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A55 Junctions 14 and 15 Improvements

Environmental Statement

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A55 JUNCTION 15 APPENDIX 7.1 ASSESSMENT OF EFFECTS ON WATER FRAMEWORK DIRECTIVE WATER BODIES

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A55 JUNCTION 15 APPENDIX 7.1
ASSESSMENT OF EFFECTS ON WATER FRAMEWORK DIRECTIVE WATER BODIES

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1. INTRODUCTION

1.1 Brief

1.1.1 Ramboll UK Limited (Ramboll) has been appointed by the Welsh Government to undertake a Water Framework Directive (WFD) assessment of the proposed A55 Junction 15 Scheme (referred to as the 'Scheme') to be undertaken at Llanfairfechan (see Figure 7.1 for the location of the site).

1.1.2 This WFD assessment has been prepared in order to support Chapter 7 ('Road Drainage and the Water Environment') of the Environmental Statement for the Scheme.

1.2 Proposals

1.2.1 Full details of the Scheme are presented in Chapter 2. The Scheme design includes the following elements that are associated with water or have an interaction with the water environment:

a) Replacement headwall and new cascade to convey existing (normally dry) watercourse down proposed earthworks slope, down slope of Penmaen Park;

b) Interception of drainage from road and catchment run-off into existing drainage network by measures including drainage ditches, filter drains and pipes/culverts; and

c) Discharge of drainage from the existing network via three existing drainage outfalls on Llanfairfechan beach, discharging surface water drainage into the sea.

1.2.2 Figure 7.1 shows that the Scheme extends for approximately 1.5 km along the length of the A55. The western site boundary abuts the Afon Ddu in Llanfairfechan, however, no activities that could have an effect on the water environment (such as excavation works) are proposed within the western-most 250 m of the site. Construction of drainage, new road infrastructure and earthworks are focussed around an area approximately 0.5 km to the east of the river, close to the existing Junction 15 roundabout. Drainage from the Scheme would outfall to the coast approximately 80 m from the existing roundabout (see Figure 7.1). For the purposes of this assessment, therefore, it is these activities close to the existing Junction 15 roundabout that present the greatest risk to the water environment and that are of relevance to this WFD assessment. All measurements of distances to, for example, Protected Areas, within this report, are therefore taken from the location of the current Junction 15 roundabout.

2. BASELINE ENVIRONMENT

2.1 The Site

2.1.1 Junction 15 (the Scheme) lies at the north-eastern end of Llanfairfechan, in Conwy County Borough. It is located at the base of hills sloping down from the south towards the coast and Conwy Bay which lies immediately to the north of the Scheme. The Conwy to Holyhead main railway line separates the Scheme from the bay.

Guidance

2.2 Geology and Hydrogeology

2.2.1 The British Geological Survey 'Geology of Britain Viewer' and 1:50,000 geological map (sheet 94) shows that the solid geology beneath the Scheme comprises mudstones and siltstones of the Nant Ffrancon Subgroup which are Ordovician in age. Below these strata lie further mudstones, siltstones and sandstones of Ordovician and Cambrian age.

2.2.2 The near surface superficial deposits under the Scheme comprise mainly Devensian Till (glacial till) which is Quaternary in age, although storm beach deposits (predominantly gravels) and coastal zone deposits (predominately clay and silt) are located to the north of the Scheme, between the A55 and Conwy Bay.

2.2.3 Historical exploratory holes carried out to inform the original design and construction of the A55 indicate that anthropogenic deposits (Made Ground/fill) are underlain by loose to medium dense sands and gravels. These are underlain in turn by peat; soft clays; layers of boulders, cobbles, gravels and sands; and firm to stiff clay. However, it should be noted that not all these strata were observed in all boreholes. The stratigraphy identified on the exploratory hole logs (see Chapter 6) is considered to represent the changing depositional systems associated with glaciation, sea level fluctuations and the dynamic coastal environment. Close to the existing Junction 15 roundabout, the bedrock was observed at a depth of approximately 14 m below (original) ground level and was described as a moderately to highly weathered mudstone.

2.2.4 Long sections along the line of the existing A55 (see Chapter 6) indicate that there is a substantial thickness of engineered fill forming an embankment under the pavement on the approaches to Junction 15.

2.2.5 The Ordovician bedrock is classified by Natural Resources Wales (NRW) as a Secondary B aquifer (low productivity, highly indurated (hardened by heating) rocks with limited groundwater content)[1] with high vulnerability[2].

2.2.6 The superficial deposits beneath the Scheme (the glacial till) are classified by NRW as a Secondary (undifferentiated) aquifer[1], also of high vulnerability[2].

2.3 WFD Surface Water Environment

2.3.1 The Scheme is located to the northeast of the Afon Ddu (Llanfairfechan) which flows in a north westerly direction, discharging into the Conwy Bay approximately 720 m west of the Scheme. It is classified by NRW as having a mid-altitude catchment of small size, running through underlying siliceous geology[3].

[1] http://mapapps2.bgs.ac.uk/geoindex/home.html
[2] Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
[3] For definition see: https://cdn.naturalresources.wales/media/684352/annex-chapter-3-final-for-publication.pdf

2.3.2 Feeding into Conwy Bay, the Menai Strait lies to the west of the Scheme and is one of the most productive mussel bed areas in Europe. The Menai East designated shellfish bed lies to the west of the Scheme, with its closest point being approximately 2.3 km from the Scheme (see Figure 7.2).

2.3.3 Within Conwy Bay there are a number of areas designated at a European level for their habitat quality (see Figure 7.2):

a) Lavan Sands Special Protection Area (SPA), a large intertidal area of sand- and mud-flats which is of importance for importance for wintering water-birds;

b) Liverpool Bay SPA, a marine area supporting large aggregations of wintering red-throated diver and common scoter as well as important marine foraging areas of little terns; and

c) Menai Strait and Conwy Bay Special Area of Conservation (SAC), a marine area with sea inlets, which is designated to protect its rich and diverse habitats. The SAC overlaps both of the SPAs.

2.3.4 Llanfairfechan has a designated bathing water, situated less than 150 m to the west of the Scheme (see Figure 7.2). Ongoing bathing water monitoring (undertaken at a location approximately 400 m from the Scheme and 300 m from the nearest outfall) shows it to have excellent water quality[4]. Natural Resources Wales do note that the bathing water at this location is subject to short term reduction in quality following rainfall (typically for up to 3 days), resulting from run-off of faecal material into the sea from livestock, sewage and urban drainage via rivers and streams.

2.3.5 Llanfairfechan Sewage Treatment Works (see Figure 7.1) treats sewage effluent from the catchments of Llanfairfechan and Abergwyngregyn. The sewage treatment works discharges secondary treated effluent through a sea outfall, approximately 1.75 km to the west of the Llanfairfechan bathing water site.

2.3.6 There are no mitigation measures implemented in order to meet the requirements of the WFD in either the Afon Llanfairfechan, Menai Strait or Conwy Bay.

2.4 WFD Groundwater Environment

2.4.1 The Llyn and Eryri groundwater body underlies the Scheme and a large area to the south and southwest of it (total area of 1,317 km^2)[5]. The groundwater body is of poor quality due to the fact that water from it supplies:

a) An associated surface water body that is not meeting its quality objectives under the WFD and groundwater contributes at least 50 % of the relevant surface water standard; and

b) A wetland where its contribution is potentially sufficient to cause significant damage to that wetland.

2.4.2 Although not subject to designation under the WFD, Ordnance Survey maps do indicate the presence of a number of springs and wells within 500 m of the Scheme, indicating the presence of groundwater close to the surface (see Figure 7.1).

[4] https://environment.data.gov.uk/wales/bathing-waters/profiles/profile.html?site=ukl1301-40170

[5] https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=2176397a06d64731af8b21fd69a143f6

3. WATER FRAMEWORK DIRECTIVE

3.1 Background

3.1.1 The WFD (2000/60/EC) was published in December 2000 and transposed into Welsh law in December 2003 through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, later being updated through The Water Environment (WFD) (England and Wales) (Amendment) Regulation 2015 and most recently The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The intention of the Directive is to provide a more holistic approach to protection of the water environment than had previously been in place, addressing a wide range of aspects of the water environment, including physico-chemical, chemical, hydromorphological and ecological.

3.1.2 The environmental objectives of the WFD are to:

a) Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;

b) Aim to achieve at least 'good' status for all water bodies 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;

c) Meet the requirements of Water Framework Directive Protected Areas;

d) Promote sustainable use of water as a natural resource;

e) Conserve habitats and species that depend directly on water;

f) Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;

g) Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and

h) Contribute to mitigating the effects of floods and droughts.

3.1.3 The Directive requires that NRW define River Basin Districts and for each of these develop a River Basin Management Plan (RBMP). As part of this process all inland (above or below ground) and coastal waters have been allocated status categories in order to help inform where water bodies are at risk and/or protective/management measures need to be put in place.

3.1.4 The Scheme is situated within the area covered by the Western Wales River Basin District and thus the Western Wales River Basin Management Plan (RBMP).

3.2 Assessment Process

3.2.1 NRW recommend the use of a WFD assessment process developed by the Environment Agency (EA) for the purposes of marine licence applications[6] in Wales. The EA process sets out a structure as to how to assess the impact of activities in estuarine (transitional) and coastal waters with respect to the requirements of the WFD. Given the location of the Scheme immediately adjacent to a coastal water body, it is considered appropriate to utilise this guidance to inform this assessment. The aim of such WFD assessments is to assist the regulator in assessing:

a) The impact an activity may have on the immediate water body and any linked water bodies; and

b) Whether the activity complies with the relevant RBMP.

[6] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

3.2.2 The process and logic of the EA procedure has been adopted for completion of the WFD in this report. The EA guidance adopts a three-stage process as follows:

a) Screening – This excludes any activities that don't need to go through the scoping or impact assessment stages;

b) Scoping – Identifies the receptors that are potentially at risk from your activity and need impact assessment; and

c) Impact assessment – Considers the potential impacts of the activity, identifies ways to avoid or minimise impacts, and shows if the activity may cause deterioration or jeopardise the water body achieving good status.

4. ASSESSMENT

4.1 Screening

4.1.1 The nature of the project is such that it does not align with any of the screening criteria listed in the EA guidance as these are focussed on EA licensing requirements rather than the planning process. However, a WFD Assessment is required to support the Environmental Impact Assessment for the Scheme so the need for a WFD assessment has been screened in.

4.2 Scoping

4.2.1 The EA protocol provides a scoping template to complete to identify the potential risks to receptors associated with a project or activities and thus inform the scope of any required detailed impact assessment. The completed scoping template is presented below.

Table 4-1a: Water Framework Directive Assessment Scoping - Baseline

Activity/Characteristic	Description Notes or More Information			
Name of activity	Construction and operation of the Scheme			
Brief description of activity	Replacement of existing roundabout with new grade-separated junction			
Location of activity (central point XY coordinates or National Grid reference)	268537E, 375504N			
Footprint of activity (ha)	Site area is approximately 12 ha			
Use or release of chemicals (state which ones)	None.			
Water body type	River	Groundwater	Coastal	Coastal
WFD water body name	Ddu (Llanfairfechan)	Llyn and Eryri	Menai Strait	Conwy Bay
Water body ID	GB110065058570	GB41002G204600	GB6810101200000	GB671010400000
River basin district name	Western Wales	Western Wales	Western Wales	Western Wales
Water body total area	n/a	1317 km^2	72.1 km^2	49.7 km^2
Overall water body status	Good (Cycle 2) (though noted to be failing on hydrological regime quality element)	Poor (Cycle 2)	Good (Cycle 2)	Moderate (Cycle 2)
Ecological status	Good (Cycle 2)	n/a	Good (Cycle 2)	Moderate (Cycle 2) (due to quality of invertebrate populations, infaunal quality index score)
Chemical status	Good (Cycle 2)	Poor (qualitative) (Cycle 2)	Good (Cycle 2)	Fail (Cycle 2) (due to the presence of mercury and Trichlorobenzenes)
Quantitative Staus	n/a	Good (quantitative) (Cycle 2)	n/a	n/a
Target water body status and deadline	Good by 2015	Poor by 2015	Good by 2015	Good by 2021

Activity/Characteristic	Description Notes or More Information			
Hydromorphology status of water body	-	n/a	-	-
Heavily modified water body and for what use	No	n/a	No	Yes – for coastal protection
Higher sensitivity habitats present (low resistance to, and recovery rate, from human pressures)	**Habitat**	**Distance from Scheme (m)**	**Area (ha)**	
	Saltmarsh	1500 m southwest		13
	Cobbles, gravel and shingle	40 m northwest	Extensive strip of shingle and rocks forming the beach extending to west and east along the coast	
Lower sensitivity habitats present (medium to high resistance to, and recovery rate from, human pressures)	Intertidal soft sediments like sand and mud	130 m northwest	Extensive area extending from the Scheme into Conwy Bay to west and east along the coast	
	Rocky shore	40 m northwest	Extensive strip of shingle and rocks forming the beach extending to west and east along the coast	
	Subtidal soft sediments like sand and mud	Approximately 300 m to northwest	Significant area along full length of Scheme and extending out into Conwy Bay	
Phytoplankton status	Blooms of the algae *Phaeocystis* can occur along the coastline during warm and calm weather in May and June. NRW report that this typically produces a cream or brown scum along the water's edge, but is otherwise harmless[4].			
History of harmful algae	Not recorded by NRW			
WFD Protected Areas within 2 km	Bathing water – Llanfairfechan (excellent quality) SPA – Lavan Sands, Conway Bay (UK9013031) SPA – Liverpool Bay (UK9020294) SAC – Menai Strait and Conwy Bay (UK0030202) Shellfish water – Menai Strait East			

4.2.2 Within each topic presented below, the conclusions as to whether further impact assessment is required or not is indicated in bold text, with the reasoning for that decision in the 'Topic' Risk Issues column to the right.

Table 4-2b: Water Framework Directive Assessment Scoping – Specific Risk Information

HYDROMORPHOLOGY			
Assess Further if Activity:	**Yes**	**No**	**Hydromorphology Risk Issue(s)**
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	Requires impact assessment	**Impact assessment not required**	No. The adjacent water bodies are of good status.
Could significantly impact the hydromorphology of any water body	Requires impact assessment	**Impact assessment not required**	No. The Scheme discharges run-off through the existing drainage sytem into the adjacent coastal water body.
Is in a water body that is heavily modified for the same use as your activity	Requires impact assessment	**Impact assessment not required**	No. The Scheme discharges into a coastal water body that is not classified as a Heavily Modified Water Body (HMWB).
BIOLOGY - HABITATS			
Asses further if the Footprint[1] of Activity is:	**Yes**	**No**	**Biology Habitats Risk Issue(s)**
0.5 km^2 or larger	Yes to one or more – requires impact assessment	**No to all – impact assessment not required**	No. The Scheme does not lie within a surface water body and the extent of potential effects from discharge of highway drainage are expected to have a footprint of less than 0.5 km^2.
1% or more of the water body's area			No. The Scheme does not lie within a surface water body and takes up less than 1% of the underlying groundwater water body. Highway runoff would be discharged via three outfalls into the Conwy Bay water body but the area affected by such outfalls would be less than 1% of its overall area.
Within 500 m of any higher sensitivity habitat			No. The closest higher sensitivity habitat is located approximately 1500 m from the Scheme.
1% or more of any lower sensitivity habitat			No. The Scheme does not lie with a lower sensitivity habitat. Highway runoff would be discharged via an outfall across a lower sensitivity habitat (rock and shingle beach) but the area affected by such outfalls would be less than 1% of the overall area of lower sensitivity habitats.
FISH			

Assess Further if Activity:	**Yes**	**No**	**Biology Fish Risk Issue(s)**
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	Continue with questions	**Go to next section**	
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	Requires impact assessment	**Impact assessment not required**	No. The Scheme is not located within an estuary.
Could cause entrainment or impingement of fish	Requires impact assessment	**Impact assessment not required**	
WATER QUALITY			
Assess Further if Activity:	**Yes**	**No**	**Water Quality Risk Issue(s)**
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns ***continuously for longer than a spring neap tidal cycle*** (about 14 days)	Requires impact assessment	**Impact assessment not required**	No. Discharge of highway run-off only occurs during and for a period of a few days after rainfall events.
Is in a water body with a phytoplankton status of moderate, poor or bad	Requires impact assessment	**Impact assessment not required**	Phytoplankton status is not recorded by NRW, however they do report that blooms of the algae *Phaeocystis* can occur along the coastline during warm and calm weather in May and June, but that the blooms are harmless[4]. Conclusion: Scheme does not fit criteria for assessment.
Is in a water body with a history of harmful algae	Requires impact assessment	**Impact assessment not required**	This information is not available. Given the nature of the proposed works this is not considered to be an issue.
Assess Further if Activity Uses or Releases Chemicals (e.g. Through Sediment Disturbance or Building Works) and	**Yes**	**No**	**Water Quality Risk Issue(s)**
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	**Requires impact assessment**	Impact assessment not required	Road run-off has the potential to contain a range of contaminants including the following in the EQSD list: copper, zinc, polyaromatic hydrocarbons (PAHs).

It disturbs sediment with contaminants above Cefas Action Level 1	Requires impact assessment	**Impact assessment not required**	No. No dredging or construction in the water environment is required as part of the Scheme.
If Activity has a Mixing Zone (such as Discharge Pipeline or Outfall)	**Yes**	**No**	**Water Quality Risk Issue(s)**
Assess further if:			
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	**Requires impact assessment**	Impact assessment not required	Surface water from the Scheme would be discharged via three outfalls into the Menai Strait water body. The water being discharged has the potential to contain a range of contaminants including the following in the EQSD list: copper, zinc, polyaromatic hydrocarbons (PAHs).
PROTECTED AREAS[2]			
Assess Further if Activity is:	**Yes**	**No**	**Protected Areas Risk Issue(s)**
Within 2 km of any WFD Protected Area[3]	**Requires impact assessment**	Impact assessment not required	Yes. The Scheme lies within 2 km of the following Protected Areas: Bathing water – Llanfairfechan SPA – Lavan Sands, Conwy Bay, Liverpool Bay SAC – Menai Strait and Conwy Bay
INVASIVE NON-NATIVE SPECIES (INNS)			
Assess Further if Activity Could:	**Yes**	**No**	**INNS Risk Issue(s)**
Introduce or spread INNS	Requires impact assessment	**Impact assessment not required**	No INNS have been identified at the site

[1] Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5 times the dredge area
[4] Protected Areas include SACs, SPAs, shellfish waters, bathing waters and nutrient sensitive areas
[3] A regulator can extend the 2 km boundary if your activity has an especially high environmental risk

4.2.3 Where no risk to potential receptors is identified at scoping stage, impact assessment does not need to be completed. The potential risks to receptors which the scoping exercise concludes need to be taken forward for detailed impact assessment, are presented in Table 4-3.

Table 4-3: Potential Risks to be Assessed

Receptor	Potential Risk to Receptor?	Note the Risk Issue(s) for Impact Assessment
Hydromorphology	No	
Biology: habitats	No	
Biology: fish	No	
Water quality	Yes	Project involves discharge of water containining EQSD substances into Protected Area
Protected Areas	Yes	The Scheme is located within 2 km of a number of Protected Areas
Invasive non-native species	No	

4.3 Impact Assessment

4.3.1 The impact assessment below is written in the context of the following early stage scheme alignment design and environmental masterplan elements being implemented:

a) Completion of construction works under the management of a Construction Environmental Management Plan (CEMP); for example, management of surface water run-off from exposed earthworks and construction compounds, provision of spills kits and emergency spill procedures; and

b) Inclusion of attenuation measures to limit flow to existing rates for existing areas of road and at greenfield rates for newly constructed highway (allowing for climate change). This would have the additional benefit of contributing to pollution control.

4.4 Water Quality

4.4.1 The scoping stage identified the potential for surface water highway run-off from the Scheme to have a detrimental effect on adjacent water bodies due to the presence of pollutants from the EQSD list within it. The Scheme would discharge surface water run-off via three existing outfalls at J15 into the Menai Strait water body, which currently has good chemical status.

4.4.2 In order to assess the potential quality of water being discharged from the Scheme a water quality assessment has been completed utilising Highways England's Water Risk Assessment Tool (HEWRAT). This is the tool adopted by the Welsh Government for such purposes. The details of this assessment and its outcome are presented in Appendix 7.3.

4.4.3 HEWRAT is designed for application in freshwater rivers and streams so its application to saline waters has limitations. However, there is currently no better alternative. While saltwater Environmental Quality Standards (EQSs) relate to annual average concentrations, aquatic organisms can tolerate higher pollutant concentrations for short periods of time[7]. This is relevant to highway discharges as they are intermittent, occurring only during and for a short time after a rainfall event. As a result of this and as a more relevant measure than EQSs, the research which underpins HEWRAT established runoff specific thresholds (RSTs) for 24 hour and 6 hour periods

[7] There are no Maximum Admissible Concentration EQSs for saltwater environments

(albeit only for copper and zinc concentrations for freshwater organisms). Concentrations below the RST6 threshold for less than 6 hours are therefore considered acceptable in terms of risk to aquatic ecology. The RST6 value has been used (rather than the RST24) due to the tidal nature of the receiving water body.

4.4.4 HEWRAT has been used to determine concentrations of copper and zinc in the routine highway runoff for the Scheme. These are end-of-pipe concentrations, i.e. before any dilution has occurred. The results are given in Table 4-4 along with the comparative RST6 values.

Table 4-4 Predicted Copper and Zinc Concentrations from Routine Runoff (without dilution)

Parameter	RST6	Predicted Concentrations			
		Mean	90%ile	95%ile	99%ile
Copper (µg/l)	42	25	46	56	108
Zinc (µg/l)	120	70	144	190	396

All values rounded to nearest whole number

4.4.5 The results shown in Table 4-4 indicate that, with respect to both copper and zinc in water, the respective RST6s are met for almost 90 % of rainfall events without factoring in the dilution that would occur upon discharge.

4.4.6 Taking the highest exceedance value from Table 4-4, a dilution of ×3.3 volumes would be required for the zinc concentration to be lower than the RST6 in 99 % of rainfall events. Given the large dilution available in the tidal waters at and around the outfalls, this dilution factor would be achieved at small distance from the outfalls.

4.4.7 For example, a storm lasting 60 minutes with a return period of 5 years in the coastal area of North Wales would have an expected rainfall depth of 17 mm[8]. The total impermeable area of the Scheme is approximately 6 ha, and would be discharged via three outfalls. Assuming each outfall served an area of 2 ha then 17 mm of rainfall would produce 340 m^3 of runoff per outfall. To achieve ×3.3 dilution would require 1,122 m^3 of sea water. Taking a water depth of 1 m (although the depth would vary as the tide rises and falls) this indicates that an appropriate level of dilution would occur within an area of approximately 30 m × 30 m from each respective outfall. It should also be noted that the 340 m^3 of runoff is not discharged all at once but over a period longer than the 60 minute storm and that during this period tides, currents and wave action would be likely to increase the rate of dilution and dispersion.

4.4.8 Whether 1,122 m^3 is an acceptably small volume within which contaminant concentrations would be in excess of the RST6 is subjective. However, the example above is very conservative in that it considers the dilution volume required when two rare events occur simultaneously, namely runoff concentrations at their 99 %ile *during* a large and rare rainfall event (60 minute storm with a return period of 5 years).

4.4.9 In conventional use for flowing watercourses, HEWRAT determines whether fine sediments in the road runoff would be likely to accumulate or disperse. Where sediments accumulate there can be associated water quality risks from sediment-bound pollutants including copper, zinc and poly-aromatic hydrocarbons (PAHs). The low-flow rate of the watercourse and the channel dimensions are key parameters used to determine whether fine sediment is likely to accumulate or disperse (and thereby whether the risk is acceptable or not). Given that the runoff from the Scheme would discharge to the sea, it is not possible to use HEWRAT to determine whether sediments accumulate or disperse. However, by its nature, the coastal environment where runoff would discharge is dynamic and subject to currents, waves and tides which would disperse fine

[8] Centre for Ecology and Hydrology, Flood Estimation Handbook, 2013

sediments such that they would not be sufficiently concentrated to be toxic to aquatic organisms living in or near bed sediments.

4.4.10 In considering whether the potential impact on water quality from routine runoff from the Scheme would be acceptable or and/or significant, it is also relevant that the existing A55 and Junction 15 already discharge to Conwy Bay via the same outfalls.

4.4.11 Taking all of the above into account, the impact of routine runoff on the water environment of Conwy Bay is considered to be negligible both from dissolved and sediment-bound contaminants.

4.4.12 A spillage risk assessment has been completed and is presented in Appendix 7.3. The assessment concludes that the annual probability of a spillage that could cause a Category 1 or 2 incident[9] is less than 0.5 % and thus that no specific pollution control measures would be required[10]. It should be noted that the removal of the roundabout would decrease the risk of spillage when compared to the current situation and thus would provide betterment in that respect.

4.4.13 Given the predicted levels of contaminants, mitigated by the inclusion of pollution control measures in the Scheme design and the significant dispersion within the coastal water body it is concluded that the discharge of surface water run-off from the Scheme would not result in significant impacts on the quality of the water within the Menai Strait water body and that the Scheme provides betterment over the current situation.

4.4.14 The Conwy Bay coastal water body is located 1.7 km to the east of the current outfall locations and would not be subject to any detrimental effects due to its distance from the outfalls and the dilution and dispersion that would take place.

4.4.15 The Afon Ddu (Llanfairfechan) would not be affected as no surface water would discharge from the Scheme into it.

4.4.16 While the drainage strategy is to discharge road runoff to the sea, elements of the drainage system may be unlined and give rise to the potential for runoff to infiltrate into the ground. An assessment was made of the potential impact on groundwater quality and is presented in Appendix 7.3. This concluded that the impact would be negligible. The Llyn and Eryri groundwater body would therefore not be affected.

4.5 Protected Areas

4.5.1 The Scheme lies within 2 km of a number of Protected Areas, as detailed in Table 4-2B. Potential effects on these Protected Areas would be associated with the quality of water discharged from the Scheme. As discussed in section 4.4, the effects associated with this are not considered to be significant. Chapter 8 discusses the potential effects of the Scheme on the adjacent SPAs and SAC. The assessment within that chapter concludes that any effects would be neutral.

4.5.2 The Llanfairfechan designated bathing water is situated less than 150 m from the Scheme and has excellent water quality (see 2.3.4). It is noted as sometimes being subject to short term reduction in quality following rainfall, due to run-off from a variety of sources including urban drainage. Faecal content and turbidity are the main parameters of concern with respect to bathing water quality. Road run-off should not contain any faecal content so the Scheme would not result in any change in that context. Increased run-off from the Scheme during periods of high rainfall could contribute to the turbidity of the sea on a very localised basis during such

[9] Category 1 or 2 incidents are defined in Incidents and their classification: the Common Incident Classification Scheme (CICS), Operational Instruction 04_01, Environment Agency, 2011

[10] Highways England, Design Manual for Roads and Bridges LA113 Road Drainage and the Water Environment

events, but inclusion of flow attenuation within the Scheme drainage design would assist in negating that and thus would not be expected to have any detrimental effect on the status of the bathing water.

4.6 Mitigation Measures Assessment

4.6.1 The Scheme is unable to have an impact on formal mitigation measures for the Menai Strait and Conwy Bay water bodies as there are none currently in place.

4.7 Deterioration and Risk to Good Status Assessment

4.7.1 The identified effects associated with the proposed Scheme would be limited in extent and time. As such no deterioration in water body classification would occur, the proposed Scheme would:

a) Not result in reduction of WFD classification in any water bodies;

b) Not put at risk the good status/potential of any water body; and would

c) Not inhibit any water body from progressing towards good status/potential.

5. CONCLUSIONS

5.0.1 It is concluded from the above assessment that, with implementation of the noted design measures plus environmental management during construction, the proposed Scheme would not result in deterioration of the adjacent coastal water bodies. It is thus in compliance with the requirements of the WFD and supports the Western Wales RBMP.

APPENDIX 7.2
FLOOD CONSEQUENCES ASSESSMENT

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A55 JUNCTION 15 APPENDIX 7.2 FLOOD CONSEQUENCES ASSESSMENT

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FLOOD CONSEQUENCES ASSESSMENT

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Table 3-2: Flood Compensation Volumes

1. INTRODUCTION

1.0.1 Ramboll UK Limited trading as Ramboll (Ramboll) was appointed by the Welsh Government ('client') to undertake a Flood Consequences Assessment (FCA) for the proposed A55 Junction 15 Improvement Scheme (referred to as the 'Scheme').

1.1 Scope and Objectives

1.1.1 This document considers the risks of various sources of flooding to the site and the consequent risk of flooding to downstream receptors (such as people, property, habitats, infrastructure and statutory sites) from the Scheme as a result of surface water runoff and loss of floodplain storage. A comparison is made between the current situation and the proposed Scheme.

1.1.2 This FCA has been carried out in accordance with Road Drainage and the Water Environment[1], Planning Policy Wales (PPW)[2] and Technical Advice Note (TAN) 15[3]. It is to be used to assist the Local Planning Authority (LPA) and Natural Resources Wales (NRW), when considering the flooding issues of the Scheme, as part of a planning application.

1.1.3 This report provides an assessment of the flood risk to the site based upon flood data and the flood maps provided by the NRW and Conwy Local Flood Risk Management Strategy[4].

1.1.4 The references for the key sources of information used to prepare this document are included in the footnotes. Ramboll cannot accept liability for the accuracy or otherwise of any information derived from third party sources.

[1] Highways England (2019), *LA113 – Road Drainage and the Water Environment,* Design Manual for Roads and Bridges, Volume 11
[2] Welsh Government (2018). *Planning Policy Wales*. [online] 10th edn. Gov.Wales. Available at: https://gov.wales/sites/default/files/publications/2019-02/planning-policy-wales-edition-10.pdf [accessed 21/06/2019]
[3] Welsh Assembly Government (2004). *Planning Policy Wales, Technical Advice Note 15: Development and Flood Risk*
[4] Conwy County Borough Council (2013). *Conwy Local Flood Risk Management Strategy. Strategic Environmental Assessment – Environmental Report.* [online] Available at: https://www.conwy.gov.uk/en/Resident/Crime-and-emergencies/Preparing-for-Emergencies/Flooding/documents/Strategic-Environmental-Assessment-Environmental-Report.pdf [accessed 21/06/2019]

2. SITE CONTEXT

2.1 Application Site Description

2.1.1 Junction 15 of the A55 is currently a roundabout with three exits; northeast and southwest to the A55 and south toward Llanfairfechan. The safety improvement Scheme proposes to remove the roundabout so that the A55 dual carriageway is continuous at this location and construct new slip roads to allow traffic to exit to and join from Llanfairfechan.

2.1.2 The Scheme lies in Conwy County Borough. It is located at the base of hills sloping down from the southeast towards the coast. Conwy Bay lies to the north of the Scheme. The Conwy to Holyhead main railway line separates the Scheme from the bay. The site location plan is provided in Figure 7.1 of the Environmental Statement (ES). Further description of the Scheme and its boundaries are given in the ES Chapter 2 The Scheme.

2.1.3 The Scheme extends for approximately 1.5 km along the length of the A55 and incorporates other works to connecting local roads, principally Penmaenmawr Road. The western site boundary ends at the A55 bridge over the Afon Ddu (Llanfairfechan). Construction of drainage, new road infrastructure and earthworks are focused around the Junction 15 area, approximately 0.5 km to the east of the river. No activities that could have an effect on the water environment (such as excavation works) are proposed within the western-most 250 m of the site.

2.2 Site Topography

2.2.1 In this location the A55 runs southeast-northwest parallel with the coast. The A55 and existing Junction 15 was constructed on an embankment, elevating it above the adjacent land. It is likely that the original reason for raising the road on an embankment was to reduce/remove the likelihood of the road being flooded. The adjacent land to the north and south of the A55 is lower and at greater risk of flooding (described in more detail in Section 3).

2.3 Geological Setting

2.3.1 The British Geological Survey (BGS) map of the area (1:50,000 scale map series, Bedrock and Superficial Deposits Edition), accessed via online digital mapping[5], indicates that the solid geology beneath the Scheme comprises mudstones and siltstones of the Nant Ffrancon Subgroup[6] which are Ordovician in age. Below these strata lie further mudstones, siltstones and sandstones of Ordovician and Cambrian age.

2.3.2 The near-surface superficial deposits under the Scheme comprise mainly Devensian till (glacial till)[7] which is Quaternary in age, although storm beach deposits (predominantly gravels) and coastal zone deposits (predominately clay and silt) are located to the north of the Scheme, between A55 and Conwy Bay.

2.3.3 Historical exploratory holes carried out to inform the original design and construction of the A55 indicate that Made Ground is underlain by loose to medium dense sands and gravels. These are underlain in turn by peat, soft clays, layers of boulders, cobbles, gravels and sands and firm to stiff clay, although not all these strata were observed in all boreholes. The stratigraphy identified on the exploratory hole logs is considered to represent the changing depositional systems associated with glaciation, sea level fluctuations and the

[5] British Geological Survey (BGS). (2019) *Geology if Britain Viewer*. [online] Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html [accessed 09/10/2019]

[6] Nant Ffrancon Subgroup-Siltstone comprise sedimentary rocks and are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences

[7] Till, Devensian-Diamicton comprise sedimentary deposits and are glacigenic in origin. They are detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary

dynamic coastal environment. Close to the existing Junction 15 roundabout, the bedrock was observed at a depth of approximately 14 m below (original) ground level and is a moderately to highly weathered mudstone.

2.3.4 The A55 itself is on an embankment constructed of a substantial thickness of engineered fill.

2.4 Hydrological Settings

2.4.1 The A55 runs parallel with the sea at Conwy Bay. At its closest the road is within approximately 30 m of the sea wall.

2.4.2 At the western end of the Scheme boundary the A55 passes over the Afon Ddu (Llanfairfechan). This river flows in a north-westerly direction, discharging into Conwy Bay approximately 230 m northwest of the A55 crossing.

2.5 Hydrogeological Setting

2.5.1 NRW has developed Groundwater Source Protection Zones (SPZs) to assist in the assessment of risk to groundwater supplies taken from an abstraction point. The site does not lie within one of these Groundwater SPZs.

2.5.2 The Ordovician bedrock is classified by BGS[8] as a Secondary B aquifer (low productivity, highly indurated (hardened by heating) rocks with limited groundwater content) with high vulnerability[9].

2.5.3 The superficial deposits beneath the Scheme (the glacial till) are classified by NRW as a Secondary (undifferentiated) aquifer, also of high vulnerability.

2.6 Existing Highway Drainage

2.6.1 It is understood that runoff from the existing A55 within the Scheme boundary drains directly to Conwy Bay via a series of outfalls. There is not believed to be any attenuation of flow rates. Drainage of local connecting roads is also via pipes direct to outfalls in Conwy Bay.

2.6.2 Drainage layout drawings of the area show that the drainage system running along Penmaenmawr Road runs to Shore Road East, then follows Shore Road East under the A55, railway and sea wall to a sea outfall.

2.6.3 Drainage from the base of the existing A55 westbound embankment is also shown to connect to a number of pipes that run under the A55 and railway to sea outfalls. The existing drainage system was constructed with the purpose of draining the existing A55 embankments. Inevitably it also intercepts surface water runoff and overland flow (during flood events). However, it would seem that this system is not able to cope, particularly under larger surface water flood events. At this stage it is not clear whether this is due to lack of capacity or disrepair.

[8] British Geological Survey (BGS). (2019) *Geoindex Onshore*. [online] Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html [accessed 09/10/2019]

[9] Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits

3. FLOOD RISK

3.1 Fluvial Flood Risk and Flood Risk from the Sea

3.1.1 The NRW flood maps identify areas in Wales at risk of flooding by allocating them into flood risk zones. Based on the NRW indicative flood maps available online[10], Figure 7.3 of the ES shows the flood zones in and around the Scheme.

3.1.2 Flood Zones are defined as:

1. Flood Zone 1 - the extent of a flood from rivers or from the sea with less than a 0.1% (1-in-1,000) chance of happening in any given year;
2. Flood Zone 2 - the extent of a flood from rivers or from the sea with up to a 0.1% (1-in-1000) chance of happening in any given year, or contains areas recorded to have flooded in the past; and
3. Flood Zone 3 – the extent of a flood from rivers with a 1% (1-in-100) chance or greater of happening in any given year, or the extent of a flood from the sea with a 0.5% (1-in-200) chance or greater of happening in any given year.

3.1.3 Figure 7.3 shows that the existing A55 and Junction 15 are elevated above the surrounding land and are in Flood Zone 1 (Zone 1 is shown without colour on Figure 7.3).

3.1.4 West of Junction 15 and either side of the A55 embankment (north and south), the land lies within Flood Zone 3, at risk of flooding from the sea. Floodwater from the sea is considered to enter this area south of the A55 via the Shore Road East Underpass. The underpass, which is approximately 70 m west of the existing Junction 15 roundabout, is also within Flood Zone 3. However, coastal flood defences are located to the north of the Scheme (the Llanfairfechan Sea Wall). The area benefitting from these defences is shown hatched on Figure 7.3. NRW state that "Hatched areas benefit from the flood defences shown, in the event of a river flood with a 1 per cent (1-in-100) chance of happening each year, or a flood from the sea with a 0.5% (1-in-200) chance of happening each year. Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions"[11].

3.1.5 Sea levels are rising as a result of climate change. Based on Welsh Government guidance[12] tidal flood levels were calculated[13] for extreme tides occurring in the future year 2120. Tidal flood levels for return period events from 2-year to 1000-year are presented in Table 3-1 for the future year 2120. Tidal flood levels for 2019 are also provided for comparison. The level of protection from tidal flooding provided by the defences will decrease over time.

[10] National Resources Wales (NRW). (2019) *Flood Risk Maps* [online] Available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default [accessed 17/10/2019]

[11] National Resources Wales (NRW). (2019) *Areas Benefiting from Defences*. [online] Available at: https://naturalresources.wales/flooding/managing-flood-risk/flood-risk-map-guidance/areas-benefitting-from-defences/?lang=en [accessed 17/10/2019]

[12] Welsh Government (2016) *Flood Consequence Assessments: Climate Change Allowances*. [online] Available at: https://gov.wales/sites/default/files/publications/2018-11/flood-consequence-assessments.pdf [accessed 17/10/19]

[13] Base extreme sea level values were extracted from the Coastal Flood Boundary Extreme Sea Levels (2018) dataset for offshore point "chainage _1088" which is the closest point to Llanfairfechan.

Table 3-1: Tidal Flood Levels for Llanfairfechan

Year	Event Return Period					
	2-year	10-year	75-year	100-year	200-year	1000-year
2019	4.75	4.94	5.18	5.21	5.29	5.49
2120	5.90	6.09	6.33	6.36	6.44	6.64

All values in m AOD

3.1.6 Figure 7.3 also shows that the residential area to the east of the Afon Ddu (Llanfairfechan) is within Flood Zone 2, at risk of fluvial flooding from the river. Lack of channel capacity and the presence of a number of inadequate structures mean that floodwater could exit the channel between Penmaenmawr Road and the A55, flowing eastward and ponding against the A55 embankment. The area at risk of fluvial flooding overlaps with the area at risk of flooding from the sea. A flood modelling exercise in 2011[14] showed that in a 0.1% fluvial event, Shore Road East would act as a flow route for floodwater, conveying flows to the sea. Note that gaps in the sea defences can be opened in the event of a fluvial flood to allow floodwater to escape.

3.1.7 To the south of the A55 and west of Junction 15 the land where the fluvial flood risk and risk of flooding from the sea overlaps is within the Scheme boundary. In this location it is proposed to widen the existing A55 embankment to carry a new west-bound on-slip. The widened embankment would therefore occupy a volume which is currently available for flood storage. The proposed location and extent of the widened embankment is shown on the Junction 15 Layout Approval Plan (drawing A55J15J16-RAM-XX-15-DR-J-2000).

3.1.8 To determine the volume which would be lost, and therefore the compensation volume required to mitigate the loss, the predicted flood level is required for the 1 in 1000 year event. The exact predicted flood level is unknown for this location so to determine a value the Flood Zone 2 outline was compared with topographic survey data, giving a flood level of 5.9 metres Above Ordnance Datum (mAOD). The Flood Zone 2 outline originates from the 2011 flood modelling exercise[14]. Since 2011, updates to climate change predictions would be likely to increase modelled fluvial flows and thereby flood levels. Following discussion and agreement with NRW, these potential increases were accounted for by including a freeboard (safety margin) of 300 mm, giving a flood level of 6.2 mAOD.

3.1.9 The base of the widened embankment for the west-bound on-slip would sit at a level of 3.8 mAOD and fill upwards. The new slip road, located on top of the new embankment, is at a level of approximately 16 mAOD, well above the flood level of 6.2 mAOD and therefore not at risk of fluvial flooding or flooding from the sea, i.e. there is no risk to the Scheme itself. The slip roads, where they connect onto Penmaenmawr Road are in Flood Zone 1.

3.1.10 Between the embankment base at 3.8 mAOD and the flood level of 6.2 mAOD, the widened embankment would occupy a flood storage volume of approximately 6,500 m^3. To compensate for this would-be loss of volume, it is proposed that an equivalent flood storage volume is made available by the reduction of levels of the school playing field, carpark at the rear of The Heath (former council offices) and part of the rear gardens of the following properties; Heath cottage and No.1 to 7 Penmaen View which are located close by.

3.1.11 For flood storage compensation to be effective, it should be as close to level-for-level as practical. For example, for each 200 mm 'slice' of lost storage an equivalent volume should be made available for flooding

[14] Llanfairfechan Flood Risk Mapping, Environment Agency Wales, March 2011

at the same elevation. Detailed analysis of the lost storage and compensation volumes will be undertaken during the detailed design phase of the Scheme. However, to inform this FCA and determine whether compensation using the school playing field, carpark and rear gardens is feasible, a basic volumetric assessment has been undertaken using the existing and proposed ground models. The results are shown in Table 3-2.

Table 3-2: Flood Compensation Volumes

Slice Base Elevation (m AOD)	Slice Top Elevation (m AOD)	Volume Lost (m^3)	Volume Gained (m^3)	Net +Gain/-Loss (m^3)
6.0	6.2	892	627	-265
5.8	6.0	788	749	-39
5.6	5.8	281	649	+368
5.4	5.6	239	688	+449
5.2	5.4	158	322	+164
5.0	5.2	443	461	+18
4.8	5.0	588	556	-32
4.6	4.8	639	586	-53
4.4	4.6	660	581	-79
4.2	4.4	687	671	-16
4.0	4.2	623	662	+39
3.8	4.0	567	621	+54
Totals		6,565	7,173	**+608**

3.1.12 Table 3-2 shows that the net loss or gain in each slice is between -265 m^3 and +449 m^3 and is approximately level-for-level, with a small net gain of storage volume overall. This demonstrates that the flood storage compensation using the school playing field, carpark and rear gardens is achievable. This meets the requirement in TAN15 Appendix A of no flooding elsewhere.

3.1.13 The area to be lowered to provide flood storage compensation will have a drainage system to prevented the area from being waterlogged in normal conditions.

3.1.14 In summary, while the proposed Scheme itself will not be at risk of fluvial flooding or flooding from the sea, placement of material for widening the embankment would displace floodwater. This can be offset by lowering the ground level of the school playing field, carpark and rear gardens such that there is no overall effect on flood risk.

3.1.15 Provision of compensatory storage may not be the only option for mitigating changes in flood risk in the area. It is recommended that the opportunity is taken at detailed design stage to explore other options to indirectly offset flood risk impacts.

3.2 Surface Water Drainage Flood Risk

3.2.1 The Flood and Water Management Act 2010 defines surface water flooding as flooding that takes place when surface runoff generated by rainwater falls on the surface of the ground and has not yet entered a watercourse, drainage system or public sewer.

3.2.2 The NRW flood risk maps for surface water flooding are provided in Figure 7.4 to Figure 7.6 of the ES. Based on the mapping, some pockets of surface water flooding may be expected on the A55 carriageway during extreme rainfall events. However, the mapping is based only on topography and does not account for the highway drainage system which, if working as designed, would restrict the flooding on the carriageway to the standards required by the Design Manual for Roads and Bridges (DMRB).

3.2.3 To the south of the A55 embankment (both east and west of Junction 15) and within the Scheme boundary, Figure 7.4 to Figure 7.6 show low-lying areas at risk of surface water flooding. The figures indicate a risk of surface water accumulation during extreme rainfall events in low lying areas to the south of the A55. This reflects the topography of the location but does not factor in the presence of existing drainage systems along the base of the A55 embankment which serve to drain these areas – although the current system is overwhelmed during larger rainfall events. The Scheme (with the widened A55 embankment) will construct and maintain a system which adequately deals with most of the extreme surface water flood events. The new drainage system will, as at present, carry water under the A55 via culverts to the existing sea outfalls. The new drainage system will also drain water from the area which will be lowered to provide compensatory flood storage, thereby preventing the area from being waterlogged in normal conditions.

3.2.4 The Scheme would result in a larger area of impermeable road surface than at present. Without mitigation this would lead to an increased rate of surface water runoff which could exacerbate surface water flooding. To prevent this, the Scheme would include attenuation systems to temporarily store runoff and discharge it at a rate no greater than the existing rate. The attenuation systems for achieving this will likely consist of oversize pipes and/or below ground storage or attenuation ponds and would be confirmed at detailed design stage.

