Avalanche East Sea Wall, Penmaenmawr

Baseline and Preliminary Water Framework Directive Compliance Assessment

August 2024

Waterco

Assessment | Modelling | Design

Project Information	
Project:	Pen-Y-Coed, Penmaenmawr
Report Title:	Baseline and Preliminary WFD Compliance Assessment
Client:	MPH Construction
Instruction:	The instruction to undertake this WFD Assessment was received from Daniel Overson of MPH Construction.
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Approval Record	
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Document History		
Revision	**Date**	**Comment**
01	16/08/2024	First issue

This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

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Introduction

This Preliminary Water Framework Directive (WFD) Assessment has been prepared by Waterco Ltd on behalf of MPH Construction for the remediation of a sea defence wall Pen-Y-Coed, Penmaenmawr, Conwy, LL34 6NN.

The sea wall currently exhibits a 20m length of wall required to protect the railway that runs along the coastline in the area of Penmaenmawr, that has been undermined due to sea water action. Leaving the wall untreated could lead to instability and damage to the infrastructure positioned behind it. Remediation works include a sheet pile concrete toe to be installed. Rock armour shall also be installed in front of the new sheets to provide additional erosion protection. A proposed scheme plan is included in Appendix A.

The aim of this Preliminary WFD Assessment is to assist the regulator in understanding the impact the outlined activities may have on the immediate water body and any linked water bodies, within a 500m Zone of Influence. A Zone of Influence Plan is included in Appendix B.

This report is intended to support a Band 2 Marine License application.

Assumptions and Limitations

All third-party published information and data is assumed to be correct, up to date and based on verified and accurate records, for example, Natural Resources Wales (NRW) flood mapping and British Geological Survey (BGS) geological mapping.

It is assumed that all required permits and formal agreements will be sought with relevant consultees.

A site walkover specifically pertaining to the WFD assessment has not been undertaken by Waterco Ltd as part of this report.

It is assumed that the site is not contaminated. No monitoring or investigation has been undertaken by Waterco Ltd.

Policy Context

Legislation

Water Framework Directive 2000/60/EC

Published in December 2000, the Directive aims to preserve, restore and improve the water environment. It is a legal requirement within England and Wales, originally transposed into law through the Water Environment (Water Framework Directive) (England and Wales) (2003) to record data within River Basin Management Plans. River Basin Planning is managed in six-year cycles.

The environmental objectives of the WFD for surface waters include:

1. Prevent deterioration in the status of aquatic ecosystems, protect and improve the ecological condition of waters;
2. Aim to achieve 'good' status for all waterbodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
3. Meet the requirement of the WFD Protected Areas;
4. Promote sustainable use of water as a natural resource;
5. Conserve habitats and species that depend directly on water;
6. Reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
7. Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
8. Contribute to the mitigating effects on floods and droughts.

Directive on Environmental Quality Standards (EQSD) 2008/105/EC

This Directive establishes the environmental quality standards (EQS) for priority substances and certain other pollutants in surface waters.

With reference to the WFD, good chemical status is achieved when a water body complies with the EQS for all the priority substances and certain other pollutants listed in the EQSD.

Water Act 2014 and Water Resources Act 1991

This Act governs the control of water abstraction, discharge to water bodies, water impoundment, conservation and drought provision.

Flood and Water Management Act 2010

This Act provides details on the management of risks associated with flooding and coastal erosion.

Environmental Protection Act 1990

This Act provides details for identifying and dealing with waste, emissions, contaminated land and water resources.

The Land Drainage Act 1991

This Act establishes the regulation of ordinary watercourses by Local Authorities and Internal Drainage Boards. It outlines that a watercourse should be maintained by its riparian owner so that the flow of water is not impeded. The riparian owner must accept the natural flow from upstream but does not need to carry out works to cater for increased flows which may result from works carried out upstream.

The Groundwater (Water Framework Directive) (Wales) Direction 2016

This Directive is on the protection of groundwater against pollution and deterioration from hazardous substances and non-hazardous pollutants.

The Groundwater (England and Wales) Regulations 2009

This Regulation transposes 2006/118/EC into law in England and Wales.

Environmental Permitting (England and Wales) Regulations 2016

This Regulation provides a consolidated system of environmental permitting including the discharge of water and groundwater activities.

The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009

This Regulation aims to prevent and remedy damage to a protected species, natural habitat, a site of special scientific interest, water or land.

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

This Regulation transposes 2000/60/EC into law in England and Wales and revokes the WFD (England and Wales) Regulations 2003.

The Environment (Wales) Act 2016

The Environment (Wales) Act puts in place a delivery framework for the sustainable management of natural resources and introduces some simple principles to underpin the way we all work.

Well-being of Future Generations (Wales) Act 2015

This act asks 44 Public Bodies in Wales to work in a sustainable way and think about the impact our work can have for people living in Wales, now and in the future.

Western Wales River Basin Management Plan 2021 – 2027

This report outlines the current baseline classification of waterbodies in the Western Wales River basin district, the objectives and targets for water quality within waterbodies of the area, challenges / issues within the catchment which have impacts on water quality and how the objectives / targets will be achieved in future.

Site Setting

Hydrological Setting

The proposed works are situated within Conwy Bay; a dynamic coastal environmental, characterised by tidal influences from the Irish Sea as well as freshwater inflows from several unnamed watercourses which drain the upper Penmaenmawr catchment.

The nearest watercourse is an unnamed watercourse located approximately 600m east of the area of proposed works, where it becomes culverted beneath the A55 before discharging to sea. No other fluvial watercourses are located within close proximity.

A Location Plan and Aerial Image are included in Appendix C.

Topography

Topographical data has been provided on the proposed scheme plan (Appendix A). The drawing shows that topographic levels range from approximately 4m AOD towards the toe of the sea defence wall to 10.35m Above Ordnance Datum (m AOD) at the crest of the sea defence wall.

Topographic levels to m AOD have also been derived from a 1m resolution Natural Resources Wales (NRW) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). The LiDAR data generally corroborates the levels shown on the proposed scheme plan. A LiDAR extract is included in Appendix D.

Geological & Hydrogeological Setting

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial coastal zone deposits (undifferentiated) generally comprising sand, silt and clay. The superficial deposits are identified as being underlain by Cambrian and Ordovician Rocks (Undifferentiated) consisting of mudstone, siltstone and sandstone.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

A historical BGS borehole record (BGS reference: SH77NW71) is located immediately east of the site (NGR: 270570, 376220) and is included in Appendix E. The borehole was advanced from a ground level of 19.97m AOD and indicates that:

- Made Ground consisting of angular cobbles, gravel and sandy silty clay from ground level to 0.4 metres below ground level (m.bgl)
- Very dense sub-angular to angular cobbles and boulders with much fine medium coarse gravel and a brown sandy silty clay binder between 0.4m.bgl and 1m.bgl.
- Stiff brown sandy silty clay, fine medium coarse gravel, cobbles and boulders up to 4.95m AOD.
- Very dense sub-angular to angular cobbles and boulders with much fine medium coarse gravel and

a brown sandy silty clay binder from 4.95m AOD and 12.8m AOD.

- Stiff to very stiff friable brown to orange brown sandy silty clay, fine medium coarse gravel, cobbles and boulders between 12.8m AOD to 15.7m AOD.
- Very dense sub-angular to angular cobbles and boulders with much fine medium coarse gravel and a brown sandy silty clay binder from 15.7m AOD to 16.6m AOD.

According to the NRW's Aquifer Designation data, obtained from the BGS GeoIndex online mapping [accessed August 2024], the superficial coastal zone deposits are classified as Secondary Undifferentiated Aquifers. Secondary Undifferentiated Aquifers are assigned in 'cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'.

The underlying Cambrian and Ordovician Rocks is described as a Secondary B Aquifer. Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.

The NRW's 'Source Protection Zones' data, obtained from the Welsh Government 'Data Map Wales' website [accessed August 2024], indicates that the site is not located within a groundwater Source Protection Zone.

Local Drainage Setting

Public sewer and water records have been obtained from Dwr Cymru Welsh Water (DCWW) in August 2024 and are included in Appendix F. The DCWW sewer records show that there are no public sewers within the area of proposed works.

Flood Risk

The Welsh Government Development Advice Map, included in Appendix G, shows that the site is partly located within Flood Zone C2 – an area considered at flood risk, without significant defence infrastructure, with a 0.1% (1 in 1000) or greater annual probability of flooding.

The NRW 'Flood Map for Planning' (Appendix G), shows that the site is partly located within Flood Zone 3 – an area considered to be at flood risk with a 0.5% (1 in 200) or greater annual probability of tidal flooding.

The NRW 'Flood Risk from Surface Water and Small Watercourses' map shows that the site is at low, medium and high risk of surface water flooding. Low risk is classified as having between a 1% and 0.1% annual probability of flooding. Medium risk is of surface water flooding is classified as having between a 3.3% and 1% annual probability of flooding. High risk of surface water flooding is classified as having a greater than 3.3% annual probability of flooding.

The NRW 'Flood risk from the Sea' map shows the site to be at high risk of tidal flooding, meaning it has a greater than 3.3% annual probability of flooding from the sea.

NRW Flood Maps are included in Appendix G.

