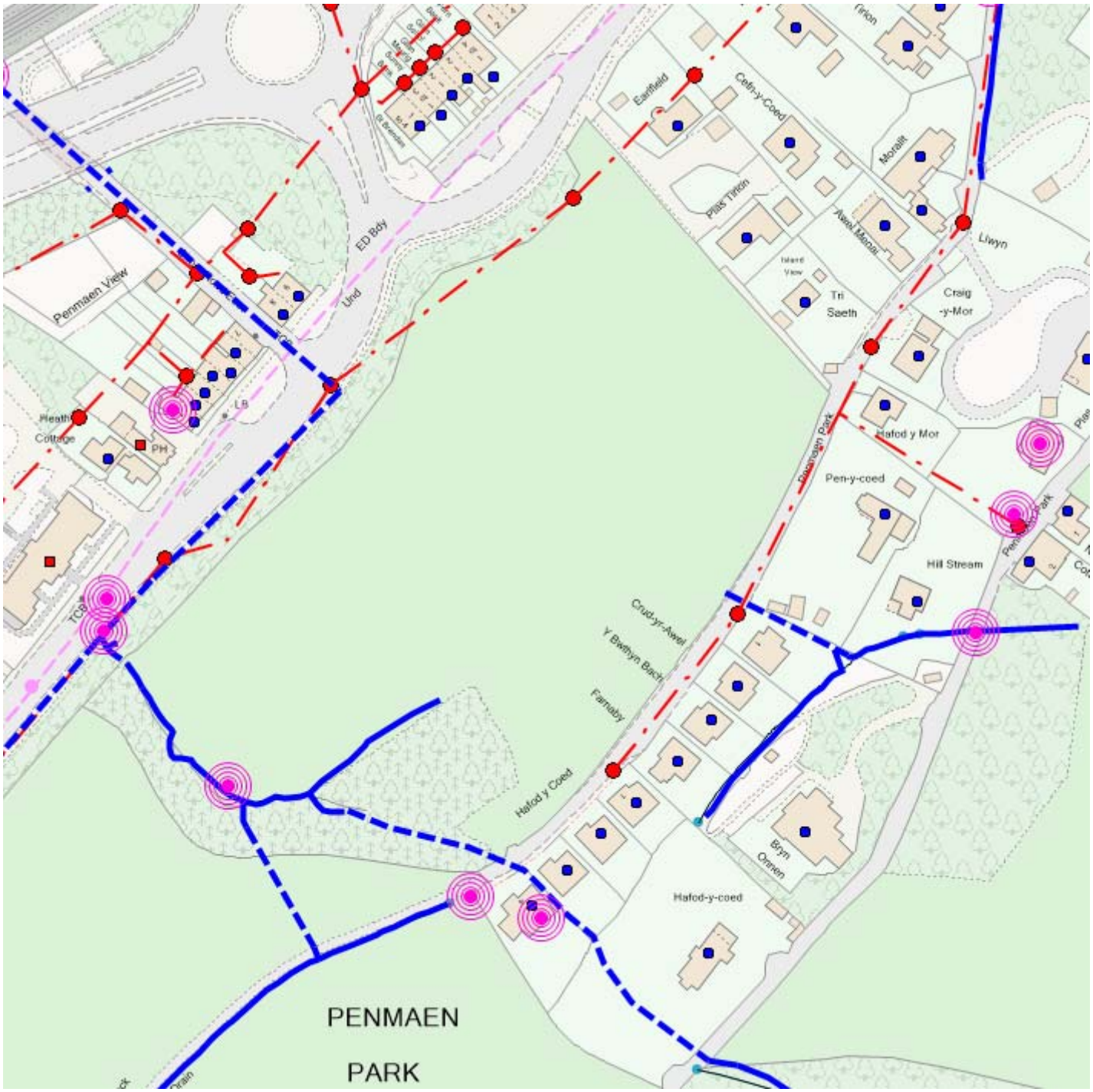
☎: (01244) 684910 ☎: Direct Dial No. (01244) 684933
🖷: (01244) 684911
✉: ajones@coopers.co.uk

Andy Jones

From: Thomas Ashton <thomas.ashton@conwy.gov.uk>
Sent: 09 December 2022 10:37
To: Andy Jones
Subject: 8098 Land Off Penmaenmawr Road, Llanfairfechan, Conwy

Good morning,

Please see below:



The pink circles represent flood incidents in the area. Blue solid line – Watercourse. Blue dotted line – Culvert Red dotted line – DCWW combined sewer.