3.2.5 With the proposed drainage system and attenuation in place, the Scheme would not lead to an increase in the frequency or extent of surface water flooding.

3.3 Groundwater Flood Risk

3.3.1 Groundwater flooding[15] is not considered by the NRW and Conwy County Borough Council to be a significant issue for the region within and around the Scheme.

3.3.2 An attenuation pond which may be included in the Scheme would be located to the northeast of the junction of Penmaenmawr Road and the west-bound off-slip. Although detailed design will be done at a later stage, the pond base would likely be at ground level or shallow, such that it would be above the groundwater table and therefore not likely to experience groundwater ingress.

3.4 Risk from Reservoirs, Canal and Other Artificial Sources

3.4.1 There are no reservoirs or canals in the vicinity of the site. The NRW indicative mapping database indicates that there is no risk of flooding from reservoirs within the site boundary.

[15] Groundwater flooding, where it occurs, is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Groundwater floods may emerge from either point or diffuse locations. They tend to be long in duration developing over weeks or months and prevailing for days or weeks.

3.4.2 The elevated nature of the A55, i.e. above surrounding ground levels, means that the risk of flooding caused by burst water pipes or blocked foul sewers is very low. Where the Scheme extends to associated work on connecting roads, there is a risk of flooding from such sources, but the risk is considered low and is unlikely to change as a result of the Scheme.

4. JUSTIFICATION TEST

4.0.1 Transport and utilities infrastructure, such as the A55 is classified as 'less vulnerable development' according to TAN15. For less vulnerable development to be permitted in Flood Zone C a 'justification test' must be passed. In a planning context, Flood Zone 2 forms the basis of Zone C in the Welsh Government Development Advice Map.

4.0.2 TAN15 states that, to pass the justification test it must be demonstrated that:

1. The development's location within Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or
2. The development's location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region; and
3. The development concurs with the aims of PPW and meets the definition of previously developed land; and
4. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in Sections 5 and Section 7 and Appendix 1 (of TAN15) found to be acceptable.

4.0.3 As stated in the 2018 A55 Public Consultation document "The key objective for the scheme is to improve access to regional, national and international markets and employment opportunities; in addition to improving resilience and safety and reducing delays both to local traffic as well as people travelling along the A55." Part 1 and Part 2 of the test is therefore considered to be met.

4.0.4 The scheme objectives aligns with the aims of PPW (Part 3), as it supports the policy to create sustainable transport infrastructure, taking into account the needs of users of active and sustainable transport.

4.0.5 For Part 4 of the test, the potential for and consequences of a flooding event have been discussed in this report. The risk of flooding to the Scheme itself is low to zero, depending on the type of flooding considered, due to the elevated nature of the road above the surrounding ground. In terms of flood risk to the surrounding area, the mitigation measures are considered to negate the potential adverse impacts such that there is no change such that, in terms of Part 4 of the justification test, the consequences are acceptable.

5. SUMMARY

5.0.1 The A55 Junction Improvement Scheme is located in Llanfairfechan, Conwy. The Scheme runs parallel with Conwy Bay in this location and is within approximately 30 m of the sea at its closest point.

5.0.2 The A55 and Junction 15 are elevated on embankment above the surrounding ground such that the existing road and junction are at low risk of flooding (Flood Zone 1).

5.0.3 Based on NRW mapping, areas around the junction are within Flood Zones 2 and 3, i.e. at risk of either flooding from the sea or fluvial flooding or a combination of both. Fluvial flooding extends from the west from the Afon Ddu (Llanfairfechan). The potential for flooding from the sea covers an area to the north (seaward) side of the A55, and also an area to the southwest of Junction 15. Floodwater from the sea is considered to enter this area via the Shore Road East Underpass. Sea defences currently offer protection against flooding from the sea up to the 1-in-200 year event. Sea levels are rising as a result of climate change such that the level of protection provided by the defences will decrease over time.

5.0.4 There are areas shown on NRW maps to be at risk of surface water flooding to the south of the A55 embankment.

5.0.5 The Scheme will widen the existing A55 embankment to the southwest of Junction 15 to allow a new west-bound on-slip. At approximately 16 mAOD the on-slip road itself will be above the 1-in-1000 year flood level (approximately 6.2 mAOD) and not at risk of flooding from the sea nor fluvial flooding.

5.0.6 The potential impact of the Scheme on flood risk to surrounding areas has been considered. The widening of the embankment for the new west-bound on-slip requires the placement of material in the flood zone which would potentially displace floodwater elsewhere and exacerbate the frequency or extent of flooding. To mitigate for this, the volume displaced would be compensated by lowering the school playing field, carpark and rear gardens by an equivalent volume on an approximately level-for-level basis. In terms of potential impacts on surface water flooding, new drainage systems at the base of the new on-slip embankment will convey water away from the embankment in the same way that the existing drainage systems currently drain the base of the existing embankment. The new drainage system will also drain water from the area which will be lowered to provide compensatory flood storage, thereby preventing the area from being waterlogged in normal conditions. Attenuation systems for road runoff will also be installed to ensure the discharge rate from the drainage system is no greater than at present.

5.0.7 In terms of flood risk to the surrounding area, the mitigation measures are considered to negate the potential adverse impacts such that there is no change. Provision of compensatory storage may not be the only option for mitigating changes in flood risk in the area. It is recommended that the opportunity is taken at detailed design stage to explore other options to indirectly offset flood risk impacts.

5.0.8 Based on TAN15, the Scheme is classified as 'transport and utilities infrastructure' and is 'less vulnerable development'. Such development in Flood Zone 3/Flood Zone C requires a 'justification test' to be passed. Given the Scheme is promoted by the Welsh Government for improving safety and that mitigation measures negate the potential adverse impacts of the Scheme on flood risk, the consequences are considered to be acceptable and the justification test passed.

APPENDIX 7.3
WATER QUALITY RISK ASSESSMENT

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A55 JUNCTION 15 APPENDIX 7.3 WATER QUALITY RISK ASSESSMENT

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WATER QUALITY RISK ASSESSMENT

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APPENDICES

Appendix A
Groundwater and Spillage Risk Assessment Results

1. INTRODUCTION

1.0.1 Ramboll UK Limited (Ramboll) has been appointed by the Welsh Government ('client') to undertake a Water Quality Risk Assessment for the proposed A55 Junction 15 Scheme (referred to as the 'Scheme').

1.0.2 Following the guidance outlined in the Design Manual for Roads and Bridges (DMRB) LA113 - Road Drainage and the Water Environment[1] an assessment of the impact on water quality has been made in relation to both routine runoff from the proposed Scheme and the risk of potential spillages. The Highways England Water Risk Assessment Tool (HEWRAT) has been used for this purpose. HEWRAT is approved by Welsh Government for use in Wales.

1.0.3 This report outlines the assessment of predicted impacts on the water quality of the waterbodies which receive drainage from the Scheme. This report supports Chapter 7 ('Road Drainage and the Water Environment') of the Environmental Statement (ES) for the Scheme.

1.1 Site Context

1.1.1 A55 Junction 15 is an existing at-grade roundabout located on the A55 North Wales Coast road at Llanfairfechan between Bangor to the west and Conwy to the east (National Grid reference (NGR) 268538 375498). The junction is located to the south of the railway, while on the north side is the foreshore and Llanfairfechan Coastal Promenade. Inland of the A55 are suburban residential areas, with the town centre of Llanfairfechan lying to the west and south of the junction.

1.1.2 The Scheme aims to reduce congestion and delays caused by the existing roundabout by replacing it with a dual carriageway with free-flowing traffic in both directions. A new grade-separated junction would provide movement on and off the A55 to both east and westbound carriageways, utilising an overbridge with a T-junction to the north of the A55 and a priority junction to the south of the existing roundabout.

1.1.3 The Scheme extends for approximately 1.5 km along the length of the A55 and incorporates other works connecting to local roads, principally Penmaenmawr Road. The western site boundary ends at the A55 bridge over the Afon Ddu (Llanfairfechan), however construction of drainage, new road infrastructure and earthworks are focused around the Junction 15 area, approximately 0.5 km to the east of the river. No activities that could have an effect on the water environment (such as excavation works) are proposed within the western-most 250 m of the site.

1.1.4 The site location plan is provided in Figure 7.1 of the Environmental Statement (ES). Further descriptions of the Scheme and its boundaries are given in the ES.

1.1.5 The existing A55 and Junction 15 drain to Conwy Bay via three sea outfalls. The Scheme would discharge surface water runoff via the same three outfalls. The additional impermeable surface area of the Scheme would generate a higher discharge rate than at present if unmitigated. To ensure the flow rate passing through pipes under the railway does not increase the new drainage system would incorporate attenuation systems. Drainage layout drawings for the scheme are issued separately.

[1] Highways England (2019), LA113 – Road Drainage and the Water Environment, Design Manual for Roads and Bridges, Volume 11, Section 3

2. METHODOLOGY

2.1 General

2.1.1 LA113 specifies procedures for the assessment of pollution impacts from both routine runoff and spillages on receiving waters. In order to assess the potential quality of water being discharged from the Scheme a water quality assessment has been completed utilising HEWRAT (the tool referenced by LA113). Further background information on the assessment method and procedures is contained within LA113 and the HEWRAT User Guide (which is opened via HEWRAT).

2.1.2 HEWRAT is designed for application in freshwater rivers and streams so its application to saline waters has limitations. However, there is currently no better alternative.

2.1.3 The process for assessment of spillage risk, and whether the level of risk is acceptable, is applicable to freshwater and saline waterbodies alike.

2.1.4 While neither the existing A55 nor the Scheme includes drainage systems that are designed to discharge to ground, the Scheme may include drainage system components, including attenuation ponds, which are unlined such that road runoff may infiltrate the ground. An assessment of potential impacts on groundwater quality is therefore also included.

2.2 Routine Runoff (Surface Water)

2.2.1 While saltwater Environmental Quality Standards (EQSs) relate to annual average concentrations, aquatic organisms can tolerate higher pollutant concentrations for short periods of time. This is relevant to highway discharges as they are intermittent, occurring only during and for a short time after a rainfall event. As a result, and as a more relevant measure than EQSs, the research which underpins HEWRAT established runoff specific thresholds (RSTs) for 24 hour and 6 hour periods (albeit only for copper and zinc concentrations for freshwater organisms). Concentrations below the RST24 and RST6 thresholds for less than 24 hours and 6 hours respectively are therefore considered acceptable in terms of risk to aquatic ecology. For the assessment of this Scheme, the RST6 value has been used (rather than the RST24) due to the tidal nature of the receiving water body.

2.2.2 In normal use HEWRAT has three steps of assessment:

1) Step 1 - compares end-of-pipe concentrations with RSTs;
2) Step 2 – compares in-river concentrations with RSTs and EQSs after dilution, and determines whether fine sediment would accumulate or disperse; and
3) Step 3 – incorporates mitigation if required and re-compares to the relevant standards.

2.2.3 As discharges from the Scheme are not to a river but to Conwy Bay, the assessment herein will utilise the end-of-pipe concentrations (Step 1). It should be noted that it is not normally expected that end of pipe concentrations would meet the RSTs or EQSs as aquatic organisms would not be expected to be living in the water in the pipe. The HEWRAT assessment considers in Step 2 the available dilution in low-flow conditions and whether the diluted concentrations would meet the RSTs and EQSs. Although HEWRAT Step 2 cannot be applied for discharges to sea, the principle of assessing the available dilution is applied.

2.3 Routine Runoff (Groundwater)

2.3.1 Although the drainage strategy does not rely on discharge to ground, infiltration may occur through unlined drainage components such as attenuation ponds (if ponds are used). An assessment of potential impacts on groundwater/groundwater-receptors is therefore included. This uses the simple assessment matrix provided

in LA113 and HEWRAT. Where the simple assessment returns a 'low' risk then, in accordance with LA113, no further assessment nor mitigation is necessary. Where the assessment returns a 'medium' or 'high' risk, further and proportionate consideration is given to the risk and how it should be addressed.

2.4 Spillage Risk

2.4.1 The spillage risk assessment methodology in LA113 provides the probability of a spillage impacting on the receiving surface waterbody or groundwater body. The probability is the product of two separate risks:

a) The probability that there will be a spillage with the potential to cause a serious pollution incident[2]; and

b) The probability - assuming such a spillage has occurred - that the pollutant will cause a serious pollution incident.

2.4.2 This is assessed on the basis of the likelihood of a road traffic accident occurring and resulting in a spillage. It is calculated by assessing the type of road, road length, presence of junctions and roundabouts, Annual Average Daily Traffic (AADT) and percentage of Heavy Goods Vehicles (HGVs) for the road drainage catchment. If a spillage occurs, the probability of it causing a serious pollution incident is then influenced by the response time of the emergency services and this is factored into the calculation.

2.4.3 LA113 defines the acceptable level of risk as being an annual probability of less than 1 %. Where discharge is into (or in close proximity to) a sensitive area, such as a Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC), the acceptable level of risk is taken to be an annual probability of less than 0.5 %.

[2] In line with LA113, a serious pollution incident is a Category 1 or 2 incident as defined in *Incidents and their classification: the Common Incident Classification Scheme (CICS)*, Operational Instruction 04_01, Environment Agency, 2011

3. INPUT PARAMETERS

3.1 Routine Runoff (Surface Water)

3.1.1 The input parameters required for a HEWRAT Step 1 assessment are summarised in Table 3.1.

Table 3-1: Routine Runoff Input Parameters – Surface Water

Parameter	Value	Notes
Annual Average Daily Traffic (AADT)	<50,000	The two-way AADT flow along the A55 mainline north of J15 is predicted to be 44,107 vehicles in the design year of 2037. Refer to ES Chapter 2 for further details. HEWRAT uses bands with the lowest being <50,000.
Climatic Region	Colder - Wet	Climatic regions shown in HEWRAT Help Guide. A55 J15 Scheme lies within the Colder – Wet region
Rainfall Site	Colwyn Bay	Closest rainfall site available to use in HEWRAT is Colwyn Bay with a standard average annual rainfall (SAAR) of 788 mm. The SAAR for Llanfairfechan is likely higher than this. However, using the lower SAAR value for Colwyn Bay is a conservative approach as it assumes less dilution of road runoff.

3.2 Routine Runoff (Groundwater)

3.2.1 The input parameters required for a LA113 groundwater simple assessment are summarised in Table 3.2. Refer to LA113 Table C.1 for parameter ranges.

Table 3-2: Routine Runoff Input Parameters - Groundwater

Parameter	Value	Notes
Traffic Flow	≤50,000 AADT	The two-way AADT flow along the A55 mainline north of J15 is predicted to be 44,107 vehicles in the design year of 2037. Refer to ES Chapter 2 for further details. LA113 uses bands with the lowest being <50,000.
Rainfall depth (annual average)	≥1060 mm	The precise average annual rainfall for Llanfairfechan is not known but is around 1,000 mm to 1,100 mm. The highest risk band (≥1060 mm) has therefore been selected as a conservative measure.
Drainage area ratio	>50 to <150	At this stage the attenuation ponds, if used at all, have not been designed in detail. Based on the drained area and the likely size of the ponds, the ratio >50 to <150 has been used (medium risk). This is a conservative assumption given that most of the runoff in the attenuation ponds would discharge via pipes to sea and not to ground.
Infiltration method	"Region" shallow infiltration systems, (e.g. infiltration basin)	Although the attenuation ponds are not infiltration basins they are a 'region' type asset.

Parameter	Value	Notes
Unsaturated zone	Depth to water table ≤5 m	Groundwater level monitoring undertaken in 2019 as part of the geotechnical investigation of the Scheme records groundwater level as generally less than 5 m below ground.
Flow type	Dominantly intergranular flow	Near surface superficial deposits comprise mainly Devensian Till – a heterogenous mixture of clay, sand, gravel and boulders. See ES Chapter Geology and Soils for further details.
Unsaturated zone clay content	≥15 % clay minerals	Based on clay content of Devensian Till.
Organic carbon	<15% to >1% soil organic matter	Organic matter percentage in most samples from the geotechnical investigation of the Scheme within the range <15% to >1%.
Unsaturated zone soil pH	pH <8 to >5	pH testing on soil from borehole BH105 gave pH 7.7 at a depth of 1 m. BH105 is close to the location of the attenuation ponds (if they are used).

3.3 Spillage Risk

3.3.1 The input parameters required for a spillage risk assessment are summarised in Table 3.3.

Table 3-3: Spillage Risk Input Parameters

Parameter	Value (A55)	Value (on/off slips and Penmaenmawr Road)	Notes
Water body type	Surface watercourse	Surface watercourse	Choice of surface watercourse or groundwater
Junction Type	No junction, or Slip Road	Side Road	Proximity to different types of junction (roundabout, slip-road etc) affects the risk of traffic collisions.
Length of road (m)	No junction = 550 m Slip road = 600 m	1,830 m	In accordance with LA113, where the rural trunk road is within 100 m of the slip road entrance the junction type is 'slip road' and beyond this 'no junction'.
Spillage Factor	No junction = 0.29 Slip road = 0.83	1.81	Spillage factor determined by junction type and road type. Refer to LA113, Table D.1.
Road Type	A-road	A-road	Choice of A-road or motorway
Urban or Rural	Rural	Urban	Influences risk of spillage. Rural/Urban determined by built up area and speed limit.
Location (response time for emergency services)	< 1 hour	< 1 hour	Choice of <20 minutes, <1 hour or >1 hour.

Parameter	Value (A55)	Value (on/off slips and Penmaenmawr Road)	Notes
Traffic Flow (AADT)	44,107	7,230	Higher (conservative) value used of Penmaenmawr Road and off slip. From predicted traffic flows for the design year of 2037. Refer to ES Chapter 2 for further information.
% Heavy Goods Vehicle (HGV)	8.4 %	4.7 %	From predicted traffic flows for the design year of 2037. Refer to ES Chapter 2 for further information.

3.3.2 The risks for all road types are combined to determine the overall risk.

4. RESULTS AND DISCUSSION

4.1 Routine Runoff (Surface Water)

4.1.1 Using the methods described in Section 2 and the input parameters set out in Section 2, HEWRAT has been used to determine concentrations of dissolved copper and zinc in the routine highway runoff for the Scheme. These are end-of-pipe concentrations, i.e. before any dilution has occurred. The results are given in Table 4.1 along with the comparative RST6 values.

Table 4-1: Routine Runoff Concentrations

Parameter	RST6	Predicted Concentrations			
		Mean	90%ile	95%ile	99%ile
Copper (µg/l)	42	25	46	56	108
Zinc (µg/l)	120	70	144	190	396

4.1.2 The results shown in Table 4.1 indicate that, with respect to both copper and zinc in water, the respective RST6s are met for almost 90 % of rainfall events without factoring in the dilution that would occur upon discharge.

4.1.3 Taking the highest exceedance value from Table 4.1, a dilution of ×3.3 volumes would be required for the zinc concentration to be lower than the RST6 in 99 % of rainfall events. Given the large dilution available in the tidal waters at and around the outfalls, this dilution factor would be achieved at small distance from the outfalls.

4.1.4 For example, a storm lasting 60 minutes with a return period of 5 years in the coastal area of North Wales would have an expected rainfall depth of 17 mm[3]. The total impermeable area of the Scheme is approximately 6 ha, and would be discharged via three outfalls. Assuming each outfall served an area of 2 ha then 17 mm of rainfall would produce 340 m^3 of runoff per outfall. To achieve ×3.3 dilution would require 1,122 m^3 of sea water. Taking a water depth of 1 m (although the depth would vary as the tide rises and falls) this indicates that an appropriate level of dilution would occur within an area of approximately 35 m × 35 m from each respective outfall. It should also be noted that the 340 m^3 of runoff is not discharged all at once but over a period longer than the 60 minute storm and that during this period tides, currents and wave action would be likely to increase the rate of dilution and dispersion.

4.1.5 Whether 1,122 m^3 is an acceptably small volume within which contaminant concentrations would be in excess of the RST6 is subjective. However, the example above is very conservative in that it considers the dilution volume required when two rare events occur simultaneously, namely runoff concentrations at their 99 %ile *during* a large and rare rainfall event (60 minute storm with a return period of 5 years).

4.1.6 In conventional use for flowing watercourses, HEWRAT determines whether fine sediments in the road runoff are likely to accumulate or disperse. Where sediments accumulate there can be associated water quality risks from sediment-bound pollutants including copper, zinc and poly-aromatic hydrocarbons (PAHs). The low-flow rate of the watercourse and the channel dimensions are key parameters used to determine whether fine sediment is likely to accumulate or disperse (and thereby whether the risk is acceptable or not). Given that the runoff from the Scheme would discharge to the sea, it is not possible to use HEWRAT to determine whether sediments accumulate or disperse. However, by its nature, the coastal environment where runoff would discharge is dynamic and subject to currents, waves and tides which would disperse fine sediments

[3] Centre for Ecology and Hydrology, *Flood Estimation Handbook*, 2013

such that they would not be sufficiently concentrated to be toxic to aquatic organisms living in or near bed sediments.

4.1.7 In considering whether the potential impact on water quality from routine runoff from the Scheme would be acceptable or and/or significant, it is also relevant that the existing A55 and Junction 15 already discharge to Conwy Bay via the same outfalls.

4.1.8 Taking all of the above into account, the impact of routine runoff on the water environment of Conwy Bay is considered to be negligible both from dissolved and sediment-bound contaminants.

4.2 Routine Runoff (Groundwater)

4.2.1 Using the methods described in Section 2 and the input parameters set out in Section 3, HEWRAT has been used to determine the risk score and screening level for groundwater quality.

4.2.2 In accordance with LA113 risk scores and screening level are banded as follows:

- <150 = low risk
- 150 to 250 = medium risk
- >250 = high risk

4.2.3 The assessment results are shown in Appendix A – as direct output from HEWRAT. The risk score is 195, giving a screening level risk of medium.

4.2.4 A result of medium requires further consideration. There are a number of factors which specifically influence the risk to groundwater quality at the Scheme which are not considered in the generic HEWRAT assessment. These are considered below.

4.2.5 The HEWRAT assessment assumes that the drainage system is designed to infiltrate road runoff into the ground. However, the drainage strategy is designed to discharge to surface water (the sea) but, through unlined components which may include attenuation ponds, some runoff may infiltrate into the ground. The great majority of runoff would discharge to the sea. Any potential impact of runoff on groundwater quality is thereby greatly reduced.

4.2.6 Further information on the hydrogeology of the site is provided in ES Chapter 6. In summary:

1) The site is not located in a groundwater abstraction source protection zone (SPZ);
2) The aquifers below the Scheme are designated as secondary;
3) The British Geological Survey website does not show any records of water wells within 500 m; and
4) The Envirocheck Report does not contain any records of groundwater abstractions within 500 m of the Scheme area.

4.2.7 The proximity of the Scheme to the coast is also likely to mean that groundwater is in hydraulic continuity with the sea such that any sizeable future groundwater abstraction is unlikely to occur, and should it do so it would be likely to be subject to saline intrusion.

4.2.8 Given these additional, site-specific, factors, it is considered that the risk of impacting groundwater and any receptors that might rely upon groundwater, is negligible.

4.3 Spillage Risk

4.3.1 Using the methods described in Section 2 and the input parameters set out in Section 3, HEWRAT has been used to determine the likely annual probability for a spillage which results in a serious pollution incident.

4.3.2 In accordance with LA113, for discharges to a sensitive area such as Conwy Bay[4], the risk of a serious pollution incident is deemed acceptable if the annual probability is less than 0.5 % (1 in 200 years).

4.3.3 The assessment results are shown in Appendix A – as direct output from HEWRAT.

4.3.4 The assessment concludes that the annual probability of a spillage that could cause a serious pollution incident has a return period of 0.078 % (1 in 1282 years), i.e. much less than 0.5 % and therefore acceptable without pollution control measures.

4.3.5 It is noted that of the various road types (slip road, roundabout, side road, no junction etc) roundabouts are associated with the highest rate of serious spillages with, for example, a rate more than ×3 greater than slip roads. Further details are given in LA113, Table D.1. Removal of the existing Junction 15 roundabout would therefore decrease the risk of spillage and thus provide betterment in that respect.

4.3.6 Taking the above into account, the likelihood of a serious pollution incident resulting from a spillage on the Scheme is considered to be acceptably low and would be lower than the existing situation.

[4] Within Conwy Bay are areas designated at a European level for their habitat quality including Lavan Sands Special Protection Area (SPA), Liverpool Bay SPA and the Menai Strait and Conwy Bay Special Area of Conservation (SAC).

5. SUMMARY

5.0.1 The A55 Junction Improvement Scheme is located in Llanfairfechan, Conwy. The Scheme runs parallel with Conwy Bay in this location and is within approximately 30 m of the sea at its closest point.

5.0.2 Drainage from the existing A55 and Junction 15 already discharges to the sea. Rainfall runoff from the Scheme would drain to the sea via the same three outfalls.

5.0.3 Assessments have been undertaken to determine the risk to water quality from routine runoff and the likelihood of a spillage and subsequent pollution incident. The assessments have been carried out in accordance with LA113 of the DMRB. Given the discharge is to the sea, rather than a freshwater watercourse, the LA113 assessment method has been adapted as described above.

5.0.4 It is normal for runoff from trunk roads to rely on a degree of dilution and dispersal in the receiving waterbody to achieve acceptable concentrations. Routine runoff from the Scheme requires only a small volume of seawater to dilute dissolved contaminants to concentrations below the thresholds given in LA113. The coastal environment at the outfalls is dynamic and subject to currents, waves and tides which would disperse sediments.

5.0.5 While the drainage strategy is to discharge road runoff to the sea, elements of the drainage system may be unlined and give rise to the potential for runoff to infiltrate into the ground. An assessment was made of the potential impact on groundwater quality. Although the HEWRAT assessment returned a medium risk result, after consideration of further site specific factors, it was concluded that the impact would be negligible.

5.0.6 5For sensitive receiving waters such as Conwy Bay, a spillage risk less than 0.5 % is acceptable. For the Scheme, the return period for a spillage which results in a serious pollution incident was calculated to be 0.078 % and therefore well within the acceptable threshold such that no pollution control measures would be required. Roundabouts are generally associated with a higher risk of accidents (and therefore spillages) than slip roads such that replacement of the existing Junction 15 roundabout with slip roads would reduce the risk of spillage.

5.0.7 It is concluded that the impact of the Scheme on the water environment of Conwy Bay would be negligible.

APPENDIX A
GROUNDWATER AND SPILLAGE RISK ASSESSMENT RESULTS

Groundwater Risk Assessment Results

Component Number		Weighting Factor	Property or Parameter	Risk Score	Component score	Weighted component score
1	SOURCE	10	Traffic flow	<=50,000 AADT	1	10
2		10	Rainfall depth (annual averages)	>=1060 mm rainfall	3	30
3		10	Drainage area ratio	>50 to <150	2	20
4	PATHWAY	15	Infiltration method	"Region", shallow infiltration systems (e.g. infiltration basin)	2	30
5		20	Unsaturated zone	Depth to water table <=5 m	3	60
6		20	Flow type (Incorporates flow type an effective grain size)	Dominantly intergranular flow (e.g. non-fractured consolidated deposits or unconsolidated deposits of fine-medium sand or finer)	1	20
7		5	Unsaturated Zone Clay Content	>=15% clay minerals	1	5
8		5	Organic Carbon	<15% to >1% SOM	2	10
9		5	Unsaturated zone soil pH	pH <8 to >5	2	10

TOTAL SCORE	**195**
RISK SCREENING LEVEL	**Medium**

Spillage Risk Assessment Results

	Method D - assessment of risk from accidental spillage		Additional columns for use if other roads drain to the same outfall							
		A (main road)	B	C	D	E	F		
D1	Water body type	Surface watercourse	Surface watercourse	Surface watercourse					
D2	Length of road draining to outfall *(m)*	550	600	1,830					
D3	Road Type *(A-road or Motorway)*	A	A	A					
D4	If A road, is site urban or rural?	Rural	Rural	Urban					
D5	Junction type	No junction	Slip road	Side road					
D6	Location (response time for emergency services)	< 1 hour	< 1 hour	< 1 hour					
D7	Traffic flow (AADT two way)	44,107	44,107	7,230					
D8	% HGV	8.4	8.4	4.7					
D8	Spillage factor *(no/10^9 HGVkm/year)*	0.29	0.83	1.81	1				
D9	Risk of accidental spillage	0.00022	0.00067	0.00041	0.00000	0.00000	0.00000		
D10	Probability factor	0.60	0.60	0.60					
D11	Risk of pollution incident	0.00013	0.00040	0.00025	0.00000	0.00000	0.00000		
D12	Is risk greater than 0.01?	**No**	**No**	**No**				**Totals**	**Return Period (years)**
D13	Return period without pollution reduction measures	0.00013	0.00040	0.00025	0.00000	0.00000	0.00000	0.0008	1282
D14	Existing measures factor	1	1	1	1				
D15	Return period with existing pollution reduction measures	0.00013	0.00040	0.00025	0.00000	0.00000	0.00000	0.0008	1282
D16	Proposed measures factor	1	1	1	0.6				
D17	Residual with proposed Pollution reduction measures	0.00013	0.00040	0.00025	0.00000	0.00000	0.00000	0.0008	1282

ES Chapter 8 Appendices	
8.1	Bat Activity Survey Report
8.2	Wintering Bird Survey Report

APPENDIX 8.1
BAT ACTIVITY SURVEY REPORT

RICHARDS MOOREHEAD & LAING LTD

PLANNING | LANDSCAPE | ENVIRONMENT

A55 Junctions 15 and 16 Improvements

Bat Activity Survey Report for Junction 15

for

WELSH GOVERNMENT

October 2019

3066

RML

R I C H A R D S

M O O R E H E A D & L A I N G L T D

P L A N N I N G | L A N D S C A P E | E N V I R O N M E N T

A55 JUNCTIONS 15 and 16 Improvements

Bat Activity Survey Report for Junction 15

for

WELSH GOVERNMENT

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1 INTRODUCTION

1.1 Background

1.1.1 Richard Moorehead & Laing Ltd (RML) were commissioned to undertake bat activity and roost surveys to inform the A55 Junctions 15 and 16 road improvement Scheme. This report sets out the methods and results of the surveys undertaken for the J15 Scheme.

1.1.2 The Scheme proposals are to remove the existing roundabout to provide a dual carriageway with free-flowing traffic in both directions. A new grade-separated junction would provide movement on and off the A55 to both east and westbound carriageways, utilising an overbridge with a T-junction to the north of the A55 and a priority junction to the south of the existing roundabout. The slip roads on the north would rise on a viaduct to meet an overbridge across the A55. Changes would also affect Penmaenmawr Road and the link road to the existing Junction 15.

1.2 Legislation and Planning Policy

1.2.1 Bats and their roosts are protected under the Conservation of Species and Habitats Regulations 2017 and the Wildlife and Countryside Act 1981 (as amended). In summary, it is an offence to:

- Deliberately capture, injure or kill a bat
- Deliberately disturb a bat, including in particular any disturbance which is likely:
    1. to impair bats' ability to survive, to breed or reproduce, or to rear or nurture their young, or;
    2. in the case of hibernating or migratory species, to impair their ability to hibernate or migrate, or
    3. to affect significantly the local distribution or abundance of the species to which they belong

- Deliberately takes or destroy the offspring of bats
- Damage or destroy a breeding site or resting place of a bat
- Possess, control, transport, exchange or sell a bat or parts of a bat, alive or dead.

The legislation applies to all life stages of this species.

1.2.2 The Environment (Wales) Act introduces a new, enhanced Biodiversity and Resilience of Ecosystem Duty on public bodies to ensure that biodiversity is an integral part of decision making. Public authorities will be required to report on the actions they are taking to improve biodiversity and promote ecosystem resilience. The resilience of ecosystems is the main driver for Biodiversity Net Gain (BNG) in Wales.

1.2.3 Section 6 of the Act places a duty on public authorities to seek to maintain and enhance biological diversity (referred to as biodiversity). All public bodies, statutory undertakers, Ministers of the Crown and other public office holders are required to apply the duty when they are carrying on any functions in Wales, or in relation to Wales.

1.2.4 Section 7 of the Act places a duty on the Welsh Ministers to publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. The following bat species are listed on Section 7 of the Act:

- Barbastelle bat *Barbastella barbastellus*
- Bechstein's bat *Myotis bechsteinii*
- Noctule *Nyctalus noctula*
- Common Pipistrelle *Pipistrellus*
- Soprano Pipistrelle *Pipistrellus pygmaeus*
- Brown long-eared bat *Plecotus auritus*
- Greater horseshoe bat *Rhinolophus ferrumequinum*

- Lesser horseshoe bat *Rhinolophus hipposideros*

1.3 Aims of the Study

The aims of the study are listed below:

- to determine the potential of structures which may be affected by the Scheme to support bats
- to determine the use of the Scheme area by bats

1.4 Survey Area Description

1.4.1 The survey area included all habitat to be affected by the Scheme with particular focus on boundary features, trees and structures.

1.4.2 Junction 15 itself comprises a relatively small roundabout with a grass mound. This junction provides access on and off the A55 to and from Penmaenmawr Road which heads south west to the town of Llanfairfechan. The section of the A55 within the survey area is part raised on an embankment, and crosses two roads, Shore Road East and Station road via two concrete bridges. Running parallel to the northern edge of the A55 is the Holyhead to Chester railway line.

1.4.3 To the south west and east of Junction 15 are roads, residential and business properties associated with the town of Llanfairfechan. South of Junction 15 are open pasture fields and Penmaen Park. North west of Junction 15 is Llanfairfechan promenade with associated areas of amenity grassland and areas for outdoor recreation. To the north and north east is the North Sea and coastline.

1.4.4 The location and extent of habitats present are shown on Figure 8.3, which is available in Volume 2 of the Environmental Statement.

2. SURVEY METHODS

2.1 Personnel and Quality Assurance

All surveys were carried out in accordance with current best practice guidelines unless sated otherwise under the supervision of senior staff and appropriately licensed and/or experienced ecologists. The survey was led by Donna Hall (79592a:OTH:CSAB:2018) and assisted by Louise Henry, Tim Yardley (accredited agent), Matt Moss, Robert Jones, Bev Plummer (79592A:OTH:CSAB:2018), Hal Shepherd, Rhodri Edwards, Amy Palmer, Claudia Smith.

2.2 Desk Study and Consultations

2.2.1 The North Wales Environmental Information Service (Cofnod) was contacted in September 2017 and was updated in July 2019 to obtain the following ecological data:

- Information on statutory designated sites within distances of 30.0 km for Special Area of Conservation (SAC) designated for bats;
- Details of any statutory and non-statutory nature conservation designations which could support bats within 2 km of the site; and
- Records of any bat species within 2 km of the site recorded within the last 10 years.

2.2.2 Survey data from previous surveys which were carried out as part of the early Scheme options were reviewed. These were:

- TACP (October 2015) A55 Junctions 15 and 16 Improvements Ecological Statement
- Atkins (January 2009) A55 Junctions 15 & 16 Study Environmental Report

2.2.3 Natural Resources Wales (NRW) and the County Council Ecologist have been engaged in discussions over the methods and extent of ecological surveys (13th June 2018).

2.3 Preliminary Roost Assessment

2.3.1 A detailed external and internal assessment (where access was possible and permissible) was carried out to any structures which would be affected by the Scheme.

2.3.2 This involved checking for direct evidence of bats and field signs such as droppings on rafters etc and staining, as well as identifying any potential access points into the structure/tree which could be used by bats. Surveyors were equipped with ladders, high powered torch and endoscope. Each structure and surrounding habitat was then categorised as per the criteria within the Bat Conservation Trust (BCT) survey guidelines as summarised in Table 1.

Table 1. Assessment of Potential Roost Features and Habitat

Suitability	Description of roosting habitat	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats	Lack of vegetation and foraging habitat within vicinity of the site and no connections to semi-natural habitats. Site located in a highly urbanised environment.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. No visible features within tree structure such as crevices, holes in trunk, hazard beam splits. However, it may have ivy cladding and hidden features due to the size and age of the tree.	Small amount of isolated habitat on site providing a potential foraging resource i.e. a single tree or a patch of introduced shrub. Maybe linked to small amount of adjacent semi-natural habitat surrounding site, however there are no distinct links to habitat further away.
Moderate	A structure or tree with one or more potential roost features that could be used by a larger number	Suitable continuous habitat with good connectivity to the wider landscape such as

Suitability	Description of roosting habitat	Commuting and foraging habitats
	of bats but unlikely to support a roost of high conservation concern.	trees, scrub, hedgerow, grassland.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and offers more long term security and likely to support a roost of high conservation concern.	Site is close and connected to known roosts. The site habitat is of high quality for foraging bats and includes features such as woodland, tree lined water courses, field margins and hedgerows. The site is well connected within the landscape to surrounding habitats and strong linear features such as hedgerows and tree lines extend from the site to the wider landscape.
Confirmed	Presence of field signs indicative of a bat roost including staining and scratch marks around a potential roost entry point combined with the following; urine staining, droppings clustered beneath a potential roosting feature and the presence of live or dead bats.	N/A

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2.4 Bat Activity Survey - Transects

2.4.1 Bat activity surveys were conducted which included five transect surveys between June 2018 - September 2018 (inclusive) and three transects conducted between May – September 2019 (to land not accessible during the surveys conducted in 2018). The survey effort was based on the habitat being of low suitability (due to the Schemes largely urban nature, following best practice guidance (Table 8.3 BCT 2016) this involves one survey visit per season (Spring – April/May, summer – June/July/August, autumn – September/October). Each transect route was initially scoped during daylight hours.

2.4.2 Dusk surveys commenced on or just before sunset and continued up to 2hrs after sunset (dependent upon length of transect route). Pre - dawn surveys commenced 1.5 – 2hrs before sunrise to on or just after sunrise. The transects were walked slowly by the surveyors using visual observations and recordings from bat detectors (Anabat walkabout and bat box duet) to identify bat activity and species.

2.4.3 Surveyors stopped for five minutes at locations along the route so as to gain additional information at 'high risk' locations, i.e. those where suitable habitats would be affected. All surveys were conducted in suitable weather conditions.

2.4.4 The bat transect routes are shown on Figures 8.4 and 8.5, which are provided in Volume 2 of the Environmental Statement. Survey dates are provided in Table 2 (2018) and Table 3 (2019).

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Table 2. Transect route survey dates 2018

Survey number	Month	Date	Dusk/pre-dawn
1	June	14/06/2018	Dusk
2	June	28/06/2018	Dusk (reversed)
3	July	24/07/2018	Dawn
4	August	07/08/2018	Dusk (reversed)
5	September	04/09/2018	Dusk

Table 3. Transect route survey dates 2019

Survey number	Month	Date	Dusk/pre-dawn
1	May	23/05/2019	Dusk
2	August	20/08/2019	Dusk (reversed)
3	September	19/09/2019	Dusk

2.4.5 During the surveys, the following details were noted:

- Weather and temperature
- Time bat detected/seen
- Frequency (kHz) at which the bat was detected
- Location within the survey area
- Direction of flight
- Species of bat
- Number of bats present
- Whether the bats appeared to be foraging or commuting

2.5 **Emergence / Return to Roost**

2.5.1 Emergence and return to roost surveys were conducted at properties which may be demolished. Those properties surveyed are detailed in Table 4 and shown on Figure 8.4, Volume 2 of the Environmental Statement. Surveyors were positioned so as to gain adequate coverage of the buildings and potential emergence points.

2.5.2 This included two surveys at the Heath (moderate potential), one dusk survey conducted on the 31st July 2018 and one dawn conducted on the 14th August 2018, an internal inspection was also conducted to the Heath building on the 3rd September 2018, static detectors were deployed in the roof void and left in situ for one week. Surveys were conducted as per the BCT guidelines (Tables 7.1 and 7.3) which state that, as a minimum, for buildings with moderate potential two surveys are required, one dusk, one dawn between the months of May to September with at least one of these conducted between May – August.

2.5.2 An emergence survey was conducted to the flats (low potential) which may be demolished located on Penmaenmawr Rd on the 17th July 2018. These properties would not be affected by the current Scheme proposals. Surveys were conducted as per the BCT guidelines (Tables 7.1 and 7.3) which state that, as a minimum, for buildings with low potential, one survey is required (dusk or dawn) between the months of May – August.

2.5.3 Two emergence surveys were conducted at the two properties beside Shore Road East. These would be demolished in order to make way for the current route option. The surveys were conducted between July – September. An internal inspection was also conducted, and static detectors were deployed in the roof voids. Initially these buildings were categorised as having low suitability for bats. However, a bat was seen to emerge during the first survey as such further surveys were conducted. Based on guidelines produced by BCT Table 7.3), three surveys are required, one of which should be a dawn survey. However, the residents were concerned by surveyors outside the property, as such, no further surveys were conducted. It is felt that the

two surveys conducted and also the deployment of the statics provides enough information on which to base the assessment of effects.

2.5.4 No emergence return to roost surveys were conducted to any trees with bat roost potential as the initial Scheme proposals did not affect any trees. However, recent design revisions show that additional land take may be required which may affect trees within the field to the south of Penmaenmawr Road. If affected, these trees would need to be re-assessed, and further surveys undertaken if necessary.

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Table 4. Properties subject to dusk and dawn surveys 2018 and 2019

Property Name	Location	Date	Dusk/dawn	Number of surveyors	Equipment
Flats at 1 – 4 St Brendas	Located to the east of Junction 15	17th July 2018	Dusk	4	Anabat walkabout x 2 Bat box duet Petterson D240
The Heath Council Buildings	Located to the west of Junction 15	31st July 2018	Dusk	8	Anabat walkabout x 2 Anabat Express x 3 Bat box duet x 2 / Magenta x 1 Echo meter Touch
		14th August 2018	Dawn	8	
8 and 9 Penmaen View, Penmaenmawr Rd	Located to the east of Shore Road East.	29th July 2019	Dusk	4	Anabat walkabout x 2 Bat box duet Anabat Express
		15th August 2019	Dusk	4	Anabat walkabout x 2 Bat box duet Anabat Express

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2.5.2 During the surveys, the following details were noted:

- Weather and temperature
- Time bat detected/seen
- Frequency (kHz) at which the bat was detected
- Whether the bat emerged/returned to roost and location
- Direction of flight
- Species of bat
- Number of bats present

2.6 Static Detectors

2.6.1 Where practical, static detectors (Anabat Swift) were deployed at suitable locations across the scheme area, with a focus on those areas where potential impacts are greatest based professional judgement and accessibility.

2.6.2 Static detectors were also deployed within the properties listed in Table 4 with the exception of the Flats at 1 – 4 St Brendas, where access was not permitted, these buildings are now being retained.

2.6.3 The detectors were set to automatically start recording at dusk until dawn. The locations of the statics and dates set are provided in Table 5. Locations of the static detectors deployed during the transects are also provided on Figures 8.4 and 8.5 in Volume 2 of the Environmental Statement. The arrow on the figures represents the direction that the microphone was facing.

2.6.4 Generally, the habitat within the Scheme area is considered to be of low value based on the guidance provided in Table 1. Following guidance as set out within the BCT Guidelines (Table 8.3) static detector deployment used in conjunction with transect surveys should be conducted at one location per transect with data to be collected over five nights per season (spring-April/May, summer – June/July/August

and autumn – September/October). For the 2018 surveys, due to access constraints, the spring surveys season was missed. This was supplemented by three surveys conducted over the summer period, in June, July and August.

Table 5. Locations of statics and dates set 2018 and 2019.

Ref / Location	Date set	Date retrieved
ST1 / North of Junction 15 on tree within woodland plantation	19th June 2018	24th June 2018
	12th August 2018	18th August 2018
	24th September 2018	1st October 2018
ST2 / South of Junction 15 on tree within woodland plantation facing towards the roundabout	17th July 2018	23rd July 2018
ST1 / in the field to the south of Penmaenmawr Rd on a tree directed along tree line	23rd July 2019	29th July 2019
ST2 / in the same field on a tree directed along a hedge	2nd September 2019	9th September 2019
NB: another date will be added in October		
The Heath Council Building two statics located within the roof of the western block.	3rd September 2018	11th September 2018
8 Penmaen View, Penmaenmawr Rd, within loft	14th August 2019	19th August 2019
9 Penmaen View, Penmaenmawr Rd, within loft	14th August 2019	19th August 2019

2.7 Data Analysis

2.7.1 After completion of each survey session and static detector recordings, digital bat recordings were analysed using Anabat Insight analysis software to confirm species identification. All the recordings were analysed using the 'BatClassify' Auto ID Plugin

with an ID Tag Certainty Threshold of 60% match. Any obvious noise files were selected and removed to a separate folder. After running the analysis program, each recording was then audited and assessed following guidance as set out In Russ 2012 and Middleton et al (2014).

2.8 Survey Limitations

2.8.1 During survey conducted in 2018, access was only permitted within publicly accessible locations for the majority of the initial transect surveys. However, as the Scheme progressed, land access was obtained and repeat, or additional surveys were carried out to ensure adequate coverage. The main area subject to surveys in 2019 was the field to the south of Penmaenmawr Rd.

2.8.2 Locations for the deployment of statics was constrained by access and the potential for theft or interference from locals.

2.8.3 No access was possible along the entire length of the plantation woodland which runs adjacent to south of the A55, however a stopping point was included so as to gain an idea of use by bats along this habitat (stopping point 1 as shown on Figure 8.4, Volume 2 of the Environmental Statement).