Other Designations and Considerations

According to MAGIC's online mapping (accessed August) there are 2no. designated sites within 500m of the site. The designated sites are as follows:

- Y Fenai a Bae Conwy / Menai Strait and Conwy Bay Special Area of Conservation
- Liverpool Bay / Bae Lerpwl (Wales) Special Protection Area

A designations plan is included in Appendix H.

Scheme Proposals

The scheme proposals are for the installation of sheet pile retaining wall in front of an existing sea defence wall, with rock armour installed in front of the new sheets to provide additional erosion protection.

The proposed sequence of works is as follows:

- Clearance of beach in front of wall to ensure no large boulders / cobbles present prior to works.
- Install working platform at back of existing wall.
- Install sheet piles.
- Installation of capping beam.
- Placement of rock armour in front of wall to provide additional protection.

A proposed scheme plan is included in Appendix A. All plant and materials will be stored on top of the sea wall (at or above 10.35m AOD).

WFD Screening (Stage 1)

The purpose of the screening stage is to identify the extent to which the proposals are likely to affect WFD water bodies within the Zone of Influence. A Zone of Influence Plan is included in Appendix B. This Zone of Influence includes the relevant WFD waterbodies for this site.

The closest Cycle 3 WFD waterbody downstream of the site is the Conwy Bay coastal waterbody (Waterbody ID: GB671010400000). This WFD water body lies within the Zone of Influence for the site and has the potential to be impacted by the proposed works. It has a catchment area of 139km^2 and a length of 50km.

The WFD Menai Strait coastal waterbody (Waterbody ID: GB681010120000) is located approximately 540m

north-west of the site. It has a catchment area of 200.9km^2. This waterbody lies outside the zone of influence but has the potential to be affected by works undertaken due to its hydrological connectivity with Conwy Bay. This waterbody is identified as part of the WFD Coastal Cycle 3.

The site is located within a WFD designated groundwater body, namely the Llyn and Eryri groundwater catchment (Water body reference: GB41002G204600) and therefore this catchment has the potential to be impacted by the proposed works. This catchment has an area of 3632km^2. This catchment is identified as part of the WFD Groundwater Cycle 3.

Classifications for these waterbodies have been obtained from the NRW Water Watch Wales Portal and are included in Tables 1, 2 and 3.

Table 1 – Conwy Bay Coastal Waterbody Classifications

Water Body			Conwy Bay Coastal Waterbody Catchment
Water body ID			GB671010400000
Catchment Area			139km^2
Length			50km
Overall Ecological Classification			Moderate
Overall Chemical Classification			Moderate
Hydromorphological Designation			Heavily Modified
Parameter			**2021**
Ecological	Biological quality elements		
		Fish	-
		Invertebrates	Moderate
		Phytoplankton bloom	Good
		Infaunal quality index (IQI)	Moderate
		Imposex	-
		Angiosperm (combination of salt marsh and sea grass sub elements)	-
		Salt marsh	-
		Sea grass	-
		Macroalgae	-
		Opportunistic macroalgae	-
		Rocky shore macroalgae	-
	Physio-chemical quality elements		
		Dissolved Oxygen	High
		Dissolved Inorganic Nitrogen (DIN)	High
		Morphology	-
	Supporting elements (Surface Water)		
		Mitigation Measures Assessment	Good
	Specific pollutants		
		Arsenic	High
		Copper	High
		Chromium (VI)	-
		Dimethoate	-
		Iron	High
		Linuron	-
		Manganese	-
		Permethrin	-
		Phenol	-
		Phenol 2,4	-
		Toluene	High
		Un-ionised ammonia	-
		Zinc	High
	Priority Hazardous Substances		
		Anthracene	-
		Brominated diphenylether (BDPE)	-
		Cadmium and Its Compounds	High
		Dioxins and dioxin-like compounds	-
		Endosulfan	-
		Hexabromocyclododecane (HBCDD)	-
		Heptachlor and heptachlor epoxide	-

		Hexachlorobenzene	-
		Hexachlorobutadiene	-
		Mercury and its Compounds	Moderate
		Noyphenol	High
		Pentachlorobenzene	-
		Perfluorooctane sulphonate (PFOS)	-
		Polyaromatic hydrocarbons (PAH)	-
		Tributyltin Compounds	-
		Triflurali	-
	Priority substances		
		Aclonifen	-
		Alachlor	-
		Atrazine	-
		Benzene	High
		Cypermethrin (Priority hazardous)	-
		1,2-dichloroethane	High
		Dichloromethane	High
		Dichlorvos	-
		Diuron	-
		Fluoranthene	-
		Isoproton	-
		Lead and Its Compounds	High
		Napthalene	High
		Nickel and Its Compounds	High
		Octylphenol	-
		Pentachlorophenol	-
		Simazine	-
		Trichlorobenzenes	High
		Trichloromethane	High
	Other pollutants		
		Carbon Tetrachloride	High
		DDT	-
		Aldrin, Dieldrin, Endrin & Isodrin	-
		Para – para DDT	-
		Tetrachloroethylene	High
		Trichloroethylene	High

Table 2 –Menai Strait Coastal Waterbody Classifications

Water Body			Menai Strait Coastal Waterbody
Water body ID			GB681010120000
Water body Area			200.9km^2
Length			160km
Overall Ecological Classification			Good
Overall Chemical Classification			High
Hydromorphological Designation			Natural
Parameter			**2021**
Ecological	Biological quality elements		
		Fish	-
		Invertebrates	Good
		Phytoplankton blooms	High
		Infaunal quality index (IQI)	Good
		Imposex	-
		Angiosperm (combination of salt marsh and sea grass sub elements)	-
		Salt marsh	-
		Sea grass	-
		Macroalgae	High
		Opportunistic macroalgae	High
		Rocky shore macroalgae	-
	Physio-chemical quality elements		
		Dissolved Oxygen	High
		Dissolved inorganic nitrogen (DIN)	High
		Morphology	-
	Supporting elements (Surface Water)		
		Mitigation Measures Assessment	-
	Specific pollutants		
		Arsenic	High
		Chromium	-
		Copper	High
		Iron	High
		Manganese	-
		Permethrin	-
		Phenol	High
		Toluene	-
		Un-ionised ammonia	High
		Zinc	High
Chemical	Priority Hazardous Substances		
		Anthracene	-
		BDPE Calc	-
		Cadmium and Its Compounds	High
		Dioxins and dioxin-like compounds	-
		Endosulfan	-
		Hexabromocyclododecane (HBCDD)	-
		Hexachlorobenzene	-
		Hexachlorobutadiene	-
		Hexachlorocyclohexane	-
		Mercury and Its Compounds	-
		Nonylphenol	High

Table 2 –Menai Strait Coastal Waterbody Classifications

Water Body		Menai Strait Coastal Waterbody	
Water body ID		GB681010120000	
Water body Area		200.9km^2	
Length		160km	
Overall Ecological Classification		Good	
Overall Chemical Classification		High	
Hydromorphological Designation		Natural	
Parameter			**2021**
		Polycyclic aromatic hydrocarbons	-
		Pentachlorobenzene	-
		Perfluorooctane sulphonate (PFOS)	-
		Tributyltin Compounds	-
	Priority substances		
		Benzene	-
		Cypermethrin	-
		1,2-dichloroethane	-
		Dichloromethane	-
		Dichlorvos	-
		Fluoranthene	-
		Lead and Its Compounds	High
		Napthalene	-
		Nickel and Its Compounds	High
		Octylphenol	-
		Trichlorobenzenes	-
		Trcichloromethane	High
	Other Pollutants		
		Carbon Tetrachloride	-
		DDT	-
		Aldrin, Dieldrin, Endrin & Isodrin	-
		Para – para DDT	-
		Tetrachloride	-
		Trichloroethylene	-

Table 3 – Llyn and Eryri Groundwater Catchment Classifications

Water Body			Llyn and Eryri groundwater catchment
Water Body ID			GB41002G204600
Surface Area			3632km^2
Overall Status			Poor
Overall Quantitative Classification			Good
Overall Chemical Classification			Poor
Parameter			**2021**
Quantitative	Quantitative Status element		
		Quantitative Dependent Surface Water Body Status	Good
		Quantitative GWDTEs test	Good
		Quantitative Saline Intrusion	Good
		Quantitative Water Balance	Good
Chemical	Chemical Status element		
		Chemical Dependent Surface Water Body Status	Poor
		Chemical Drinking Water Protected Area	Good
		Chemical GWDTEs test	Poor
		Chemical Saline Intrusion	Good
		General Chemical Test	Good
	Supporting elements (Groundwater)		
		Trend Assessment	High

WFD Scoping (Stage 2)

The purpose of the scoping stage is to identify the risks from the Proposed Scheme's activities to receptors based on the identified WFD waterbodies. The WFD Scoping (Stage 2) considers the potential risks during both the construction phase of the Proposed Scheme and once construction is complete. Where risks have been considered, but the potential effect is considered to be negligible, this has been stated.

Risks to Hydromorphology

The hydromorphology of a water body / groundwater can be impacted by the proposed Scheme. Table 4 outlines the potential hydromorphological effects of the Proposed Scheme on Conwy Bay and Menai Strait coastal waterbodies and the underlying Llyn and Eryri groundwater catchment.