These flood incidents were mainly caused by blockages within culverted sections of the watercourses or poor channel maintenance and generally affected single properties. However, blockages to the culvert by the Penmaenmawr Road caused by storm events washing debris into the trashscreen, causes flooding to the highway. Highway flooding due to excess water from the blocked culvert and from blocked gullies has caused internal flooding to one property. Clearing of the gullies and culvert trashcreen caused the water to subside rapidly.

We do not have any records of flooding to the area which was caused by the topography of the catchment or other naturally occurring incidents.

If you require any additional information, please do not hesitate to get in touch.

Kind regards,

Tom

Thomas Ashton

Swyddog Perygl Llifogydd a Chaniatâd / Flood Risk and Consenting Officer
Yr Amgylchedd, Ffyrdd a Chyfleusterau / Environment, Roads & Facilities
Cyngor Bwrdeistref Sirol CONWY County Borough Council

✉: thomas.ashton@conwy.gov.uk
✆: 01492 575577
www.conwy.gov.uk

Sefyllfa Bresennol Gwasanaethau'r Cyngor | **Council Services Current Situation**

Andy Jones

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 08 December 2022 13:00
To: Andy Jones
Subject: RE: FCA Historical Flood Information

Dear Mr Jones,

Thank you for your email.

For historical flood mapping data, please see this link – http://lle.gov.wales/catalogue/item/HistoricFl/?lang=en

Also the Modelling for Flood Consequence Assessments https://naturalresources.wales/flooding/modelling-for-flood-consequence-assessments/?lang=en – will assist you.

If you do require model data, please do come back to us.

Yn gywir / Yours sincerely,

Michelle Lewis

Cyfoeth Naturiol Cymru / Natural Resources Wales
Symudol / Mobile: 07917243096

Office Location Llys Afon, Hwlffordd / Office Location River Court, Haverfordwest
Cwsmer, Cyfarthrebu a Masnach - Customer, Communications and Commercial

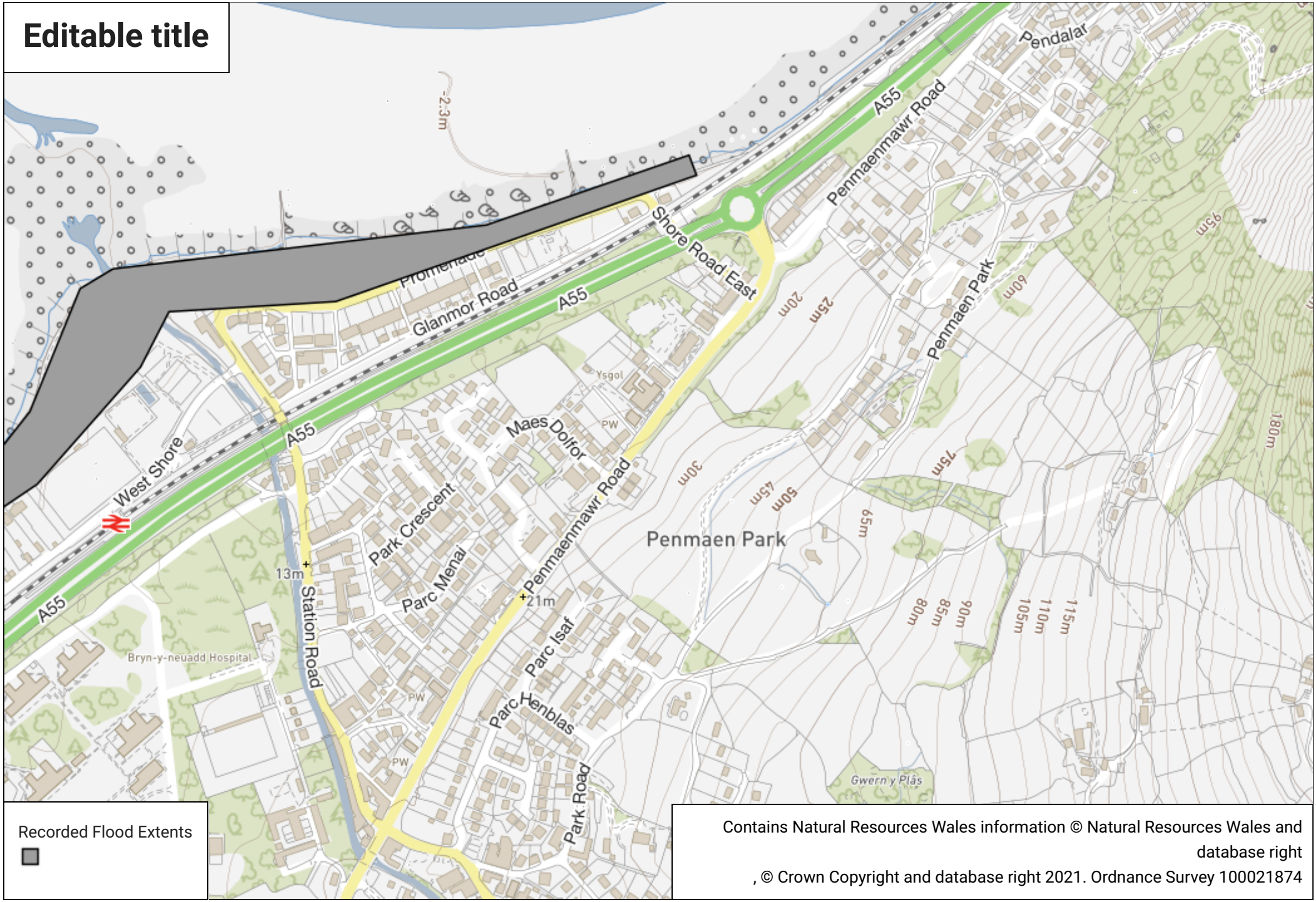
Oriau gwaith arferol/Normal working hours – Mon-Fri, 9 to 5