2.8.4 Due to late access provisions in 2018, surveys were not conducted within April/May. However, two transect surveys were conducted in June and static deployment was supplemented by three surveys conducted over the summer period, in June, July and August. It is unlikely that species encountered, or numbers would alter the assessment of effects upon bats.

2.8.5 No emergence or return to roost surveys were conducted to any trees with bat roost potential as the initial Scheme proposals did not affect any trees. However, recent design revisions show that additional land take may be required which may affect trees within the field to the south of Penmaenmawr Road. If affected, these trees would need to be re-assessed, and further surveys undertaken if necessary.

2.8.6 The time during the evening that the transect routes are surveyed will inevitably lead to a bias in relation to the time at which surveyors are positioned in the

transect and the bats that are recorded. To limit this bias, the starting point of the transect survey was alternated on each survey round.

2.8.7 Some of the transect routes were fairly small (i.e. one field) as such surveys were not conducted for the recommended guidelines of 2-3hrs. However, smaller transects were walked twice during the survey and were also supplemented with the deployment of statics. Professional judgement was used as to what was proportional in order to gain an understanding of how bats utilise the landscape, including likelihood of species, species numbers and potential effect from the Scheme.

2.8.8 No return to roost (dawn) survey was conducted to the properties 8 and 9 Penmaen View, Penmaenmawr Rd, which would be demolished, so as not to disturb the residents.

2.8.9 No survey has been conducted during the hibernation period due to the accessibility of structures. However, it is possible that all of the structures could be used by bats for hibernating, namely pipistrelle bats.

2.8.10 Access to the roof voids in the Heath was restricted due to no access hatch and the presence of wasp nests. However, these buildings will no longer be demolished as part of the Scheme proposals.

2.8.11 Due to the height and complexity of the roof structure of the Heath, not all roof aspects were visible.

3. RESULTS

3.1 Desk Study

3.1.1 Three Special Areas of Conservation (SACs) where bats are a feature interest are located within 30 km of the Scheme. These are:

- Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC, located 20.0 km due south
- Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC located 21.5 km due south, and
- Glynllifon SAC located 28.5 km due west

3.1.2 The Lesser horseshoe bat *Rhinolophus hipposideros* is a feature of all of these sites.

3.1.3 There are two Sites of Special Scientific Interest (SSSI) within 2km, these are:

- Traeth Lafan SSSI, located adjacent to the site and
- Sychnant Pass SSSI located 1.4 km due east

3.1.4 Two Local Nature Reserves (LNR) are present within 2km, these are Nant-y-Coed LNR, and Traeth Lafan LNR. The closest of these is Traeth Lafan LNR which is located 50 m due north and is a component of SSSI.

3.1.5 Sixteen Candidate Local Wildlife Sites (LWS) are present within 2 km of the survey area, the closes of which is Penmaenmawr Old Quarry located 270 m east.

3.1.6 There are thirty six Ancient Semi-natural woodland sites, including Restored Ancient Woodland and Plantation on Ancient Woodland within 2 km of the survey area. The closest of which are located approximately 200 m from the Scheme, to the south of Penmaen Park. None of these would be affected by the Schemes proposals.

3.1.7 A number of bats including brown-long eared *Plecotus auritus*, lesser horseshoe, soprano and common pipistrelle *Pipistrellus pygmaeus* and *P. pipistrellus* have been recorded roosting within 2 km of the survey area. The nearest roost is located within 400m with evidence of pipistrelle and lesser horseshoe bat species.

3.1.8 Species records are provided in Table 6.

Table 6. Records within 2km within the last 10 years

Species	Distance from Scheme (m)	Type of record
Pipistrellus Bat Species	0	Bat activity
Common Pipistrelle	28	Foraging
Unknown Bat	212	Roost
Brown Long-eared Bat	341	Potential roost
Myotis Bat Species	368	Bat activity
Soprano Pipistrelle	368	Roost
Lesser Horseshoe Bat	368	Roost
Pipistrellus Bat Species	400	Droppings
Common Pipistrelle	400	Roost
Brown Long-eared Bat	400	Droppings
Lesser Horseshoe Bat	400	Roost
Noctule Bat	797	Foraging
Common Pipistrelle	797	Foraging
Soprano Pipistrelle	797	Foraging
Pipistrellus Bat Species	806	Roost
Common Pipistrelle	1322	Bat activity
Soprano Pipistrelle	1322	Foraging
Daubenton's Bat	1331	Foraging
Noctule Bat	1331	Foraging
Common Pipistrelle	1331	Foraging

Species	Distance from Scheme (m)	Type of record
Soprano Pipistrelle	1331	Foraging

3.2 Previous reports

3.2.1 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015. Their report states that in general, the surveyed area is of local ecological value for roosting and foraging bats. The report by Atkins in 2009 stated that further surveys were required to inform the development of the Scheme.

3.3 Preliminary Roost Assessment

3.3.1 Table 7 details the results of the preliminary roost assessment.

3.3.2 The trees located within the field to the north east of Penmaen Park (Target Note 1 on Figure 8.3, Volume 2 of the Environmental Statement) were found to have low – moderate potential to support bat roosts.

3.3.3 The underpass located on Shore Road East was inspected from the ground and is considered to have negligible potential for roosting bats.

Table 7. Preliminary Roost Assessment

Building Reference / Name	Potential suitability	Potential roost features	Comment
Flats at 1 – 4 St Brendas	**Low.** Building converted into flats which extend into the roof (Velux windows present), rendered walls with cobbling along the roof. Roof is tiled with slate. Limiting factors to roost potential include location adjacent to main road, street lighting (lux level of 24.4) limited connecting habitat.	Slipped and missing tiles, gaps around dormer windows, gaps in brick corbelling. Gaps under lead flashing and around chimney.	No internal inspection carried out as no access. This building will not be demolished under the current Scheme proposals.
The Heath Council Buildings	**Moderate.** The building is large with a complex roof structure. Access internally was limited. The roof voids were of a trussed rafter construction with no sarking/roof felt but were backed with lime mortar and sprayed with an insulating foam spray. A large Jackdaw nest was located within the roof void at the western section of the building, where the static detectors were positioned.	In general, the building is in a good state of repair. Slipped and missing tiles, gaps under lead flashing and around chimney, gaps around dormer windows and gaps in brickwork.	This building will not be demolished under the current Scheme proposals.

Building Reference / Name	Potential suitability	Potential roost features	Comment
	No evidence of bats were noted during the inspections.		
8 and 9 Penmaen View, Penmaenmawr Rd	**Confirmed** Two three storey houses with pitched slate roofs of rendered brick construction. Both roof voids are of a trussed rafter construction the tiles are backed with a bitumastic roof felt. The roofs are used for storage and contained loft insulation. No evidence of bats were noted during the inspections.	Under barge boards, slipped tiles, gaps under ridge tiles, gaps under lead flashing	These buildings would be demolished. **A single pipistrelle bat was seen to emerge from the back of the property and head due north over the trees during each emergence survey**.

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3.4 Bat Activity Surveys – Transects

3.4.1 Three species of bat were recorded during the transects conducted in 2018 (within the wider Scheme area) and four in 2019 (to areas where access was not available in 2018). These are Common and soprano pipistrelle and noctule *Nyctalus noctula* and whiskered/brandts *Myotis brandtii/Myotis mystacinus* in 2019. The majority of activity was recorded along the southern boundary of the field to the south of Penmaenmawr Rd, along the Afon Ddu / Llanfairfechan and concentrated around the group of trees within the field, mainly recorded at each of the stopping points. The most active month in 2018 was August with a higher number of recordings whilst May and September were more productive during the surveys in 2019.

3.4.2 The results of the transect survey provided in Tables 8 and 9.

Table 8. Transect survey results 2018

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
14/06/2018	Start: 21:45 Finish: 23:35 Sunset: 21:44	Junction 15 Survey 1	10% cloud cover. Average relative humidity 52%. Average temperature 18.2 °C.	22:04 – Ppip, along Afon Llanfairfechan / Ddu opposite Park Crescent, heard not seen 22:52 – Ppip, at bottom of the road leading to Penmaen Park 23:06 – Nnoc, SP10, 3 bats foraging around big old oak trees in improved grassland field to the south of Penmaenmawr Rd. Calls constant for 5 minutes 23:31 – Ppyg, SP12, x1 pass heard not seen
28/06/2018	Start: 21:45 Finish: 23:32 Sunset: 21:47	Junction 15 Survey 2	0% cloud cover, average relative humidity 53%, average temperature 23.1°C.	21:52 – Nnoc, SP12, x 1 pass heard not seen 22:20 – Ppip, just east of SP9, x1 pass, possible emergence from Llwyn Cottage. 22:54 – Nnoc, SP5, x1 pass heard not seen 23:12 – Ppip, SP3, commuting 23:19 – Ppyg, just before SP2, heard not seen 23:20 – 2 x Ppip, SP2, foraging along Afon Llanfairfechan / Ddu. Calls constant
24/07/2018	Start: 3:25 Finish: 5:22 Sunrise: 5:19	Junction 15 Survey 3	Drizzle, rain, 100% cloud cover, average relative humidity 68%, average temperature 20°C.	3:43 – 1x Ppyg, SP2, foraging over Afon Llanfairfechan /Ddu. Calls constant 4:03 – 1x Nnoc, SP4, foraging 4:06 – Ppip, near SP12 walking from SP4 to SP5, heard not seen

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
07/08/2018	Start: 21:00 Finish: 23:05 Sunset: 21:01	Junction 15 Survey 4	60% cloud, Beaufort 1, no rain, average relative humidity 56%, average temperature, 14.5°C.	21:22 – Ppip, SP9, heard not seen 21:23 – Ppip, SP9, heard not seen, distant 21:30 – Ppip, SP10, commuting towards big Oak trees in field to the south of Penmaenmawr Rd 21:31 – Ppip, Nnoc, SP10, heard not seen, most likely foraging around big Oak trees in field 21:32 – Ppyg, SP10, as 21:31. 21:35 – Ppip, Ppyg, SP10, commuting, flew over hedge and back into field 21:36 – Nnoc, SP10, heard not seen. 21:38 – Ppyg, halfway between SP9 and SP10, commuting heard not seen walking along road 21:42 – Ppip, downhill walking from SP9 to SP11, commuting flying down hill 21:43 – Ppip, description as 21:42 but heard not seen 22:22 – Ppip, western side of The Heath building, heard not seen, assumed foraging along hedgerow 22:30 – Ppip, SP4, commuting heard not seen 22:35 – Nnoc, SP3, heard not seen 22:44 – Ppip, Ppyg, SP2, foraging heard not seen. Calls constant 22:59 – Ppip, SP1, foraging in clearing. Calls constant
04/09/2018	Start: 20:00 Finish: 22:05 Sunset: 19:59	Junction 15 Survey 5	Dry, average relative humidity 50%, average temperature 15°C.	20:36 – Myotis sp., between SP3 and SP4, heard not seen 20:51 – Ppip, SP5, x1 pass commuting heard not seen 20:53 – Ppyg, SP5, commuting heard not seen 20:58 – Pip SP6, heard not seen

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
				21:03 – Ppyg, between SP6 and SP7, 1 pass, probably commuting 21:31 – Ppip, between SP8 and SP9, x1 pass commuting 21:43 – Ppyg, east of SP9, x1 pass heard not seen 21:45 – Ppip, east of SP9, x1 pass 21:48 – Ppip, bottom of road leading to Penmaen Park, x1 pass heard not seen 22:01 – Nnoc, SP12, x1 pass
Key Ppip = Common pipistrelle *Pipistrellus pipistrellus* Ppyg = Soprano pipistrelle *P. pygmaeus* Nnoc = Noctule *Nyctalus noctula* Myotis = Myotis Species Pip = Pipistrelle species SP# = Stopping point number				

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Table 9. Transect survey results 2019

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
23/05/2019	Start: 21:15 Finish: 22:10 Sunset: 21:21	Junction 15 Survey 1	100% cloud cover. Average temperature 14.5 °C.	21:35 – Ppyg commuting along east field boundary, from south to north 21:37 – 21:38 – Ppyg x 2 bats foraging near to east field boundary 21:41 – Nnoc – x 2 bats seem commuting overhead from the west boundary heading due west 21:41 – Ppip x 1 bat as above 21:43 – Ppip, Ppyg - commuting from west field boundary, heading due west 21:43 – Nnoc - at least 3 bats seen commuting west, from west field boundary 21:46 – Ppyg – x 2 bats foraging around mature trees in field 21:47 – Ppip – x 1 bat foraging as above 21:52 – Ppyg SP3 commute x 1 pass heading due south west towards Penmaen Park 21:54 – Ppip as above 21:55 – 21:57 - Ppip – SP3 foraging within tree canopy 22:00 – 22:02 – Ppyg, Ppip – SP4 foraging around south east corner of the field around oak tree, hedgerow and scrub 22:03 – Nnoc – SP4 x 1 pass heard not seen 22:03 – Ppip – SP4 as above 22:07 – Ppip foraging along east field boundary

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
20/08/2019	Start: 20:30 Finish: 22:00 Sunset: 20:34	Junction 15 Survey 2	50% cloud cover, light drizzle, moderate breeze, average temperature 16°C.	20:59 – Ppip – SP3 constant foraging of a single bat around mature trees. 21:08 – Pip – SP2 x 1 pass heard not seen 21:18 – Pip – SP1 x 1 pass very faint, heard not seen 21:21 – Ppip – SP1 couple of passes, heard not seen but likely to be foraging along north field boundary 21:31 – Pip faint heard not seen south field boundary 21:34 – 21:40 Ppyg – SP3 constant foraging around tree canopy 21:46 – Ppip – SP2 x 1 pass heard not seen 21:54 – Ppip – SP1 x 1 pass, faint heard not seen
19/09/2019	Start: 19:28 Finish: 20:39 Sunset: 19:23	Junction 15 Survey 3	Calm, dry, 0% cloud cover, average temperature 14.5°C.	19:37 – Pip – x 1 pass along western field boundary 19:39 – Ppip – SP2 foraging along western field boundary 19:43 – Ppip – SP3 foraging around tree canopy 19:45 – Ppip, Ppyg - SP3 x 2 bats foraging around tree canopy 19:50 – Ppip – few passes foraging along southern field boundary 19:53 – Ppip – as above 19:55 – Ppip SP4 few passes along southern field boundary and then up the lane due east 19:57 – Ppip SP4 x 2 bats flew due east over oak tree 19:58 – Ppip SP4 x 1 pass heard not seen 19:59 – Ppip as above 20:04 – Ppyg – SP1 x 1 pass due east along north field boundary 20:13 – Ppip – SP2 heard not seen x 1 pass 20:15 – Ppip as above 20:22 – MbraMmys – SP3 heard not seen x 1 pass

Date	Start and end times and time of sunset/sunrise	Transect route and survey number	Weather conditions	Species recorded/time/location/activity
				20:24 – Ppip – x 1 pass southern filed boundary 20:25 – Ppip, Ppyg – couple of passes along southern field boundary and also seen foraging around streetlamp, social calls too. 20:28 – Ppip – few passes along southern field boundary

Key
Ppip = Common pipistrelle *Pipistrellus pipistrellus*
Ppyg = Soprano pipistrelle *P. pygmaeus*
Pip = *Pipistrellus sp*
Nnoc = Noctule *Nyctalus noctula*
MbraMmys = Whiskered/Brandts *Myotis brandtii/Myotis mystacinus*

SP# = Stopping point number

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3.5 Emergence / Return to Roost

3.5.1 Table 10 details the results of the emergence / return to roost results of the structures subject to surveys.

3.5.2 No bats were seen to emerge during the surveys to the Heath or Flats at 1 – 4 St Brendas, there was very little activity around the flats, most likely due to its location close to the junction and the high levels of light. A lot of activity was noted around the Heath building of the common and soprano pipistrelle bats, most likely a small number (one or two) bats foraging around the building, noctules were heard over head during the surveys, especially over the field to the south of Penmaenmawr Rd. One pipistrelle bat was seen to emerge on two occasions during the surveys to 8 and 9 Penmaen View, Penmaenmawr Rd.

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Table 10. Emergence / Return to Roost survey results – structures (2018 and 2019)

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
Flats at 1 – 4 St Brendas	17/7/2018	Start: 21:18 Finish: 22:40 Sunset: 21:34	Calm, dry, 80% cloud cover, average relative humidity 42%, average temperature 21.5°C.	22:40 – Nnoc – heard not seen **No bats seen to emerge**
The Heath Council Buildings	31/07/2018	Start: 21:05 Finish: 22:45 Sunset: 21:15	Calm, very light occasional drizzle, 50% cloud cover, average relative humidity 53%, average temperature 20°C.	21:24 – Unknown flew from north west corner of building and across the carpark, no echolocation 21:41 – Ppip – foraging along access to carpark and around shrubs in car park 21:45 – Pip – foraging along treeline along the west boundary of the carpark 21:45 – Ppip commuting north east along Penmaenmawr Rd 21:46 – Pip heard not seen, very faint. Surveyor positioned at the west aspect, may have picked up the bat commuting along Penmaenmawr Rd 21:47 – Ppip heard not seen, surveyor positioned to the front of the building 21:49 – Pip - foraging along treeline along the west boundary of the carpark 21:52 – Pip - foraging along treeline along the west boundary of the carpark from south to north

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				21:52 – Pip – heard not seen, faint, surveyor positioned to the front of the building, may have picked up the bat foraging along the west boundary 21:58 – Nnoc – heard not seen 22:18 – Ppip – couple of passes through the carpark to the north of the building 22:05 – Ppip flew from plantation woodland which is located along Penmaenmawr Rd, bat headed toward the front of the building 22:06 – Ppip, faint, heard not seen surveyor positioned to the front of the building 22:20 – Ppip - foraging along treeline along the west boundary of the carpark 22:21 – Ppip – heard not seen, surveyor position in car park to the rear of the building 22:22 – Ppip – heard not seen, surveyor positioned to the south east aspect of the building 22:22 – Ppyg - heard not seen, surveyor positioned to rear of the building within the car park 22:24 – Ppip across the road along plantation woodland 22:26 – Ppyg heard not seen, surveyor positioned to the front of the building 22:26 – Ppip – heard not seen surveyor position across the rad looking at the front of the building 22:27 – Ppip - heard not seen, surveyor positioned to rear of the building within the car park

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				22:32 – Ppip - foraging along treeline along the west boundary of the carpark 22:34 – Ppip heard not seen, surveyor positioned to the south east aspect of the building 22:38 – Ppip - heard not seen surveyor position across the rad looking at the front of the building 22:39 – Ppip - heard not seen, surveyor positioned to rear of the building within the car park 22:40 – Ppip – from Penmaenmawr Rd due north along tree line to the west of the car park 22:40 – Ppip - heard not seen, faint, surveyor positioned to the front of the building, may have picked up the bat foraging along the west boundary at same time 22:41 – Ppip - foraging along treeline along the west boundary of the carpark 22:42 – Ppip – faint heard not seen, surveyor positioned to the front of the building 22:43 – Nnoc –commuting over the building 22:43 – Ppip – foraging around carpark 22:45 – Nnoc – heard not seen **No bats seen to emerge**
	14/08/2019	Start: 04:15 Finish: 05:54	Slight breeze, 100% cloud cover,	04:15 – Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
		Sunrise: 05:52	average relative humidity 61%, average temperature 17°C.	04:17 – Ppip – heard not seen, surveyor positioned to the front of the building 04:21 - Ppip – heard not seen, surveyor positioned to the front of the building 04:22 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:23 – Pip – foraging along tree line to the west boundary 04:24 – Ppip – heard not seen, social calls and a few passes surveyor positioned at the back of the building 04:25 – Nnoc – heard not seen, surveyor positioned at the front of the building 04:26 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:26 – Pip - heard not seen, surveyor positioned at the back of the building 04:28 – Ppip – foraging around carpark to the back of the building 04:29 – Nnoc & Ppip- heard not seen, surveyor positioned at the front of the building 04:30 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:31 - Nnoc & Ppip - heard not seen, surveyor positioned at the front of the building 04:31 – Ppip - foraging around carpark to the back of the building

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				04:32 - Ppip - heard not seen, surveyor positioned at the back of the building 04:35 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:36 – Ppip - heard not seen, surveyor positioned at the front of the building 04:38 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:40 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:45 - Ppip heard not seen, faint audio. Surveyor positioned across the road to the front of the building 04:49 - Pip - heard not seen, surveyor positioned at the front of the building 04:50 - Ppip heard not seen. Surveyor positioned across the road to the front of the building 04:50 – Ppip – foraging along tree line to the west boundary few passes 04:55 – Ppip - foraging along tree line to the west boundary few passes 04:57 – Ppip – flew around the building, social calls heard 04:58 - Nnoc - heard not seen, surveyor positioned at the front of the building 04:58 – Ppip – heard not seen, surveyor positioned to the east aspect of the building

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				04:58 – Pip - heard not seen, surveyor positioned at the back of the building 04:59 – Ppip – foraging around carpark to the back of the building 04:59 - Pip - heard not seen, surveyor positioned at the back of the building 05:00 – Ppip - heard not seen, surveyor positioned to the east aspect of the building 05:00 – Ppip - Ppip heard not seen. Surveyor positioned across the road to the front of the building 05:01 – Ppip - heard not seen, surveyor positioned to the front of the building 05:01 - Nnoc - heard not seen, surveyor positioned at the front of the building 05:01 – Ppip – social calls around the carpark 05:03 – Nnoc & Ppip - heard not seen, surveyor positioned at the front of the building 05:03 – Ppyg - heard not seen, surveyor positioned to the east aspect of the building 05:06 – Ppip - foraging along tree line to the west boundary 05:06 – Ppip - heard not seen, surveyor positioned at the back of the building, social calls 05:10 – Pip – foraging up and down entrance to car park, located to the east of the building

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				05:10 – Pip - heard not seen, surveyor positioned at the front of the building 05:10 - Ppip heard not seen. Surveyor positioned across the road to the front of the building 05:11 – Ppip – flew to the back of the building and then back across the carpark due north 05:11 - Ppip - foraging along tree line to the west boundary 05:13 - Nnoc - heard not seen, surveyor positioned at the front of the building 05:13 – Pip - heard not seen, surveyor positioned at the front of the building 05:14 – Pip - heard not seen, surveyor positioned to the east aspect of the building, faint calls 05:23 – Ppip – heard not seen, surveyor positioned at the front of the building 05:24 – Pip – one pass at the front of the building, was not seen entering 05:24 – Ppyg - foraging up and down entrance to car park, located to the east of the building 05:24 – Pip - heard not seen, surveyor positioned at the back of the building 05:25 – Ppip - heard not seen, surveyor positioned at the west aspect of the building 05:25 – Ppip – seen to commute across the road towards the access to the carpark, from south to north

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				05:38 – Bat seen to fly up to the eaves of the back of the building but then no visual, possible entry but not confirmed. **No confirmed evidence of bats returning to roost within the building**
8 and 9 Penmaen View, Penmaenmawr Rd	29/07/2019	Start: 21:00 Finish: 22:30 Sunset: 21:17	Calm, 70% cloud cover, dry, average temperature 19°C.	21:23 – Nnoc – multiple passes high up above the properties, from west to east above Penmaenmawr Rd 21:25 – Nnoc – commuting high up above the properties, from west to east above Penmaenmawr Rd and then from east to west 21:30 – Nnoc x 2 – flying high up around the field to the south of Penmaenmawr Rd 21:35 – Pip – heard not seen, surveyor positioned across the road 21:36 – Nnoc – heard not seen x 1 pass **21:37 – Pip – one bat seen to emerge from the top of the roof of the rear of 9 Penmaen View, exact location unknown. Bat flew due east to woodland plantation** 21:58 – Nnoc – heard not seen 22:02 – Pip x 2 passes surveyor positioned across the road 22:05 – Pip – heard not seen x 2 passes, most likely foraging in vegetation to the rear of the properties. 22:06 – Nnoc – heard not seen 22:07 - Nnoc – heard not seen x 1 pass 22:15 - Nnoc – heard not seen x 1 pass 22:18 - Nnoc – heard not seen x 1 pass 22:21 - Nnoc – heard not seen x 1 pass

Building Reference / Name	Date	Start and end times and time of sunset/sunrise	Weather conditions	Species recorded/time/location/activity
				22:25 - Nnoc – heard not seen x 2 passes 22:26 - Nnoc – heard not seen x 1 pass
	15/08/2019	Start: 20:30 Finish: 22:00 Sunset: 20:44	Calm, 10% cloud cover, dry, average relative humidity 74.5, temperature 17°C.	**21:14 – Ppip one bat seen to emerge from the top of the roof of the rear of 8 Penmaen View, above dormer window. Then foraged in vegetation and flew due east to woodland plantation** 21:26 – Nnoc x 1 pass 21:28 – Ppyg – heard not seen surveyor located to the west aspect on Shore Road East 21:37 – Nnoc x 1 pass 21:59 – Ppip heard not seen, surveyor positioned to the front of the building
Key Ppip = Common pipistrelle *Pipistrellus pipistrellus* Ppyg = Soprano pipistrelle *P. pygmaeus* Pip = *Pipistrellus sp* Nnoc = Noctule *Nyctalus noctula*				

3.6 Static Detectors

3.6.1 Tables 11 and 12 detail the results obtained from the static detectors including species and number of passes recorded throughout the duration of the evening (dusk until dawn) with the analysis run as counts per minute. Figures 1 – 4 show total number of passes per species per month.

3.6.2 The majority of calls were returned from the statics located within the field to south of Penmaenmawr Rd in particular for the noctule bat. During the deployment in July, calls were detected just before sunset and at sunrise which means that this bat may be roosting nearby, the mature trees within this field being a potential roosting opportunity.

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Table 11. Static detector results Junction 15 - 2018

Location of static	Dates set	Sunset / sunrise	Min/max Temp Deg C[1]	Species recorded/number of passes	Time of first/last recording
ST1	19th June – 24th June	21:43 (19th) 21:44 (24th) 04:48 (19th) 04:49 (24th)	Min – 12 Max - 14.4	Ppip - 1 Ppyg - 2	01:43 / 02:38 00:20 / 02:38
	12th August – 18th August	20:47 (12th) 20:35 (18th) 05:50 (12th) 06:00 (18th)	Min – 15.3 Max – 19.9	MbraMmys- 4 Nnoc - 4 Ppip - 22 Ppyg - 1	01:45 / 03:35 22:38 / 23:31 00:47 / 22:39 21:47 / 21:48
	24th Sept – 1st Oct	19:08 (24th) 18:51 (1st Oct) 07:03 (24th) 07:15 (1st Oct)	Min – 11.3 Max – 17.4	Ppip 16 Ppyg 14	20:04 / 04:07 19:40 / 06:48
ST2	17th July – 23rd July	21:30 (17th) 21:22 (23rd) 05:10 (17th) 05:18 (23rd)	Min – 15.4 Max – 20.4	Ppip 5 Ppyg 1	00:01 / 23:14 04:44 / 04:45
Key Ppip = Common pipistrelle *Pipistrellus* Ppyg = Soprano pipistrelle *P. Pygmaeus* MbraMmys = Whiskered/Brandts *Myotis mystacinus/brandtii agg* Nnoc = Noctule *Nyctalus noctula*					

[1] Recorded over deployment period

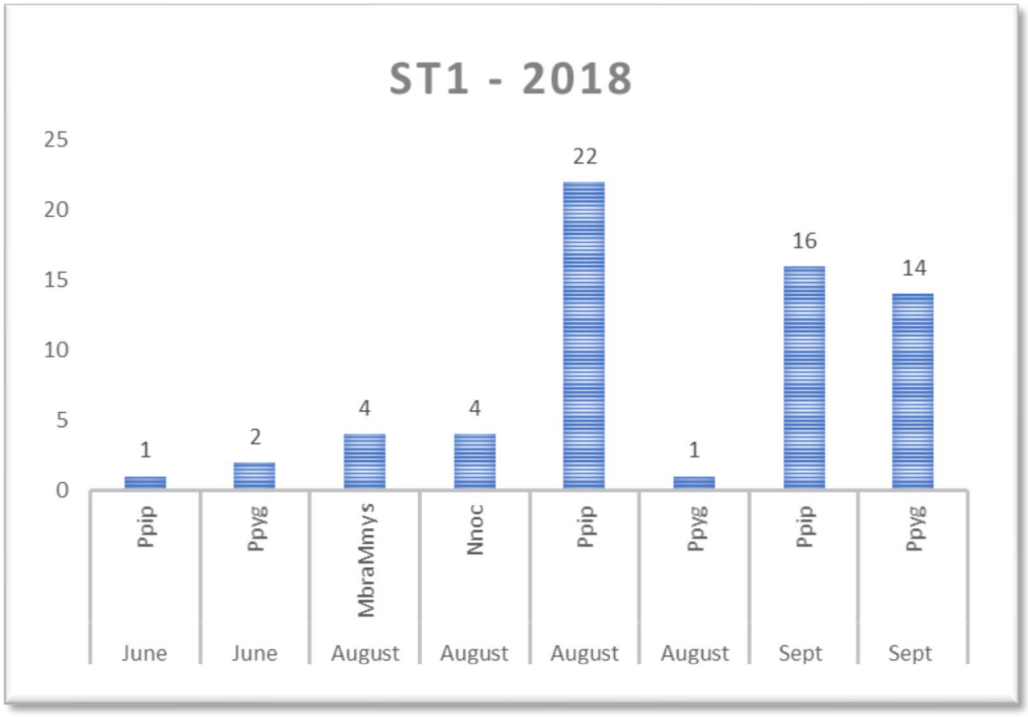


Figure 1: Total number of passes per species / per month

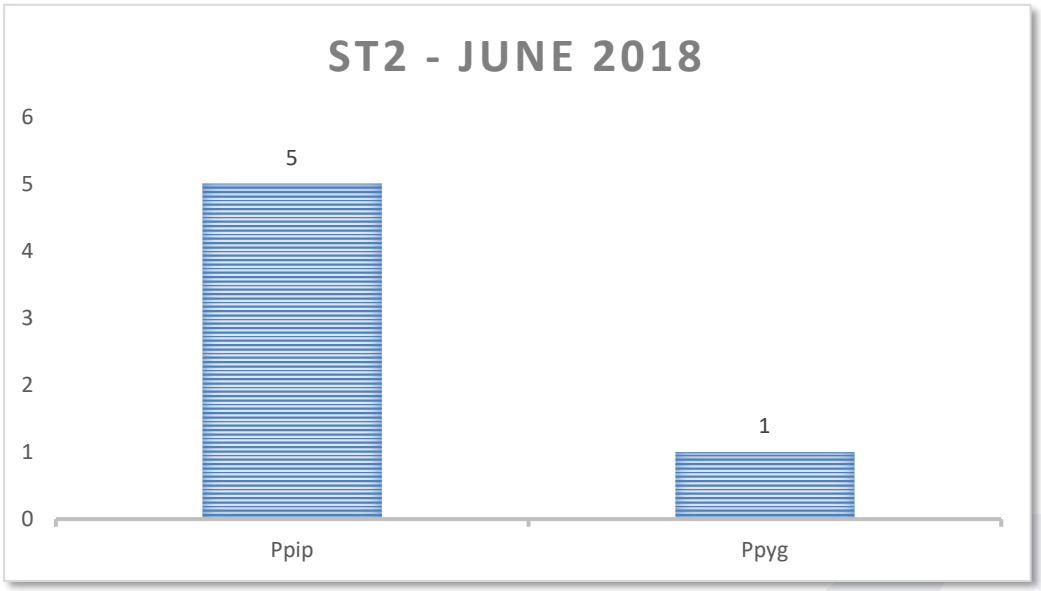


Figure 2: Total number of passes per species / per month

3.6.3 The most commonly encountered bat at these locations was the common and soprano pipistrelles. Both of these statics were located adjacent to the junction on trees located within the estate road plantation woodland, which is most likely where bats were detected.

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Table 12. Static detector results Junction 15 - 2019

Location of static	Dates set	Sunset / sunrise	Min/max Temp Deg C[2]	Species recorded/number of passes	Time of first/last recording
ST1	23rd July – 29th July	21:23 (23rd) 21:13 (29th) 05:18 (23rd) 05:27 (29th)	Min – 14.3 Max -21.5	Mdau 1 Mnat 2 Nnoc 1342 Paur 2 Ppip 950 Ppyg 232 Rhip 4	01:43 / 01:44 22:04 / 22:25 21:04 / 05:20 03:05 / 22:50 21:32 / 05:06 21:30 / 05:07 23:25 / 03:22
ST2	2nd Sept – 9th Sept	20:01 (2nd) 19:45 (9th) 06:25 (2nd) 06:37 (9th)	Min – 9.8 Max – 18.3	MbraMmys 1 Mdau 11 Mnat 4 Nnoc 4 Ppip 485 Ppyg 76	20:56 / 20:57 21:08 / 04:25 00:01 / 03:13 22:07 / 02:46 20:04 / 06:26 20:02 / 06:04
		Additional survey to be done in Oct			

Key
Ppip = Common pipistrelle *Pipistrellus*
Ppyg = Soprano pipistrelle *P. Pygmaeus*
MbraMmys = Whiskered/Brandts *Myotis mystacinus/brandtii agg*
Nnoc = Noctule *Nyctalus noctula*
Mdau = Daubentons *Myotis daubentonii*
Mnat = Natterers *Myotis nattereri*
Paur = Brown long-eared *Plecotus auritus*
Rhip = Lesser horseshoe *Rhinolophus hipposideros*

3.6.4 Noctules and pipistrelle bats were by the far the most encountered species at this location with statics positioned in the field to the south of Penmaenmawr Rd. It is possible that a noctule roost is located within the trees within this field. Survey results show that this field is used by a number of bat species throughout their active period.

[2] Recorded over deployment period

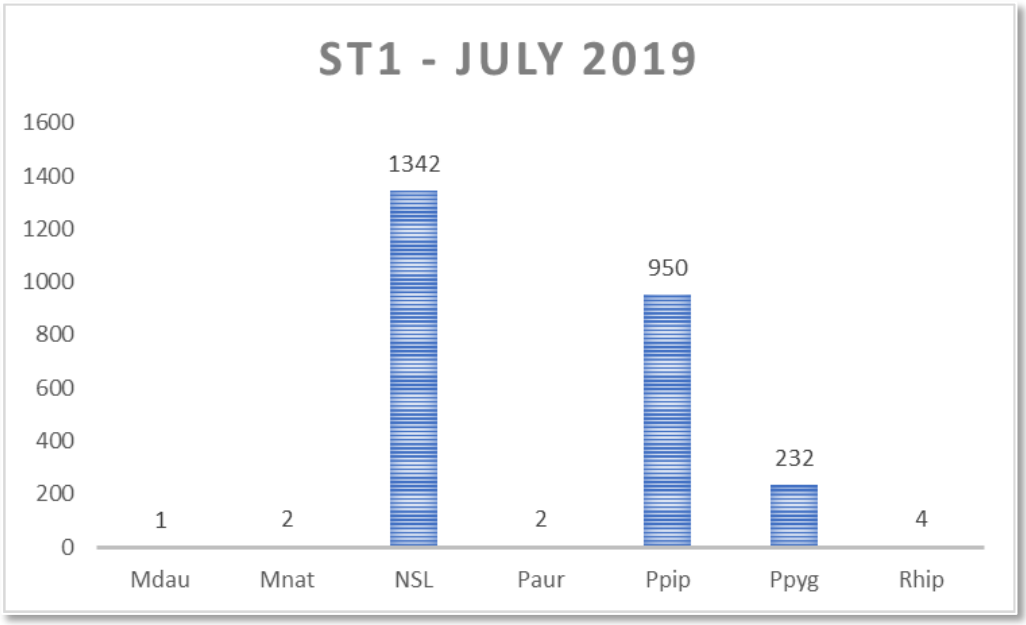


Figure 3: Total number of passes per species / per month

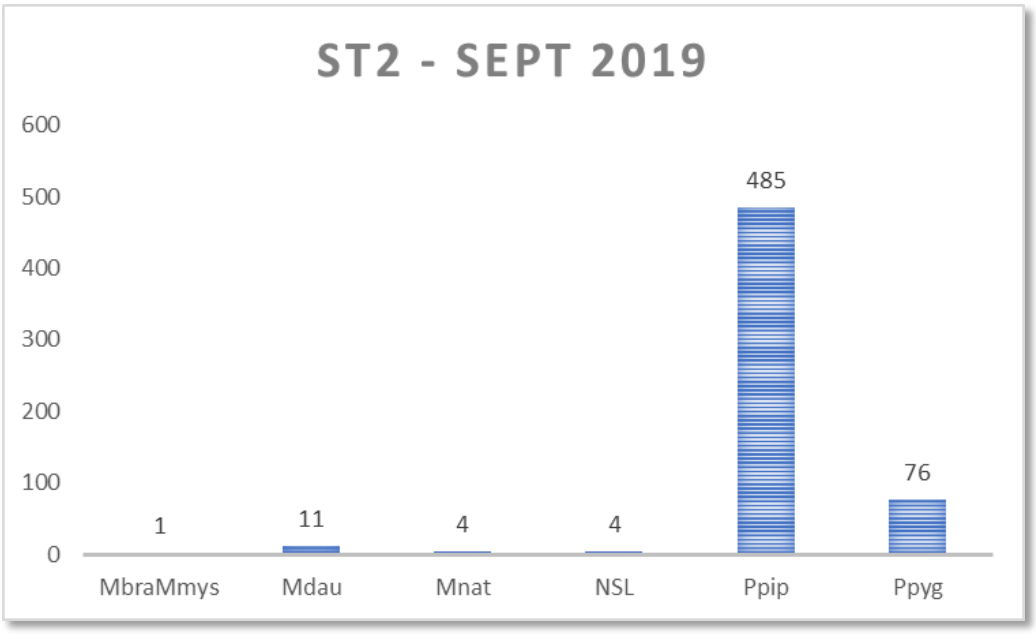


Figure 4: Total number of passes per species / per month

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4. SUMMARY AND CONCLUSION

The findings of the surveys are summarised in this section, along with a summary of the status and distribution of species at a national, county and local level. Information on species status and distribution has been obtained from The State of UK Bats (2017) and National Bat Monitoring Programme (NBMP) up to summer 2018.

One roost has been identified from the surveys conducted to date. A single common pipistrelle bat was seen to emerge on two separate occasions from the roof of the houses located to the east of Shore Road East during the emergence survey conducted in 2019. The status of the roost is either a transitional/occasional roost or summer roost used by males and/or non-breeding breeding females on an adhoc basis. It is also possible that the roof structure could be used by pipistrelle bats for hibernation. Utilising the scoring system detailed within Wray et al (2010) the roost is considered to be of *local* importance due to the use as a roost by individual bat species of common species (i.e. common pipistrelles).

No roosts were identified during the emergence surveys to the Heath and the flats located to the east of the Junction as part of surveys conducted in 2018.

The trees located within the field to the north east of Penmaen Park were found to have low – moderate potential to support bat roosts. No emergence surveys have been conducted to these to date. If affected, these trees would need to be re-assessed, and further surveys undertaken if necessary.

The areas of mixed plantation woodland supports foraging and commuting bats. However, there are no large or mature trees, or trees with features such as cracked limbs or rot holes within these which could support a bat roost.

Three species of bat were recorded during the transects conducted in 2018 (within the wider Scheme area) and four in 2019 (to areas where access was not available in 2018). These are Common and soprano pipistrelle and noctule and whiskered/brandts in 2019. The majority of activity was recorded along the

southern boundary of the field to the south of Penmaenmawr Rd, along the Afon Ddu / Llanfairfechan and concentrated around the group of trees within the field, mainly recorded at each of the stopping points.

Static detectors deployed in 2018 identified four species of bat, noctule, common and soprano pipistrelle and whiskered/brandts sp. The majority of activity were passes from the common pipistrelle. During 2019, statics were placed within the field to the south of Penmaenmawr Rd along the hedgerow and also along the tree line to the west of the field. A large number of passes were recorded, in particular of the noctule and common pipistrelle, other bat species recorded were brown long-eared bat, lesser horseshoe, soprano pipistrelle, natterers and Daubentons, a total of seven species.

The state of UK bats latest trends indicate that populations of the bat species noted at the site, are, in general, stable or recovering. Field Survey data for the UK show statistically significant population increases for both the common and soprano pipistrelle species since 1999. Both roost and hibernation surveys show significant population increases of the lesser horseshoe bat since 1999.The noctule and natterers all show increases whilst the brown long-eared bat shows a slight decrease.

The results of the National Bat Monitoring Programme (NBMP) up to summer 2018 states that in Wales, the long term trend for Daubenton's bat, natterers and the lesser horseshoe bat shows a significant increase since 2013. Whilst for the brown long-eared bats the trend is not significantly different. There are insufficient data to calculate population trends for noctules in Wales, though throughout Great Britain, this species is considered to be stable. The common and soprano trend in Wales is showing a decline in roost counts but an upward trend in field survey data. However, it is likely that these species' frequent roost switching results is a negative bias in the roost count trend and this trend is not therefore considered a reliable measure of population change for soprano and common pipistrelles.

Little information could be found on the status of bats within Conwy. However, in general, it is considered that the current conservation status of bats within Conwy and within the Scheme footprint is stable.

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APPENDIX 8.2
WINTERING BIRD SURVEY REPORT

A55 Junctions 15 and 16 Wintering Bird Survey Report Intended for
Welsh Government

Document type
Report

Date
July 2018

A55 JUNCTIONS 15 & 16 WINTERING BIRD SURVEY 2017/2018

Llywodraeth Cymru
Welsh Government

RAMBOLL

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CYNGOR GWYNEDD COUNCIL

A55 JUNCTIONS 15 & 16
WINTERING BIRD SURVEY 2017/2018

Revision	**02**
Date	**31 Jan 2020**
Made by	**Martyn Owen Biome Consulting**
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3.	**RESULTS**	**5**

APPENDICES

Appendix A
Figures

1. BACKGROUND

1.1 Project Background

Junction 15 and Junction 16 of the A55 are proposed for improvement works. These Junctions are located on North Wales coast, adjacent to the Irish Sea. Due to the presence of nearby statutorily designated sites and the identification of potential impacts to qualifying features, wintering bird surveys were completed to determine the assemblage of species present and the distribution of qualifying features in areas that could be subject to direct impacts and/or disturbance.

1.2 Designated Sites

The proposed development areas are located in close proximity to two Natura 2000 sites which are designated due to their avian importance. Junction 15 is in close proximity to both Liverpool Bay Special Protection Area (SPA) (0.3km/north) and Lavan Sands SPA (adjacent/north), and Junction 16 is adjacent to Lavan Sands SPA (0.3km/north); the qualifying features of these internationally designated sites are summarised below.

Table 1: Designated Site Details

Qualifying Features	Feature Type	% of Population
Liverpool Bay SPA		
Red-throated Diver *Gavia stellata* (non-breeding)	Annex I species	6.89% GB
Little Gull *Hydrocoloeus minutus* (non-breeding)	Annex I species	N/A
Common Scoter *Melanitta nigra* (non-breeding)	Regularly occurring migratory species	10.31% of NW European
Waterbird assemblage[1]	Assemblage	N/A
Little Tern *Sternula albifrons* (breeding)	Annex I species	6.84% GB
Common Tern *Sterna hirundo* (breeding season)	Annex I species	1.80% GB
Lavan Sands SPA		
Oystercatcher *Haematopus ostralegus* (in non-breeding season)	Regularly occurring migratory species	0.5% Europe & Northern/Western Africa

1 Red-throated Diver, Common Scoter, Little Gull, Red-breasted Merganser *Mergus serrator*, Cormorant *Phalacrocorax carbo*; (less than 1% GB or less than 2000 Individuals) Black-headed Gull *Chroicocephalus ridibundus*, Common Gull *Larus canus*, Eider *Somateria mollissi*ma, Fulmar *Fulmarus glacialis*, Great Black-backed Gull *Larus marinus*, Great Crested Grebe *Podiceps cristatus*, Guilimot *Uria aalge*, Gannet *Morus bassanus*, Puffin *Fratercula arctica*, Herring Gull *Larus argentatus*, Kittiwake *Rissa tridactyla*, Lesser Black-backed Gull *Larus fuscus*, Great Northern Diver *Gavia immer*, Shag *Phalacrocorax aristotelis*, Razorbill *Alca torda*, Velvet Scoter *Melanitta fusca*.

2. METHODOLOGY

2.1 Study Areas

The study areas (Figure 1) included all areas that will be subject to direct impact during the proposed works and where disturbance to qualifying features could occur (including the adjacent inter-tidal areas) as a consequence of the proposed works.

2.2 Scoping Survey

To assess usage by SPA/Ramsar qualifying features of areas in the vicinity of the proposed junction upgrades, surveys of the inter-tidal area and areas inland which could support qualifying features were completed.

To ensure appropriate coverage of the required survey areas, an initial scoping visit was completed in October 2017. During this scoping visit all accessible parts of the two survey areas were reviewed, and habitats with the potential to support qualifying features of the adjacent designated sites identified. A number of viewpoints and transects were then determined (Figure 2), which afforded appropriate coverage of all relevant areas.

2.3 Through the Tide Surveys

A total of six Through The Tide Count (TTTC) surveys of each of the two survey areas was completed, with monthly surveys between October 2017 and March 2018 (inclusive). Each survey encompassed one complete tidal cycle during daylight hours, starting at either high or low tide. During each survey, three full counts were completed (i.e. counts around low, mid and high tide). Surveys took place utilising vehicles or vegetation/structures (e.g. hedgerows, buildings, sea walls etc.) as a hide or screen to avoid unnecessary disturbance to waders as far as possible. The viewpoints were carried out in conjunction with the TTTC.