Table 4 - Potential Effects on Hydromorphology

Construction or Operational Phase	Source of Effect	Potential Effects
Construction	Suspended Solids Increased fine sediment supply to the coastal waterbody is likely to occur during construction works. This may result from plant and machinery movement.	A possible short-term increase in turbidity and siltation may occur.
Operational	Rock Armour Installation The introduction of rock armour can modify local tidal flows and wave energy.	A possible change in sediment deposition and subsequent erosion rates.

Risks to Biology

The biological habitats and fish and other species within the zone of influence can be impacted by the Proposed Scheme. Table 5 outlines the potential biological effects of the Proposed Scheme on Conwy Bay and Menai Strait coastal waterbodies and the underlying Llyn and Eryri groundwater catchment

Table 5 – Potential Effects on Biology

Construction or Operational Phase	Source of Effect	Potential Effects
Construction	Suspended Solids Increased fine sediment supply to the coastal waterbody is likely to occur during construction works. This may result from plant and machinery movement.	Increased fine sediment has the potential to smother benthic organisms such as bivalves, crustaceans and worms (removing prey from the food chain), increase turbidity and clog fish gills and spawning habitats.
Construction	Pollutants from construction vehicles and machinery The use of machinery and vehicles on or within the vicinity of the Scheme Area during the construction phase has the potential to allow uncontrolled releases of pollutants such as fuel, cement dust, solvents and oils.	If not properly maintained and managed, pollutants from construction vehicles and machinery have the potential to harm aquatic life.
Construction	Incorrect disposal of waste materials Waste materials from the construction phase could be incorrectly “disposed” of on the beach shore.	Incorrect disposal of waste materials has the potential to harm aquatic vegetation and organisms.
Construction	Provision for grouting behind sheet piles Potential leakage or seepage of grout material into the surrounding marine environment	Chemicals in the grout can be toxic to marine organisms and have the potential to harm aquatic life.

Risk to Water Quality

There is potential for the Proposed Scheme to impact on the water quality of a watercourse / water body. Table 6 outlines the potential water quality effects of the Proposed Scheme on the Conwy Bay and Menai Strait coastal waterbodies and the underlying Llyn and Eryri groundwater catchment

Table 6 – Potential Effects on Water Quality

Construction or Operational Phase	Source of Effect	Potential Effects
Construction	Pollutants from construction vehicles and machinery The use of machinery and vehicles on or within the vicinity of the Scheme Area during the construction phase has the potential to allow uncontrolled releases of pollutants such as fuel, cement dust, solvents and oils.	Accidental leakages and spillages during the construction phase can have short to medium term effect on the coastal waterbodies and underlying groundwater.
Construction	Incorrect disposal of waste materials Waste materials from the construction phase could be incorrectly "disposed" of along the beach shore.	
Construction	Provision for grouting behind sheet piles Potential leakage or seepage of grout material into the surrounding marine environment	Increased turbidity from grout particles can reduce light penetration and thus reduce the water quality of the coastal waterbody.
Operational	From a review of the available information, no vulnerable receptors have been identified as part of the operational phase of the Scheme.	The proposals are considered to have a negligible impact on the water quality of the WFD waterbodies during the operational phase.

Construction and Operational Phase Mitigation

Impacts of the Proposed Scheme on WFD Compliance

Providing the mitigation measures identified below are implemented, the Proposed Scheme will have a negligible effect on the identified waterbodies during both the construction and operational phases.

Construction Phase Mitigation

In order to minimise the risk of deleterious effects of the Proposed Scheme on the Conwy Bay and Menai Strait coastal waterbodies and Llyn and Eryri groundwater catchment, and to ensure that the Proposed Scheme is WFD compliant, the following mitigation measures are recommended during the construction phase.

Sediment

Timing of works must be carefully considered. The construction should be carried out during low tide to reduce the risk of scour and erosion around structures and reduce runoff from the construction area.

Contamination

Potential contamination risks can be mitigated by ensuring that a suitably experienced and competent contractor is employed to undertake the works. The contractor should ensure that all method statements are prepared with due consideration to minimising the release of potentially contaminative materials / compounds such as fuel, oils and chemicals, which could have a significant impact in the vicinity of the construction site. Contractors should also provide / implement the necessary measures needed to be in place to prevent the accidental release of pollutants into the sea and onto surrounding land. This could include provision of oil spill kits on site.

Appendix I details some of the pollution prevention measures which should be put in place.

Further guidance on good practice is provided in the documents below:

- CIRIA Report C741 (January 2015) Environmental Good Practice on site guide (fourth edition);
- Environment Agency (EA) (2004) Getting Your Site Right: Industrial and Commercial Pollution Prevention; and
- Guidance for Pollution Prevention (GPP), the most relevant being:
    - GPP 1 – Understanding your environmental responsibilities – good environmental practices (June 2021);
    - GPP 3 – Use and design of oil separators in surface water drainage systems (March 2022);
    - GPP 5 – Works and Maintenance in or near Water (February 2018);
    - GPP 13 – Vehicle Washing and Cleaning (April 2017);

- GPP 21 - Pollution incident response planning (June 2021);
- GPP 22 – Dealing with spills (October 2018)

Invasive Non-Native Species

Where invasive species are identified, their removal should be undertaken by a suitably qualified and experienced person. Appropriately experienced vegetation clearance contractors should be appointed to ensure that suitable measures are put in place to prevent further distribution of invasive plants in the local area. Removal and disposal should take place in accordance with the EA guidance document Treatment and Disposal of Invasive Non-native Plants: RPS 178 (April 2019). Where invasive non-native species are identified, efforts should be made not to spread these species within the site or to accidentally spread them to other sites. Relevant biosecurity measures should be implemented to reduce this risk and to reduce the risk of introducing invasive non-native species to the site.

Construction Phase Residual Risks

Implementing the measures detailed above will ensure the residual effects of the construction of the Proposed Scheme in the context of the WFD are negligible.

Where contamination is suspected, a suitability experienced operative should be appointed to undertake appropriate mitigation works.

Operational Phase Residual Risks

Implementing the measures detailed above will ensure the residual effects of the operation of the Proposed Scheme in the context of the WFD are negligible.

Conclusions and Recommendations

Impact of the Proposed Scheme on WFD Compliance

The Proposed Scheme could have some local effects on the hydromorphological, biological and chemical status of the WFD Conwy Bay and Menai Strait coastal waterbodies, primarily during the construction phase. The works also have the potential to impact the WFD Llyn and Eryri groundwater catchment. The effects will be negligible if a competent and experienced contractor is employed and work is undertaken in accordance with relevant pollution prevention guidance and construction best practice.

Overall, the works as proposed are expected to have negligible impact on the overall status of the receiving WFD waterbodies.

Recommendations

It is recommended that all contractors prepare method statements which include the necessary pollution prevention and construction good practice requirements for the Proposed Scheme. These can be collated in a Construction Environmental Management Plan (CEMP) or similar style document that would ensure that all stakeholders during the construction stage are working towards the same standard.

It would be prudent to ensure there is a maintenance schedule which ensures inspection of the sea wall and rock armour is undertaken as and when required.

It is recommended that all mitigation measures (both during the construction and operational phases of the development) outlined within this report are implemented to ensure the risks to controlled waters is negligible.