From: Andy Jones <ajones@coopers.co.uk>
Sent: 08 December 2022 12:35
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: FCA Historical Flood Information

8098 Land Off Penmaenmawr Road, Llanfairfechan, Conwy
SH686753

FCA Historical Flood Information

Editable title



Recorded Flood Extents

Appendix 5

MicroDrainage Calculation

Source Control Greenfield Run-off Calculation (1ha)

Storage Estimate (Source Control)

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Andy Jones
Site name:	Plas Estate
Site location:	Llanfairfechan

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.

Site Details

Latitude:	53.25886° N
Longitude:	3.97114° W
Reference:	3297971809
Date:	Oct 04 2022 11:44

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.7

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	1130	1130
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 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):	5.43	8.55
1 in 1 year (l/s):	4.77	7.53
1 in 30 years (l/s):	9.66	15.22
1 in 100 year (l/s):	11.83	18.64
1 in 200 years (l/s):	13.35	21.04

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.403	0.403	8.6	221.7	O K
30 min Summer	98.537	0.537	8.6	304.2	O K
60 min Summer	98.677	0.677	8.6	395.9	O K
120 min Summer	98.814	0.814	8.6	491.2	O K
180 min Summer	98.886	0.886	8.6	543.0	O K
240 min Summer	98.926	0.926	8.6	572.8	O K
360 min Summer	98.970	0.970	8.6	605.3	O K
480 min Summer	98.989	0.989	8.6	619.9	O K
600 min Summer	98.994	0.994	8.6	623.8	O K
720 min Summer	98.992	0.992	8.6	622.0	O K
960 min Summer	98.982	0.982	8.6	614.7	O K
1440 min Summer	98.952	0.952	8.6	591.6	O K
2160 min Summer	98.894	0.894	8.6	549.0	O K
2880 min Summer	98.824	0.824	8.6	497.9	O K
4320 min Summer	98.677	0.677	8.6	395.7	O K
5760 min Summer	98.549	0.549	8.6	311.6	O K
7200 min Summer	98.441	0.441	8.6	244.4	O K
8640 min Summer	98.355	0.355	8.6	192.8	O K
10080 min Summer	98.289	0.289	8.4	154.5	O K
15 min Winter	98.449	0.449	8.6	249.1	O K
30 min Winter	98.596	0.596	8.6	342.3	O K
60 min Winter	98.751	0.751	8.6	446.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.224	0.0	224.5	26
30 min Summer	82.324	0.0	311.2	40
60 min Summer	54.441	0.0	417.6	70
120 min Summer	34.784	0.0	534.1	128
180 min Summer	26.337	0.0	606.6	188
240 min Summer	21.437	0.0	658.4	246
360 min Summer	15.978	0.0	736.0	364
480 min Summer	12.964	0.0	796.0	482
600 min Summer	11.012	0.0	844.9	600
720 min Summer	9.631	0.0	886.4	668
960 min Summer	7.786	0.0	954.4	786
1440 min Summer	5.756	0.0	1053.7	1044
2160 min Summer	4.243	0.0	1177.9	1468
2880 min Summer	3.412	0.0	1262.7	1872
4320 min Summer	2.503	0.0	1388.5	2636
5760 min Summer	2.010	0.0	1489.8	3352
7200 min Summer	1.697	0.0	1571.7	4040
8640 min Summer	1.478	0.0	1641.8	4752
10080 min Summer	1.315	0.0	1702.7	5440
15 min Winter	119.224	0.0	251.9	26
30 min Winter	82.324	0.0	348.7	40
60 min Winter	54.441	0.0	467.9	68