All waders and wildfowl were recorded, with their locations recorded on a map.

All fieldwork was completed by an experienced bird surveyor, Martyn Owen MCIEEM (Biome Consulting).

Table 1: Survey details

Date	Tide Times	Survey Times	Weather Conditions
Junction 15			
13/10/2017	LT: 11:44 (2.05m) HT: 17:49 (6.36m)	11:44 – 17:49	Cloud(Oktas): 7/8-8/8 Temp(°C): 13-14 Wind: 2-3 SW Precip.: Occasional heavy rain
09/11/2017	LT: 08:21 (1.20m) HT: 14:11 (7.32m)	08:21 – 14:11	Cloud (Oktas): 3/8 – 8/8 Temp(°C): 12 - 16 Wind: 1-2 W Precip.: Occasional light rain
15/12/2017	HT: 08:52 (6.88m) L: 15:22 (1.55m)	08:50 – 15:22	Cloud (Oktas): 6/8-8/8 Temp(°C): 5-7 Wind: 2-4N Precip.: Nil
23/01/2018	LT: 08:40 (1.50m) HT: 14:29 (7.00m)	08:35 – 14:30	Cloud (Oktas): 8/8 Temp(°C): 9-10 Wind: 4-5 SW Precip.: Rain
21/02/2018	LT: 08:13 (1.08m) HT: 14:03 (7.30m)	08:10 – 14:04	Cloud (Oktas): 5/8-7/8 Temp(°C): 6-10 Wind: 0-1 E Precip.: Nil
15/03/2018	HT: 09:39 (6.92m) LT: 16:14 (1.10m)	09:30 – 16:15	Cloud (Oktas): 7/8-8/8 Temp(°C): 8-11 Wind: 1-3 SE Precip.: Light rain
Junction 16			
12/10/2017	LT: 10.31 (1.66m) HT: 16:26 (6.66m)	10:31 – 16:26	Cloud (Oktas): 1/8-5/8 Temp (°C): 15-16 Wind: 1-2W Precip.: Nil
08/11/2017	LT: 07:29 (0.75m) HT: 13:16 (7.74m)	07:29 – 13:16	Cloud (Oktas): 1/8-7/8 Temp(°C): Wind: 1-2 SW Precip.: Nil
14/12/2017	HT: 08:04 (6.64m) LT: 14:35 (1.78m)	08:00 – 14:35	Cloud (Oktas): 4/8-8/8 Temp(°C):4-7 Wind: 3-5 W Precip.: Occasional light rain
22/01/2018	LT: 08:00 (1.30m) HT: 13:48 (7.20m)	08:00 – 14:00	Cloud (Oktas): 6/8 Temp(°C): 7-8 Wind: 6/8-8/8 Precip.: Nil
22/02/2018	LT: 08:58 (1.34m) HT: 14:50 (6.98m)	08:50 – 14:50	Cloud (Oktas): 7/8 – 8/8 Temp: 3-6 Wind: 1-2 SE Precip.: Nil
14/03/2018	HT: 09:01 (6.52m) LT: 15:37 (1.49m)	09:00 – 15:37	Cloud (Oktas): 7/8-8/8 Temp: 8-9 Wind: 3-4 SE Precip.: Occasional light rain

2.4 Limitations

The findings presented in this study represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors which affect the presence of animals, such as the time of year, migration patterns and behaviour.

Although efforts were made to avoid double counting, due to the size of the survey area it is possible that, if birds moved within the survey area during a tidal state survey, double-counting may have occasionally occurred.

3. RESULTS

Survey results in relation to SPA qualifying features (refer to Table 1) recorded during surveys of Junction 15 are presented in Figures 3 to 9, with Figures 10 to 18 illustrating the results in relation to Junction 16. Figures 3 (Junction 15) and 10 (Junction 16) present a combined summary of the survey results during all surveys in relation to Oystercatcher (as this was the sole SPA qualifying feature recorded in sufficient numbers to make data presentation worthwhile). The remaining figures present the survey results by month, split by tidal state for SPA qualifying species only.

The below tables (Table 2 and Table 3) present the total counts of all wildfowl and waders within each survey area during each survey month, split by tidal state.

Table 2: Junction 15 Survey Results

	2017			2018		
	October	**November**	**December**	**January**	**February**	**March**
Mute Swan *Cygnus olor*						
High	2	2	7		2	2
Mid	2	2	7		2	
Low	2		7		2	
Greater Scaup *Aythya marila*						
High						1
Mid						1
Low						
Mallard *Anas platyrhynchos*						
High	68	53	31	42	40	14
Mid	57	33	37	38	40	38
Low	5	31	31	43	35	32
Goosander *Mergus merganser*						
High				1		
Mid						
Low						
Great Crested Grebe^						
High		1		2		
Mid		1		1	1	1
Low						
Red-breasted Merganser^						
High						
Mid	1					
Low	1					
Cormorant^						
High						
Mid						
Low	1					
Bar-tailed Godwit *Limosa lapponica*						
High						
Mid	1		19			
Low	1		1			

	2017			2018		
	October	November	December	January	February	March
Curlew *Numenius arquata**						
High			3	27		
Mid	6		1	28		
Low	6	2		1	4	1
Oystercatcher*						
High	28	7	97	105	10	13
Mid	85	65	425	181	28	68
Low	1322	68	226	225	147	163
Redshank *Tringa totanus**						
High				11	12	
Mid	1	1	1	9		1
Low	5	1	5	2		
Ringed Plover *Charadrius hiaticula*						
High	1					
Mid						
Low	3					
Turnstone *Arenaria interpres*						
High	23	5	22		22	
Mid	4	23		1	16	
Low	1	2	1			

Key:
* Lavan Sands SPA Qualifying Feature
^ Liverpool Bay SPA waterbird assemblage species

Table 3: Junction 16 Survey Results

	2017			2018		
	October	November	December	January	February	March
Eider^						
High						
Mid	3	10				
Low					1	
Red-throated Diver#^						
High	1	7				
Mid	2	2				
Low						
Great Crested Grebe^						
High	2	9				3
Mid	4			1		
Low						
Red-breasted Merganser^						
High						
Mid		3				
Low						

	2017			2018		
	October	**November**	**December**	**January**	**February**	**March**
Curlew						
High			12	34		
Mid	1	42	24	40		
Low		2	32	1		
Oystercatcher*						
High	39	82	137	40	16	19
Mid	85	117	118	120	20	15
Low	40	34	94	70	38	28
Ringed Plover						
High	10					
Mid		6				
Low						
Turnstone						
High	3				3	
Mid	10					
Low						

Key:
* Lavan Sands SPA Qualifying Feature
Liverpool Bay SPA Qualifying Feature
^ Liverpool Bay SPA wintering bird assemblage species

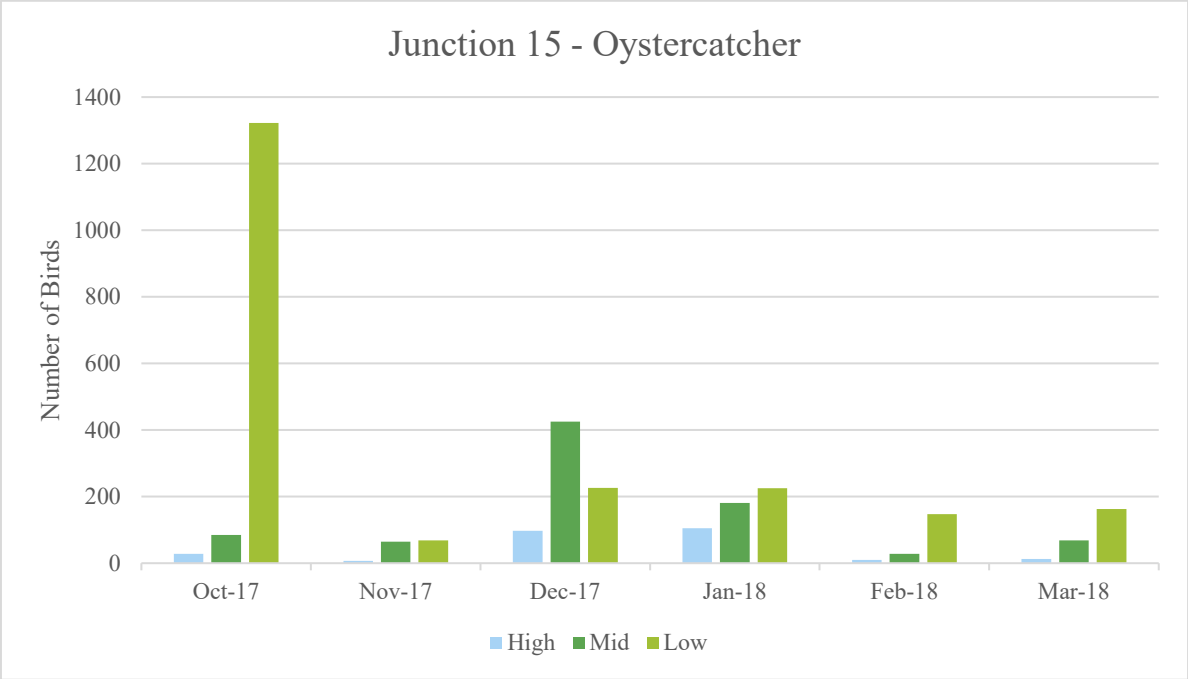
3.1 Junction 15

The results in relation to SPA qualifying species logged within the Junction 15 survey area as well as other waders/wildfowl are discussed in this section.

Oystercatcher

Chart 1 illustrates the survey results in relation to Oystercatcher. As illustrated by this graph and Figure 3, Oystercatcher were most abundant within the survey area during low tide, when a maximum of 1,322 were present (October 2017), predominantly foraging within the intertidal area to the west of Junction 15. Numbers within the survey area reduced as the tide flooded and birds left to forage/roost elsewhere with a maximum of 105 birds present at high tide (January 2018). During high tide, Oystercatcher were recorded using the recreational amenity grassland areas to the north of the A55 and Penmaen Park to the south. Only a small percentage of birds were recorded in areas which would be affected by the scheme (up to 25 individuals as shown on Figure 7).

Chart 1: Junction 15- Oystercatcher Survey Results



Other Species

Mute Swan was recorded during five of six surveys (no records during January 2018), with a maximum count of seven which occurred during each tidal state in December. This species was solely logged on the sailing lake within the recreational area in the west of the survey area.

A single female **Greater Scaup** was recorded during high and mid tide surveys, on the sailing lake within the recreational area, in March 2018.

Mallard were logged during each survey and each tidal state. A maximum survey count of 68 birds was made at high tide in October 2017. This species favoured the stream and sailing lake in the west of the survey area.

A single **Goosander** was logged on the sailing lake in the west of the survey area at high tide in January 2018.

Great Crested Grebe were recorded forging on the sea during four survey months, with a maximum of two birds present (high tide, January 2018).

Single **Red-breasted Merganser** were recorded during mid and low tide surveys in October 2017.

One **Cormorant** was logged in flight during the low tide survey in October 2017.

Bar-tailed Godwit were logged at the stream outflow, and adjacent inter-tidal areas during surveys in October 2017 (one bird) and December 2017 (maximum of 19 birds).

Curlew were recorded during each survey, predominantly at low tide foraging in the inter-tidal area. However, the maximum number of birds occurred in January 2018 (28) when Curlew were recorded foraging at mid and low tide within Penmaen Park.

Redshank were recorded during each survey month, predominantly foraging in the inter-tidal area near the stream outflow in the west of the survey area. A maximum of

12 birds were observed during any survey, roosting just above the high tide line on the beach in the west of the survey area in February 2018 (at high tide).

Ringed Plover were observed at high and low tide in the west of the survey area near the stream outflow in October 2017 (maximum of three birds).

Turnstone were logged during five of six survey months, with up to 23 birds observed (high tide in October 2017 and mid-tide in November 2017). This species favoured the intertidal area in the west of the survey area.

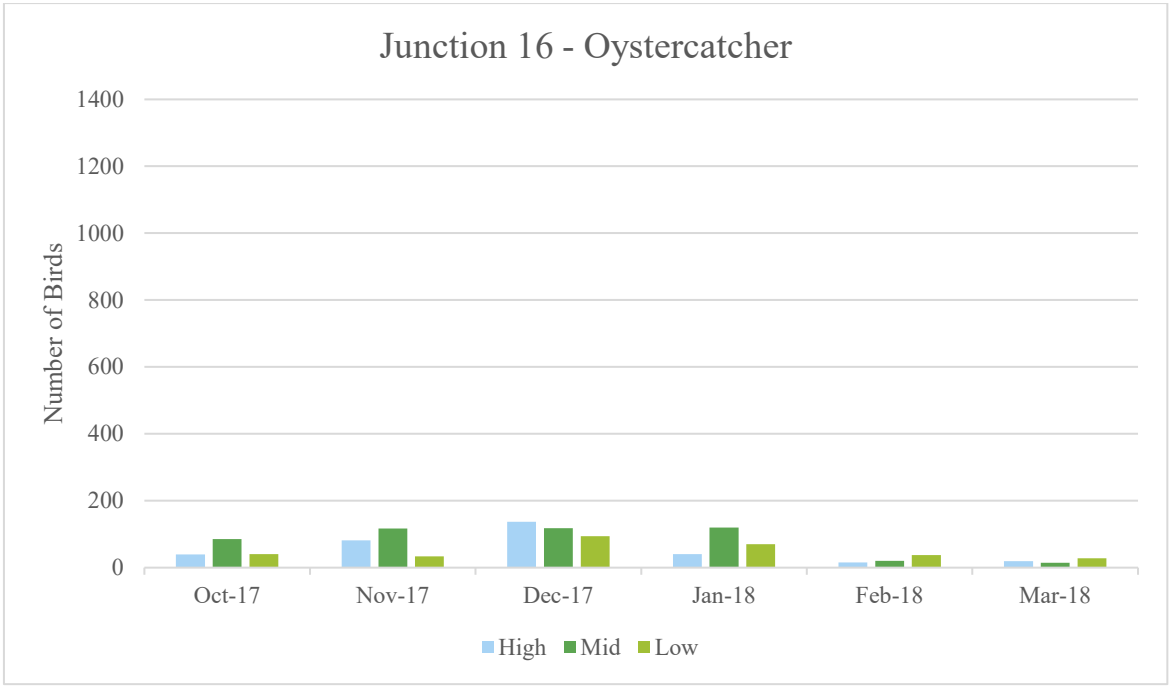
3.2 Junction 16

The results in relation to SPA qualifying species logged within the Junction 16 survey area as well as other waders/wildfowl are discussed in this section.

Oystercatcher

A maximum of 120 Oystercatcher were recording within the Junction 16 survey area, occurring during the mid-tide survey in January 2018 (Figure 14). Numbers within the survey area were typically fairly consistent during each survey during each month. At high tide Oystercatcher moved from the intertidal area to forage within nearby pasture and recreational areas. Only a small percentage of birds were recorded within these areas which would be affected by the scheme up to 41 individuals (Figs 13 and 14).

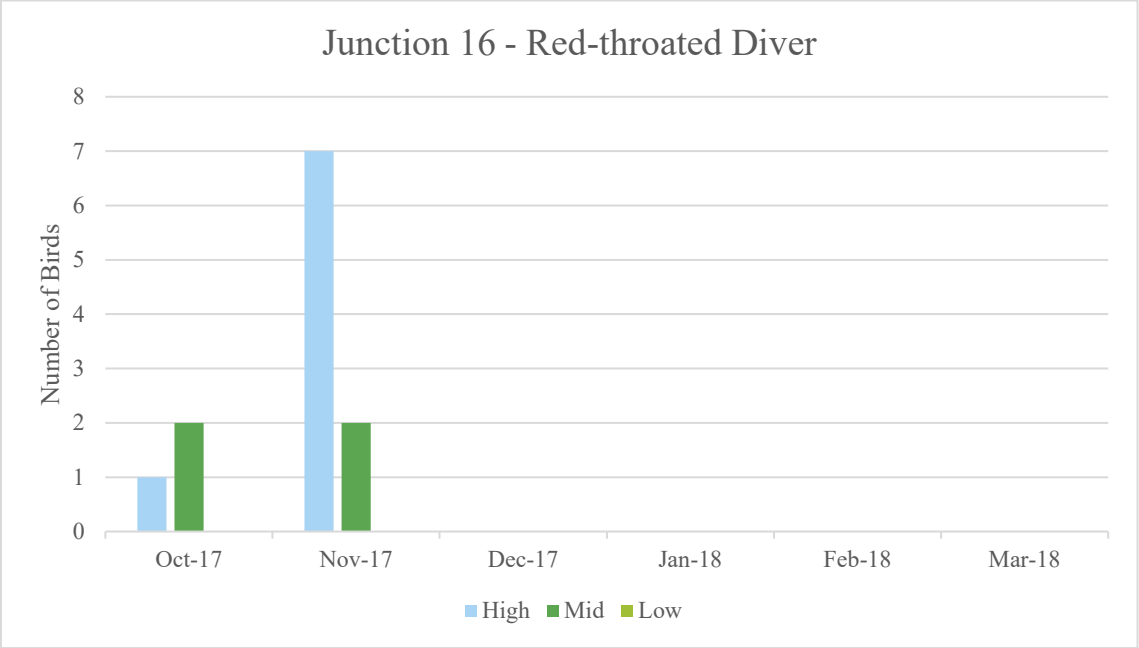
Chart 2: Junction 16- Oystercatcher Survey Results



Red-throated Diver

Recorded during two survey months (October (Figure 17) and November 2017 (Figure 18)), with a maximum of seven birds recorded during any survey (high tide, November 2017).

Chart 3: Junction 16- Red-throated Diver Survey Results



Other Species

Eider was recorded on the sea during three survey months (October 2017, November 2017 and February 2018), with a maximum of ten birds present (mid-tide, November 2018).

Great Crested Grebe were logged on the sea during four of six surveys (no records in December 2017 and February 2018), with a maximum of nine birds present at high tide in November 2018.

Red-breasted Merganser were solely recorded at mid-tide in November 2017, when three birds were present in the west of the survey area.

Curlew were logged during four of six surveys (no records in February or March 2018). A maximum of 40 birds were observed at mid-tide in January 2018, just to the east of the survey area within pasture.

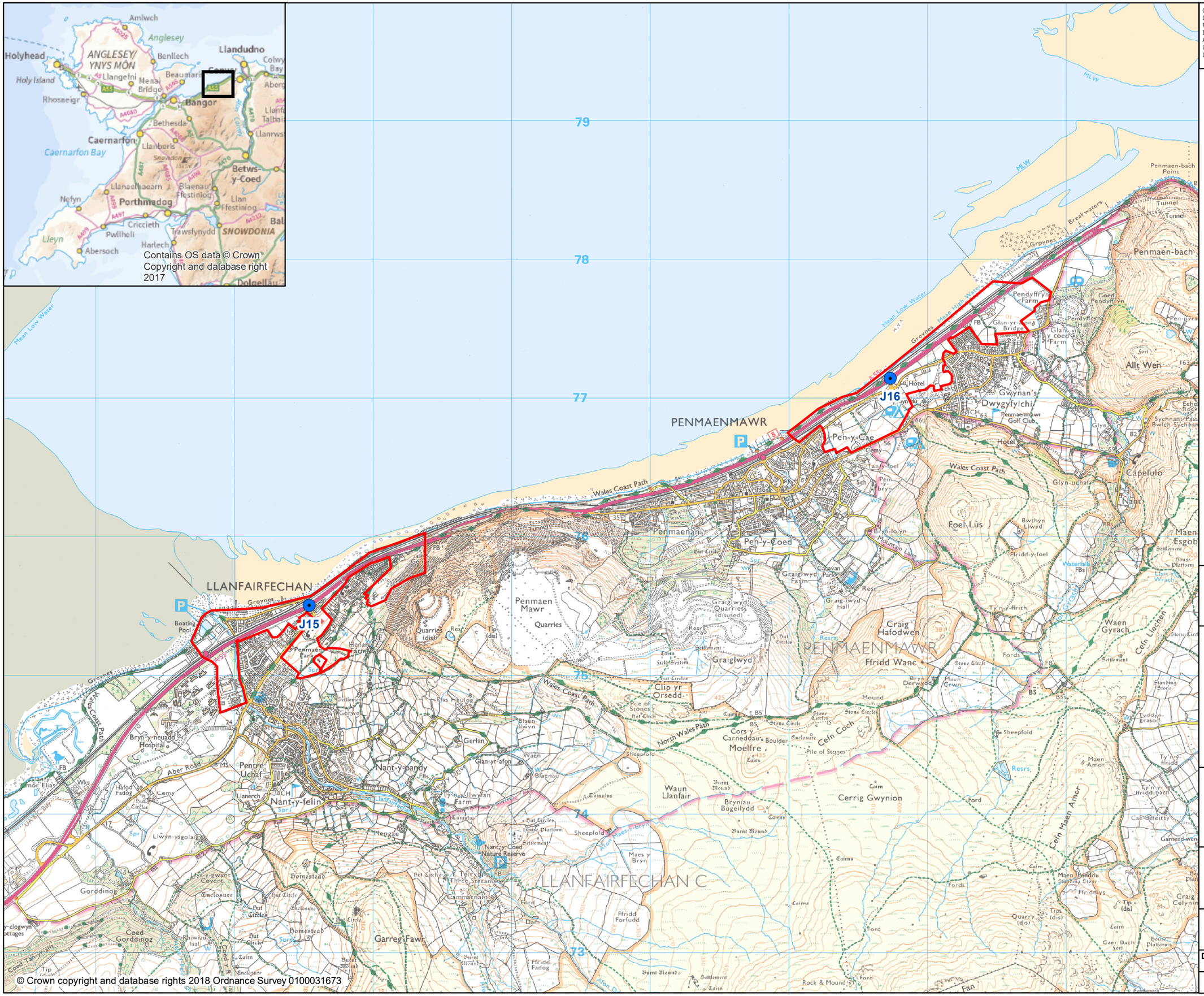
Ringed Plover were logged in October 2017 (ten birds at high tide) and November 2017 (six birds at mid-tide).

Turnstone were logged at high tide (three birds) and mid-tide (ten birds) in October 2017 just above the high-tide line in the centre of the survey area. Three birds were also observed at high tide in February 2018.

APPENDIX A
FIGURES

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- A55 Junctions
- Study Area Boundaries

A55 Junctions 15 & 16; Wintering Bird Survey 2017/2018

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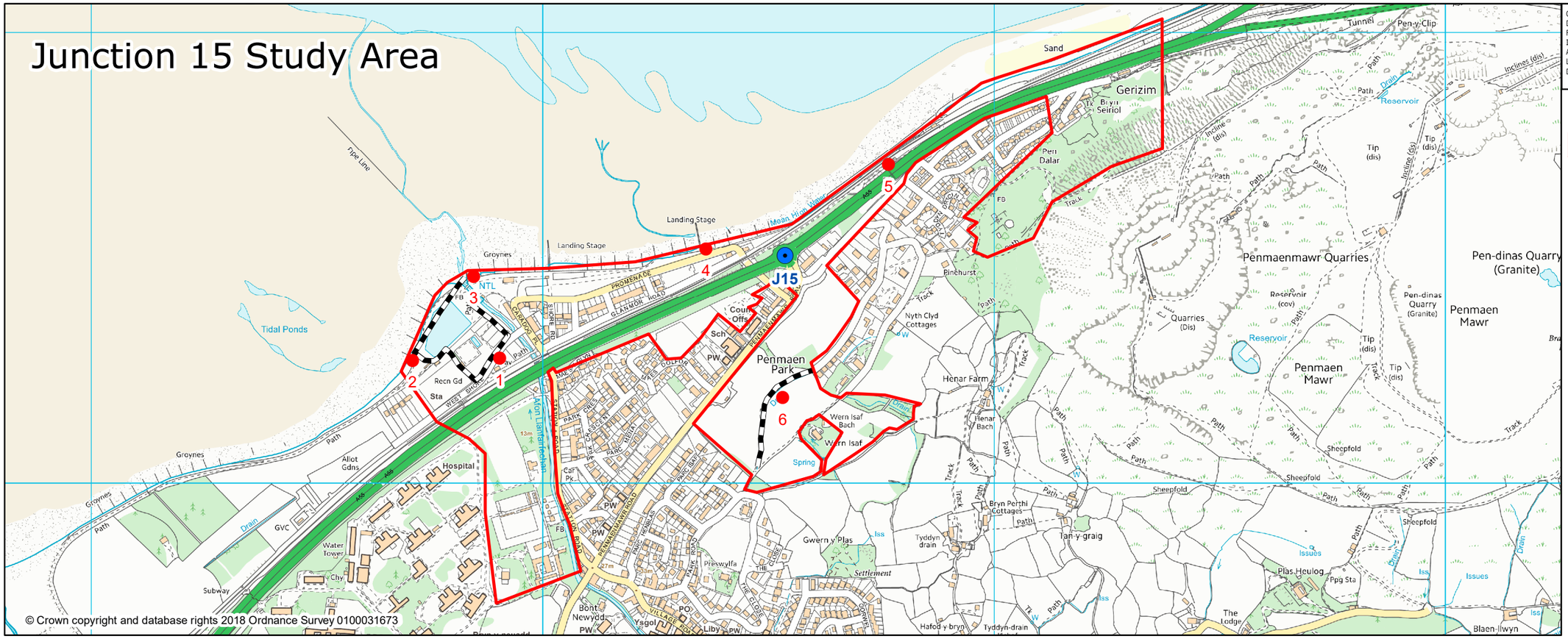
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Fig 1 Site Location

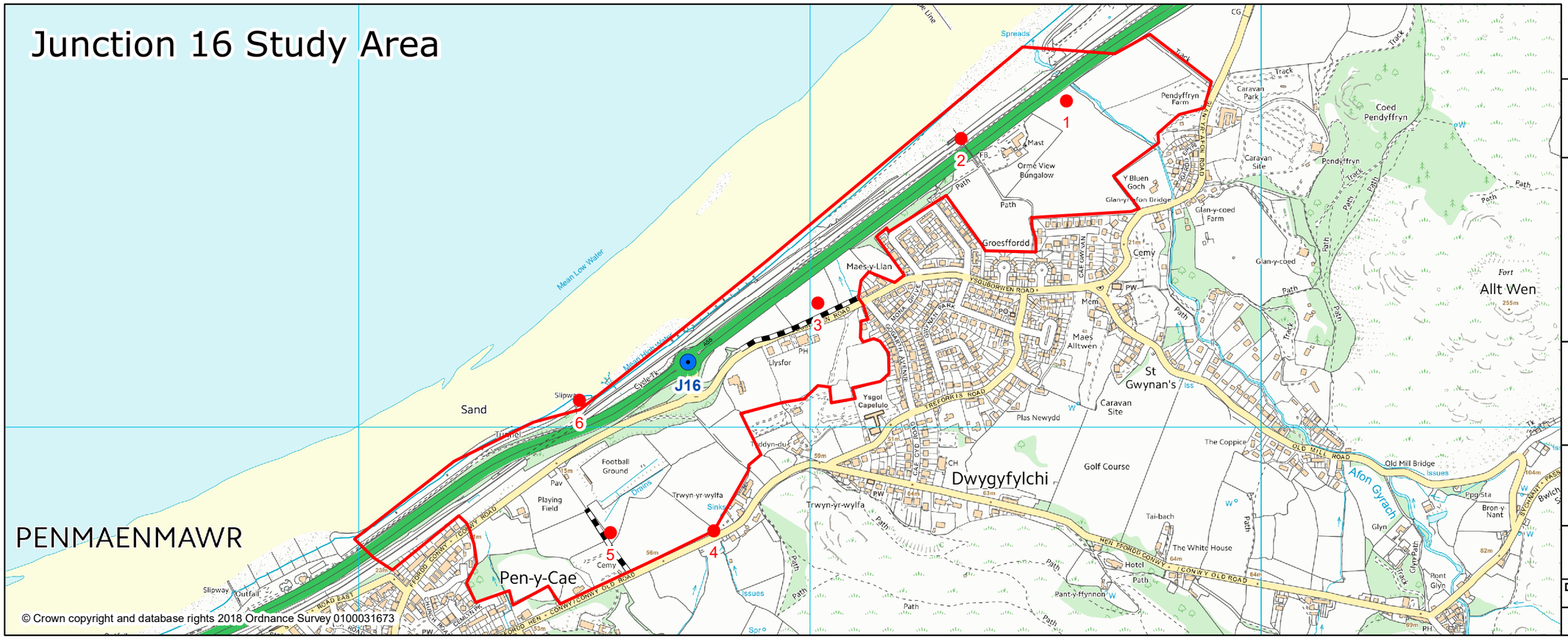
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Junction 15 Study Area



Junction 16 Study Area



- A55 Junctions
- Study Area Boundary
- Viewpoint
- Transects

A55 Junctions 15 & 16; Wintering Bird Survey 2017/2018

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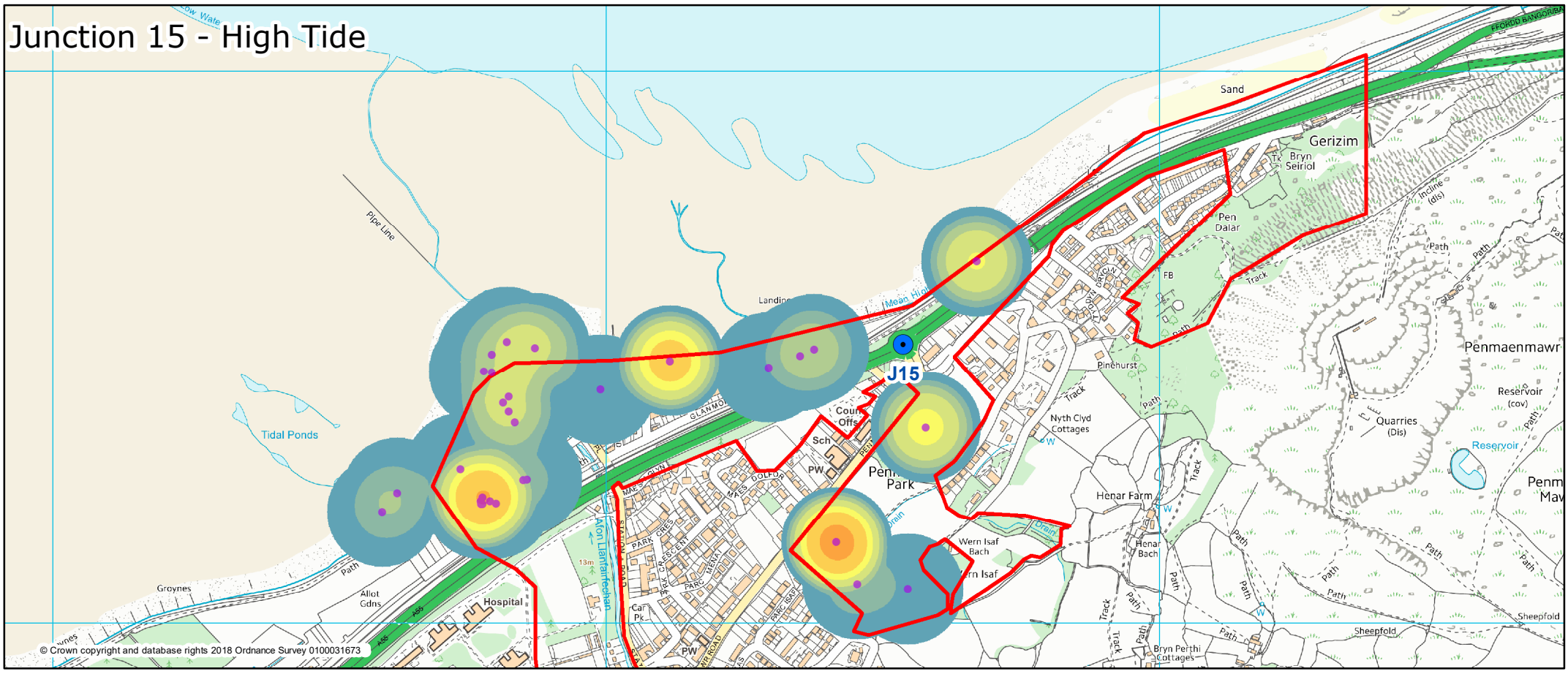
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Fig 2 Study areas and Survey Routes

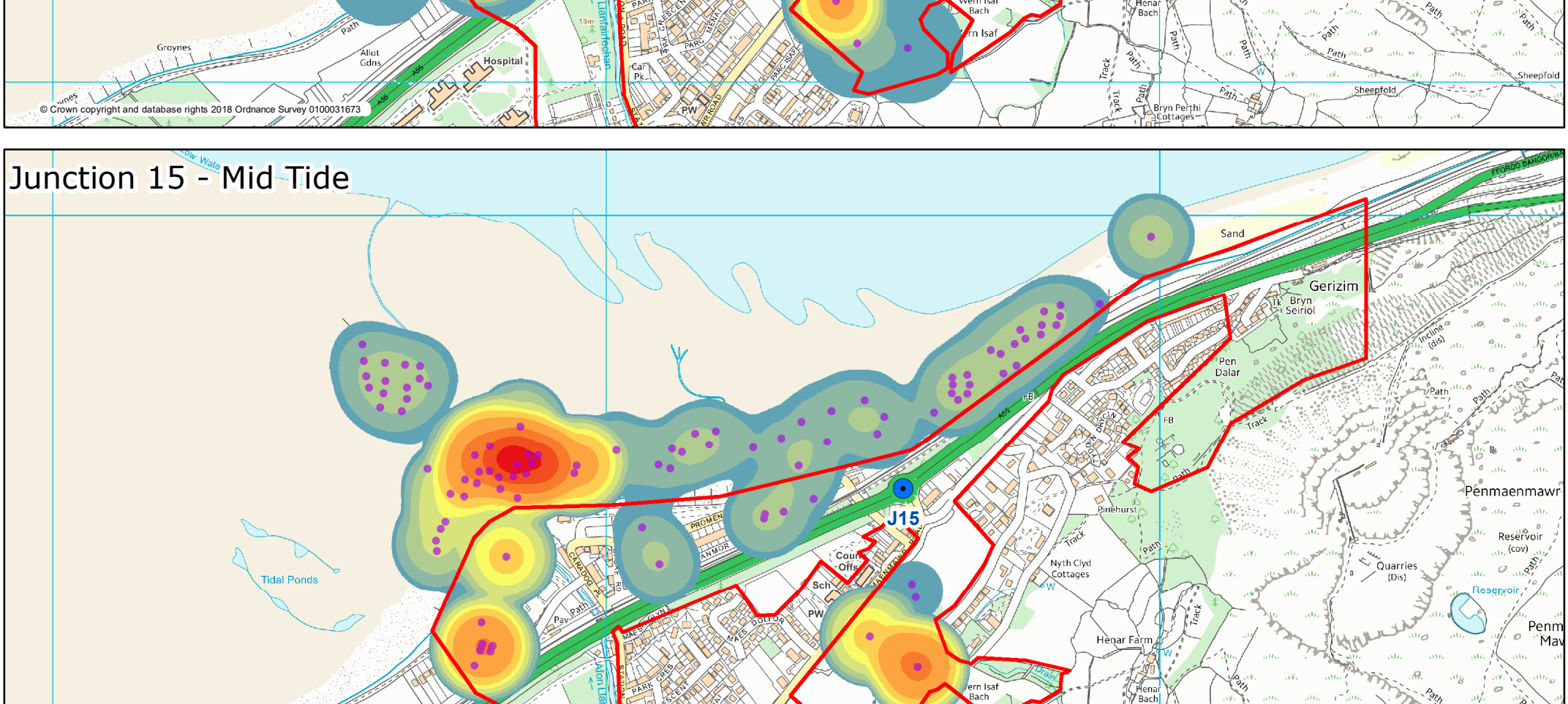
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Drawing No: 2		Rev:

Junction 15 - High Tide



Junction 15 - Mid Tide

Junction 15 - Low Tide



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A55 Junctions 15 & 16; Wintering Bird Survey 2017/2018

Fig 3 Cumulative Oystercatcher Distribution J15 (Oct-Mar)

Drawn: JG	Scale (@A3): 1:10,000	Date: 18/07/2018
Drawing No: 3		Rev:

Oystercatcher Cumulative Counts

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 550

- A55 Junctions
- Study Area Boundary
- Bird Observations

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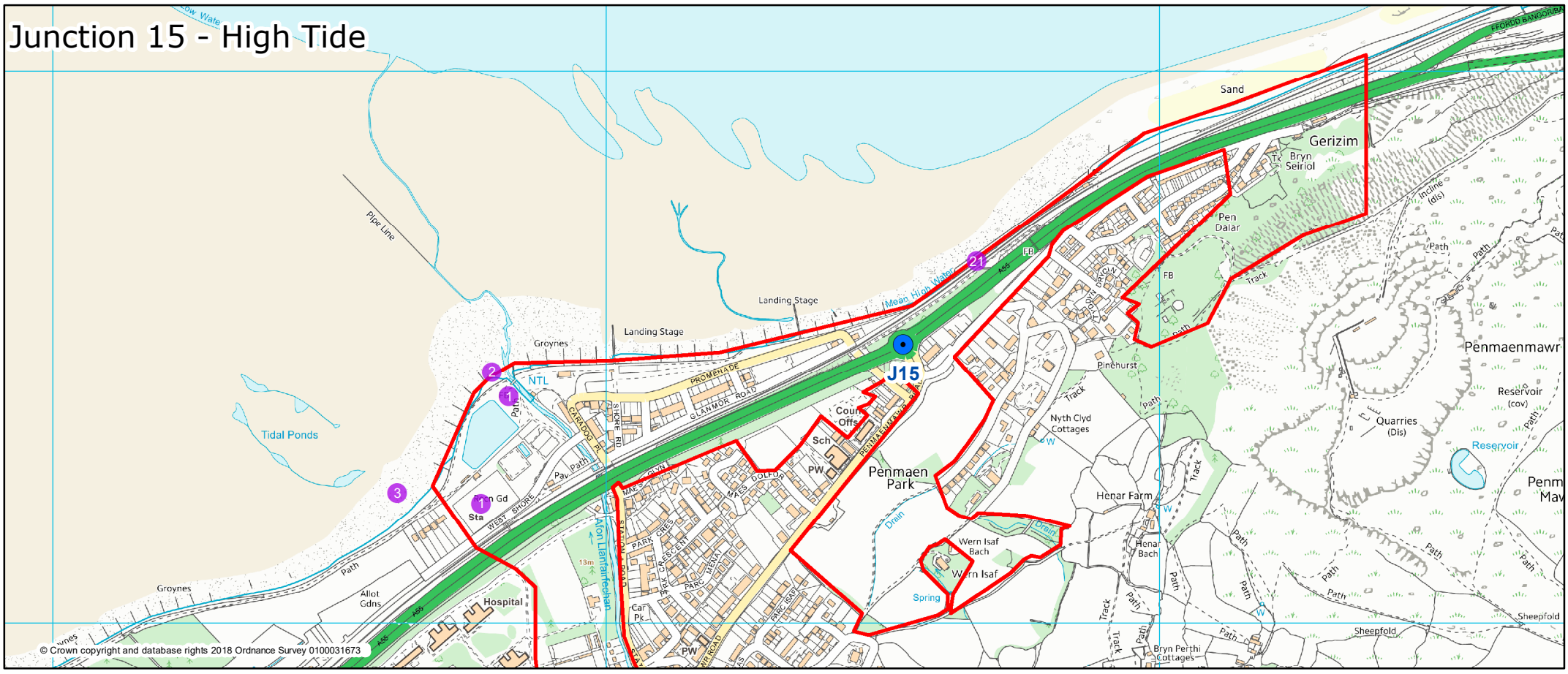
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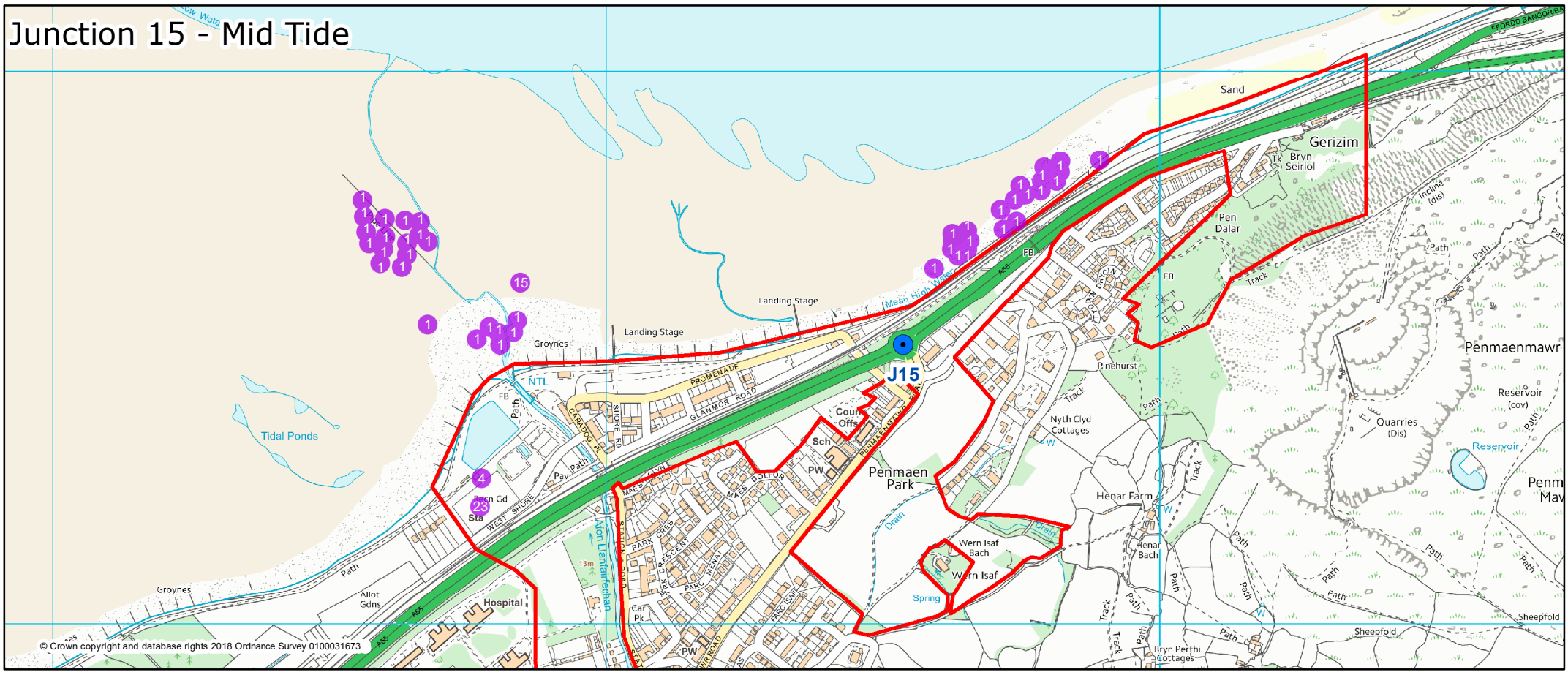
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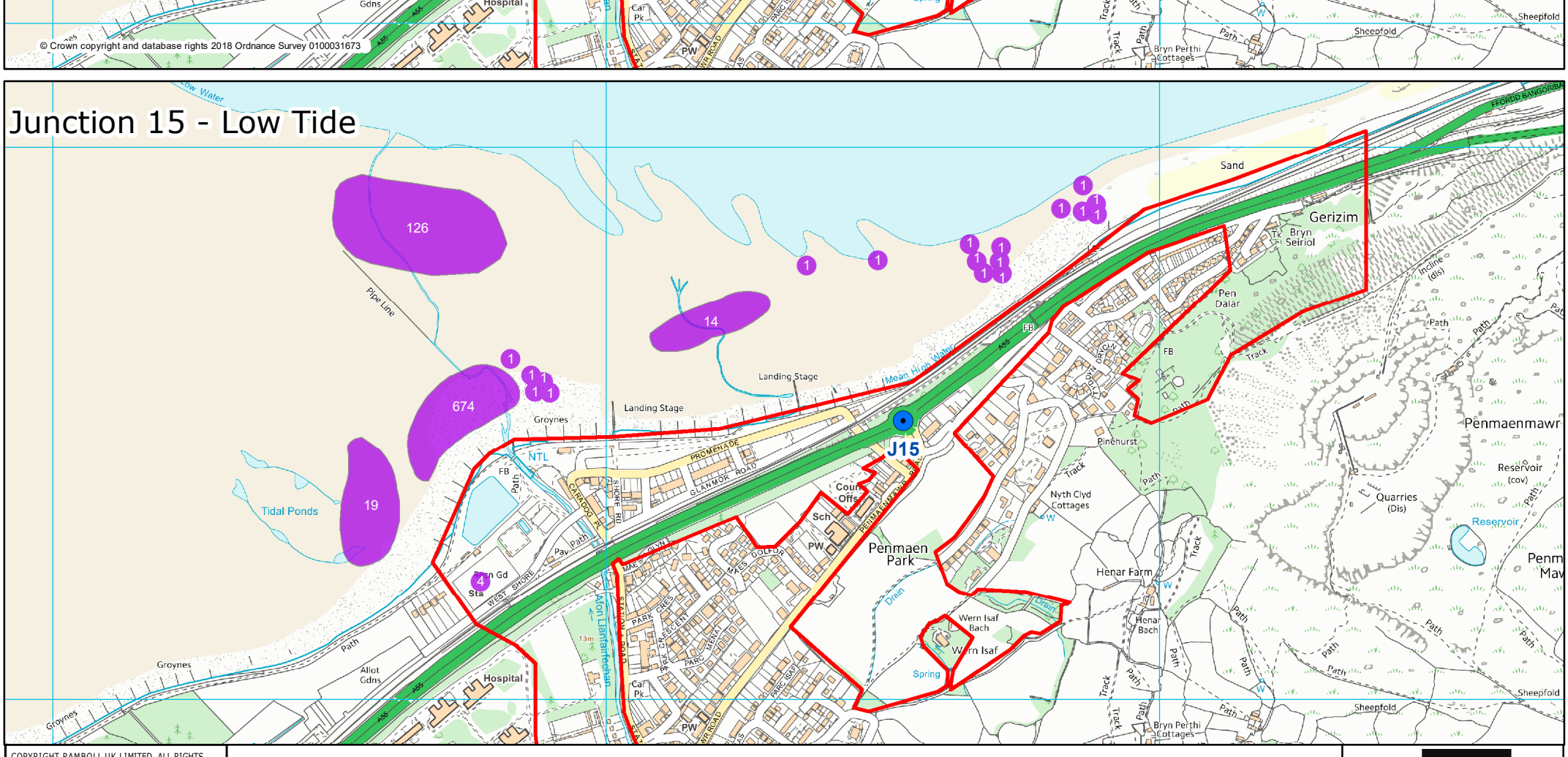
Junction 15 - High Tide