Appendix A Proposed Scheme Plan

Plan

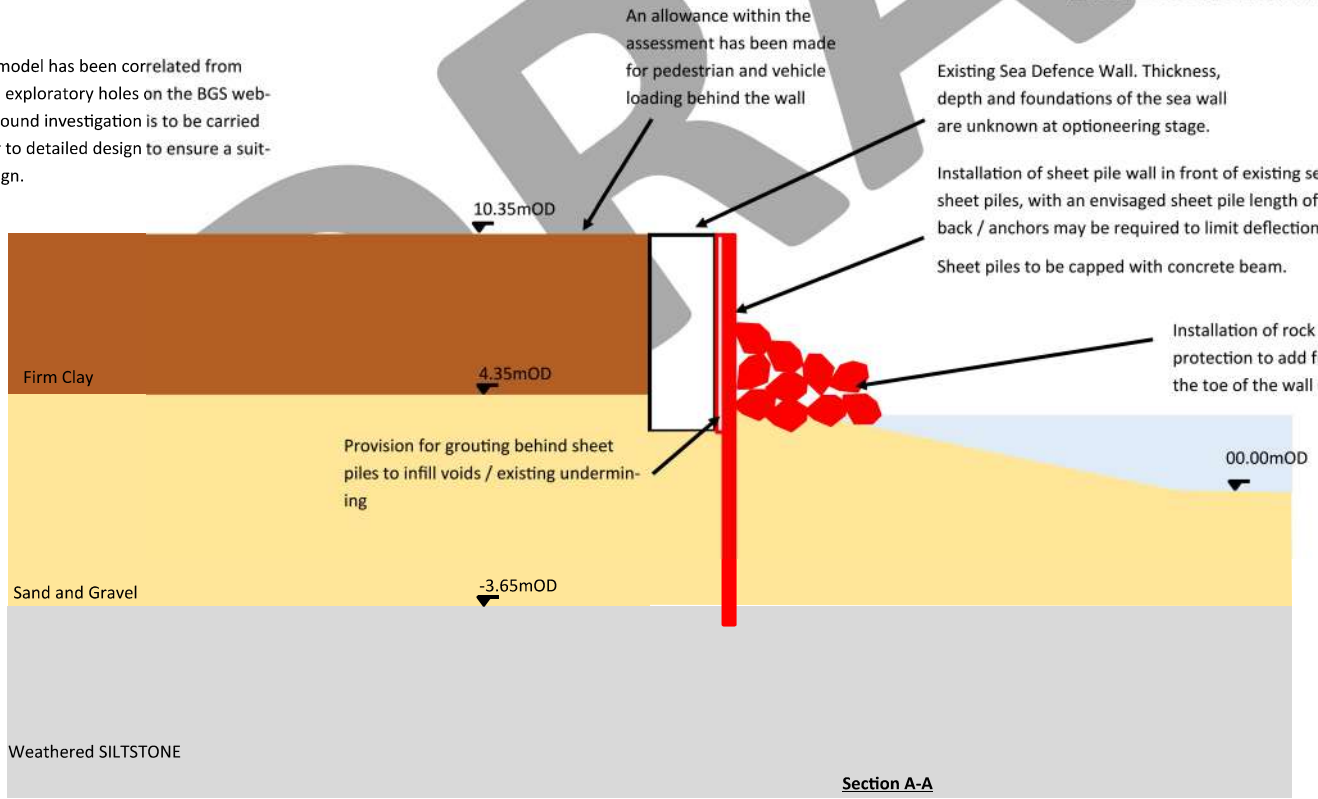
Not to Scale

Photo 1—Area of wall undermining

Photo 2— Close up of undermining extents

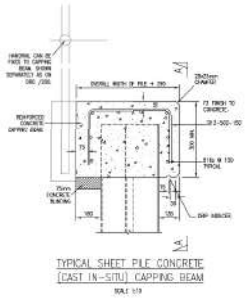
Note:

Ground model has been correlated from available exploratory holes on the BGS web-site. A ground investigation is to be carried out prior to detailed design to ensure a suit-able design.



Section A-A

Not to Scale



Detail A—Concrete (Cast In-situ) Capping Beam

Taken from NR/CIV/SD/205 Issue D

Notes

1. Do not scale from this sketch. This sketch is for illustrative purposes only.
2. All levels have been taken from the BGS Boreholes utilized and Google Earth.
3. Ground conditions for the area have been derived from available BGS Boreholes.

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Status: FOR APPROVAL — Suitability: S0

CROUCH WATERFALL

Contractors: MPH CONSTRUCTION

Project: Penmaenmawr Sea Defense Wall

Drawing Title: Option 2—Sketch

Designed	Ben Core	Signed	Date 22/03/2024
Drawn	Ben Core	Signed	Date 22/03/2024
Checked	Vera Faustino	Signed	Date 27/03/2024
Approved	Dave Brock	Signed	Date 27/03/2024

Scale: AS SHOWN — ELR & Mileage

Alternative — Sheet

Drawing Number: 240BBW-SKE-002 — Revision: A01

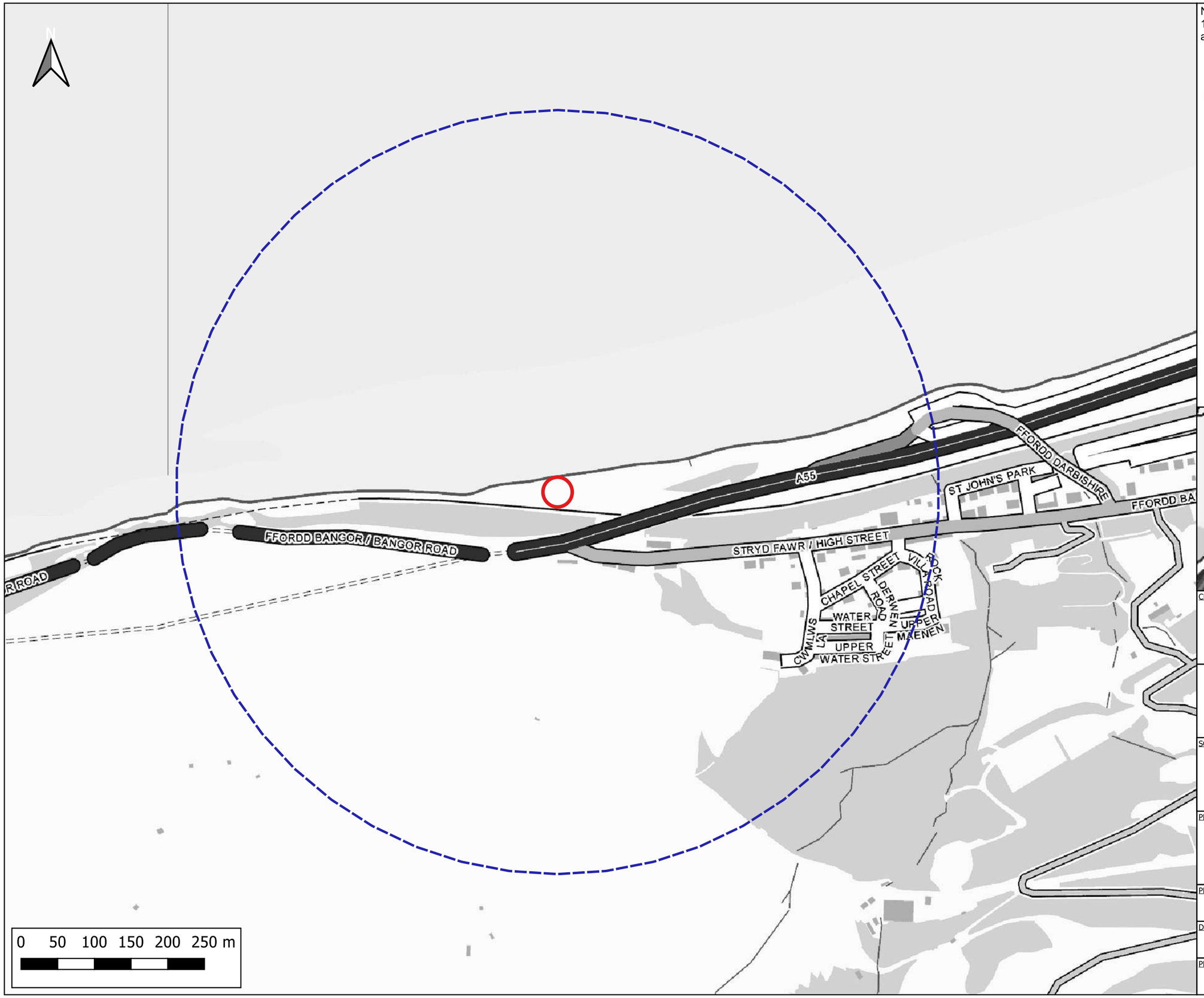
Drawing Number

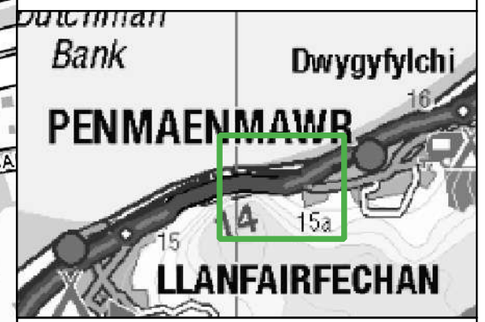
Appendix B Zone of Influence Plan

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- 500m Zone of Influence





CLIENT:
MPH Construction

www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
Zone of Influence Plan

PLOT STATUS:			DATE:
FINAL			08-08-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:5000
PLOT NAME:			REVISION:
16064_ZoI_Plan			-

Appendix C Location Plan and Aerial Image

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Study Area
- Watercourses
- Waterbodies

CONWY BAY

A55

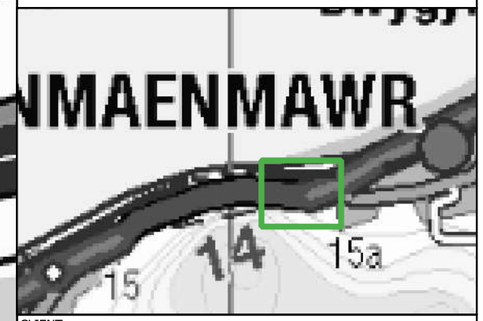
R / BANGOR ROAD

STRYD FAWR / HIG

CWMLWS

LA

0 50 100 150 200 250 m



CLIENT:
MPH Construction

waterco
www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
Location Plan

PLOT STATUS:	DATE:
FINAL	02-08-2024

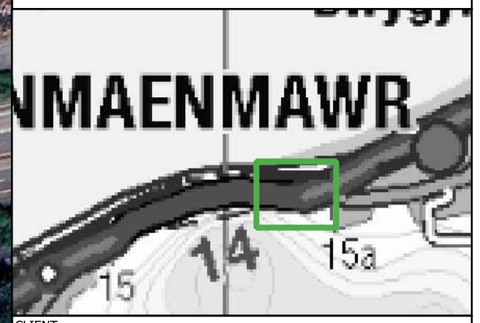
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:2000

PLOT NAME:	REVISION:
16064_Location_Plan	-

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

Study Area



CLIENT:
MPH Construction

Waterco
www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
Aerial Plan

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:2000

PLOT NAME:	REVISION:
16064_Aerial_Plan	-

Appendix D LiDAR Extract

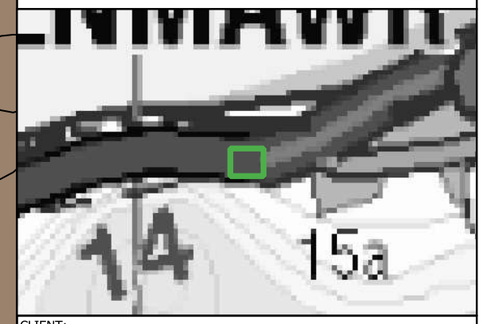
Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Study Area
- Site Levels
- 1m contour

Ground Elevations (m AOD)

- <= 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- > 5.0



0 25 50 75 100 m

CLIENT:
MPH Construction

www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
LiDAR Plan
1m Resolution
Data from Natural Resources Wales

PLOT STATUS:	DATE:
FINAL	14-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:500

PLOT NAME:	REVISION:
_LiDAR_Plan	-

Appendix E Historical BGS Borehole Record

Norwest Holst Soil Engineering Ltd.