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
120 min Winter	98.904	0.904	8.6	556.4	O K
180 min Winter	98.983	0.983	8.6	615.4	O K
240 min Winter	99.029	1.029	8.6	650.5	O K
360 min Winter	99.081	1.081	8.6	691.0	O K
480 min Winter	99.107	1.107	8.6	711.8	O K
600 min Winter	99.118	1.118	8.6	720.6	O K
720 min Winter	99.119	1.119	8.6	721.8	O K
960 min Winter	99.106	1.106	8.6	711.1	O K
1440 min Winter	99.066	1.066	8.6	679.7	O K
2160 min Winter	98.987	0.987	8.6	618.0	O K
2880 min Winter	98.891	0.891	8.6	546.4	O K
4320 min Winter	98.652	0.652	8.6	379.2	O K
5760 min Winter	98.458	0.458	8.6	254.7	O K
7200 min Winter	98.316	0.316	8.5	170.1	O K
8640 min Winter	98.225	0.225	8.1	118.5	O K
10080 min Winter	98.170	0.170	7.6	88.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	34.784	0.0	598.3	126
180 min Winter	26.337	0.0	679.5	184
240 min Winter	21.437	0.0	737.4	242
360 min Winter	15.978	0.0	824.2	356
480 min Winter	12.964	0.0	891.2	470
600 min Winter	11.012	0.0	945.8	582
720 min Winter	9.631	0.0	991.9	690
960 min Winter	7.786	0.0	1067.2	892
1440 min Winter	5.756	0.0	1172.1	1112
2160 min Winter	4.243	0.0	1319.3	1584
2880 min Winter	3.412	0.0	1414.3	2048
4320 min Winter	2.503	0.0	1555.7	2812
5760 min Winter	2.010	0.0	1668.7	3512
7200 min Winter	1.697	0.0	1760.5	4112
8640 min Winter	1.478	0.0	1839.1	4760
10080 min Winter	1.315	0.0	1907.7	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+50

Time Area Diagram

Total Area (ha) 1.030

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.343	4	8	0.343	8	12	0.343

Model Details

Storage is Online Cover Level (m) 99.500

Tank or Pond Structure

Invert Level (m) 98.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.700	680.3	1.400	888.3	2.100	1124.1
0.100	524.1	0.800	708.3	1.500	920.3	2.200	1160.0
0.200	548.7	0.900	736.9	1.600	952.9	2.300	1196.5
0.300	573.9	1.000	766.1	1.700	986.0	2.400	1233.6
0.400	599.6	1.100	795.8	1.800	1019.6	2.500	1271.2
0.500	626.0	1.200	826.1	1.900	1053.9		
0.600	652.9	1.300	856.9	2.000	1088.7		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0131-8600-1350-8600
Design Head (m)	1.350
Design Flow (l/s)	8.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	131
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.350	8.6	Kick-Flo®	0.847	6.9
Flush-Flo™	0.397	8.6	Mean Flow over Head Range	-	7.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.7	1.200	8.1	3.000	12.5	7.000	18.8
0.200	7.9	1.400	8.7	3.500	13.5	7.500	19.4
0.300	8.5	1.600	9.3	4.000	14.4	8.000	20.0
0.400	8.6	1.800	9.8	4.500	15.2	8.500	20.6
0.500	8.5	2.000	10.3	5.000	16.0	9.000	21.2
0.600	8.3	2.200	10.8	5.500	16.7	9.500	21.8
0.800	7.4	2.400	11.3	6.000	17.4		
1.000	7.5	2.600	11.7	6.500	18.1		

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 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.

The infiltration tests undertaken as part of the site investigation report 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 to ground within the site boundary.

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 100m^2. 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.