Junction 15 - Mid Tide



Junction 15 - Low Tide



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Fig 4
Oystercatcher Distribution J15 (Oct)

Drawn: JG	Scale (@A3): 1:10,000	Date: 18/07/2018
Drawing No: 4		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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Welsh Government

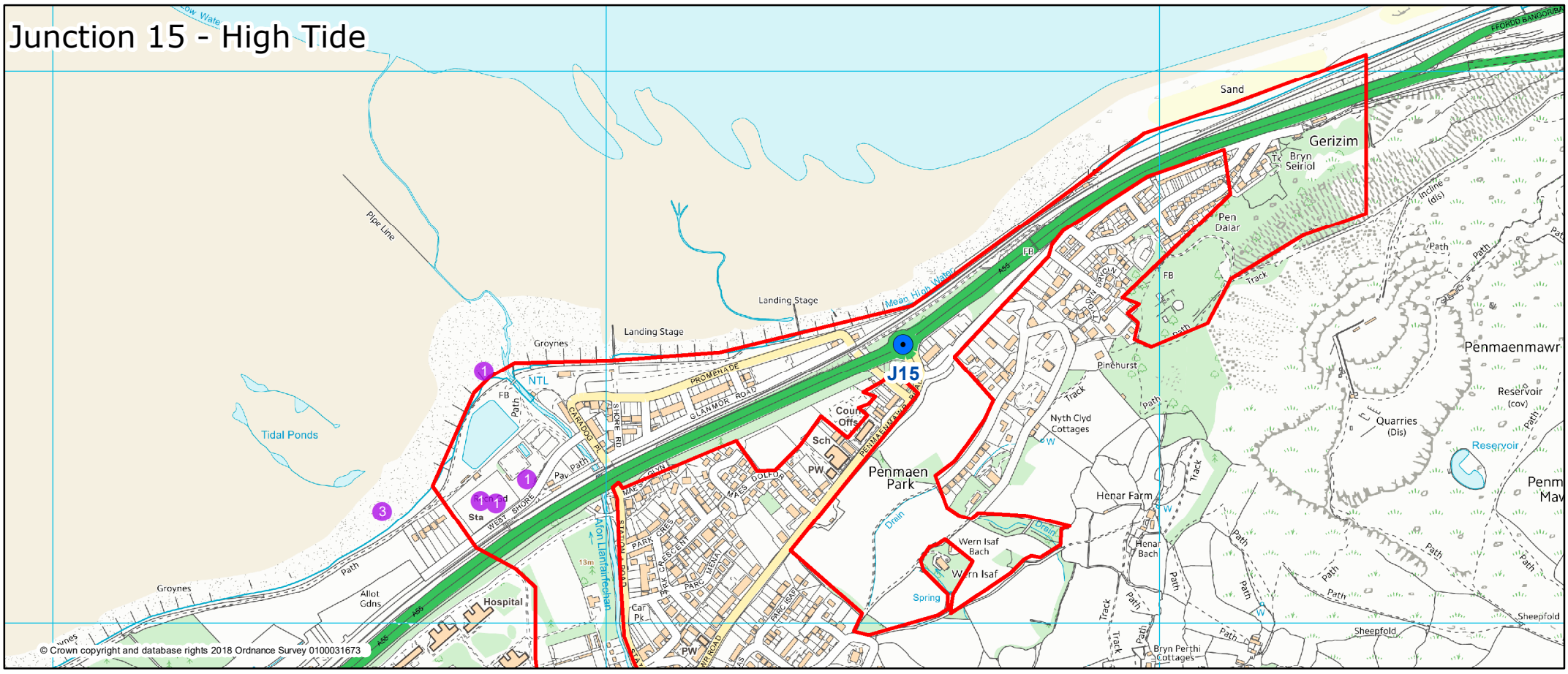
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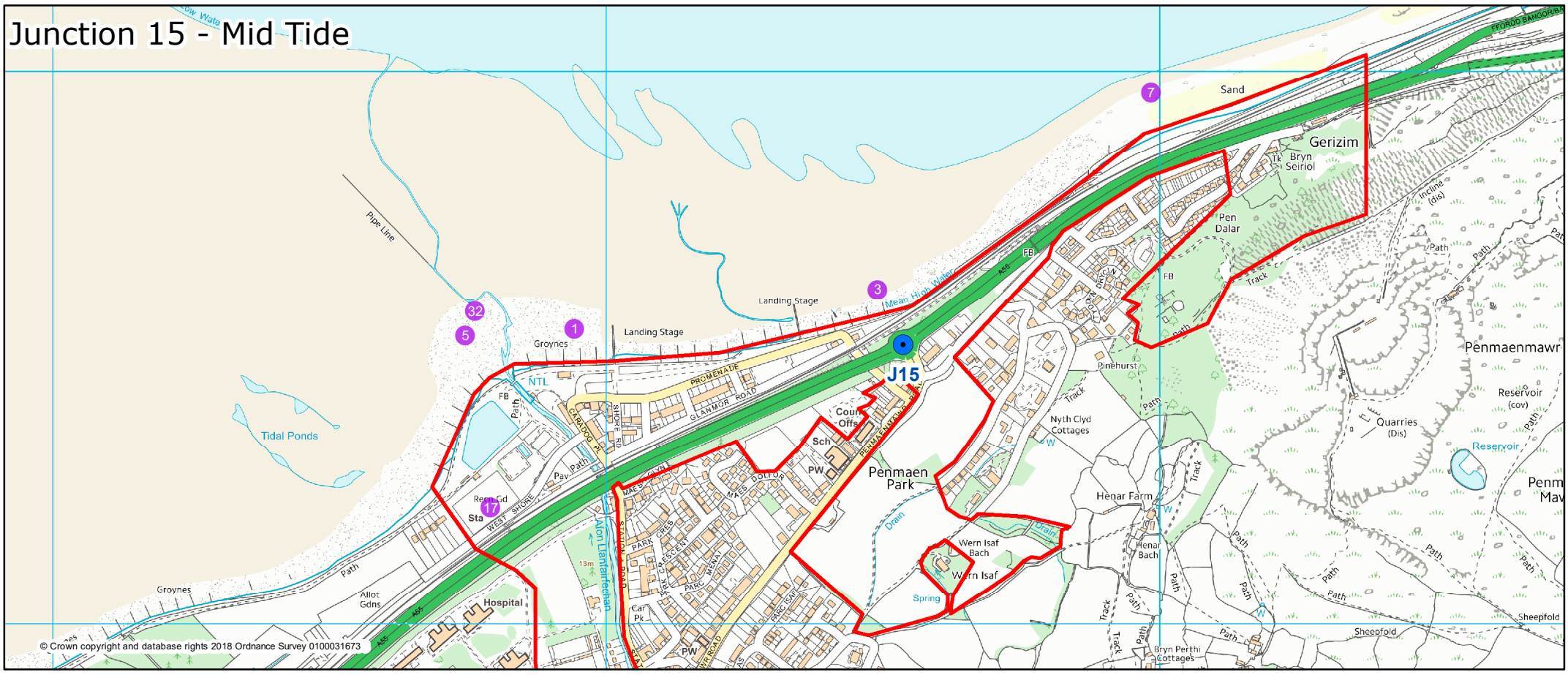
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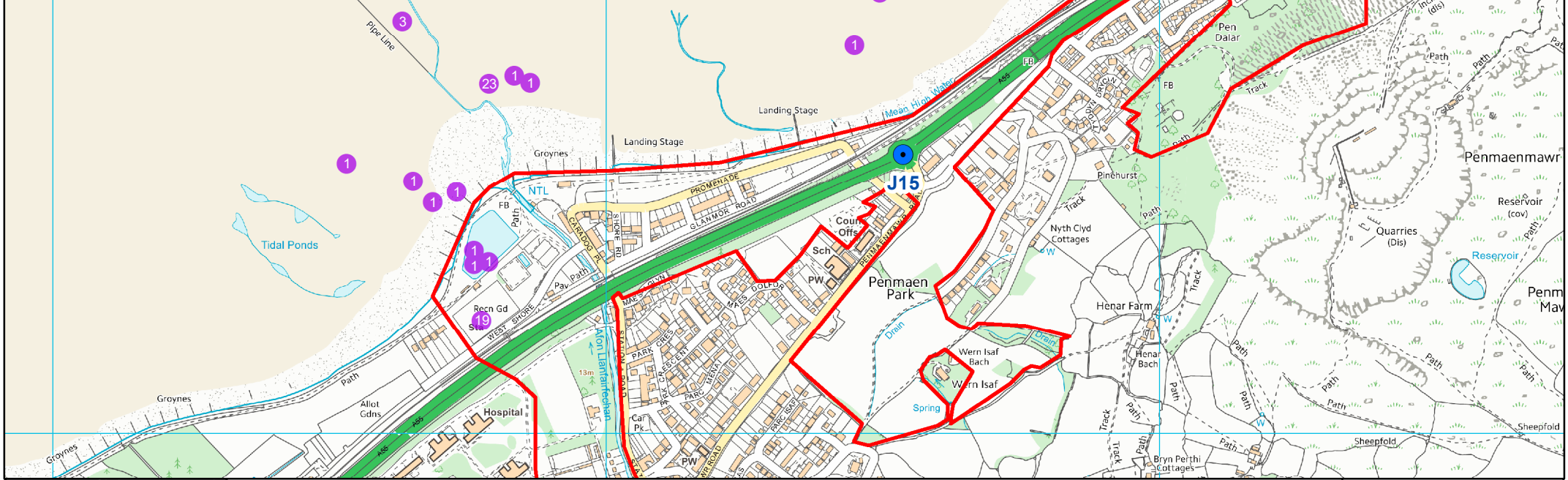
Junction 15 - High Tide



Junction 15 - Mid Tide



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Fig 5
Oystercatcher Distribution J15 (Nov)

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Drawing No: 5		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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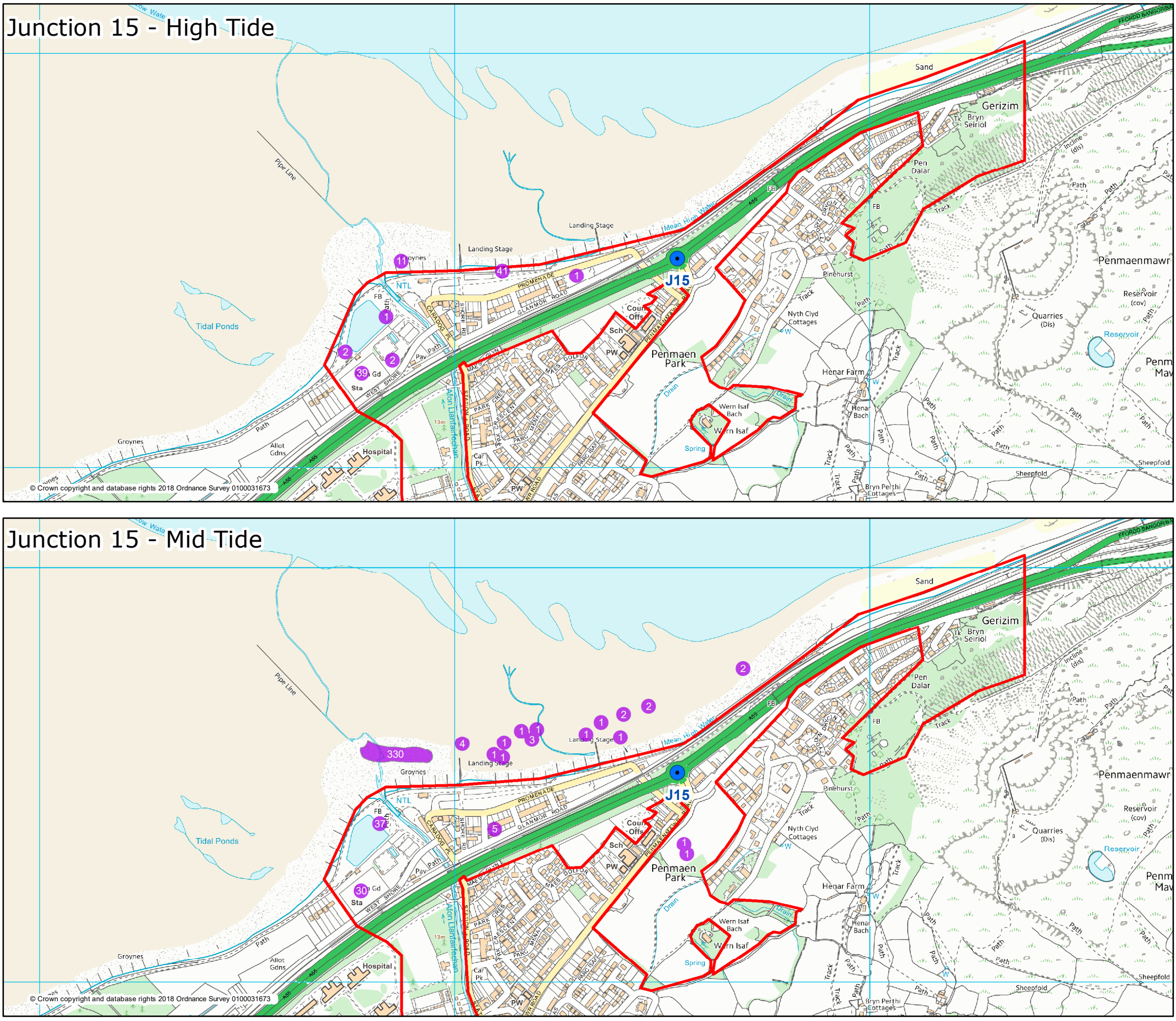
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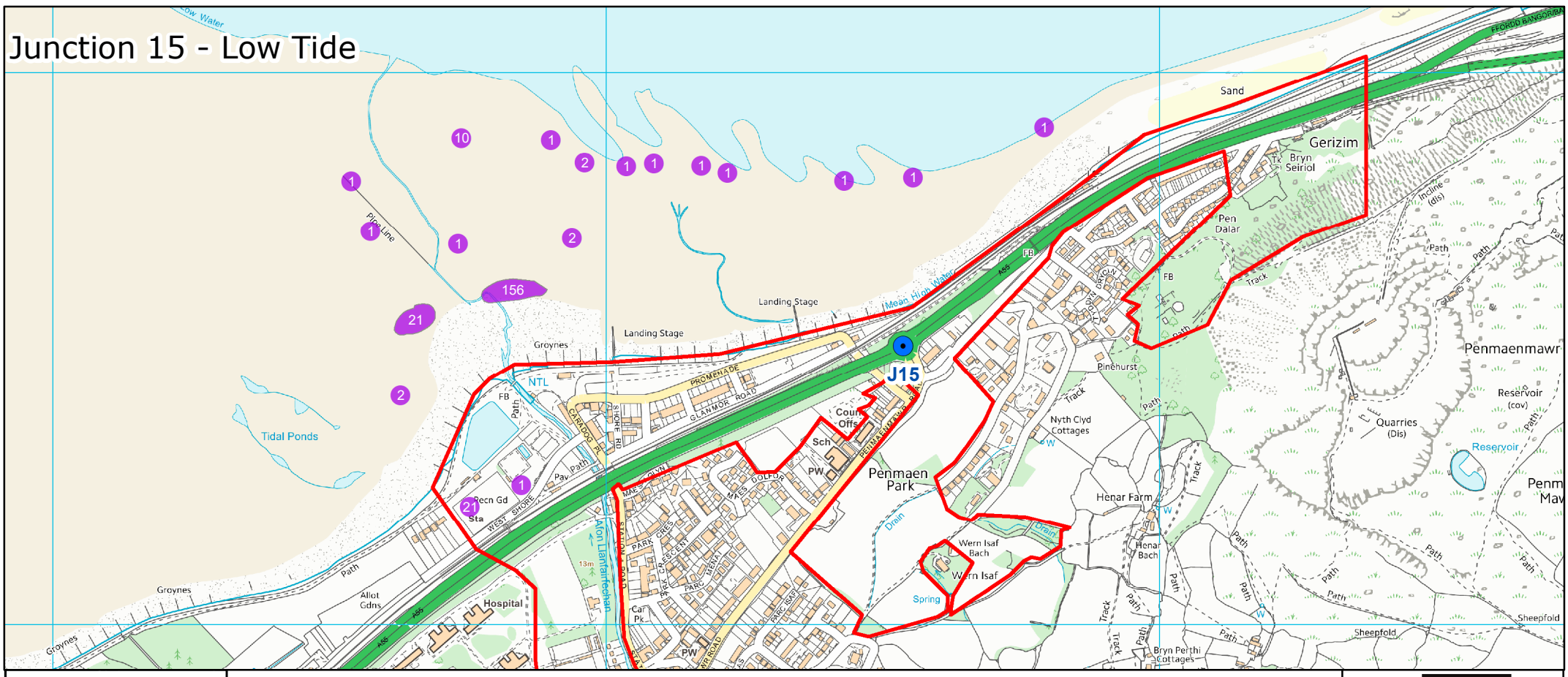
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Junction 15 - High Tide

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Fig 6
Oystercatcher Distribution J15 (Dec)

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Drawing No: 6		Rev:

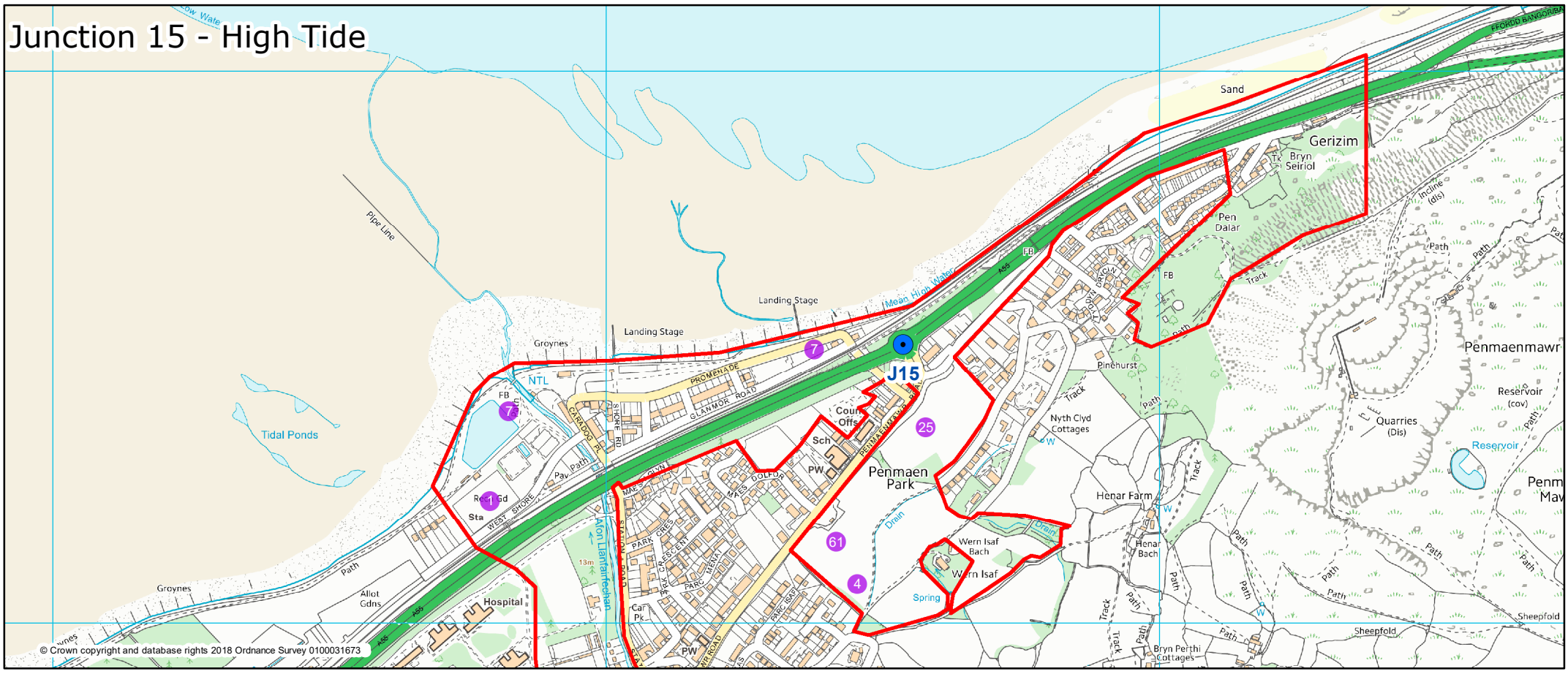
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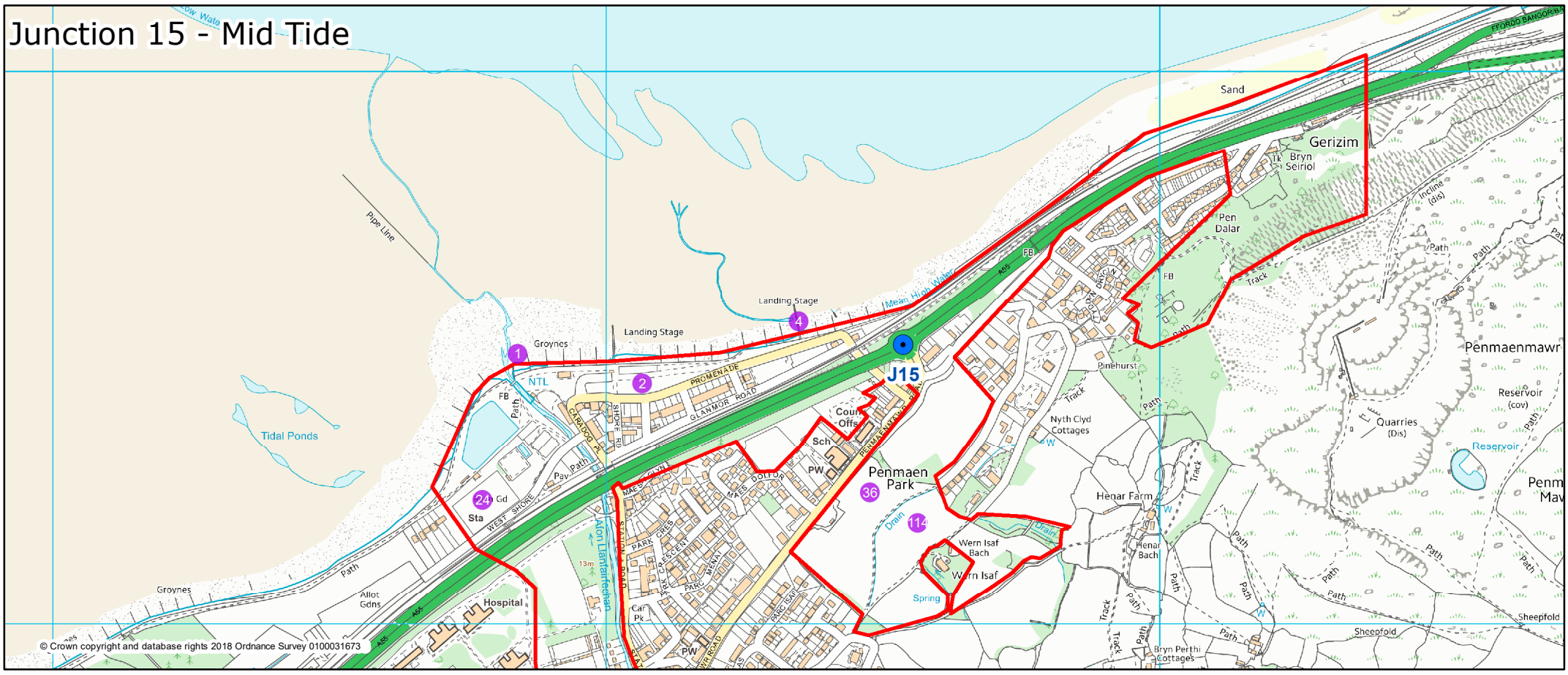
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Junction 15 - High Tide



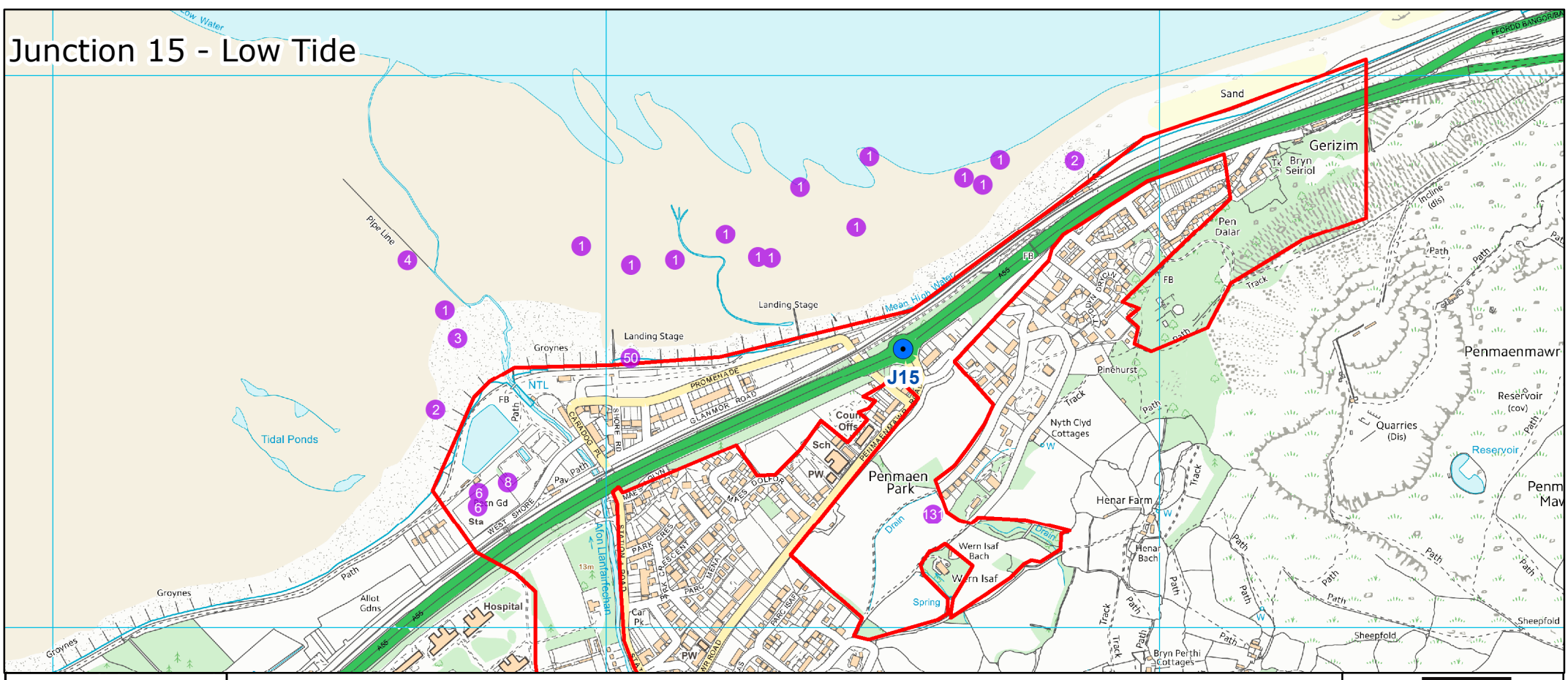
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Junction 15 - Mid Tide



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Junction 15 - Low Tide



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Fig 7
Oystercatcher
Distribution J15 (Jan)

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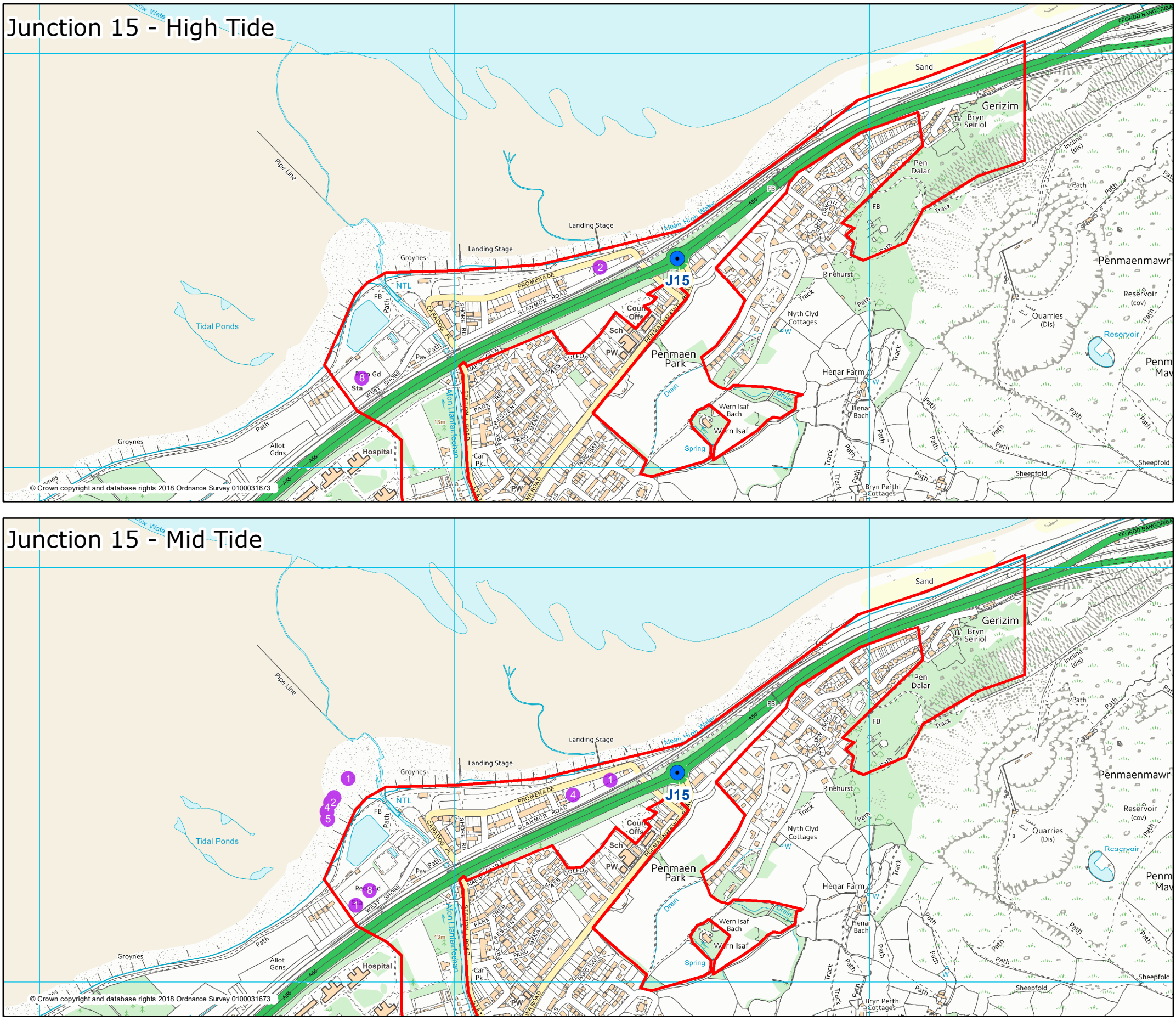
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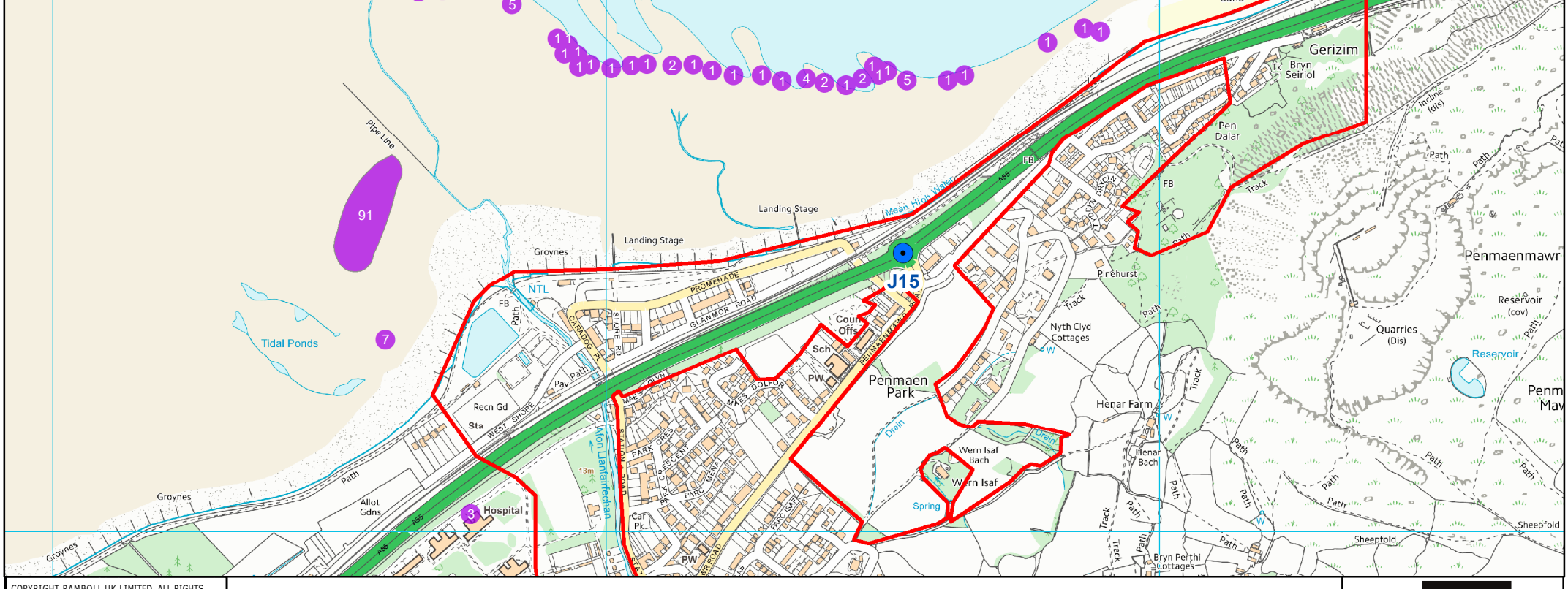
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Junction 15 - High Tide

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Junction 15 - Low Tide



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Fig 8
Oystercatcher Distribution J15 (Feb)

Drawn: JG	Scale (@A3): 1:10,000	Date: 18/07/2018
Drawing No: 8		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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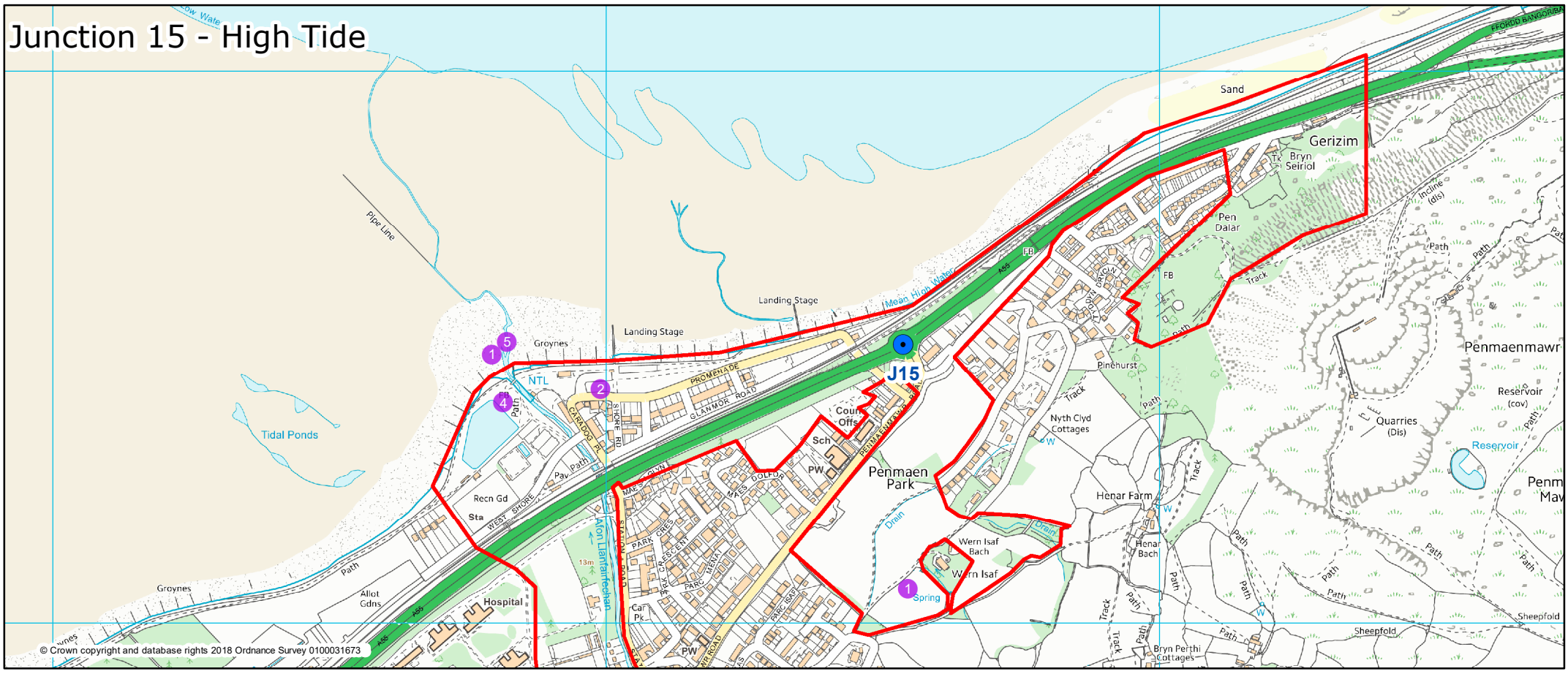
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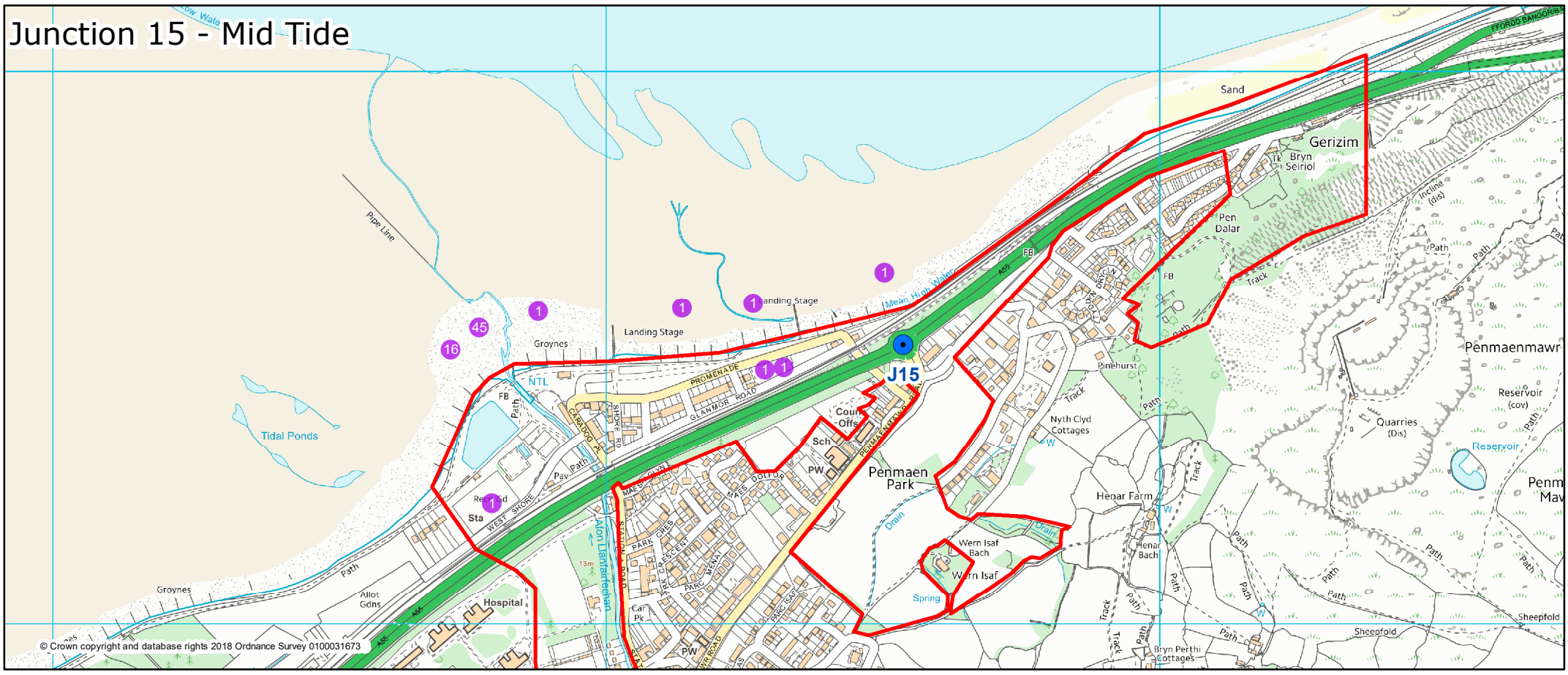
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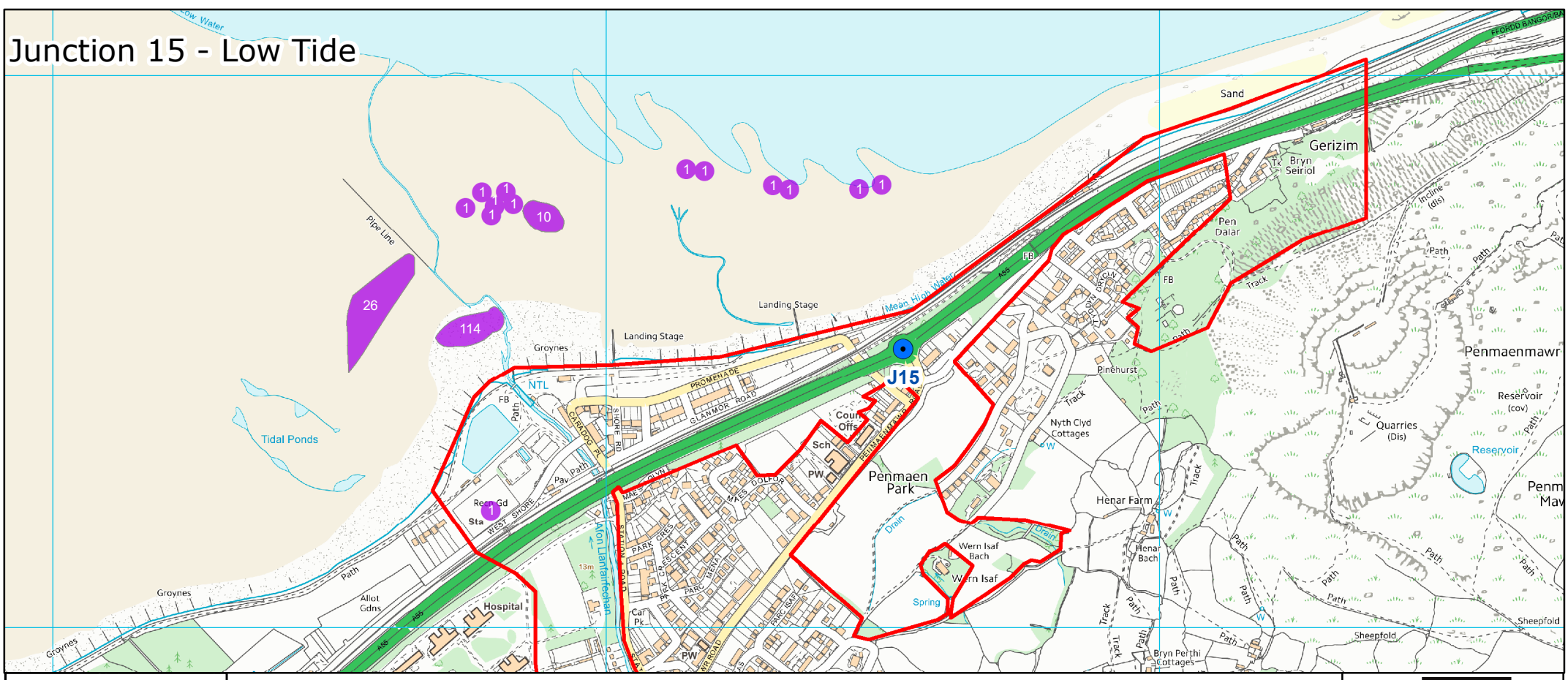
Junction 15 - High Tide