Borehole No. **L3A**

BOREHOLE LOG

SH77NW/71

Contract No. F4920
Location. A55-Penmaenmawr
Client. Welsh Office
Method of Boring. Percussion
Diameter of Borehole. 250mm to 8.20m; 150mm to 16.60m

Sheet 1 of 2
Project Coordinates: 20616E; 16287N
Ground Level 19.97 m.A.O.D.
Date 14/10/81-9/11/81

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Angular cobbles, gravel and sandy silty clay with much ash.		0.40	19.57				14/10
Very dense sub-angular, some angular COBBLES and BOULDERS with much fine medium coarse gravel and a brown sandy silty clay binder. ...1.00 to 4.95m stiff brown sandy silty CLAY, fine medium coarse GRAVEL, COBBLES and BOULDERS.		(12.40)	(74.75)	250mm to 2.00m 250mm to 5.00m 250mm to 5.60m 250mm to 6.00m "8.20 250mm to 7.60m 250mm to 8.00m "8.20	0.80-1.00 1.00 1.45 2.00 2.00-2.20 2.50 3.00 3.20 3.20-3.65 4.00 4.80-5.15 5.15 6.50 6.50-6.90 7.50-7.95 9.50 9.55-9.70	86for 106mm 22 50for 31mm 50for 22mm	15/10 16/10 19/10 21/10 22/10 29/10 30/10 2/11

Type of Sample

- Is S.P.T.
- Ic. C.P.T.
- O Jar
- ● Bulk
- ■ Undisturbed
- × Vane
- Δ Water
- Piezometer

Remarks (Observations of Ground Water etc.)

3/11/81 1700hrs Water level at 4.00m AOD. Casing at 11.40m AOD.
4/11/81 1000hrs Water level at 3.65m AOD. Casing at 3.30m AOD.
5/11/81 0700hrs Water level at 6.28m AOD. Casing at 3.10m AOD.
6/11/81 0700hrs Water level at 5.25m AOD. Casing at 3.00m AOD.
9/11/81 0900hrs Water level at 6.30m AOD. Casing at 3.00m AOD.
10/11/81 1730hrs Water level at 6.38m AOD. No casing.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No. **L3A**

BOREHOLE LOG

SH77NW/71

Contract No. E4920
Location A55-Penmaenmawr
Client Welsh Office
Method of Boring Percussion
Diameter of Borehole 250mm/150mm

Sheet 2 of 2
Project Coordinates: 20616E: 16287N
Ground Level 19.97 m.A.O.D.
Date 14/10/81-3/11/81

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Very dense sub-angular, some angular COBBLES and BOULDERS with much fine medium coarse gravel and a brown sandy silty clay binder.		12.80	7.17		11.00 C	50for 57mm	3/11
Stiff to very stiff friable brown to orange brown sandy silty CLAY, fine medium coarse GRAVEL, COBBLES and BOULDERS.		(2.90) 15.70	(4.50) 4.27		12.80 13.25 14.00 No Recovery 14.50 15.50 15.45-15.60		
Very dense sub-angular to angular COBBLES and BOULDERS with some fine medium coarse gravel and a brown sandy silty clay binder.		(27.00) 16.60	3.37	150mm to 16.30m "16.50 "16.60	16.40 16.50		4/11 5/11 6/11

Type of Sample

Is	S.P.T.	▮	Undisturbed
Ic	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.)

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Appendix F DCWW Sewer Records

Dŵr Cymru
Welsh Water

16064 - Pen-Y-Coed, Penmaenmawr, Conwy, LL34 6NN

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.

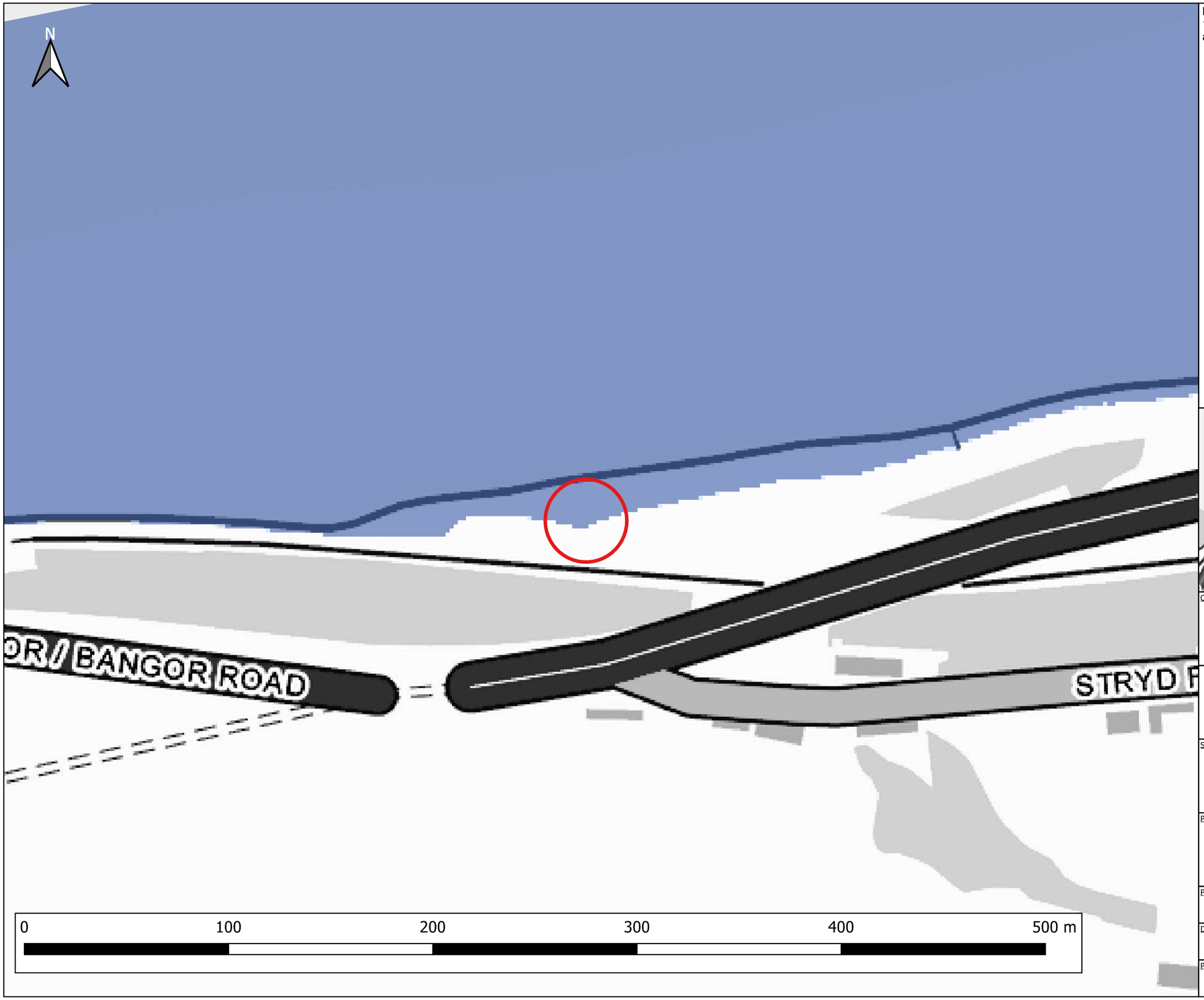
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former 524 sewers (for indicative purposes only)

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

Map Ref:	270460,376250
Map scale:	1:1000
Printed by:	Tyrieque Golding
Printed on:	01 Aug 2024