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Fig 9
Oystercatcher
Distribution J15 (Mar)

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- Bird Observations
- A55 Junctions
- Study Area Boundary

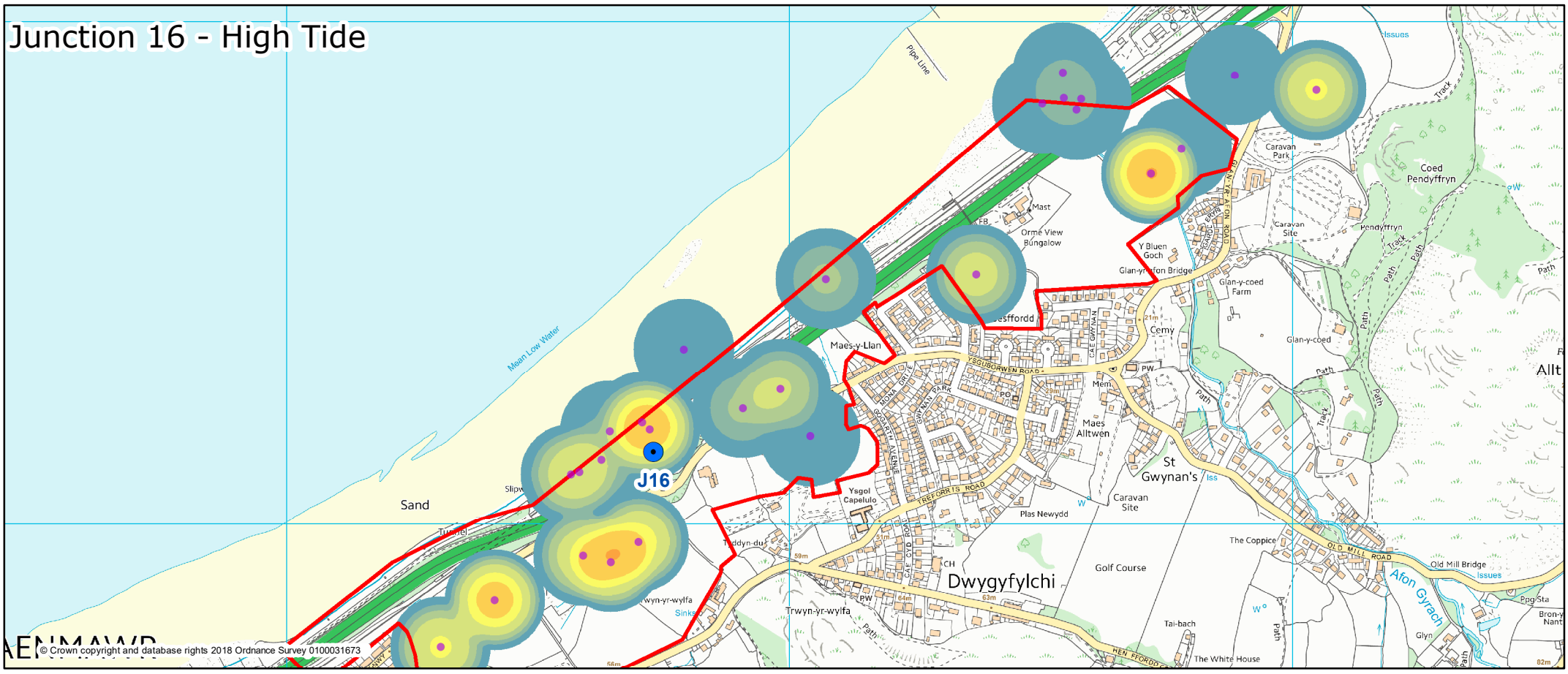
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Junction 16 - High Tide

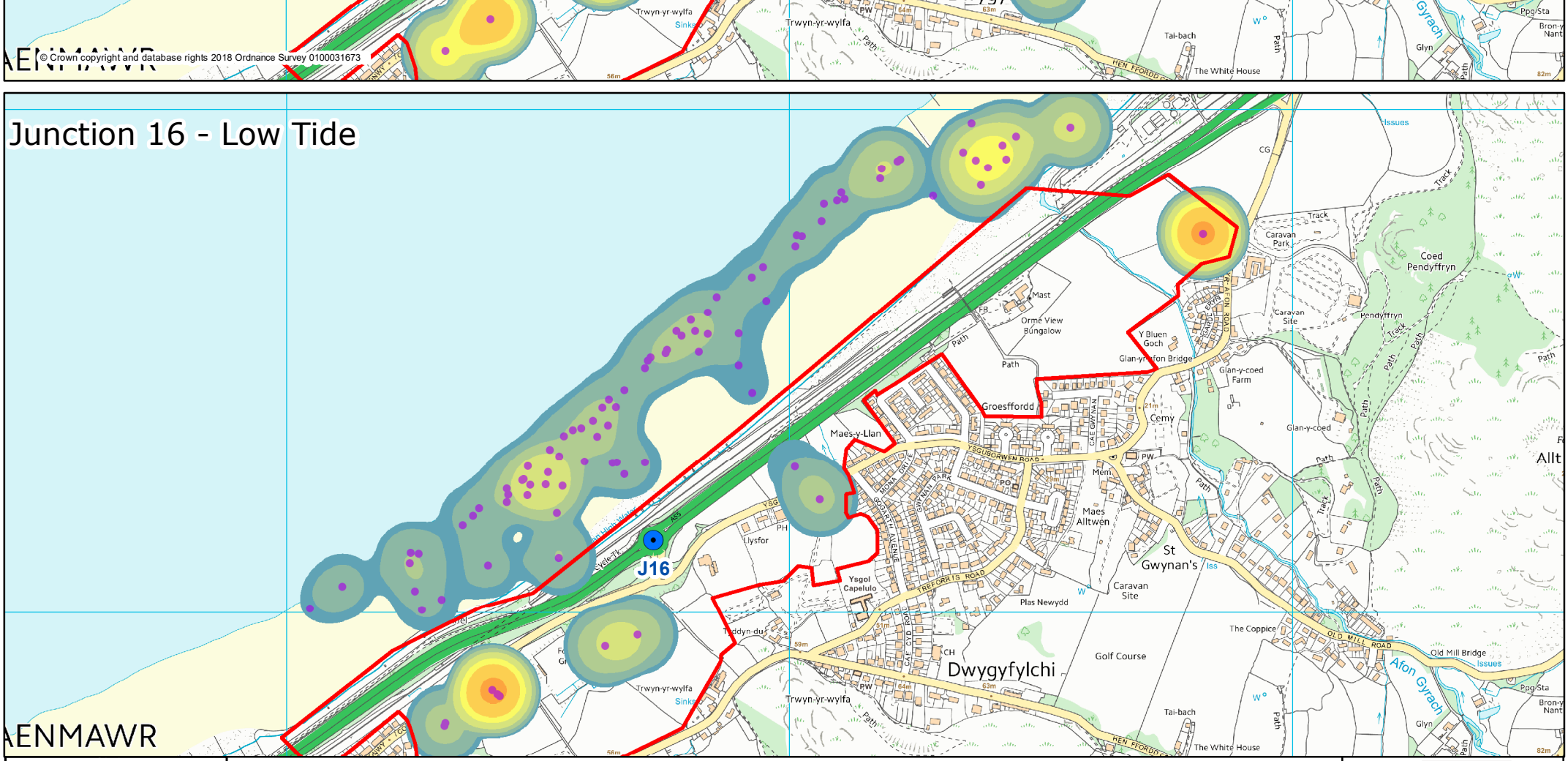


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Junction 16 - Mid Tide

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Oystercatcher Cumulative Counts

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 550

- A55 Junctions
- Study Area Boundary
- Bird Observations

A55 Junctions 15 & 16; Wintering Bird Survey 2017/2018

Fig 10 Cumulative Oystercatcher Distribution J16 (Oct-Mar)

Drawn: JG	Scale (@A3): 1:11,000	Date: 18/07/2018
Drawing No: 10		Rev:

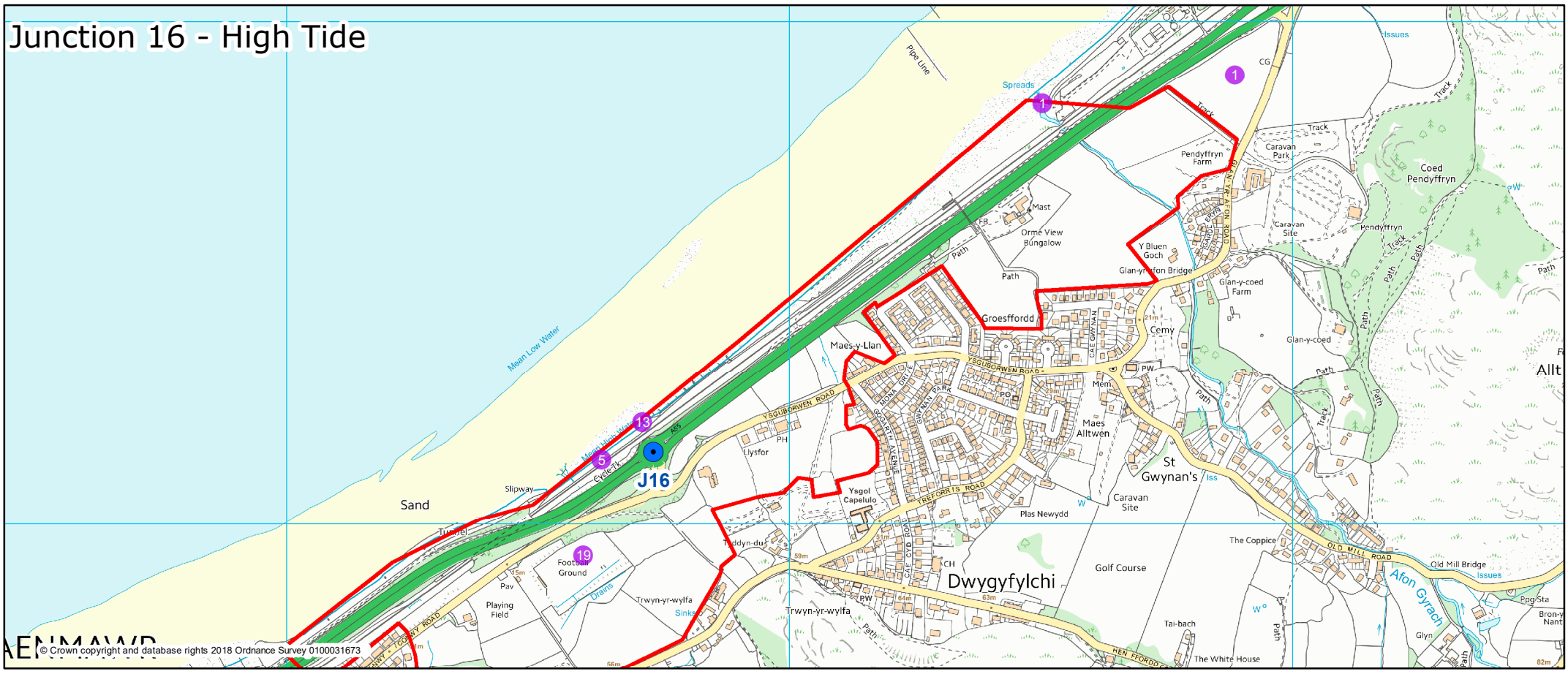
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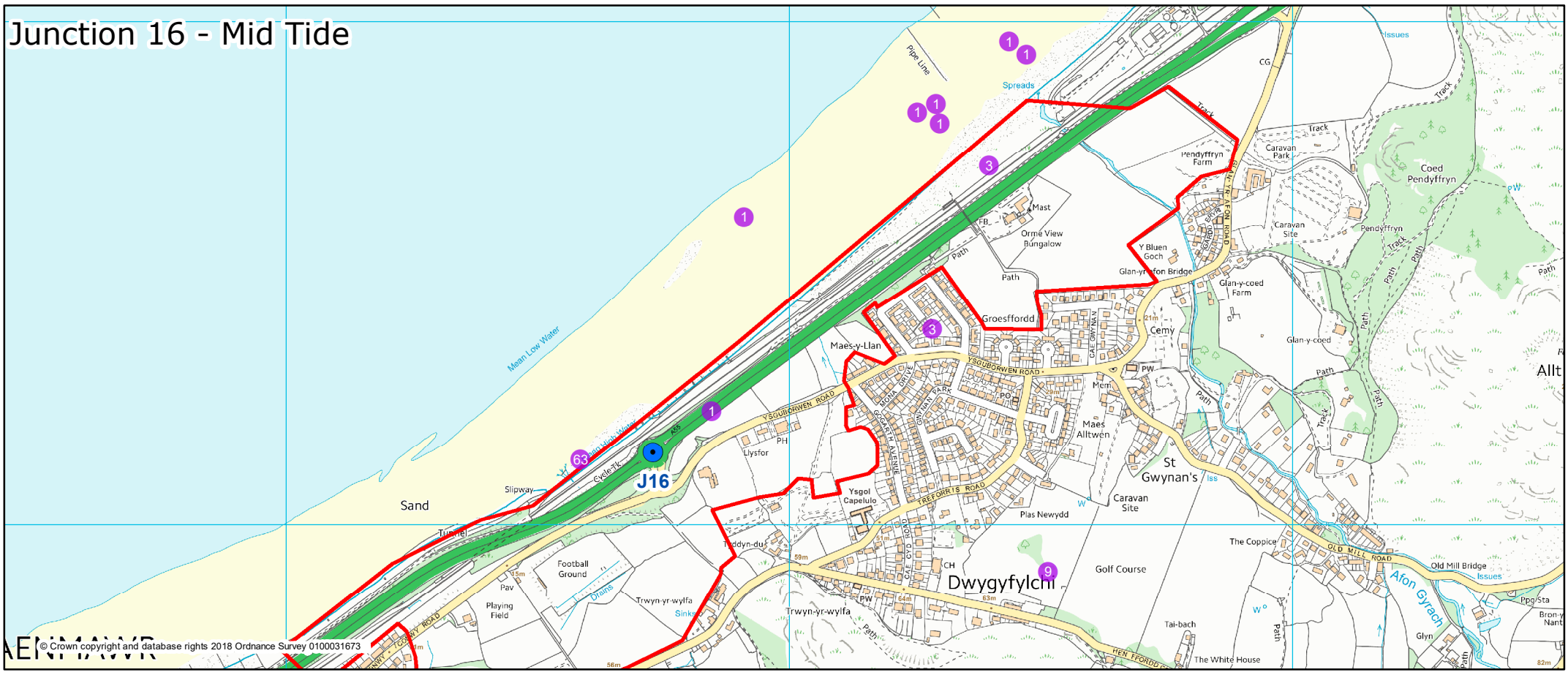
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Junction 16 - High Tide



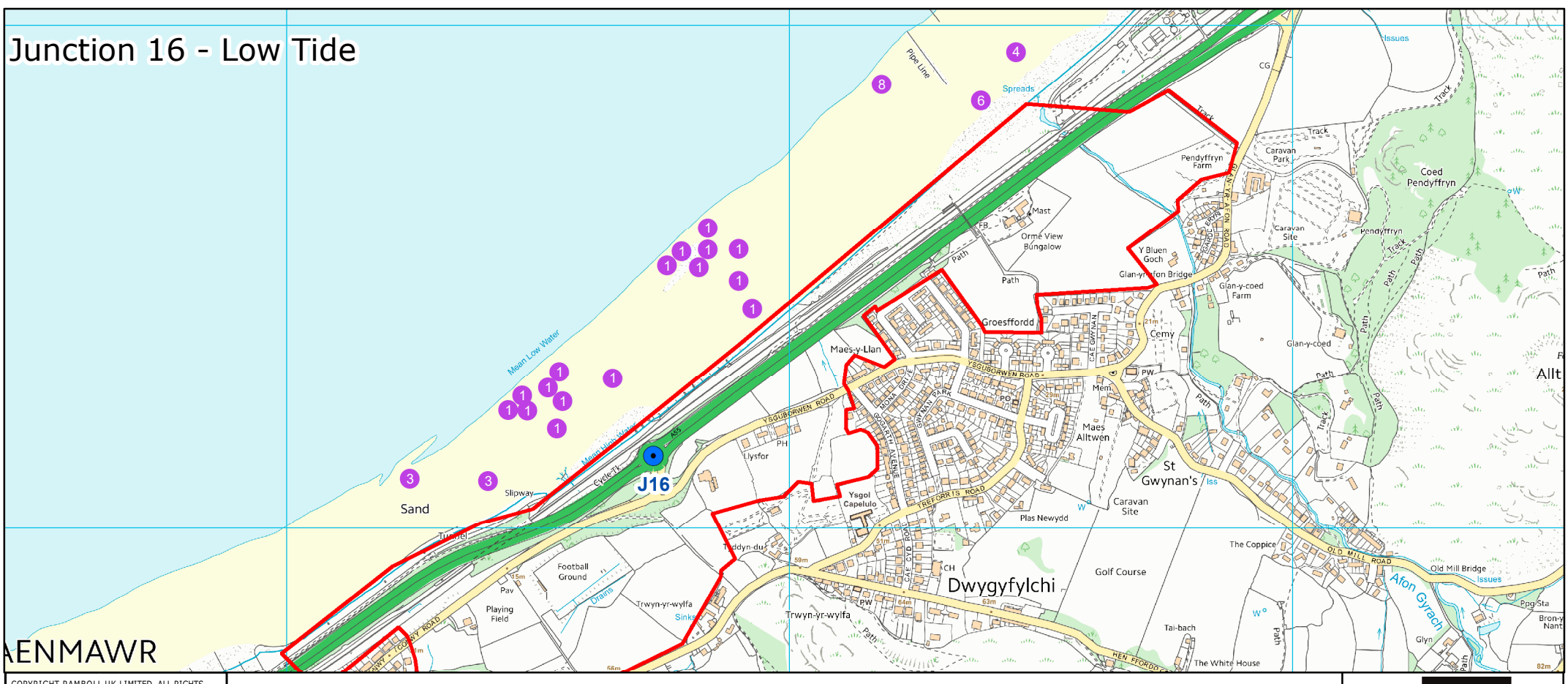
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Fig 11
Oystercatcher Distribution J16 (Oct)

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Drawing No: 11		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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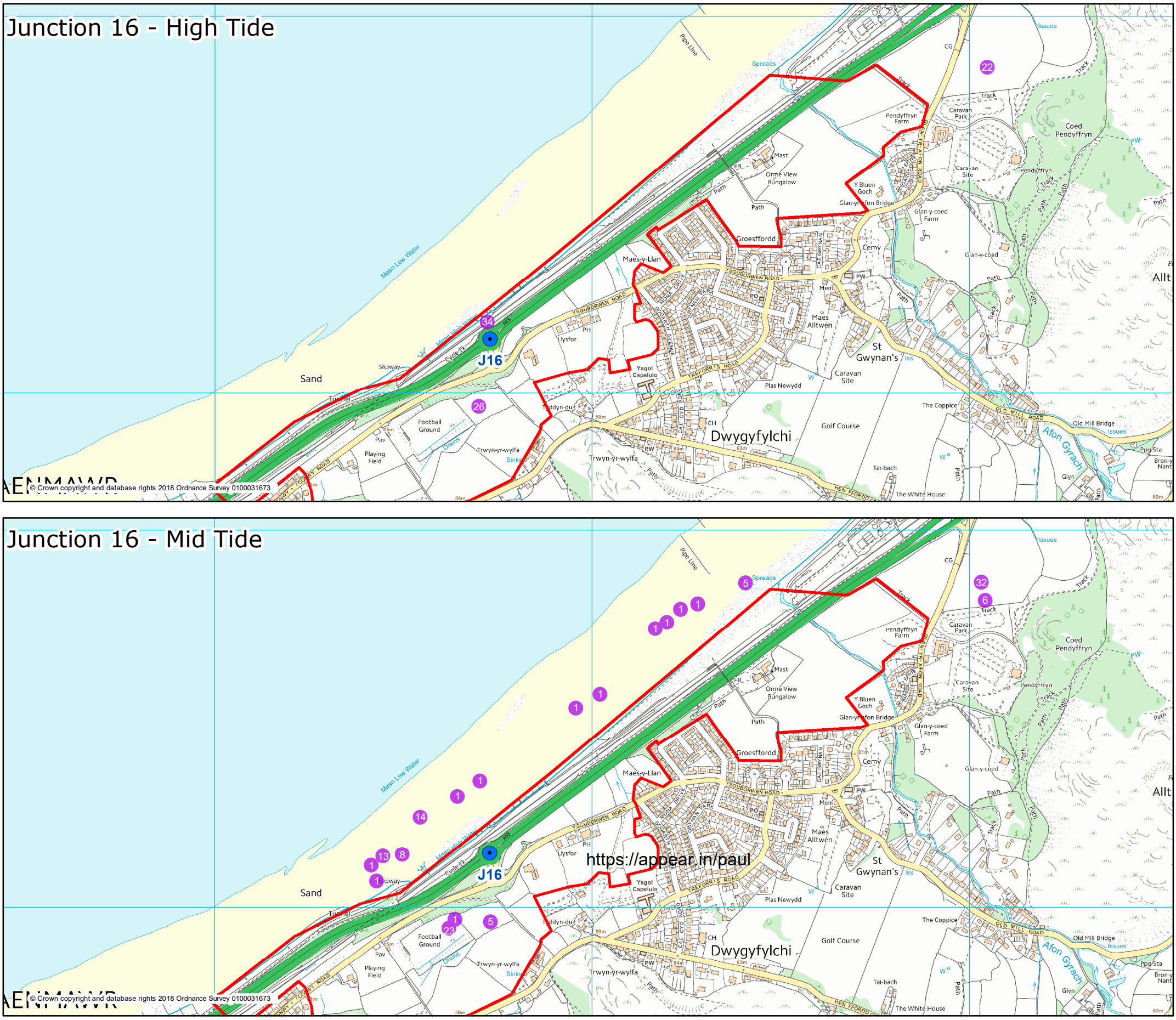
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Junction 16 - High Tide

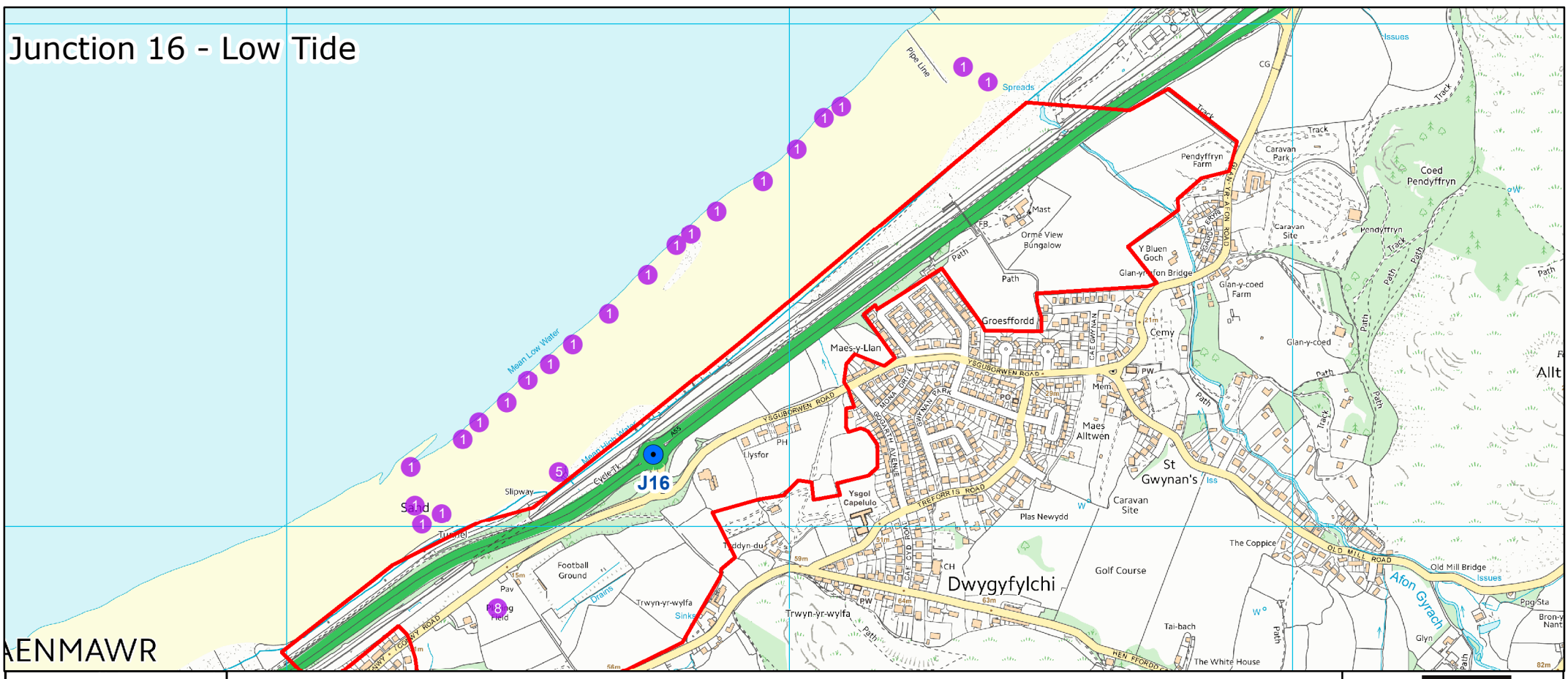
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Junction 16 - Mid Tide



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Fig 12
Oystercatcher Distribution J16 (Nov)

Drawn: JG	Scale (@A3): 1:11,000	Date: 18/07/2018
Drawing No: 12		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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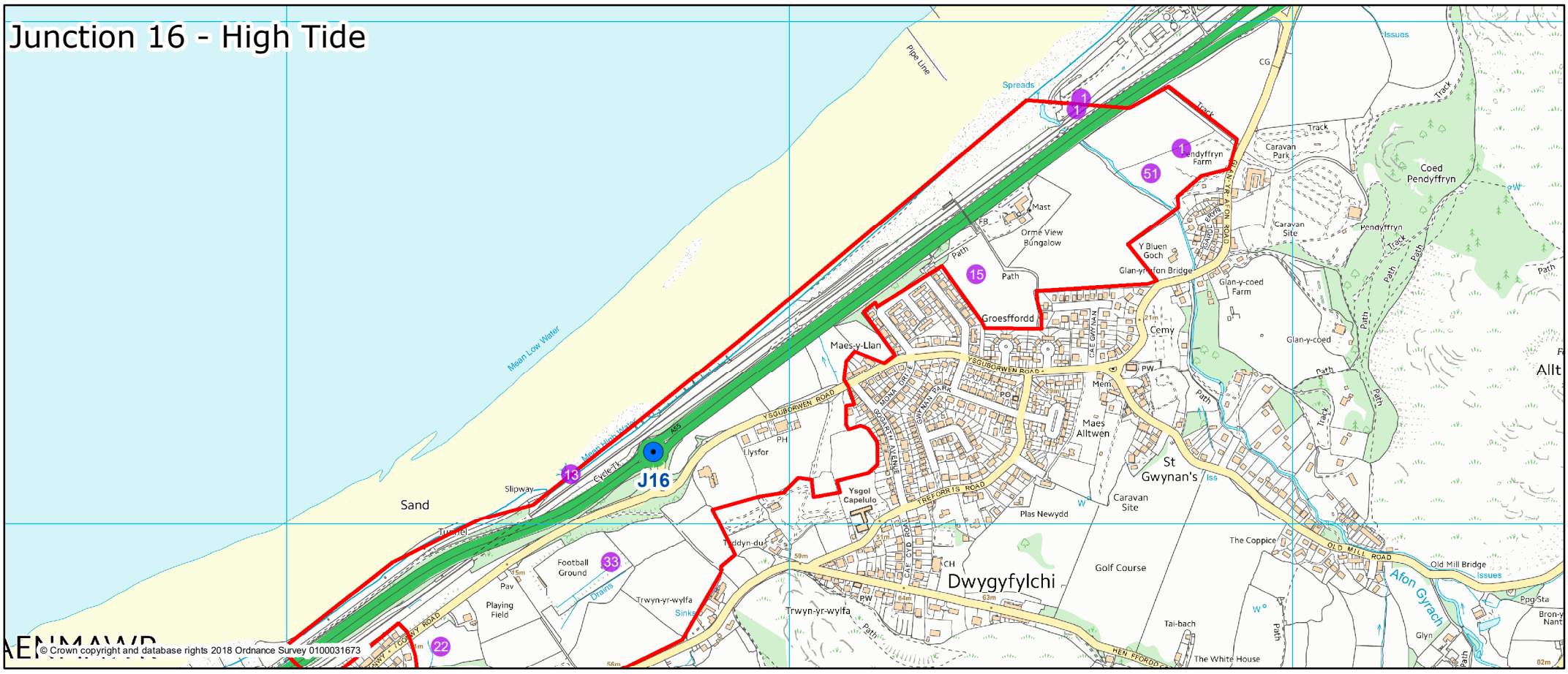
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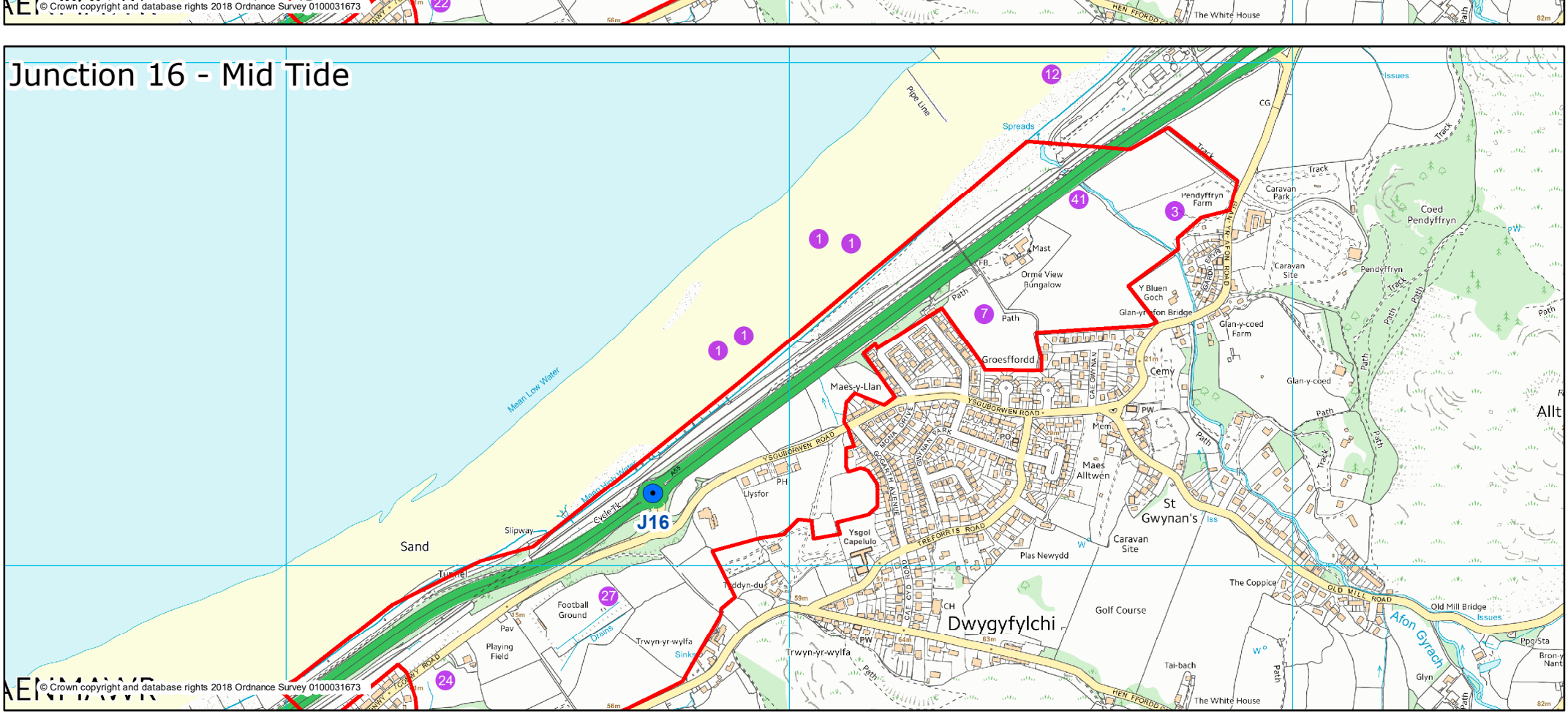
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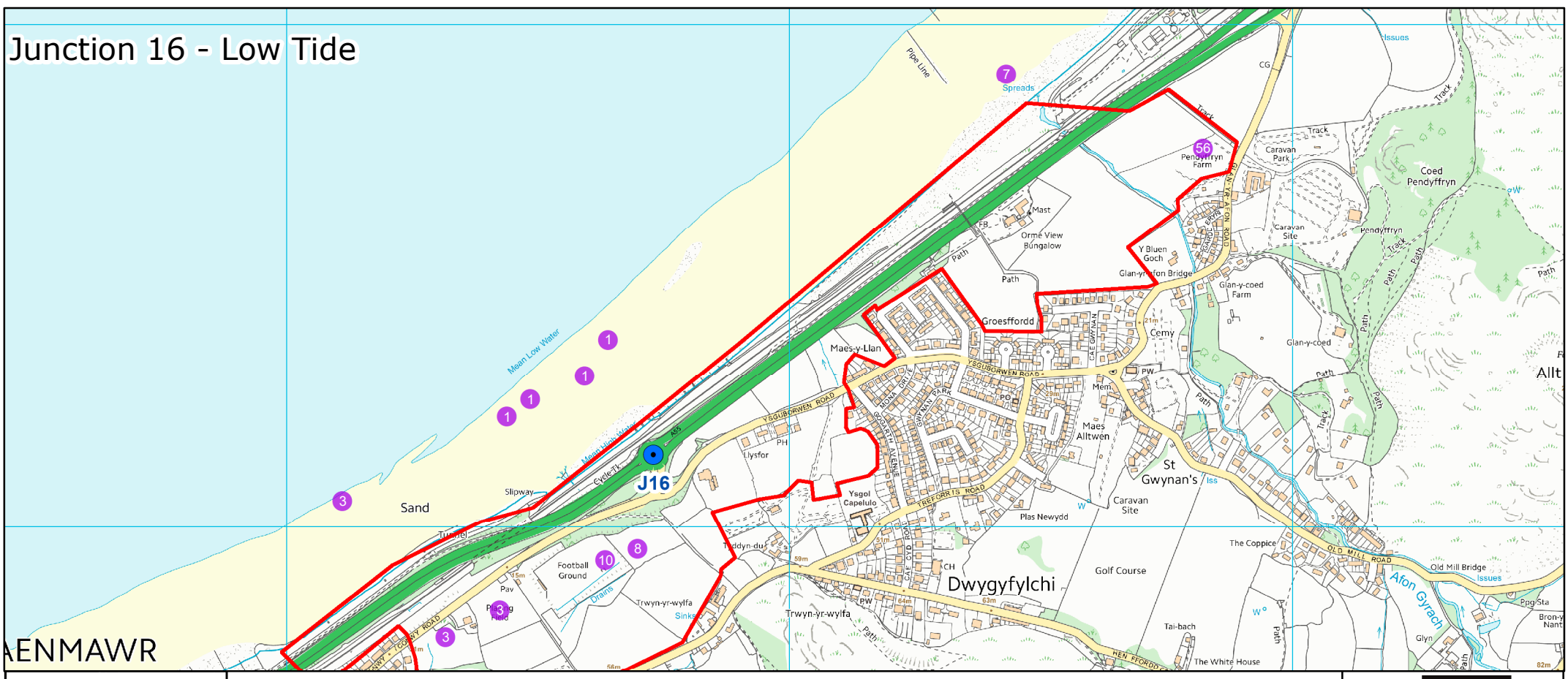
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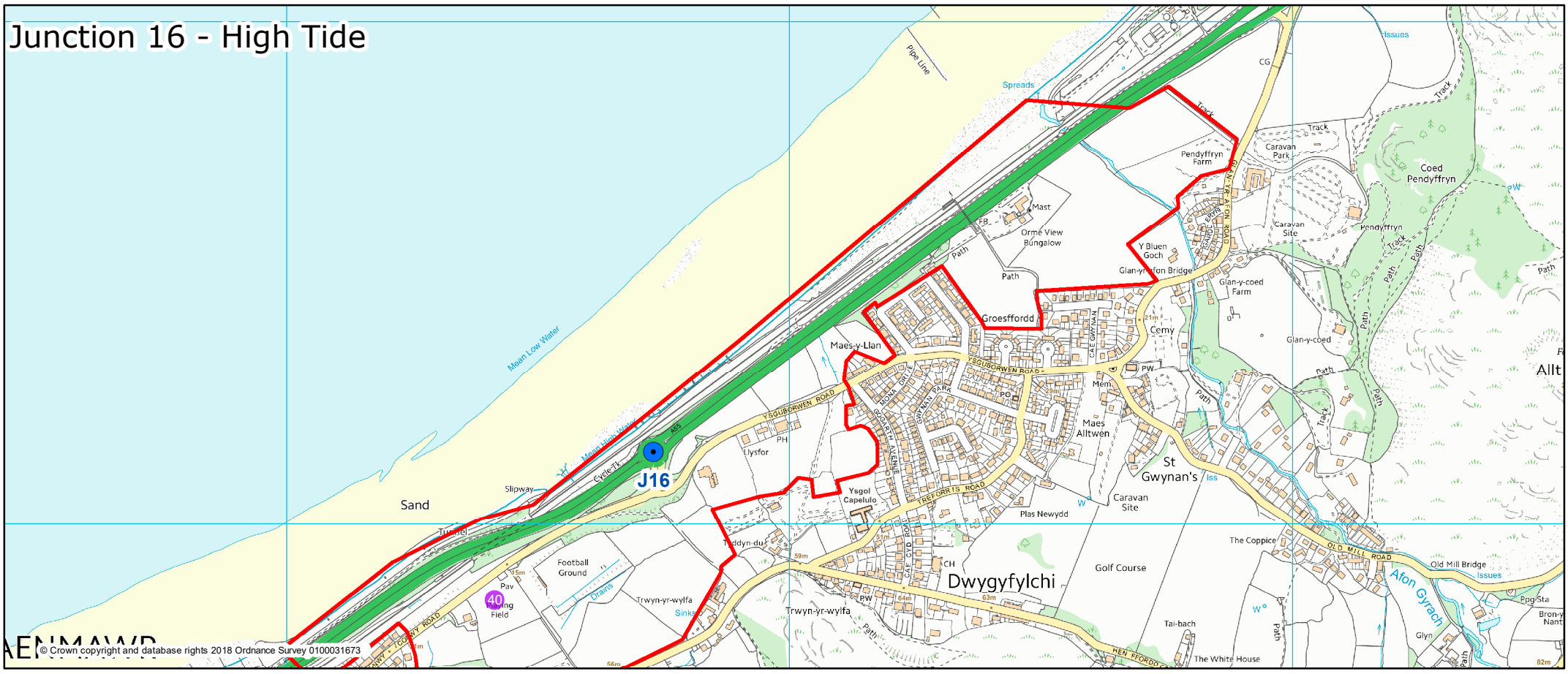
Fig 13
Oystercatcher Distribution J16 (Dec)

Drawn: JG	Scale (@A3): 1:11,000	Date: 18/07/2018
Drawing No: 13		Rev:

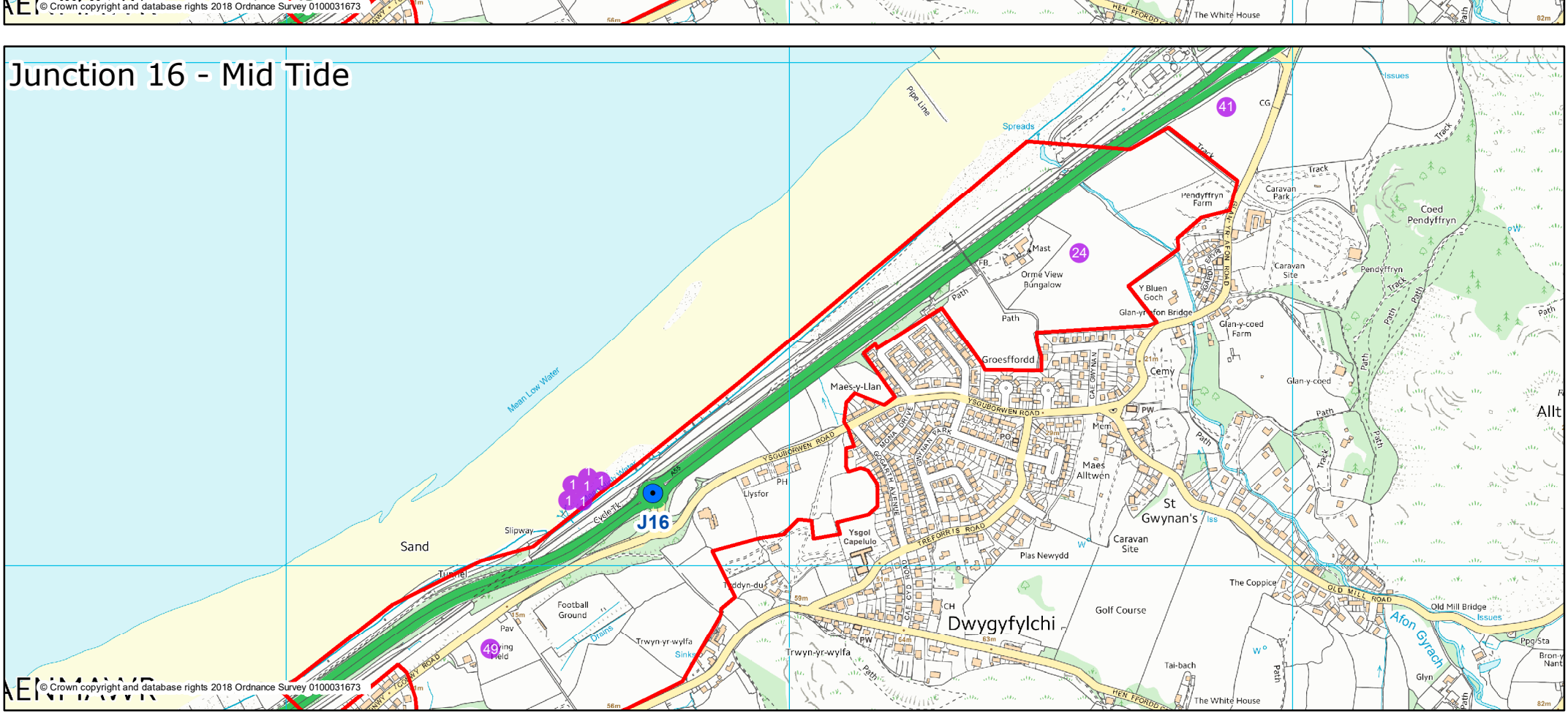
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- A55 Junctions
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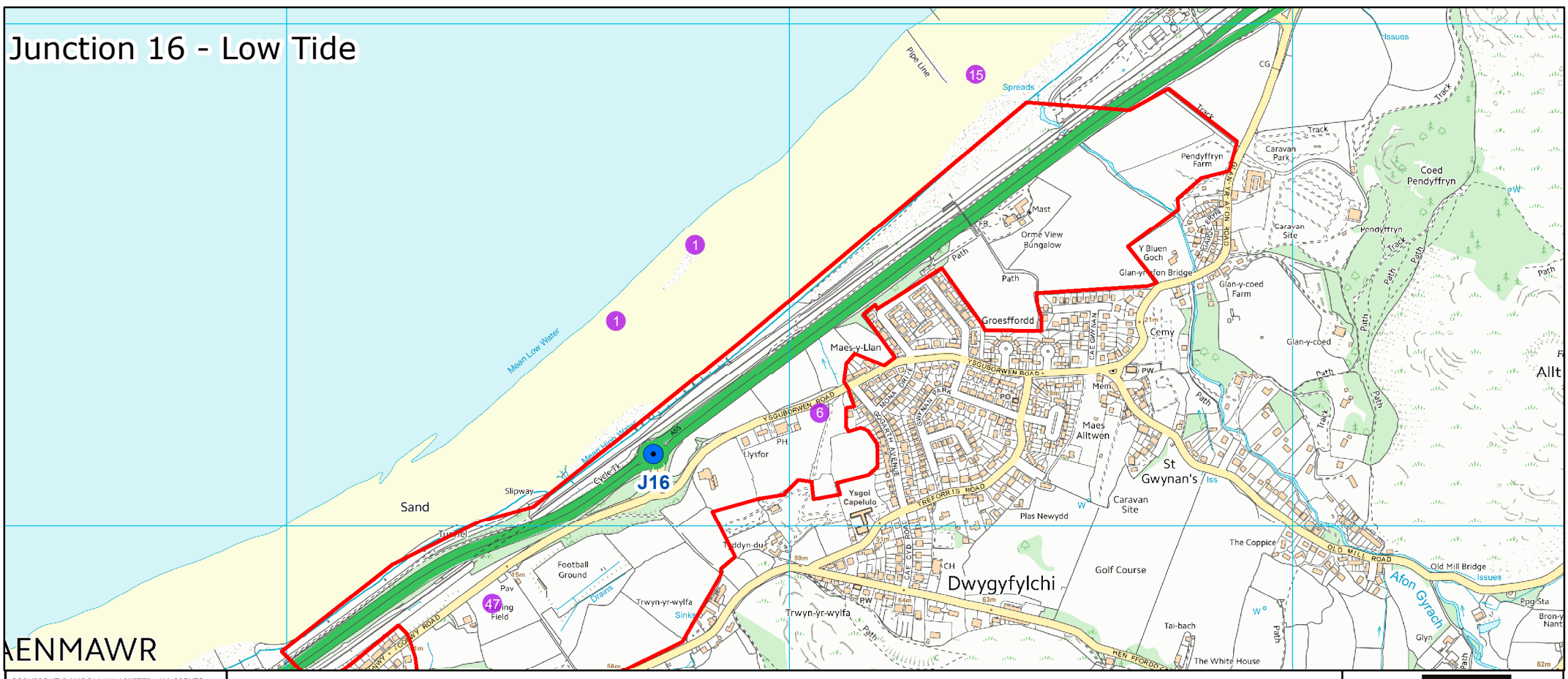
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Fig 14
Oystercatcher Distribution J16 (Jan)

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Drawing No: 14		Rev:

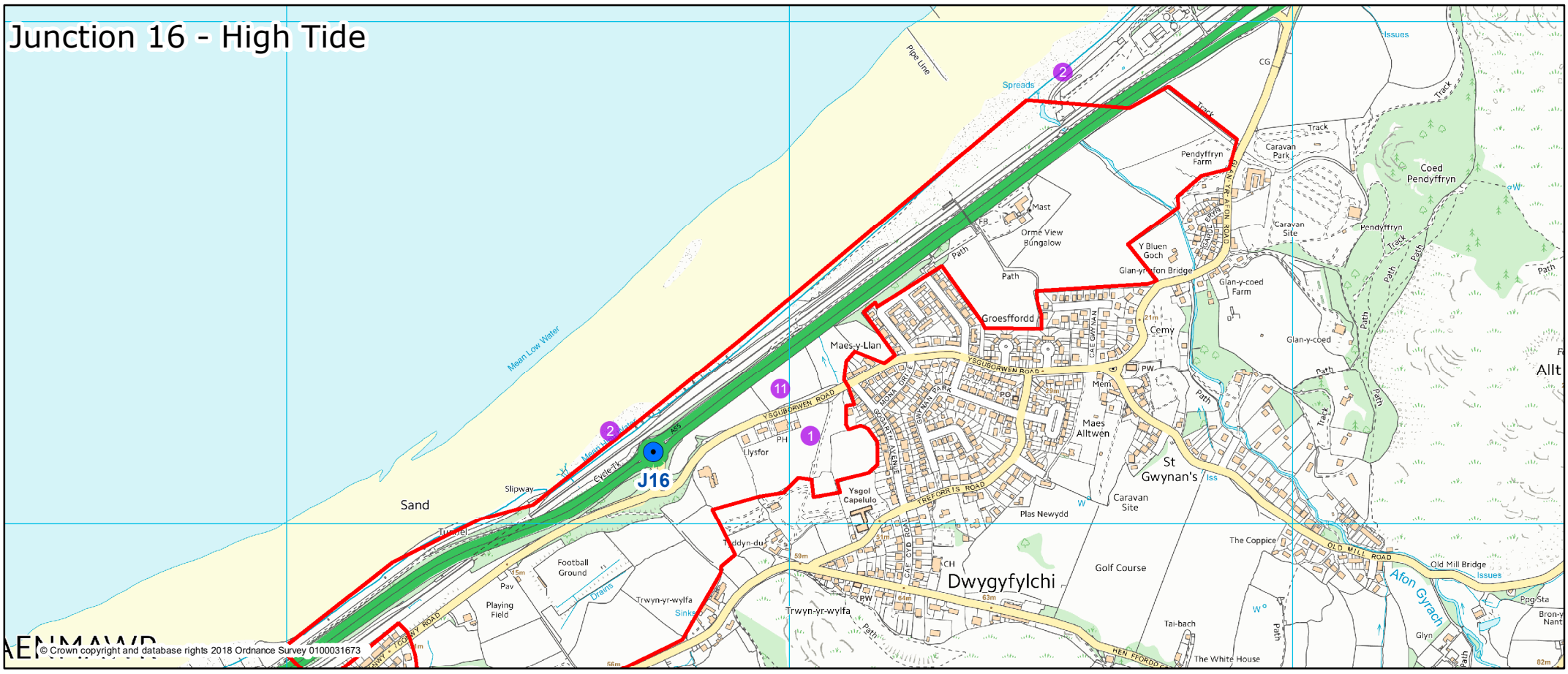
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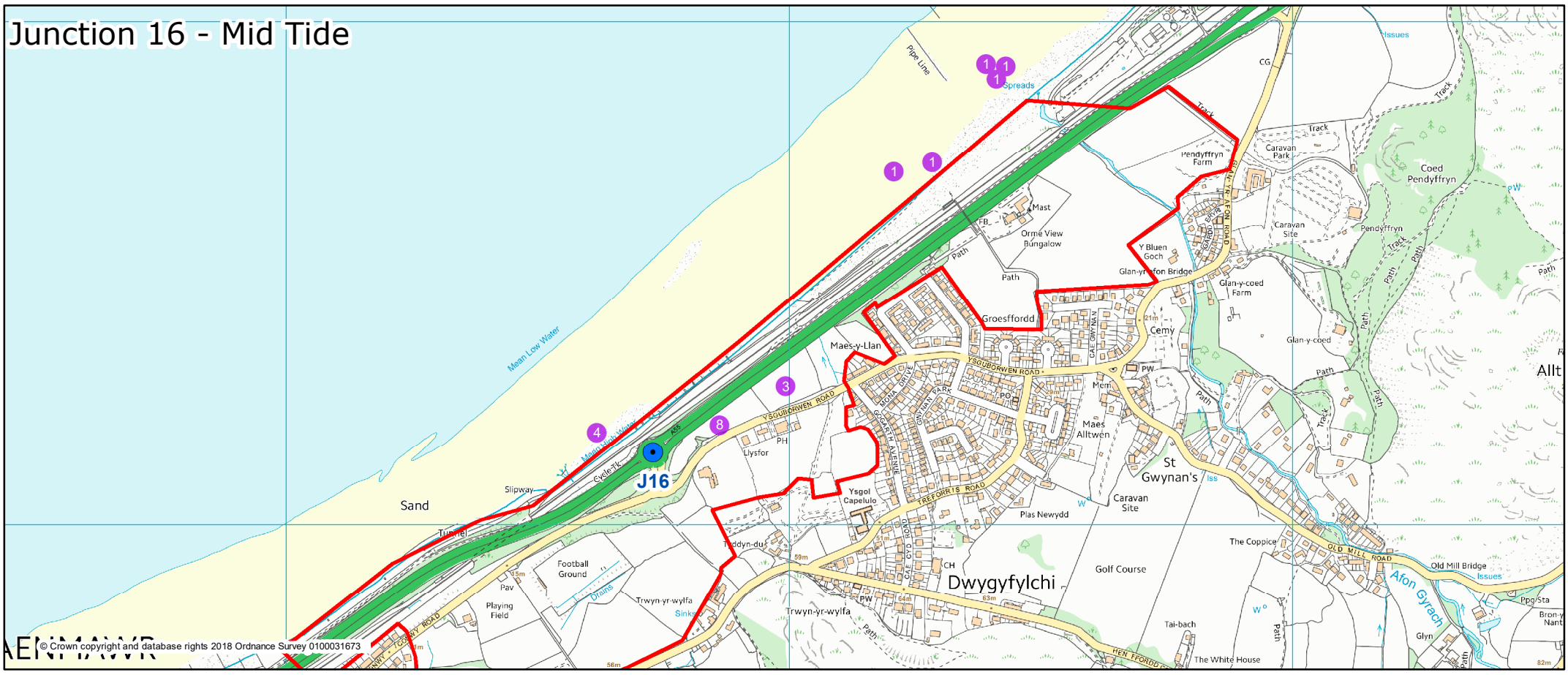
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Junction 16 - High Tide



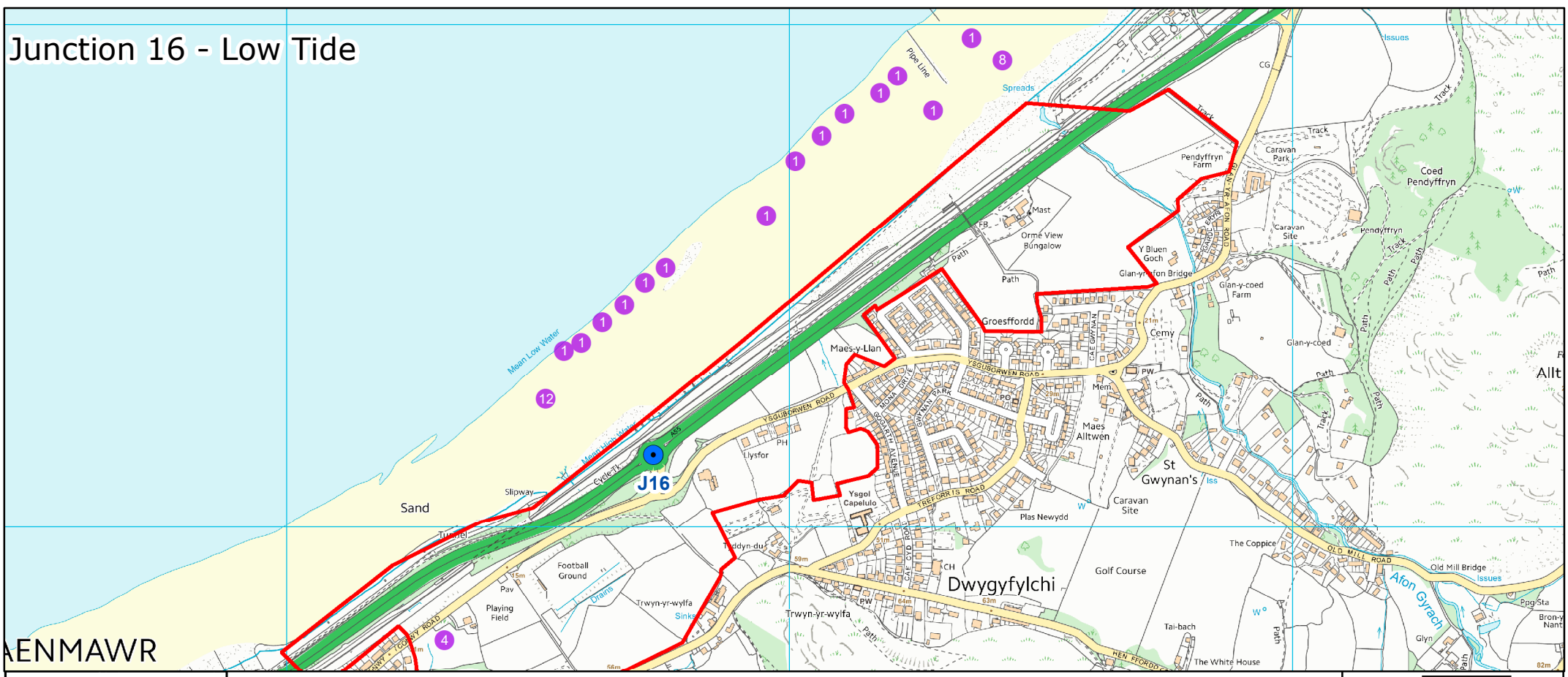
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A55 Junctions 15 & 16; Wintering Bird Survey 2017/2018

Fig 15
Oystercatcher Distribution J16 (Feb)

Drawn: JG	Scale (@A3): 1:11,000	Date: 18/07/2018
Drawing No: 15		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

Llywodraeth Cymru Welsh Government

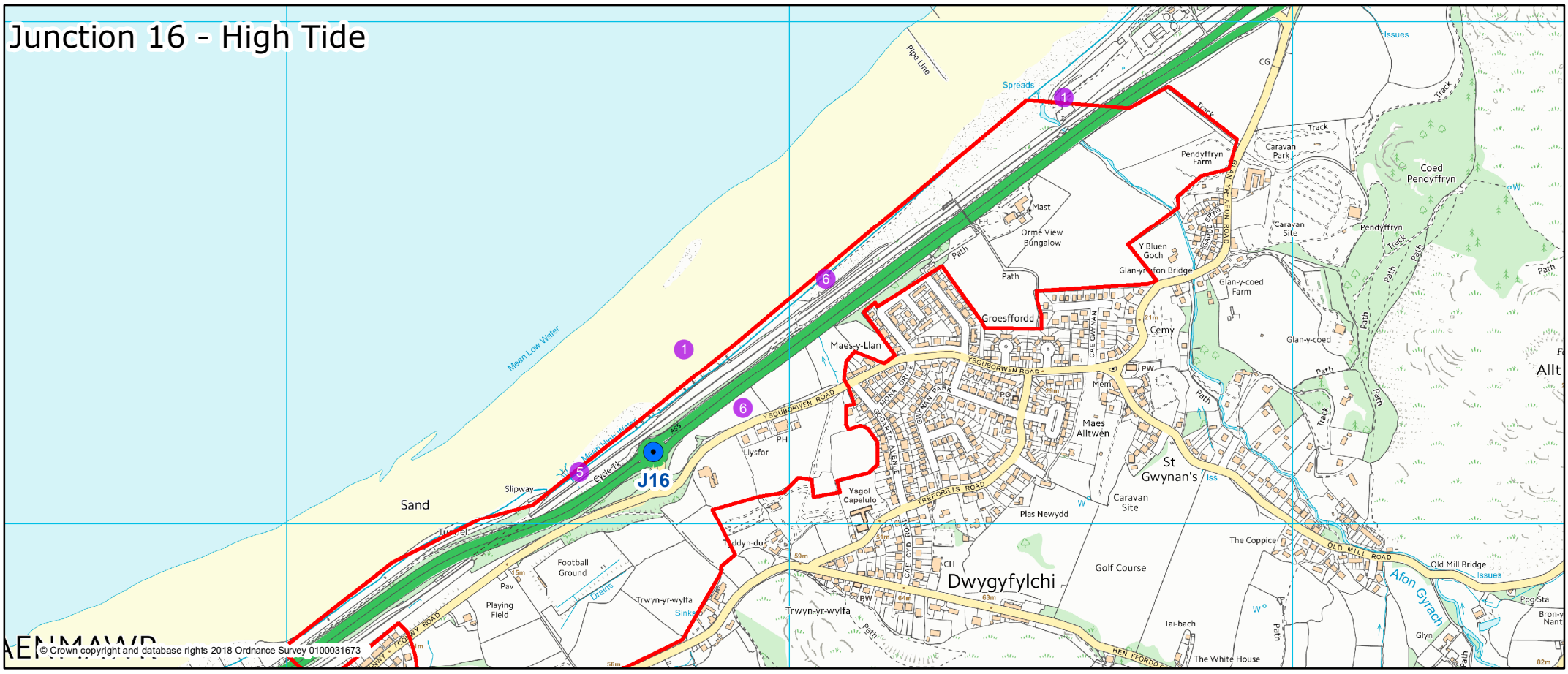
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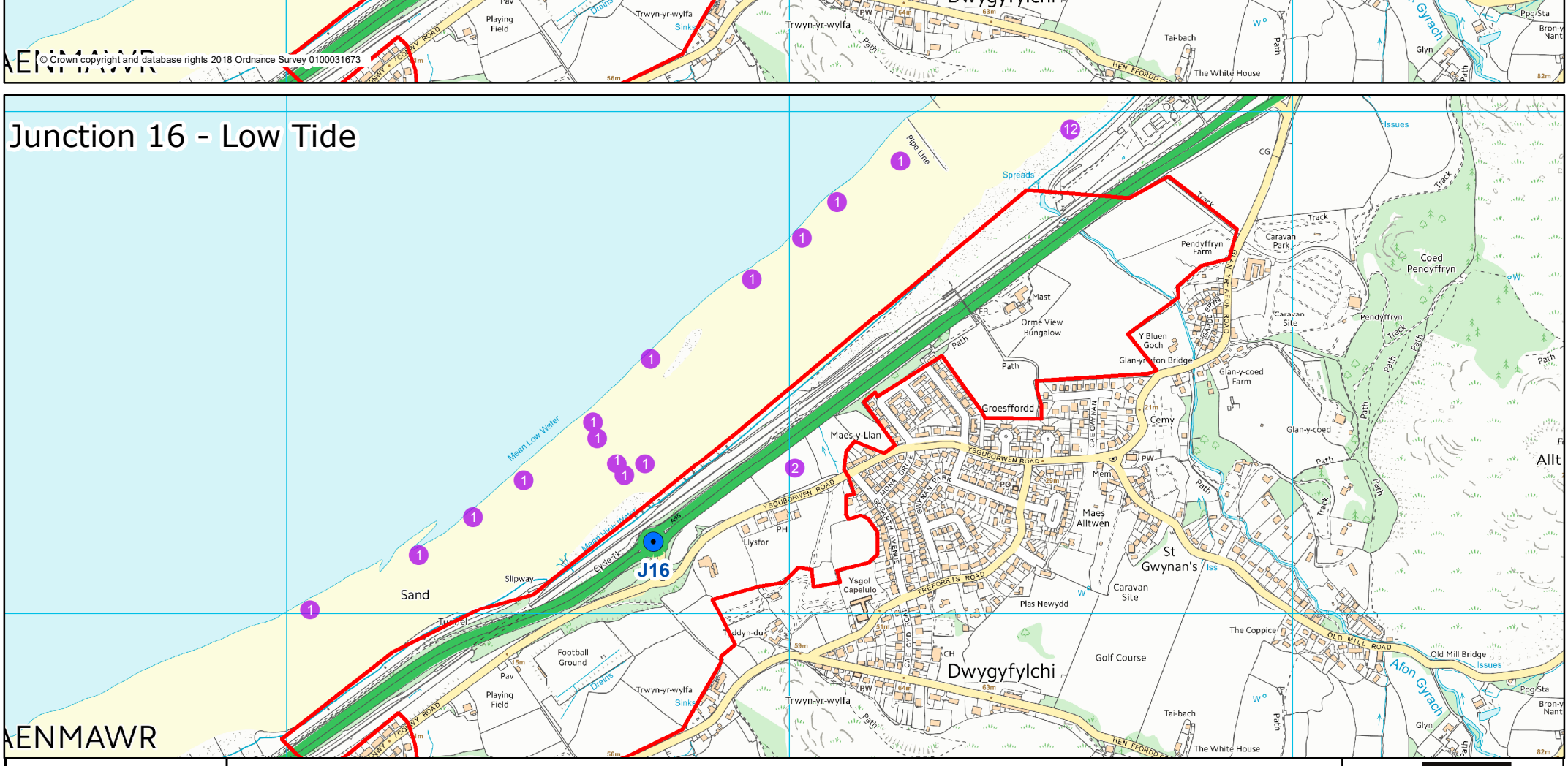


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Fig 16
Oystercatcher
Distribution J16 (Mar)

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Drawing No: 16		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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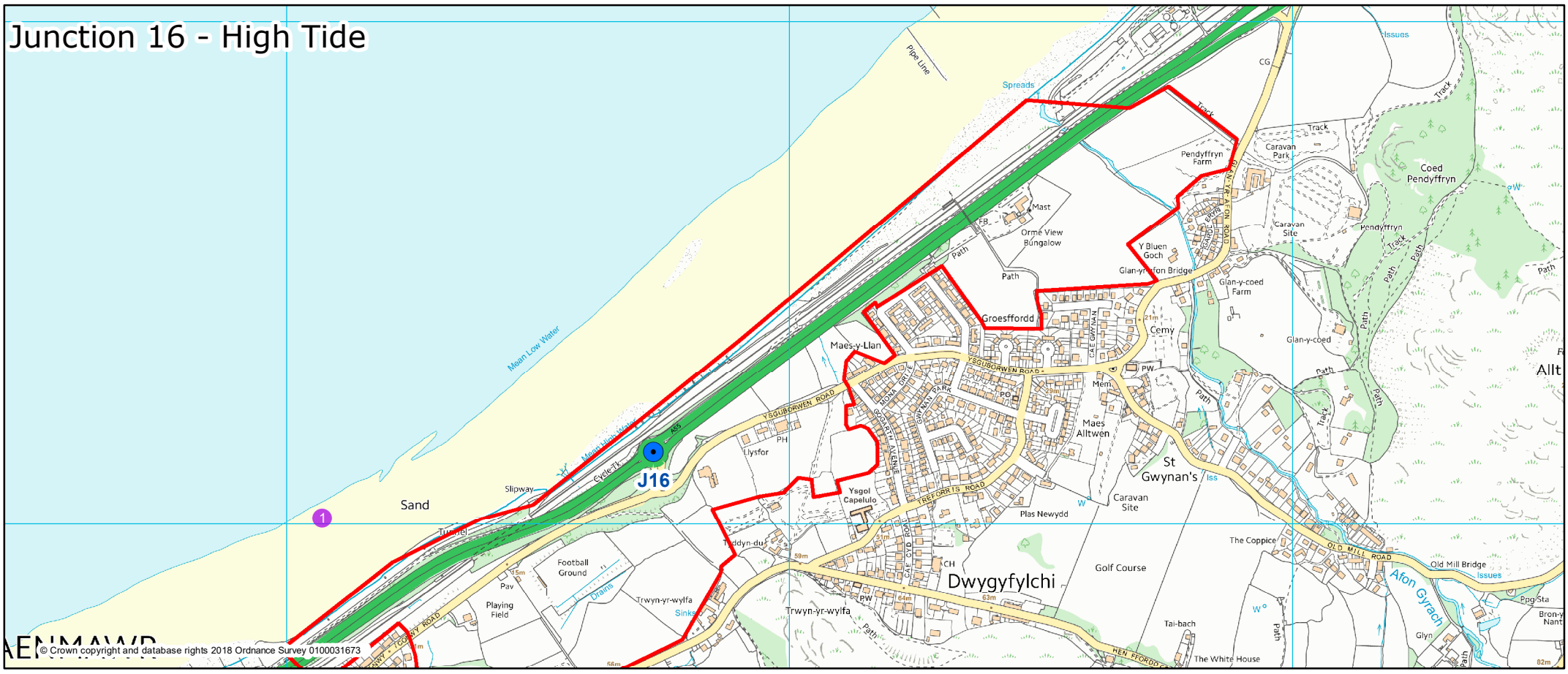
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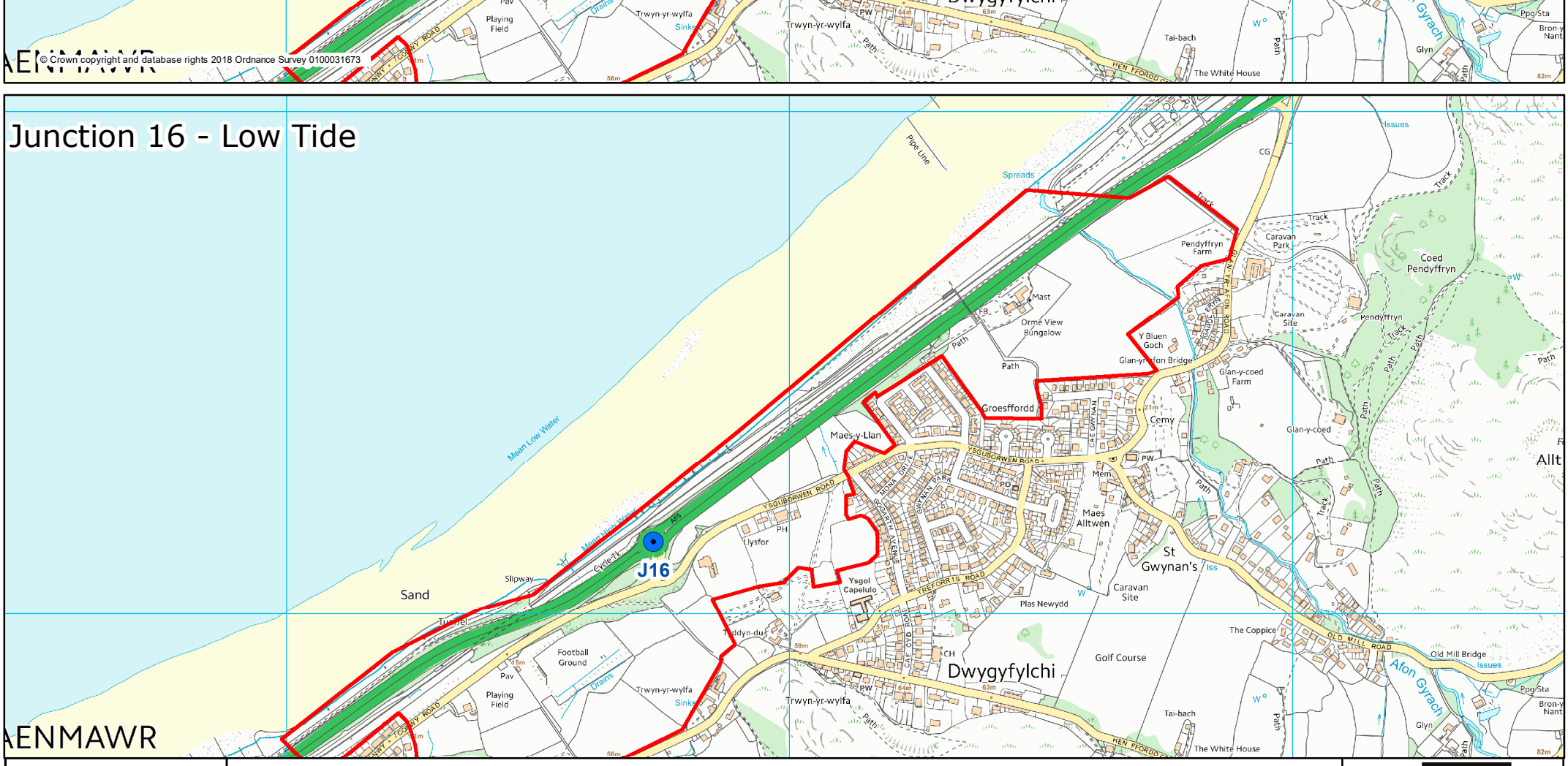
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Fig 17
Red-throated Diver Distribution J16 (Oct)

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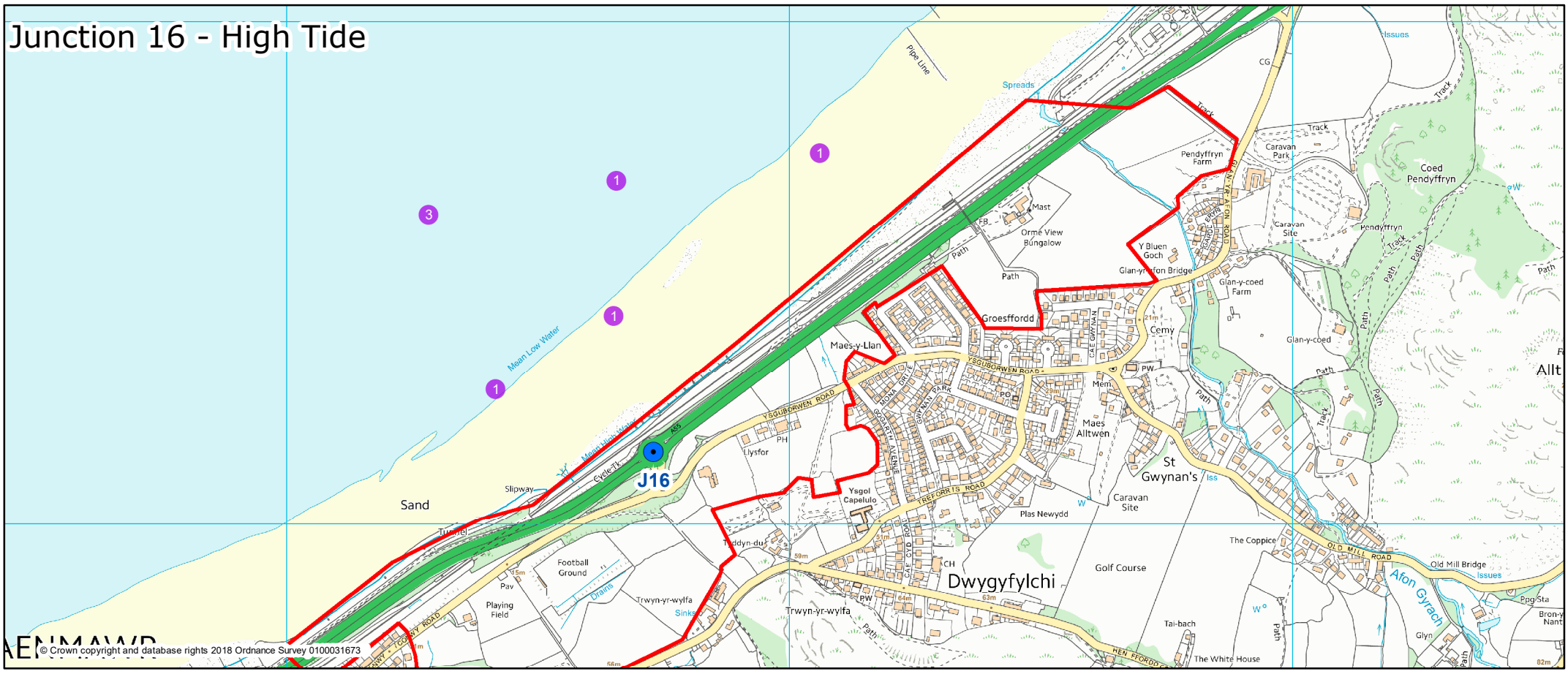
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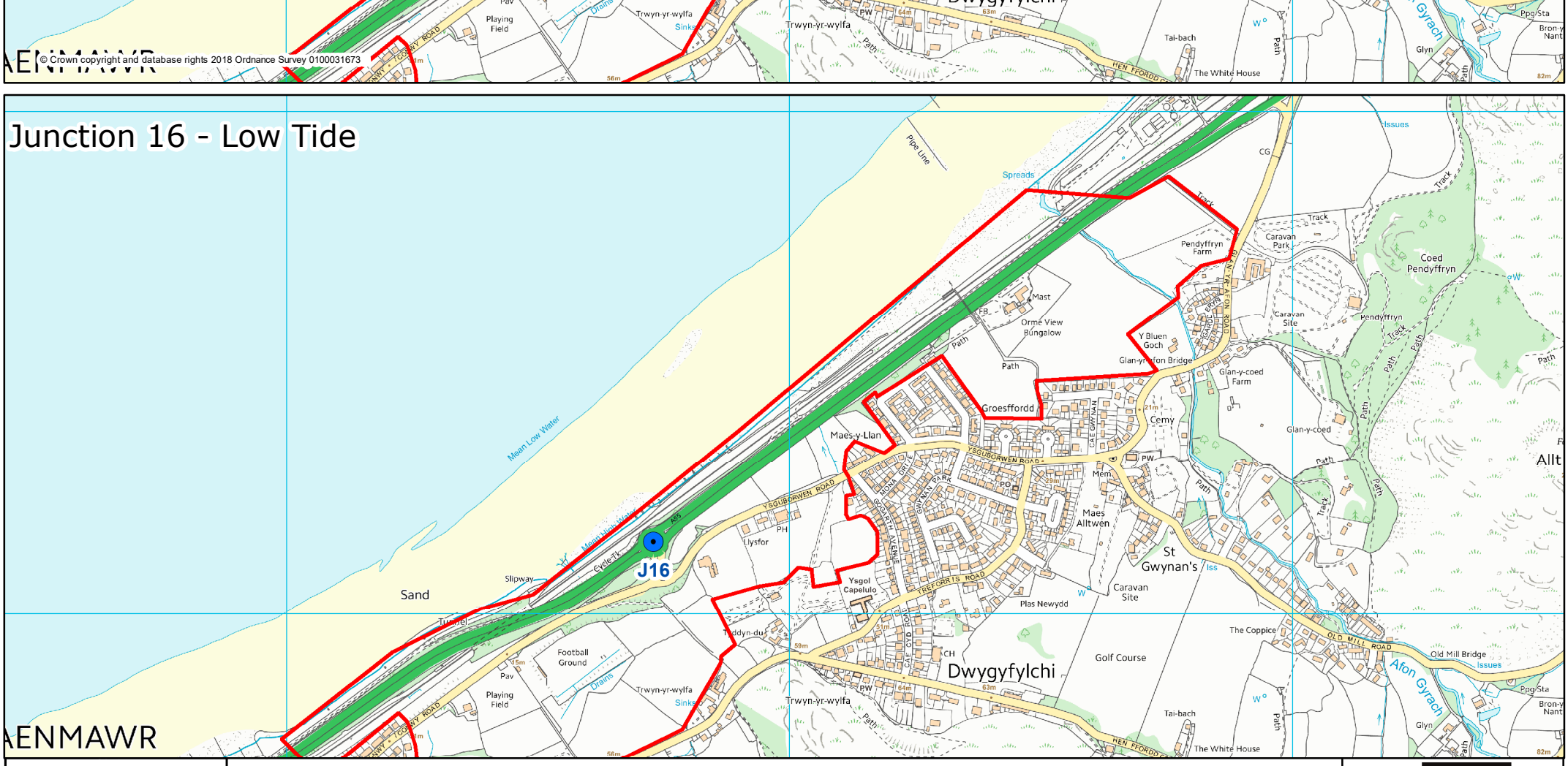


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Fig 18
Red-throated Diver Distribution J16 (Nov)

Drawn: JG	Scale (@A3): 1:11,000	Date: 18/07/2018
Drawing No: 18		Rev:

- Bird Observations
- A55 Junctions
- Study Area Boundary

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ES Chapter 9 Appendices	
9.1	Landscape and Visual Impact Assessment Methodology
9.2	Photographic Methodology
9.3	Landscape Character Area Descriptions
9.4	Representative Viewpoints
9.5	Visual Effects Schedules

APPENDIX 9.1
LANDSCAPE AND VISUAL IMPACT ASSESSMENT METHODOLOGY

1.0 Appendix 9.1 Landscape and Visual Assessment - Methodology

1.1 Introduction

1.1.1 This methodology has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) and Interim Advice Note 135/10(W). The DMRB guidance was withdrawn on 30th May 2017. In August 2019 Highways England began the replacement of the DMRB Volume 11. The new guidance (DMRB 2019) has been published in sections commencing August 2019. The new guidance for Landscape and visual effects (LA 107) was published in September 2019 and replaces DMRB Volume 11 Section 3 Part 5 and IAN 135/10. The guidance does not state explicitly that this replaces IAN 135/10 (W) but it is assumed that this will be the case.

1.1.2 Work on the screening and scoping stages of the EIA for this Scheme began in 2018 and all of the assessments were well advanced by August 2019 and the landscape and visual assessment substantially completed by September 2019. Therefore, the decision was made to continue using the DMRB 2008 guidance, rather adopting the 2019 version, because of the advanced state of the EIA.

Relevant Guidance

1.1.3 The assessment of landscape and visual effects has therefore been carried out in accordance with the methodology described within Interim Advice Note 135/10 (W), · Landscape and Visual Effects · Wales Only (Welsh Government, 2014), which replaces guidance in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 5 (Highways Agency, 1993). IAN 135/10 (W) refers to Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3), published by the Landscape Institute and the Institute of Environmental Management and Assessment, 2013.

1.1.4 In addition to the methodology set out in IAN 135/10 (W), the following documents have also been referred to;

a. Guidelines for Landscape and Visual Impact Assessment. (GLVIA3);

b. Design Manual for Roads and Bridges (DMRB) Volume 10 Environmental Design;

c. Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment;

d. Interim Advice Note (IAN) 125/09 (W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment';

e. DMRB Volume 11 Section 2 HA 201/08: General principles and guidance of environmental impact assessment;

f. Interim Advice Note (IAN) 135/10 (W): Landscape and Visual Effects Assessment (Wales Only).

g. Design guides produced by the Welsh Government, e.g. 'Roads in Lowland Areas' (Welsh Office, 1993).

h. Natural Resources Wales guidance notes on LANDMAP including Guidance Note 3 – 'Landscape and Visual Impact Assessment for onshore windfarms', (Natural Resources Wales, 2013a) and Guidance Note 4 – 'LANDMAP and the Cultural Landscape' (Natural Resources Wales, 2013b).

i. TAG Unit A3 - Environmental Impact Appraisal - December 2015 Department for Transport

j. IEMA: Environmental Impact Assessment - Guide to Delivering Quality Development

k. Photography and Photomontage in Landscape and Visual Impact Assessment Advice Note 01/11 (Landscape Institute, 2011).

1.1.5 During the LVIA process, consultation has taken place with stakeholders and Statutory Environmental Bodies. Consultation includes the agreement of LVIA methodology, the extent of the LVIA study area, the identification of visual receptors, location of representative viewpoints and photomontages, and the requirements for mitigation.

1.1.6 Landscape and Visual Impact Assessment (LVIA) is defined in the (GLVIA)[1] as a;

"tool used to identify and assess the significance of and effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity".

1.1.7 The GLVIA guidance and IAN 135/10 (W) refer to the European Landscape Convention (ELC) and its definition of landscape as;

"Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".[2]

1.1.8 The ELC also acknowledges *"that the landscape is an important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as in areas of high quality, in areas recognised as being of outstanding beauty as well as in everyday areas".*

Simple and detailed assessments

1.1.9 IAN 135/10 refers to simple and detailed assessment levels. A simple assessment should be used if it is considered unlikely that the proposed scheme(s) would have any significant landscape or visual effects. A detailed assessment is required if significant effects are anticipated, the two levels are differentiated in the table below[3];

Table 1 – Simple and detailed assessment

Simple Assessment		**Detailed Assessment**	
Landscape	**Visual**	**Landscape**	**Visual**
When the landscape is in a poor or degraded condition	Where there are no sensitive receptors (e.g. an industrial area)	When the landscape resource is of distinctive quality with a range of landscape elements in good condition	Where there are sensitive receptors in the immediate vicinity (e.g. a recreational path or residential properties)
When impacts are temporary or minor in scale ie. addition of new signage to an existing road or minor improvements to an existing junction	Where there are no nearby receptors (e.g. residential properties some distance away)	When impacts are significant in terms of duration and scale (e.g. major new road improvements, road widening projects, major lighting schemes)	Where there are large numbers of sensitive receptors (e.g. a residential suburb which overlooks the project)

1 Guidelines for Landscape and Visual Impact Assessment Third Edition by the Landscape Institute and Institute of Environmental Management and Assessment 2013 para 1.1
2 European Landscape Convention (2002)
3 Extracted from IAN 135/10 paras 3.3 – 3.8

Simple Level of Assessment

1.1.10 A simple level of assessment is usually undertaken to[4];

a. address potential aspects identified at the Scoping level;

b. reach an understanding of the likely environmental effects to inform the final design and assessment; or

c. reach an understanding of the likely environmental effects that identifies the need for a Detailed Assessment.

1.1.11 DMRB Volume 11 Section 2 HA 201/08 states that a *"Simple assessment would be sufficient if it established confidently that the forecast environmental effect would not be a fundamental issue in the decision-making process".*[5] The simple level of assessment would typically use desk-based information and previous studies to inform the assessment. If more detailed field surveys or modelling is required to assess the potential effects, this would require a more detailed assessment.

Detailed Level of Assessment

1.1.12 The objective of detailed levels of assessment is to gain a thorough understanding of any significant beneficial or adverse effects as a result of the scheme on environmental resources (e.g. landscape) and receptors (e.g. residential areas). Detailed assessments will be required where there are likely to be any potential for significant landscape and visual effects. Any mitigation to avoid or reduce adverse effects will be addressed in the assessment process.

Stages in the Assessment

1.1.13 The stages in the assessment process be it for scoping, simple or detailed assessments are to:

a. Define the study area;

b. Collect and collate information on the landscape;

c. Assess the character and value of the landscape through consultation and desk study;

d. Carry out the site survey to assess landscape character and condition and augment the desk study;

e. Assess the magnitude of impact or degree of change caused by the project;

f. Assess the sensitivity of the landscape to accommodate change rising from the project;

g. Identify and develop mitigation as a component of the iterative design process to avoid, reduce or where possible remedy adverse effects;

h. Assess the significance of the residual landscape effects;

i. Assess cumulative impacts if appropriate

4 Extracted from HA 201/08 para 2.14
5 HA 201/08 para 2.15

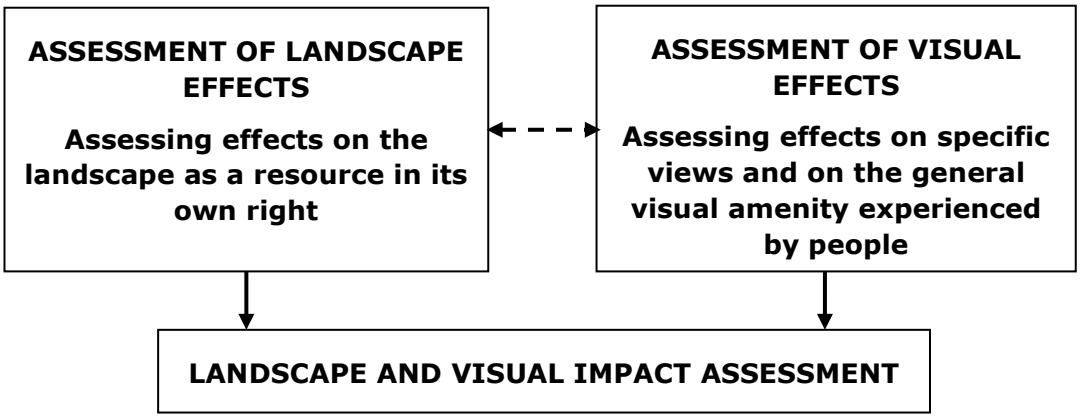
1.1.14 Guidance in IAN 135/10 suggests that the two stages of assessment should not be sequential as if the assessment indicates that significant effects are unlikely, further detailed work may not be required. For the purposes of this methodology, it is assumed that a detailed level of assessment would be required.

Landscape and Visual Assessment

1.1.15 The assessment of landscape and visual effects are two separate but related processes. Landscape and visual assessments address two separate but related issues and should be clearly distinguished between each other as highlighted below;

- Assessment of Landscape Effects: assessing effects on the landscape as a resource as resource in its own right; and
- Assessment of Visual Effects: assessing visual effects on specific views and on the general visual amenity experienced by people[6].

Figure 1: Assessment of landscape and visual effects



1.1.16 To summarise with guidance from IAN 135/10[7];

"The assessment of landscape and visual effects must address both effects on landscape as a resource in its own right as well as effects on views and visual amenity".

1.1.17 The stages and processes in undertaking the landscape assessment are set out in Figure 2 below and will be described in more detail in the following text.

1.1.18 For both the landscape and visual assessment, it is assumed that the project characteristics are defined within other sections of the environmental statement and that generic landscape and visual impacts are described in the landscape and visual assessment.

6 Interim Advice Note 135/10 (W) para 2.4
7 Interim Advice Note 135/10 (W) para 2.4

1.2 Landscape Assessment

Stage 1 – Define Scope of the Landscape Assessment

1.2.1 The study area covers the area of scheme (s) proposals and the full extent of the wider landscape that may be significantly influenced or affected as a result of the scheme proposals. This is based on the extent of the Landscape Character Areas that may be significantly affected either directly or indirectly. The study area has also been defined by preparing a Zone of Theoretical Visibility that will establish areas from which the scheme may be visible.

1.2.2 A study area was identified for the assessment of landscape and visual effects that included the whole area from which the Scheme with traffic would theoretically be visible. This initial study area was based on a digital Zone of Theoretical Visibility (ZTV) created using GIS software and Ordnance Survey (OS) Terrain 50 height data, based on a 50m resolution digital terrain model (DTM).

1.2.3 IAN 135/10 (W)[8] states that the study area should also include *"the full extent of any neighbouring features of special value"* including designated landscapes such National Parks, Areas of Outstanding Natural Beauty (AONB's), Sites of Special Scientific Interest (SSSI's) Special Areas of Conservation (SAC's) and Scheduled Ancient Monuments (SAM's). There are several neighbouring features of special value such as Snowdonia National Park and Menai Strait and Conwy Bay SAC, but the full extent of these designated sites have not been included in the study area as they are extensive and stretch far beyond the extent and potential influence of the Scheme proposals.