Appendix G NRW Flood Maps



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

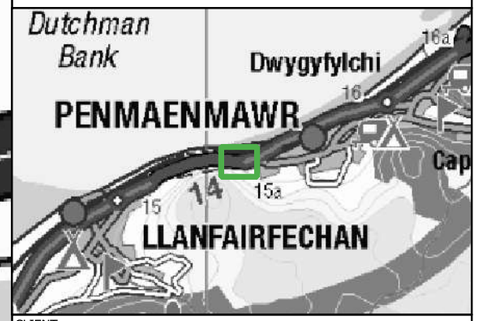
LEGEND

Site Boundary

NRW Flood Map for Planning

Flood Zone 2

Flood Zone 3



CLIENT:
MPH Construction

waterco
www.waterco.co.uk

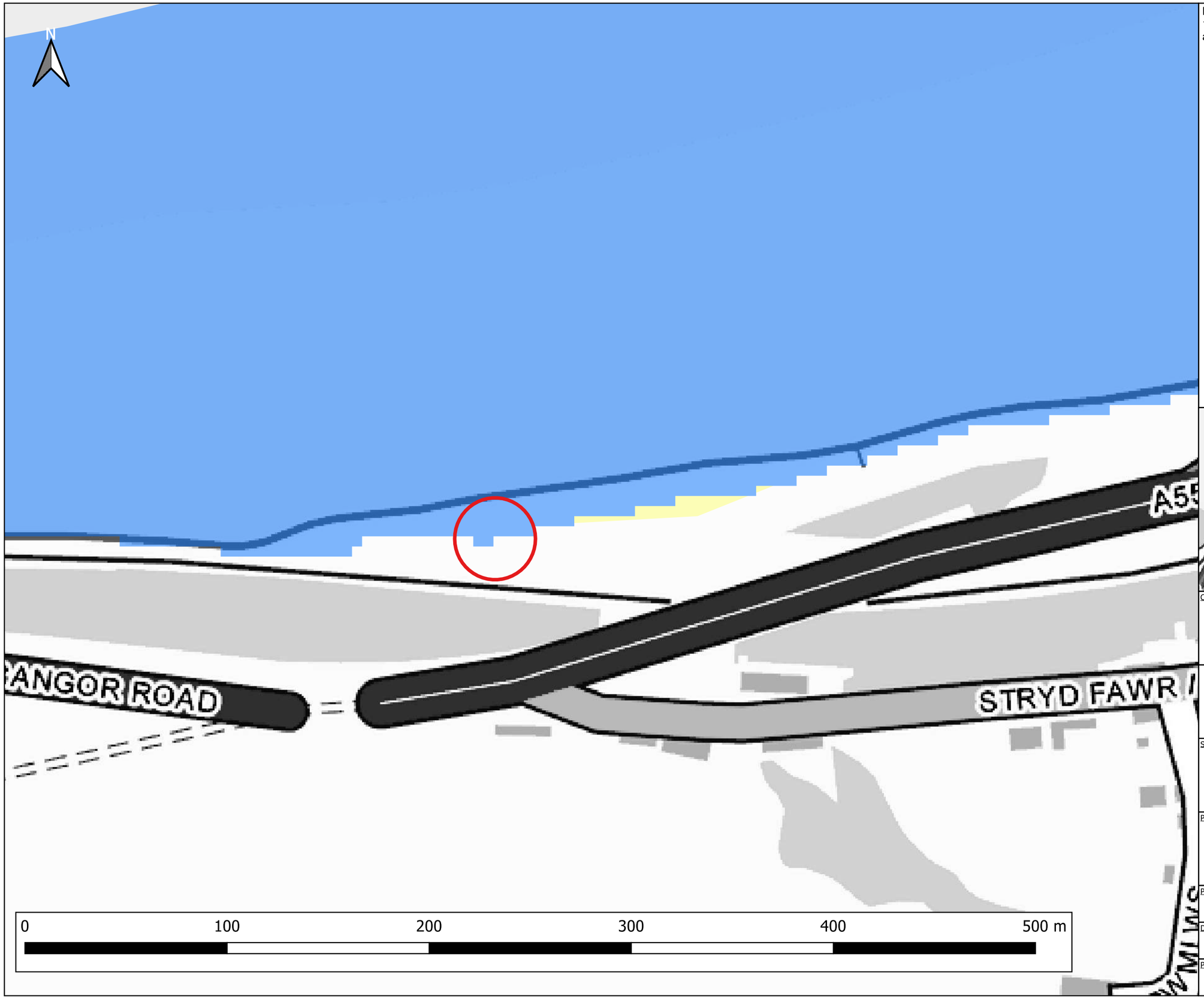
SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Flood Map for Planning
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	14-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_FMfP_Map	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

Site Boundary

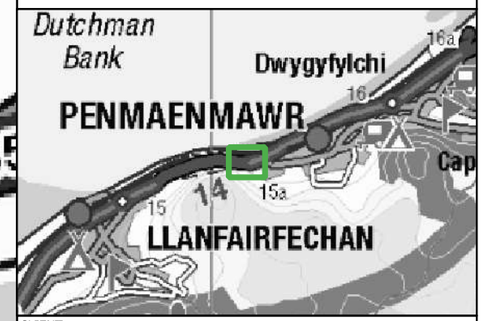
Development Advice Map (TAN15)

Zone A

Zone B

Zone C1

Zone C2



CLIENT:
MPH Construction

waterco
www.waterco.co.uk

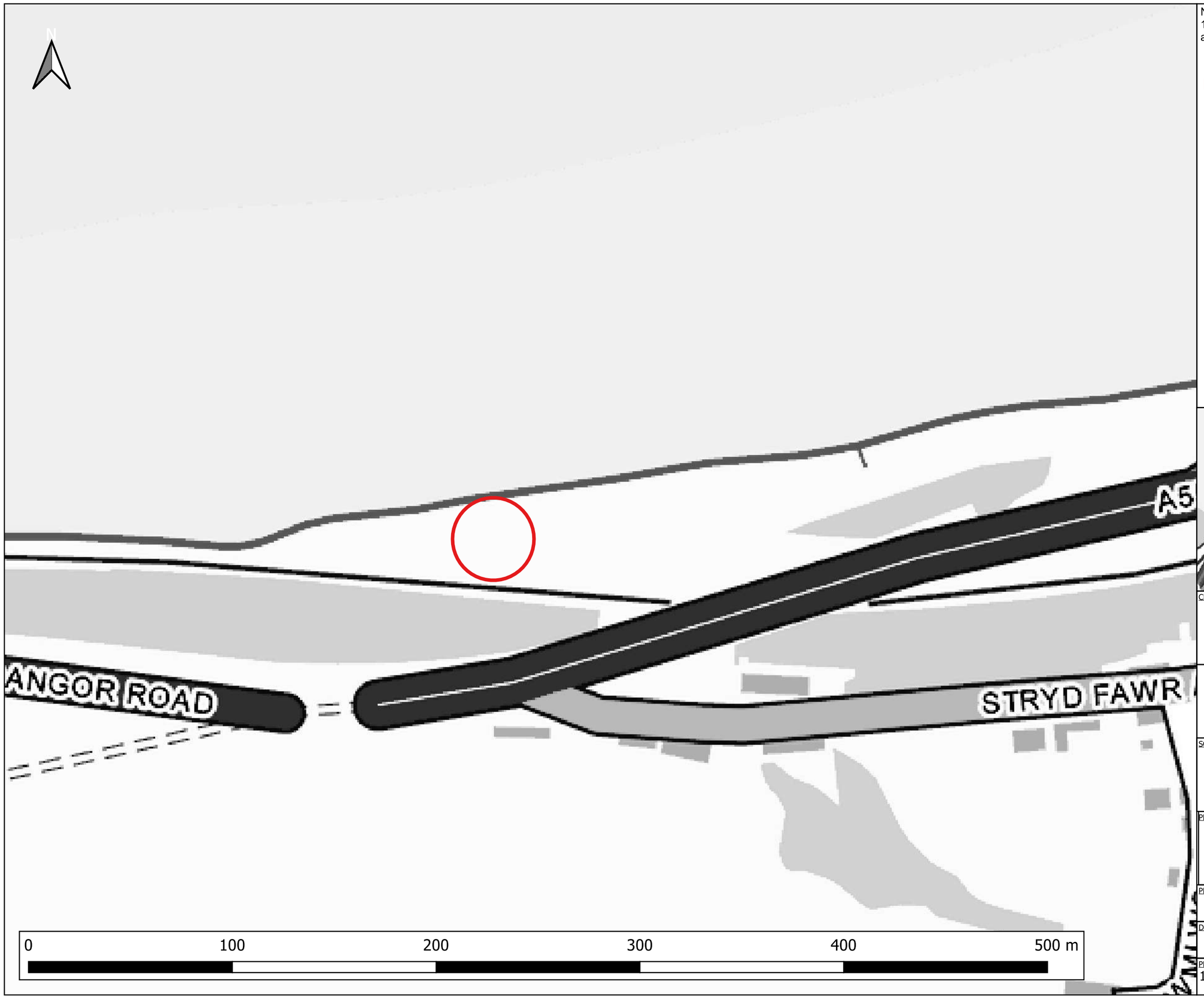
SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Development Advice Map
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_DAM_Map	-



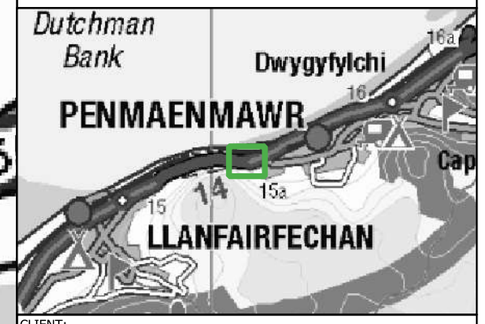
Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary

Flood Risk from Rivers

- High
- Medium
- Low



CLIENT:
MPH Construction

www.waterco.co.uk

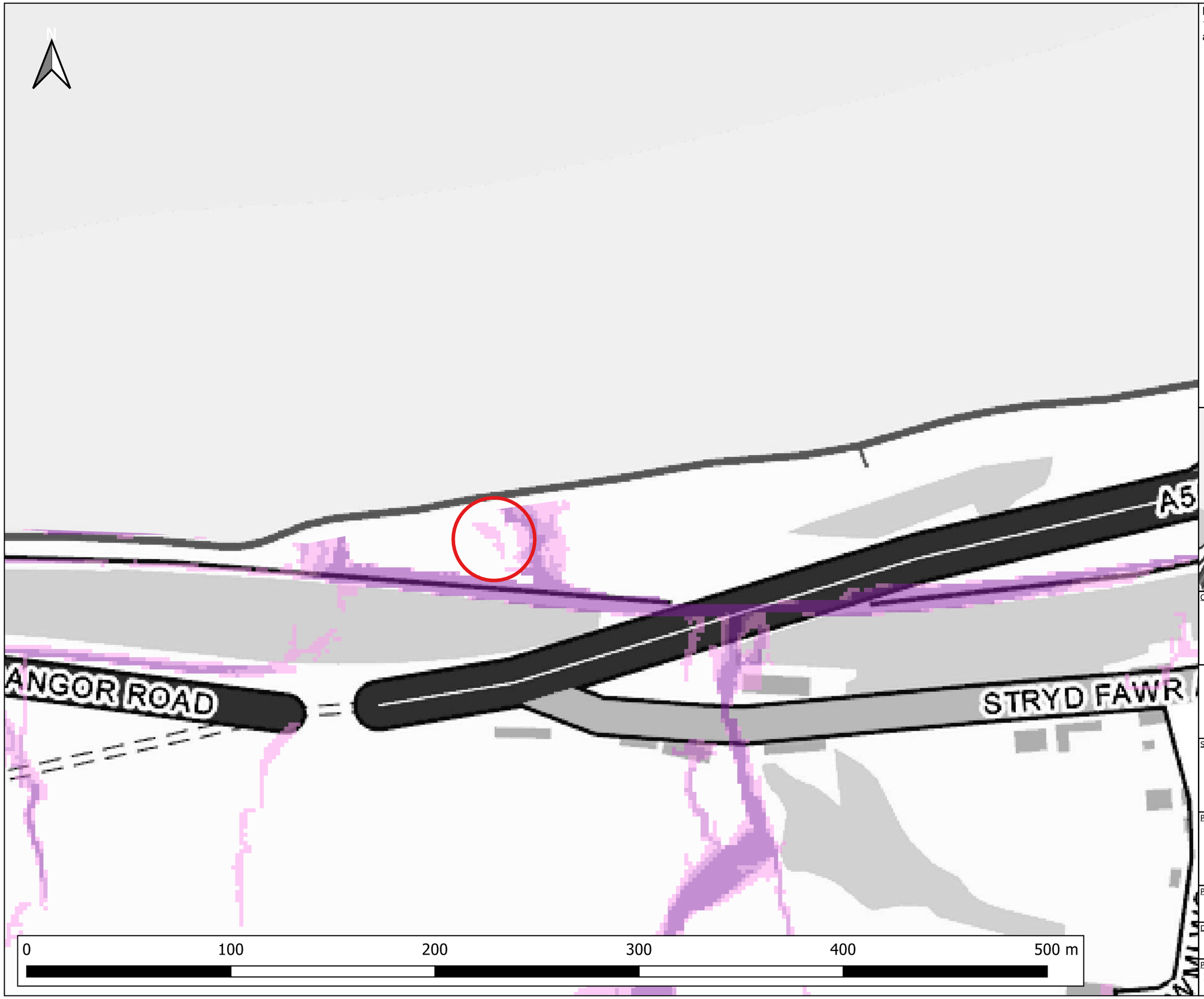
SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Flood Risk from Rivers
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_Flood_Risk_from_Rivers	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

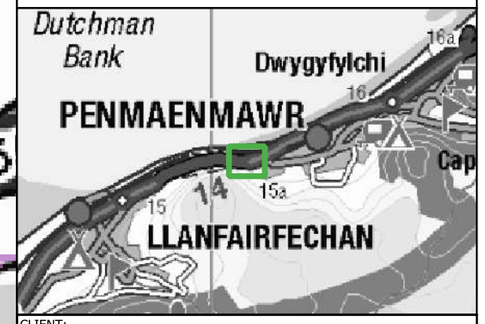
Site Boundary

Flood Risk from Surface Water & Small Watercourses

High

Medium

Low



CLIENT:
MPH Construction

www.waterco.co.uk

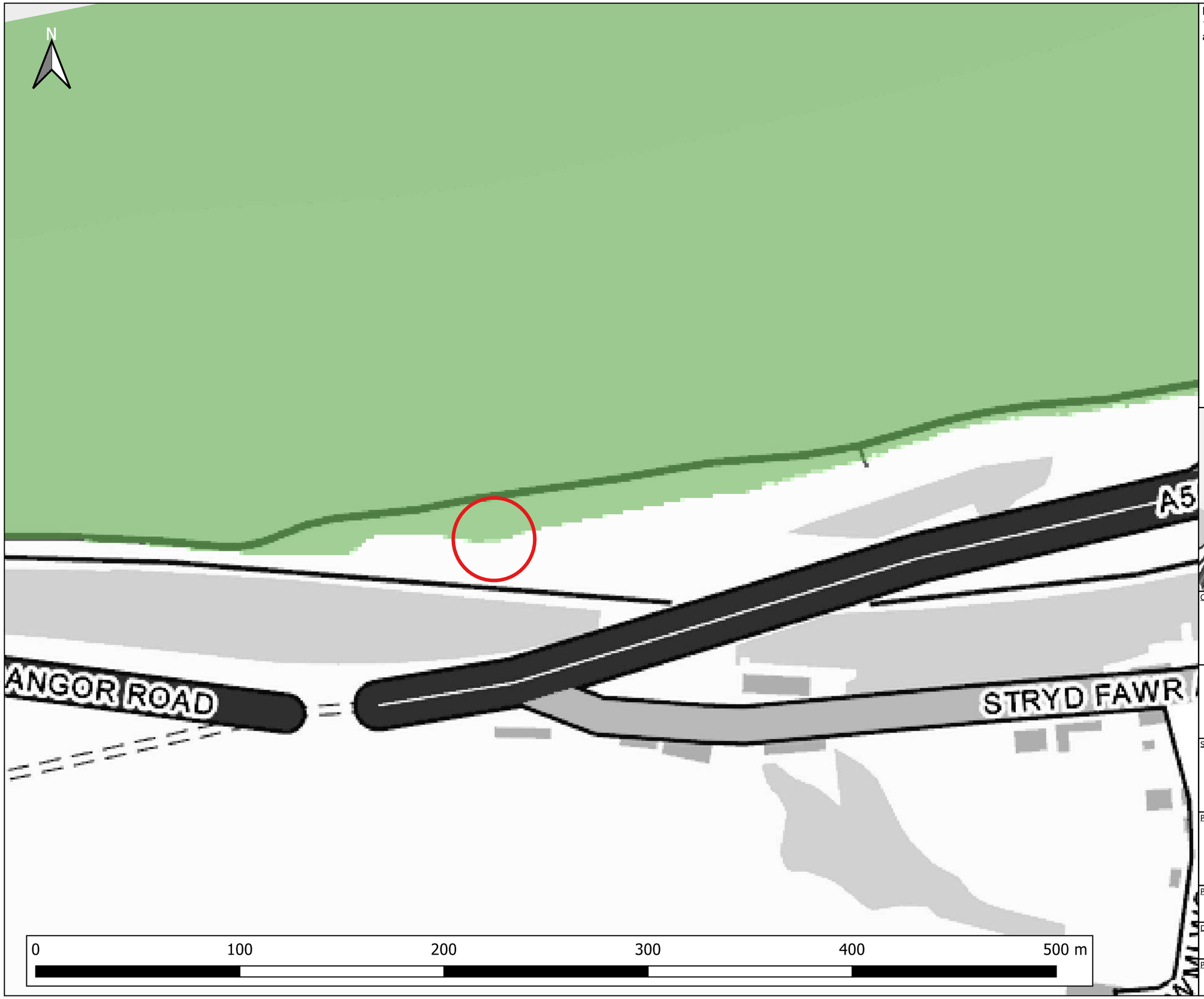
SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Flood Risk from Surface Water & Small Watercourses
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_Flood_Risk_from_Surface_Water	-



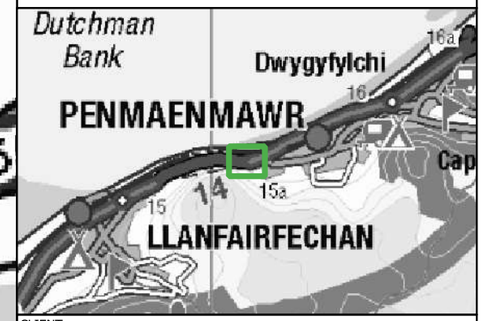
Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary

Flood Risk from the Sea

- High
- Medium
- Low



CLIENT:
MPH Construction

waterco
www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Flood Risk from the Sea
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_Flood_Risk_from_the_Sea	-

N

A5

ANGOR ROAD

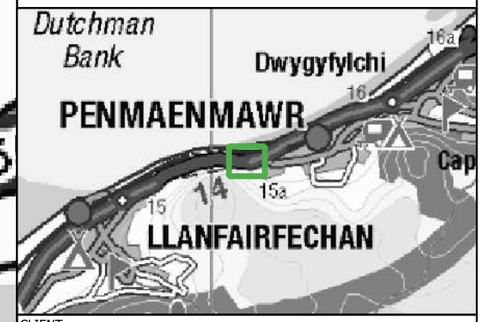
STRYD FAWR

0 100 200 300 400 500 m

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Flood Risk from Reservoirs Extent



CLIENT:
MPH Construction

waterco
www.waterco.co.uk

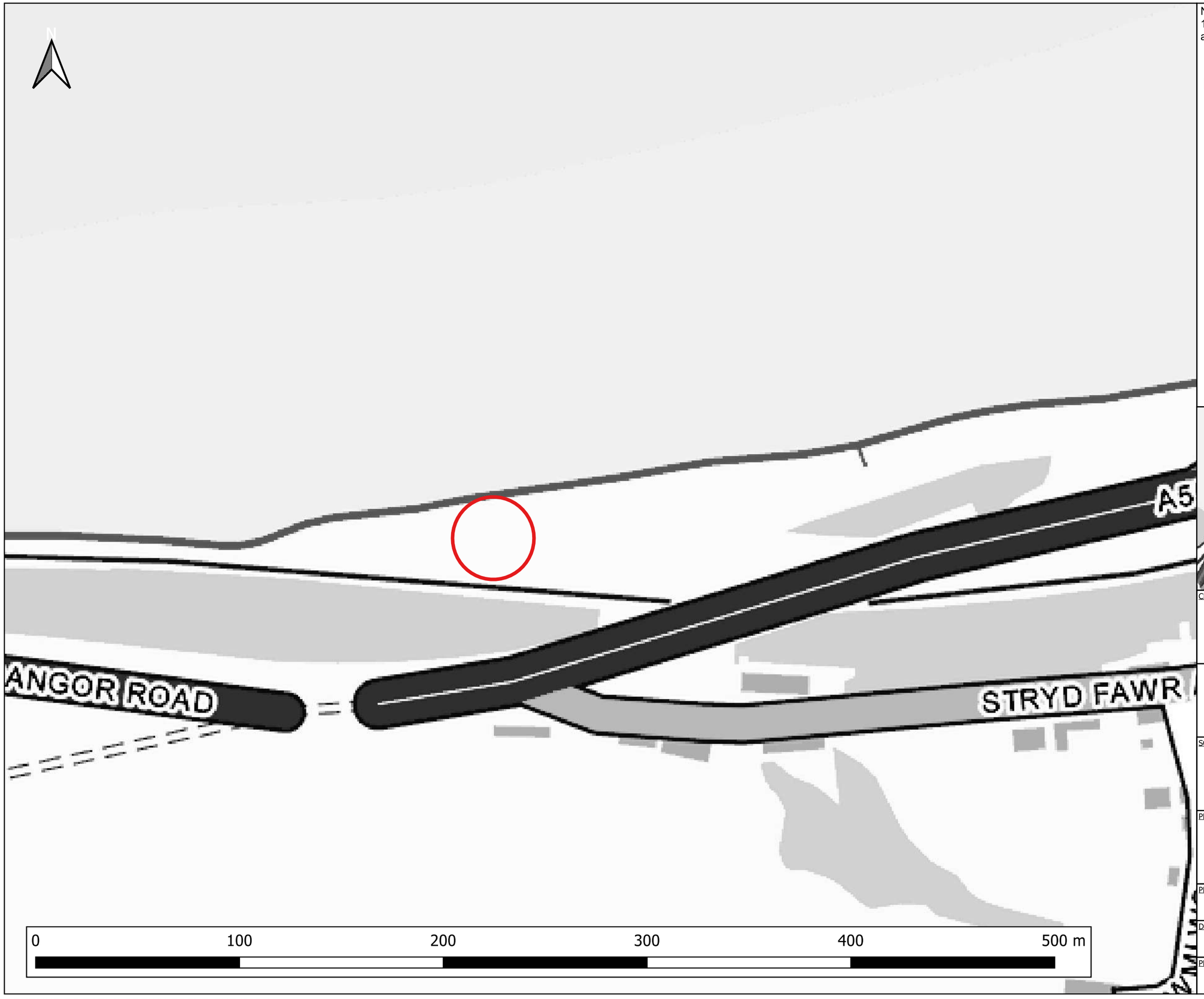
SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Flood Risk from Reservoirs
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

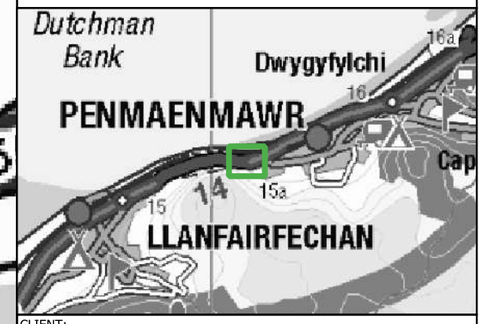
PLOT NAME:	REVISION:
16064_NRW_Flood_Risk_from_Reservoirs	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Historic Flood Map



CLIENT:
MPH Construction

www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
NRW Historic Flood Risk
Data accessed August 2024

PLOT STATUS:	DATE:
FINAL	02-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:1800

PLOT NAME:	REVISION:
16064_NRW_Historic_Flood_Risk	-

Appendix H Designations Map

N

A55

FFORDD DARBISHIRE

ST JOHN'S PARK

FFORDD BANGOR / BANGOR ROAD

BANGOR / BANGOR ROAD

STRYD FAWR / HIGH STREET

CHAPEL STREET

VILLA ROAD

BACK

DERWEN ROAD

WATER STREET

UPPER MAENEN

CWMLLWS LA

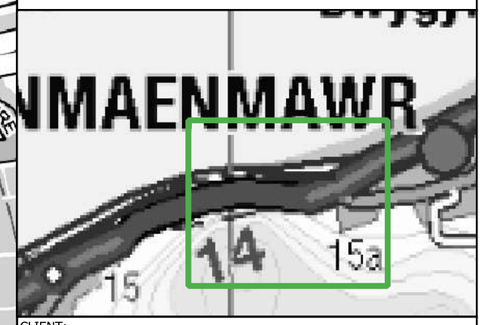
UPPER WATER STREET

0 50 100 150 200 250 m

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- 500m Zone of Influence
- NRW_SAC



CLIENT:
MPH Construction

Waterco
www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
Designations Plan
Special Areas of Conservation

PLOT STATUS:	DATE:
FINAL	08-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:5000

PLOT NAME:	REVISION:
16064_Designation_Plan_SAC	-

N

A55

FFORDD DARBISHIRE

ST JOHN'S PARK

FFORDD BANGOR / BANGOR ROAD

FFORDD BANGOR / BANGOR ROAD

STRYD FAWR / HIGH STREET

CHAPEL STREET

VILLA ROAD

BACK

DERWEN ROAD

WATER STREET

UPPER MAENEN

CWMLLWS LA

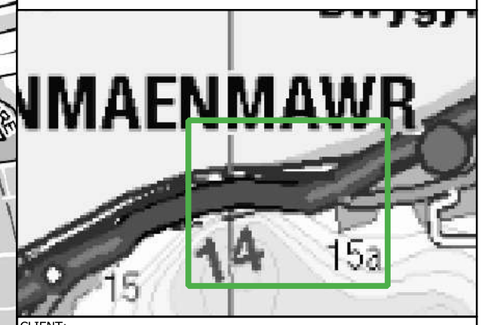
UPPER WATER STREET

0 50 100 150 200 250 m

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- 500m Zone of Influence
- NRW_SPA



CLIENT:
MPH Construction

Waterco
www.waterco.co.uk

SCHEME:
Pen-Y-Coed, Penmaenmawr

PLOT TITLE:
Designations Plan
Special Protection Areas (SPA)

PLOT STATUS:	DATE:
FINAL	08-08-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MJW	AW	MW	1:5000

PLOT NAME:	REVISION:
16064_Designations_Plan_SPA	-

Appendix I Pollution Control Measures

Typical pollution control measures to be considered during the construction phase; the list below is best practice, is not exhaustive and reference to the appropriate and relevant guidance should also be undertaken on more complex schemes:

- Potentially contaminating materials should be stored correctly. Minimise the potential for accidental release but protecting from the elements (wind & rain) and from vandalism and theft.
- Potentially contaminating liquids, such as oils and fuel, should be stored in a suitably bunded contained if present in a bulk container. Smaller container volumes should be stored on a drip tray or in a closed storage unit when not in use.
- Equipment should be regularly checked to ensure that leakage from hydraulic lines and engines does not occur.
- Spill kits should be available on site at all times and operatives should be trained in how to use them.
- Any ground contaminated during the course of the works should be excavated and disposed of correctly in accordance with current waste disposal legislation. Where gross contamination occurs, professional advice should be sought immediately.
- Cleaning of tools /equipment will be carried out an appropriate distance away from the area of works.
- In any event of expected heavy rain any activities which increase the risk of contaminating runoff and should not be undertaken.
- Ensure suitable measures are in place to prevent pollution from grout (in the event of any spillage or leakage) to the marine environment. Stop and contain any leakage as soon as it is identified.