1.2.4 A review of the landscape resource and topography within the study area was carried out as part of the desk study with reference to the following relevant published sources to establish the national and regional landscape character:

a) Landscape Character Map for Wales (Countryside Council for Wales and Land Use Consultants);

b) LANDMAP data system published by Countryside Council for Wales and maintained by Natural Resources Wales;

c) National and Local Planning Policy as outlined is Section 9.2;

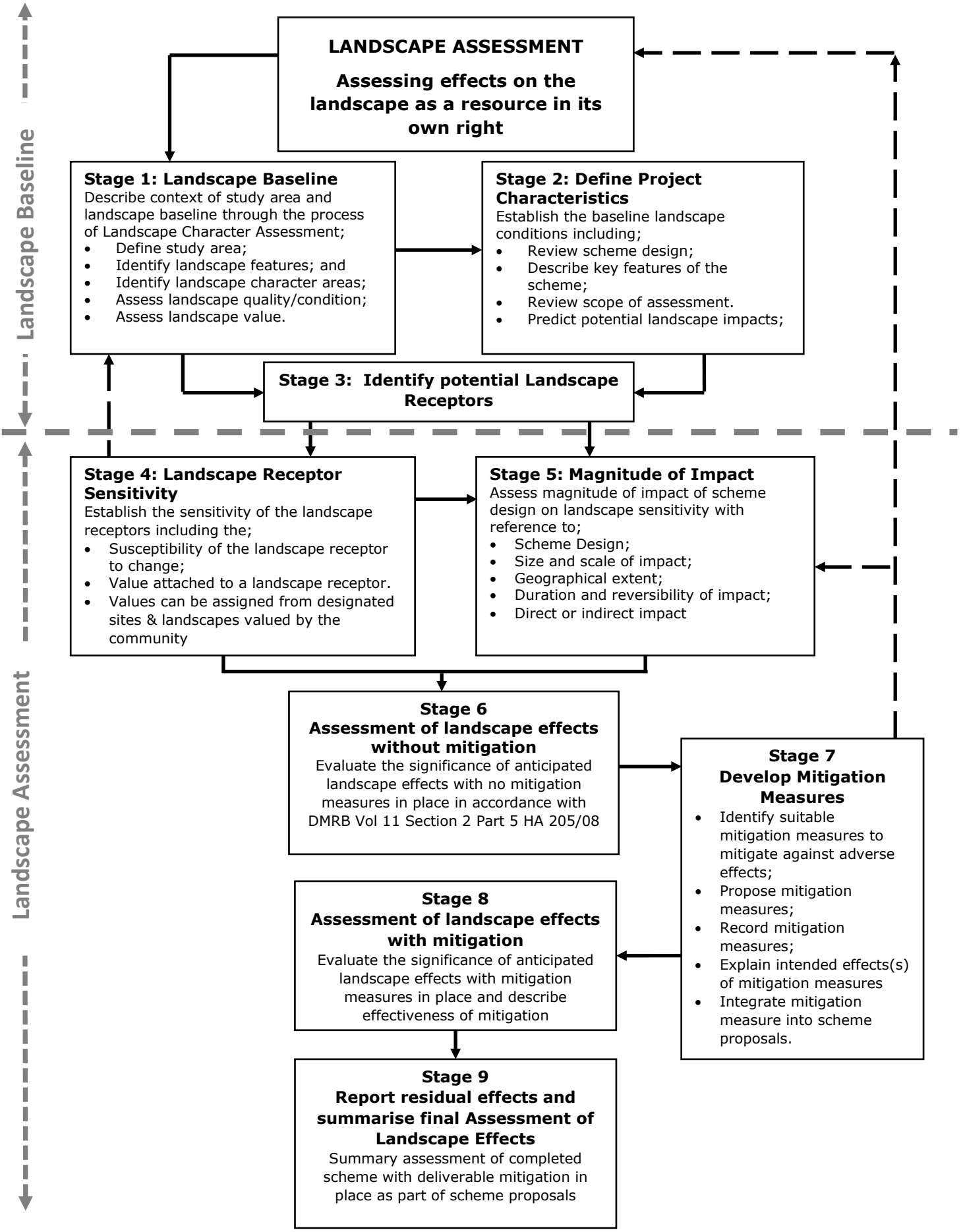
d) Ordnance Survey 1:25,000 and 1:50,000 scale maps;

e) Aerial photography.

1.2.5 Site based assessments were carried out during summer of 2019 to validate the findings of the desk study.

[8] IAN 135/10 (W) para 2.2

Figure 2: Stages and processes followed for undertaking the assessment of landscape effects.



Stage 1 - Landscape Baseline

1.2.6 The initial process in undertaking the assessment of landscape and visual effects is to establish the baseline landscape conditions. The information collated will form the basis for the assessment of landscape effects as a result of the scheme proposals. The landscape baseline has been prepared using a mix of desk study and fieldwork to establish and record the character of the landscape and the elements that contribute to that character. In rural locations the baseline will establish the characteristics of the landscape. In more urban areas there is a requirement to undertake the same exercise but to establish the baseline for the townscape.

1.2.7 The assessment of the landscape baseline within the study area has considered the following:

a) National landscape designations such as National Parks, Areas of Outstanding Natural Beauty (AONB's), Heritage Coasts, Historic Parks and Gardens

b) Ecological and historic designations such as SSSI's, RAMSAR Sites, Special Areas of Conservation, World Heritage Sites, Scheduled Ancient Monuments;

c) Other designations such as Landscapes of Historic Interest in Wales, Conservation Areas, tranquil areas, dark sky reserves;

d) Protected hedgerows, veteran trees and Tree Preservation Orders;

e) Review of National and Local Authority Character Areas and Assessments including LANDMAP;

f) A description of the existing landscape elements that contribute to the landscape character including physical components of the landscape such as man-made features, topography, watercourses, existing vegetation and field patterns;

g) Establishing the value of the existing landscape including references to statutory and non-statutory designations, landscape quality, amenity and recreational value;

h) Identification of landscape receptors that could potentially be affected by the scheme proposals.

1.2.8 The landscape baseline has initially used data from LANDMAP Information System first published by Countryside Council for Wales and now maintained by Natural Resources Wales (NRW). LANDMAP is a GIS based system that contains five, nationally consistent, quality assured spatial datasets:

a) Geological Landscape;

b) Landscape Habitats;

c) Visual and Sensory;

d) Historic Landscape;

e) Cultural Landscape

1.2.9 For each of these datasets the landscape is divided into "aspect areas" that can be interrogated via an interactive map that links to details of each aspect area. The most relevant aspect for the LVIA is the Visual and Sensory dataset that describes the topography, land cover and form of the landscape that helps define landscape character areas within the study area.

1.2.10 LANDMAP is a useful source of baseline information but has been reviewed for relevance this particular LVIA. As a result of the review, primarily the Visual and Sensory dataset, the study area may be further divided into local Landscape Character Areas (LCA's).

1.2.11 Local Landscape character areas (LCAs) within the study area have been identified by:

a) Organizing the landscape into areas of distinct, consistent and recognisable character;

b) Describing the key characteristics in accordance with IAN 135/10 (W) (paras 2.13 & 2.14) such as;

i. Physical Characteristics (built environment, landform and landcover);

ii. Perceptual Characteristics (scale, scenic quality, tranquillity, intrusive features and night-time light sources);

iii. Cultural and Social Characteristics (historic features and elements and human interaction);

iv. Designations (National Parks, AONB's SSSI's etc)

c) Assessing their condition, scenic quality and overall landscape value taking into account any landscape, ecological or cultural designations and any assets of local significance without designation that may be valued by local communities.

1.2.12 Each LCA is described and assigned a landscape value using the criteria[9] set out in Table 2 below adapted from DMRB HA 205/08;

[9] Source: Adapted from DMRB Volume 11 Section 2 Part 5 HA 205/08 Table 2.1 Environmental Value

Table 2: Landscape Value

Value	Typical Descriptors
Very High (Outstanding)	Internationally recognised value and importance, e.g World Heritage Site, RAMSAR Site, National Park. Nationally recognised value and importance e.g. Area of Outstanding Natural Beauty. Aesthetically pleasing areas with a strong sense of place and may be rare in terms of character type. Usually containing sites of historic, cultural, geological or natural habitat importance. These areas may be important tourist destinations.
High	Regionally recognised value and importance as defined by local authority designations, e.g. Special Landscape Area or Historic Landscape Area. Some picturesque attributes that are aesthetically pleasing, and some features that are fragmented and/or spoilt. The area may be associated with tourism although it would not be the main destination.
Moderate	Non-designated landscape with some features of value or a distinguishable landscape structure. The areas are unlikely to contain a coherent and aesthetically pleasing composition but may be appreciated locally.
Low (Ordinary)	Non-designated landscape with limited aesthetically pleasing scenery, where characteristics are fragmented and/or spoilt. The areas are unlikely to contain tourist attractions and are unlikely to be rare in character type. Not likely to contain sites of local importance as defined by local authority designations.
Poor (Negligible)	Degraded or damaged landscape structure. Contains one or more detracting elements. Very low importance and rarity, local scale

Stage 2 - Define Project Characteristics

1.2.13 Defining the project characteristics is an opportunity to review the scheme proposals in light of any route selection process or following the announcement of a preferred route. More design work may have been undertaken that enables a better understanding of the scheme proposals and likely Zone of Influence. Key features of the scheme can be described along with the potential sites identified for site compounds and accommodation works that may influence the scope of the assessment.

Stage 3 – Potential Landscape Receptors

1.2.14 In preparing the landscape baseline, a preliminary assessment on the likely landscape receptors affected by the Scheme proposals can be made. This may entail a review of the study area to ensure any potential landscape receptors are captured in the assessment process. It also allows potential landscape receptors to be scoped out of the assessment process should it be proven that there is likely to be no significant effects due to physical factors such as distance or topography.

Stage 4 – Landscape Receptor Sensitivity

1.2.15 Landscape receptors need to be assessed firstly in terms of their **susceptibility** and secondly **value.** The level of sensitivity is a judgement combining the two factors, **susceptibility to change** as a result of the specific development or scheme (in this case a new highway junction within an existing transport corridor) and the **value** attached to the landscape.[10]

1.2.16 The term "susceptibility" is not used in DMRB or referenced in IAN 135/10 (W) but is used in GLVIA3 and means *"the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies".*[11] The guidance[12] recommends that judgements about susceptibility of landscape receptors to change should be set out on a verbal scale and these are set out below in Table 3.

Table 3 - Landscape susceptibility to change

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High	Effects from the type of scheme proposed are likely to cause a major change to the baseline landscape
Medium	Effects from the type of scheme proposed are likely to lead to a moderate change in the baseline landscape
Low	Effects from the type of scheme proposed can be accommodated with only a minor, or no, change to the baseline landscape

[10] Adapted from GLVIA para 5.39
[11] GLVIA3 – para 5.40
[12] GLVIA3 – para 5.43

1.2.17 The sensitivity of a landscape is a combination of judgements of a landscape receptor's ability to accommodate change of the type proposed and the value of the landscape receptor established during the baseline assessment.

Table 4 - Landscape Sensitivity Matrix – Susceptibility x Value

Landscape Sensitivity Matrix		**Landscape Value**				
Susceptibility to Change		**Very High**	**High**	**Moderate**	**Low**	**Poor**
	High	High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Low
	Low	Medium	Medium	Low	Low	None

1.2.18 Taking into consideration the susceptibility and landscape value, the criteria to assess the landscape sensitivity is used to inform the assessment of Construction Effects and Operational Effects in a response to the nature of change caused by the Scheme. These have been derived from the methodology and examples in IAN 135/10 (W), Annex 1, Table 2, which are presented in Table 5 below;

Table 5: Landscape Receptor Sensitivity

Sensitivity	Typical Descriptors and Examples
High	Landscapes which by nature of their character would be unable to accommodate change of the type proposed. Typically, these would be: • Of high quality with distinctive elements and features making a positive contribution to character and sense of place; • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale; • Areas of special recognised value through use, perception or historic and cultural associations; • Likely to contain features and elements that are rare and could not be replaced.
Medium	Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically, these would be: • Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place; • Locally designated, or their value may be expressed through non- statutory local publications; • Containing some features of value through use, perception or historic and cultural associations; • Likely to contain some features and elements that could not be replaced.
Low	Landscapes which by nature of their character would be able to accommodate change of the type proposed. Typically, these would be: • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place; • Not designated; • Containing few, if any, features of value through use, perception or historic and cultural associations. • Likely to contain few, if any, features and elements that could not be replaced.

Stage 5: Magnitude of Impact

1.2.19 For the purpose of both landscape and visual impact assessment, impacts have been graded according to their scale and magnitude. The following aspects are used to determine the magnitude of impact.

a) The size or scale of the impact, i.e. the quantity of landscape elements that would be affected and the proportion that this represents within the character area or the extent of views that would be changed, and whether the changes affect key characteristics of the landscape or views;

b) Geographical extent, i.e. the area which the Scheme would influence;

c) Duration and reversibility of impact, i.e. whether the impact is short term to long term and whether the impact is permanent or can be reversed to its original condition;

d) Consider if the impacts are direct or indirect.

1.2.20 Terms used to describe the magnitude of landscape impacts are derived from IAN 135/10 (W), Annex 1, Table 1, and presented in Table 6.

1.2.21 Criteria applies to both negative (adverse), and positive (beneficial), due to the nature of the change according to their scale or magnitude. Where the Scheme, or a part of it, would become a detracting feature or focal point of the view, this is assessed as negative. Where the Scheme, or part of it, would result in an improvement in the view, this is assessed as a positive.

Table 6: Magnitude and Nature of Landscape Impact and Typical Descriptors

Magnitude	Typical descriptors
Major Adverse	Total loss or large-scale damage to existing character or distinctive features and elements, and/or the addition of new and uncharacteristic conspicuous feature and elements.
Moderate Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new and uncharacteristic features and elements.
Minor Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new and uncharacteristic features and elements.
Negligible Adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new and uncharacteristic features and elements.
No Change	No noticeable loss, damage or alteration to character or features or elements.
Negligible Beneficial	Barely noticeable improvement in character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Minor Beneficial	Slight improvement of character by the restoration of existing features and elements and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic features.
Moderate Beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major Beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous elements, or by the addition of new distinctive features.

Stage 6: Significance of landscape effects without mitigation

1.2.22 The magnitude of impact and the sensitivity of the receptor are combined to establish the significance of effect, which is expressed as a scale ranging from neutral to very large. The scale can be positive and negative. This is in accordance with IAN 135/10 (W). The matrix used to determine the Significance of Effect is the same for both Landscape and Visual Impact. Derived from 1AN 135/10 (W), Annex 1, Table 3; and Annex 2, Table 3, the Significance of effect matrix is presented in Table 7.

Table 7: Significance of Landscape Effects

		Magnitude of Impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity	**High**	Neutral	Slight	Moderate	Large	Very Large
	Medium	Neutral	Neutral	Slight	Moderate	Large
	Low	Neutral	Neutral	Neutral	Slight	Moderate

1.2.23 Effects falling within the categories moderate to very large are considered to be significant for the purpose of this assessment.

1.2.24 The terms used to describe the landscape and visual impact significance of effect categories are presented in Table 8 that is extracted from IAN/135/10 (W), Annex 1, Table 4.

1.2.25 The effects on the landscape character will be undertaken by considering the components that *"define character and their sensitivity to the type, scale and duration of the proposed change, taking into account any mitigation measures. In Wales, the assignment of significance before the before the consideration of the effectiveness of the design and committed mitigation measures should also be undertaken, allowing for the case or reason for and the effectiveness of mitigation to be described".*[13]

1.2.26 The stage at which the Scheme proposals are assessed without mitigation is not clearly defined in the DMRB. For the purposes of this methodology, the Scheme proposals were assessed without mitigation following the announcement of the preferred route ie. the Scheme and at the commencement of the Environmental Impact Assessment process. This enabled the proposed mitigation proposals to be captured and integrated into the design process.

1.2.27 The potential effects on individual landscape elements and on the physical, perceptual and cultural/social characteristics of the landscape will be undertaken and recorded.

Table 8: Typical Descriptors of Significance of Effect

[13] IAN 135/10 (W) Annex 1 para 3.4

Effects	Descriptors
Very Large Beneficial Effect	The Scheme would: • Greatly enhance the character (including quality and value), of the landscape; • Create an iconic, high quality feature and/or series of elements; • Enable a sense of place to be created or greatly enhanced.
Large Beneficial Effect	The Scheme would: • Enhance the character (including quality and value), of the landscape; • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development; • Enable a sense of place to be enhanced.
Moderate Beneficial Effect	The Scheme would: • Improve the character (including quality and value), of the landscape; • Enable the restoration of characteristic features and elements lost or diminished as a result of changes from inappropriate management or development; • Enable a sense of place to be restored.
Slight Beneficial Effect	The Scheme would: • Complement the character (including quality and value), of the landscape; • Maintain or enhance characteristic features and elements; • Enable a sense of place to be retained.
Neutral Effect	The Scheme would: • Maintain the character (including quality and value), of the landscape; • Blend in with characteristic features and elements; • Enable a sense of place to be retained.
Slight Adverse Effect	The Scheme would: • Not quite fit the character (including quality and value), of the landscape; • Be at variance with characteristic features and elements; • Detract from a sense of place.
Moderate Adverse Effect	The Scheme would: • Conflict with the character (including quality and value), of the landscape; • Have an adverse impact on characteristic features and elements; • Diminish from a sense of place.
Large Adverse Effect	The Scheme would: • Be at considerable variance with the character (including quality and value), of the landscape; • Degrade or diminish the integrity of a range of characteristic features and elements; • Damage a sense of place.
Very Large Adverse Effect	The Scheme would: • Be at complete variance with the character (including quality and value), of the landscape; • Cause the integrity of characteristic features and elements to be lost; • Cause a sense of place to be lost.

Stage 7: Develop Mitigation Measures

1.2.28 The mitigation design aims to avoid or reduce the impacts on the landscape and the visual effects on views, while also integrating the other physical mitigation measures that are proposed by other environmental disciplines within the project team. The purpose of this mitigation stage is to;

- Identify suitable mitigation measures to mitigate against adverse effects;
- Propose mitigation measures;
- Record mitigation measures;
- Explain intended effects(s) of mitigation measures
- Integrate mitigation measure into scheme proposals.

1.2.29 The DMRB[14] identifies two types of mitigation; essential or desirable and defines them as follows[15].

Table 9: Essential and Desirable Mitigation

Essential Mitigation	Desirable Mitigation
Mitigation which the Overseeing Organisation has the statutory power to achieve	A measure considered to be environmentally beneficial but that cannot usually be achieved using statutory powers. For example, third party agreement may be required: Eg Off Site planting

1.2.30 Determining whether mitigation is essential or desirable is recognised in the DMRB as being reliant on professional judgement of the topic specialist[16]. If mitigation is defined as essential, it can be provided for under the relevant legislation ie. The Highways Act 1980 (as amended) and acquired under Compulsory Purchase Order usually subject to Public Local Inquiry.

1.2.31 Essential mitigation can therefore be guaranteed as part of the Scheme proposals and is taken into consideration during the assessment process. The assessment process will define how significant the impact of the Scheme is and can be either beneficial or adverse. Significance is therefore assigned with mitigation in place *"allowing for the positive contribution of all mitigation that is deliverable and committed*[17]*".* However, DMRB also requires that (in Wales) *"the assignment of significance before the consideration of the effectiveness of the design and mitigation measures should also be undertaken, allowing for the case or reason for the effectiveness of mitigation to be described.*[10]*"* Therefore an assessment of significance is required without mitigation in place and also with mitigation that can be delivered and justified as part of the Scheme proposals (Stage 8)

[14] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 1.64
[15] DMRB Volume 11 Section 2 Part 7 HA 218/08 Glossary of Terms
[16] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 1.64
[17] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 2.9

1.2.32 Land identified in the Draft Orders will include areas required for essential mitigation including land for various engineering purposes and some further land required for environmental mitigation. Where possible mitigation has been provided within that permanent land take and is therefore within the Compulsory Purchase Order as 'Title'. All of the mitigation provided on land taken as 'Title is essential for mitigation for landscape integration, visual screening or ecological purposes.

Stage 8: Assessment of Landscape Effects with mitigation

1.2.33 An assessment of the effects on the landscape resource will be undertaken with the mitigation measures in place. Again, the potential effects on individual landscape elements and on the physical, perceptual and cultural/social characteristics of the landscape will be undertaken and recorded.

Stage 9: Report residual effects and summarise final assessment of landscape effects

1.2.33 The final stage of the landscape assessment is to report any significant impacts that the scheme proposals will have on the landscape receptors. There may be residual impacts that cannot be mitigated against and the final assessment should report on why these cannot be mitigated and what impact there will remain for the lifetime of the project.

1.3 Visual Assessment

Stage 1 – Define Scope of the Visual Assessment

1.3.1 The visual baseline assessment describes and analyses people that may have specific or general views of the study area, which may be changed by the Scheme. The scope of the visual assessment was initially undertaken using desktop data and later verified in the field during the preparation of the visual baseline.

1.3.2 IAN 135/10 states that for visual effects, *"the study area will extend to the whole of the area from which the project could be visible".* This guidance has not been followed as the Scheme proposals fall within or close to the existing road corridor that is visible from some considerable distance, particularly to the north, north-west and north-east where there are distant views across the sea to distant landmarks. Therefore a 2-kilometre radius was taken from the centre line of the proposed scheme as a basis for the initial study area.

1.3.2 A desk study was carried out, with reference to the following technical sources:

a) Ordnance Survey 1:25,000 and 1:50,000 small scale maps;

b) Ordnance Survey 1:1,250 and 1:2,500 large scale maps;

c) Aerial photography;

1.3.3 A Zone of Theoretical Visibility (ZTV) was plotted using Natural Resources Wales LiDAR digital terrain model that does not include surface features such as buildings and vegetation such as woodland or plantations, hedgerows and individual trees. The ZTV is now the recommended process since *"it makes clear that the area so defined only shows land from which the proposal may theoretically be visible. That is, it treats the world as 'bare earth' and does not take into account of potential screening by vegetation or buildings"*[18]*.* These potential screening features lie outside the scope of the scheme proposals and could be subject to removal or alteration by other parties. The bare earth ZTV indicated potential views of;

a) The road surface;

b) High sided vehicles;

c) Views of lighting columns.

1.3.4 Heights of the major components of the Scheme taken from a 3D model of the scheme proposals were combined to generate the ZTV. This provided a broad overview of the likely visual extents and was used as a basis for the visual baseline.

Consultations

1.3.5 During the LVIA process, consultation has taken place with stakeholders. Consultation includes the agreement of LVIA methodology, the extent of the LVIA study area, the identification of visual receptors, location of representative viewpoints and photomontages, and the requirements for mitigation.

1.3.6 During the consultation period no request for specific viewpoints were received. All viewpoint locations were based on professional judgment and are at locations accessible to the public.

[18] GLVIA3 – Para 6.8

1.3.7 The visual baseline was prepared using the ZTV as a general overview of potential visibility within a 2-kilometre radius.

1.3.8 Potential visual receptors were identified using the ZTV and verified on site during fieldwork.

1.3.9 Fieldwork was carried out during summer 2019 following the announcement of the preferred route on 5th April 2019.

1.3.10 The following aspects concerning potential inter-visibility were considered during the fieldwork including;

a) Potential screening features, including substantial vegetation, buildings and urban areas;

b) Potential visual receptors such as residential properties, business properties, Public Rights of Way and recreation areas;

c) Extent of long-distance views and likely significance;

d) Perceptual characteristics such as scale and appearance, scenic quality, tranquillity, discordant and intrusive features and night-time light sources that also influence the landscape character areas.

Stage 2 - Define Project Characteristics

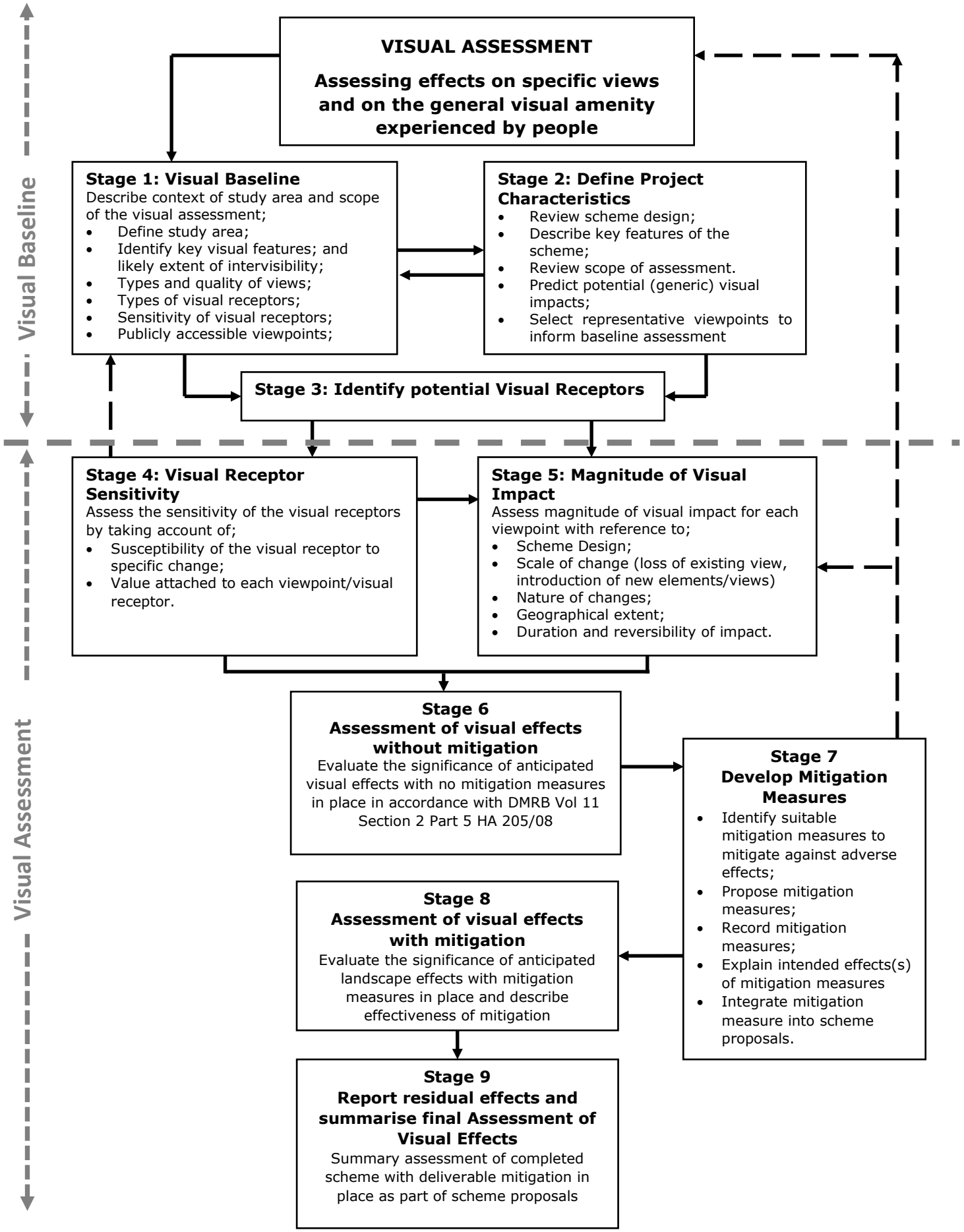
1.3.11 Defining the project characteristics is an opportunity to review the scheme proposals in light of any route selection process or following the announcement of a preferred route. More design work may have been undertaken that enables a better understanding of the scheme proposals and likely Zone of Influence. Key features of the scheme can be described along with the potential sites identified for site compounds and accommodation works that may influence the scope of the assessment.

Stage 3 - Identify potential Visual Receptors

1.3.12 The visual baseline will establish the potential visual receptors that will experience a change in view as a result of the scheme proposals''. In preparing the visual baseline, a preliminary assessment on the likely visual receptors affected by the Scheme proposals can be made. This may entail a review of the study area to ensure any potential visual receptors are captured in the assessment process. It also allows potential visual receptors to be scoped out of the assessment process should it be proven that there is likely to be no significant effects due to physical factors such as distance or topography. The extent of the area affected by the Scheme proposals and that is the focus of the assessment process is referred to as the Zone of Influence (ZOI).

1.3.13 Representative viewpoints were selected to assess the impact of the scheme proposals from typical visual receptors within the Zone of Influence.

Figure 3: Stages and processes followed for undertaking the assessment of visual effects



Stage 4: Sensitivity of Visual Receptors

1.3.13 The sensitivity of the visual receptor is a judgement of the type of change to views and visual amenity brought about by the Scheme and the activity of the viewer.

1.3.14 Visual amenity receptors are identified during the desk study and verified during field survey work. The extent and nature of their views are described, and the sensitivity of the receptors defined.

1.3.15 Criteria used to assess the visual sensitivity are derived from IAN 135/10 (W), Annex 2, Table 1, which are presented in Table 10;

Table 10: Receptor Sensitivity and Typical Descriptors

Sensitivity	Type of visual receptor
High	- Permanent residential properties; - Users of Public Rights of Way or other long-distance recreational trails (e.g. Coastal Paths, Cycle Routes, footpaths, bridleways etc) - Users of Public Open Space (e.g Promenade and Beach areas) for general amenity (e.g dog walking, picnicking, bird watching) - Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside (e.g. Open access land) - Visitors to Scheduled Ancient Monuments and areas of historic interest and value.
Medium	- Caravan Parks and temporary accommodation; - Users of outdoor recreational facilities and tourist attractions (eg golf courses) - Outdoor workers such as farmers; - Users of scenic roads, railways or waterways or users of designated tourist routes; - Schools and other institutional buildings, and their outdoor spaces; - Sailors, mariners and users of private watercraft
Low	- Indoor workers - Users of main roads (e.g. trunk roads), or passengers in public transport on main arterial routes. - Users of recreational facilities where the purpose of that recreation is not related to the view (e.g. sports facilities).

Stage 5: Magnitude of Visual Impact

1.3.16 For the purpose of both the landscape and visual impact assessment, impacts were graded according to their scale and magnitude. In determining the magnitude of impact or degree of change, the following should be considered;[19]

a) Scale of change;

b) Nature of change;

c) Duration of change;

[19] IAN 135/10 (W) para 3.9

d) Distance;

e) Screening;

f) The direction and focus of view;

g) Removal of past mitigation or existing vegetation;

h) Whether the receptor is static or moving;

i) Numbers and types of receptors potentially affected at a viewpoint.

1.3.17 In accordance with IAN 135/10 (W), impacts are rated to a five-point scale of major, moderate, minor, negligible (adverse or beneficial), and no change.

1.3.18 Terms used to describe the magnitude of visual impacts are derived from IAN 135/10 (W), Annex 2, Table 2, and presented in Table 11.

Table 11: Magnitude of Visual Impact and Typical Descriptors

Magnitude	**Typical descriptors**
Major	The Scheme, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The Scheme, or a part of it, would form a noticeable feature or element of the view, which is readily apparent to the receptor
Minor	The Scheme, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No Change	No part of the project, or work or activity associated with it is discernible.

1.3.19 Criteria applies to both negative (adverse), and positive (beneficial), due to the nature of the change according to their scale or magnitude. Where the Scheme, or a part of it, would become a detracting feature or focal point of the view, this is assessed as negative. Where the Scheme, or part of it, would result in an improvement in the view, this is assessed as a positive.

Stage 6: Significance of Visual Effects without mitigation

1.3.20 It is a requirement of the DMRM to undertake an assessment of the significance of landscape and visual effects without mitigation. "*In Wales, the assignment of significance before the before the consideration of the effectiveness of the design and committed mitigation measures should also be undertaken, allowing for the case or reason for and the effectiveness of mitigation to be described".*[20]

1.3.21 As stated in the landscape assessment methodology, the stage at which the Scheme proposals are assessed without mitigation is not clearly defined in the DMRB. For the purposes of this methodology, the Scheme proposals were assessed without mitigation following the announcement of the preferred route ie. the Scheme and at the commencement of the Environmental Impact Assessment process. This is when the Scheme had been progressed to a sufficient level of detail to enable a preliminary assessment to be undertaken. This enabled the proposed mitigation proposals to be captured and integrated into the design process.

1.3.22 IAN 135/10[21] recommends that the assessment of visual effects should be undertaken for three scenarios, the construction period, the first day of opening (in the winter) and during the summer 15 years after opening. This full assessment will be undertaken when mitigation measures are in place rather than during the preliminary assessment prior to mitigation.

Stage 7: Develop Mitigation Measures

1.3.23 The development of mitigation measures has previously been described in section 1.2.27 of the landscape assessment and also apply to the visual assessment. Visual mitigation measures may be solid barriers, such as fences or earth mounds which would be effective from the date of implementation. They may also have a dual purpose and mitigate against other forms of impact such as air quality or noise. Mitigation measures such as these may also have an adverse visual effect by blocking open views or by having an adverse effect on levels of visual amenity.

1.3.24 As stated in the landscape assessment methodology, the purpose of this mitigation stage is to;

- Identify suitable mitigation measures to mitigate against adverse effects;
- Propose mitigation measures;
- Record mitigation measures;
- Explain intended effects(s) of mitigation measures
- Integrate mitigation measure into scheme proposals.

[20] IAN 135/10 (W) Annex 1 para 3.4
[21] IAN 135/10 Annex 2 para 3.1

Stage 8: Significance of Visual Effects with Mitigation

1.3.25 With mitigation measures now in place and committed as part of the scheme proposals, IAN 135/10[22] recommends that the assessment of visual effects should be undertaken for three scenarios as follows;

Table 11: Scenarios for assessment of visual effects

Construction Period	Assuming maximum visibility or maximum perceived change situation (ie. when construction activity is at its peak for any given view) and noting how long that period is likely to last
Winters Day 1 Open to Traffic	A winter's day in the year that the project would be open to traffic or be fully operational (i.e with noise/visual screens and mounds in place but before any planted mitigation has begun to take effect). This is usually a reflection of the operationally non-fully mitigated/maximum visibility scenario.
Summers Day in 15th Year	A summer's day in the fifteenth year after opening (ie. when planted mitigation measures can be assumed to be substantially effective). This is usually a reflection of the near fully mitigated scenario under normal conditions.

Significance of Effect

1.3.26 The magnitude of impact and the sensitivity of the receptor are combined to establish the significance of effect, which is expressed as a scale ranging from neutral to very large. The scale can be positive and negative. This is in accordance with IAN 135/10 (W). The matrix used to determine the Significance of Effect is the same for both Landscape and Visual Impact. Derived from IAN 135/10 (W), Annex 1, Table 3; and Annex 2, Table 3, the Significance of effect matrix is presented in Table 12.

Table 12: Significance of Visual Effects

		Magnitude of Impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Visual Sensitivity	**High**	Neutral	Slight	Slight/ Moderate	Moderate/ Large	Large/ Very Large
	Medium	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Slight/ Moderate

[22] IAN 135/10 Annex 2 para 3.1

1.3.27 The terms used to describe the landscape and visual impact significance of effect categories are presented in Table 13. They are derived from IAN/135/10 (W), Annex 2, Table 4.

Table 13: Typical Descriptors of Visual Impact Significance of Effects Criteria

Effects	**Descriptors**
Very Large Beneficial Effect	The Scheme would create an iconic new feature that would greatly enhance the view.
Large Beneficial Effect	The Scheme would lead to a major improvement in a view from a receptor of high sensitivity.
Moderate Beneficial Effect	The Scheme would cause obvious improvement to a view from a receptor of medium sensitivity, or perceptible improvement to a view from a receptor of high sensitivity.
Slight Beneficial Effect	The Scheme would cause limited improvement to a view from a receptor of medium sensitivity or would cause greater improvement to a view from a receptor of low sensitivity.
Neutral Effect	No perceptible change in view.
Slight Adverse Effect	The Scheme would cause limited deterioration to a view from a receptor of medium sensitivity or would cause greater deterioration to a view from a receptor of low sensitivity.
Moderate Adverse Effect	The Scheme would cause obvious deterioration to a view from a receptor of medium sensitivity, or perceptible to a view from a receptor of high sensitivity.
Large Adverse Effect	The Scheme would lead to a major deterioration to a view from a receptor of high sensitivity and would constitute a major discordant feature in the view.
Very Large Adverse Effect	The Scheme would cause the loss of views from a receptor of high sensitivity and would constitute a dominant discordant feature in the view.

Stage 9: Report residual effects and summarise final assessment of visual effects

1.3.28 The final stage of the landscape assessment is to report any significant impacts that the scheme proposals will have on the landscape receptors. There may be residual impacts that cannot be mitigated against and the final assessment should report on why these cannot be mitigated and what impact there will remain for the lifetime of the project.

APPENDIX 9.2
PHOTOGRAPHIC METHODOLOGY

Appendix 9.2 - Photographic Methodology

1.1 The following camera setup was used on site to carry out the photography:

- Digital SLR Camera with full frame sensor: Canon EOS 5D Mk II
- Fixed focal length prime lens: Canon EF 50mm - f/1.4 USM Lens
- Hoya 58mm Pro-1 Digital UV Screw in filter
- Remote Shutter release cable
- Tripod - Manfrotto 190xDB/496RC2
- Panoramic Tripod Head - Manfrotto 303SPH Multi Row
- Tripod Leveller - Manfrotto 338 Levelling base
- Digital camera (for recording the location of the photograph taken)
- Tape measure (for 1.5m height accuracy)
- Compass (for calculating viewing angle)

1.2 At each receptor point, the following procedure was carried out in sequence:

- Camera time/ date set and images set to RAW and JPEG format.
- Camera height set 1.5m above ground (from centre of lens) and tripod levelled through 360 degrees using the tripod mounted levelling base. Panoramic head of the tripod set to 20 degree fixed increments.
- Remote shutter release cable attached to camera.
- Camera pointed towards the centre of the site and a compass bearing taken to record the angle of view.
- Apply camera settings (Manual setting, aperture f/14, ISO 100 or 200 if cloudy).
- Camera is manually focused and fixed for all subsequence shots in the panoramic sequence.
- Shutter speed is set making sure the exposure bar is +/- is set on 0.
- Time of photograph recorded and a full 360 degree panoramic sequence of 18No shots taken (clockwise).
- Camera setup and location photographed.
- GPS reading taken.

1.3 At each of the viewpoints the following details are recorded:

- Record location of the camera using onsite measurements from fixed features
- The grid reference of the viewpoint
- The horizontal field of view of the viewpoint
- The approximate altitude at viewpoint
- The viewer height at 1.5m (measured to the centre of the camera lens)

- The date, time and weather conditions the photo was taken
- The viewing angle/ direction of view to the development
- The distance to the development from the viewpoint (nearest visible feature)
- GPS reading taken.

Single Frame Image

1.4 Images were downloaded from the camera in RAW and JPEG format. The jpeg images have a resolution of 5616 x 3744 pixel dimensions. For each of the viewpoints single frame images have been included to show the central view towards the proposed site.

1.5 According to the Landscape Institute Advise note 01/11 the viewing distance for hand held photographs should be between 300mm and 500mm. The LI advice note (which cross refers to the Scottish Natural Heritage Visual Representation of Wind Farms Good Practice Guidance March 2006) recommends that for a 50mm lens on a 35mm camera printed to an image size of 360 x 240mm, the correct viewing distance to provide a realistic view would be 500mm.

1.6 The overall print size can also be determined by combining the viewing distance and the horizontal field of view. On a 50mm fixed focal lens the horizontal field of view is 39.6 °, however it is usual for a prime lens focal length to vary depending on the manufacturer of the lens. In order to calculate the exact horizontal field of view, the lens focal length for the camera was obtained using PTGui Software and then input into the below formula, which generated a field of view of 38.95 °

Horizontal Field of View ° = 2 arctan [width of image mm (36mm) ÷ 2 x Lens Focal Length]

The correct viewing distance is calculated using the following formula

Correct viewing distance = width of image ÷ 2tan [horizontal field of view ÷ 2]

1.7 The viewpoints have been represented on an A3 sheet at 360mm x 240mm and are to be viewed at 500mm, whilst holding them in a flat plane. The LI Advise Note 01/11 recommends the minimum resolution for a 500mm viewing distance is 180 pixels per inch.

Panoramic Photographs

1.8 In order to represent a wider context for each of the viewpoints single frame images are required to be stitched together. The Jpeg images (18No) were automatically merged together using PTGui Software, to produce a 360° cylindrical panorama (36000pixel image size). As the image is cylindrical it is to be viewed with one eye at the correct viewing distance whilst curving the image in a 90° arc around the viewer. The viewing distance is therefore represented as a radius dimension.

1.9 We have chosen to create a panorama using 3.75 images stitched together which gives a 75° field of view. The viewing distance can be calculated using the formula below:

Correct viewing distance = 180 x width of image ÷ π x horizontal field of view

1.10 Therefore, the correct viewing distance for the panoramic at 390mm width on an A3 sheet is 300mm radius. The LI Advise Note 01/11 recommends the minimum resolution for a 300mm viewing distance is 300 pixels per inch.

Viewpoint Locations

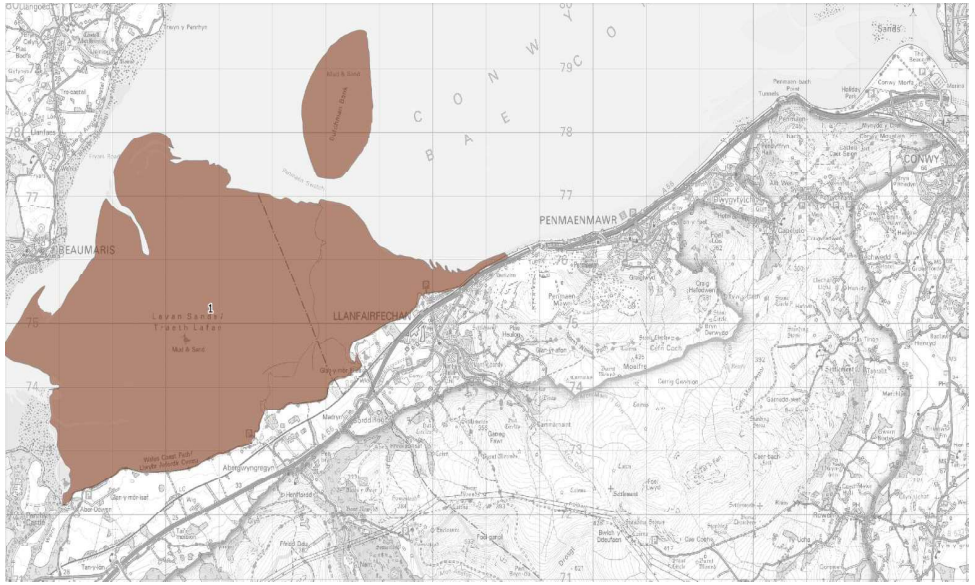
1.11 The GPS coordinates accurate to within 10m, were recorded on site for the location of each camera viewpoint. More accurate coordinates to within a metre, were obtained using Ordinance Survey raster mapping, overlaid with the proposed scheme. Survey station photographs, taken during the survey with a compact camera, were used to locate the viewpoint locations accurately.

1.12 Accurate bearing of the single frame images, representing the centre of the proposed development, were obtained from the OS base. Locatable features clearly represented in both the photographs and OS base were used to cross reference and verify the horizontal bearing of the camera and accurate coordinate location of the viewpoint."

APPENDIX 9.3
LANDSCAPE CHARACTER AREA DESCRIPTIONS

LCA1 – Traeth Lafan and Dutchman Bank		
Category:	Coastal	
LANDMAP Aspect Areas Overlap	Visual and Sensory: GWNDDVS001 - Traeth Lafan	
General Description and Designations		
General Description	An extensive marine and coastal zone covering the inter-tidal area of Conwy Bay north and west of the town Llanfairfechan. The coastal zone is a popular destination for local residents and seasonal tourists and provides a spectacular coastal setting with the mountains of Snowdonia rising steeply to the south. The area is a valuable resource for nature conservation and contains designations of international and national importance primarily as an important maritime habitat for marine birds.	
Designations	Traeth Lafan SSSI; Menai Strait and Conwy SAC; Liverpool Bay SPA; Traeth Lafan Local Nature Reserve; North Arllechwedd Historic Landscape	
Physical Characteristics		
Built environment	Parade of houses along promenade define the coastal zone. Timber groynes and sea defence walls at Llanfairfechan Promenade.	
Landform, geology and hydrology	Mudflats and beaches comprising of mud, sand and shingle.	
Landcover and vegetation	Open mudflats and beach. Little vegetation.	
Perceptual Characteristics		
Scale and Appearance	Large scale, flat and open. Appearance varies considerably with tides and weather conditions.	
Scenic quality	High scenic quality with expansive views across sea to Anglesey and Great Orme. Views inland to coastal town and promenade of Llanfairfechan.	
Tranquillity	Largely tranquil with calls of Lapwing and Curlew on mudflats at low tide contributing to feeling of remoteness and peacefulness. Occasional noise of train on mainline railway.	
Discordant/intrusive features	None	
Night-time light sources	A55 road corridor is lit and the dominant light source during night-time.	
Cultural/Social		
Historic features and elements	Penmaen Swatch, a post medieval anchorage, (NPRN 518960) a deep channel that runs between Traeth Lafan and Dutchman Bank, only perceptible at periods of low tide.	
Human Interaction	The coastal zone is used for coastal and maritime recreation such as sailing, kayaking and angling. Bait digging is also undertaken at periods of low tide.	
Landscape Value		
Highly scenic and picturesque area with backdrop of mountains descending to coastal plain. Contains several designations primarily for marine and coastal nature conservation and has features of historic interest. Valued as a resource by the local community and as a venue for tourism.		
Quality	**Condition**	**Overall Landscape Value**
Excellent	Good, intact and unspoilt	Very High

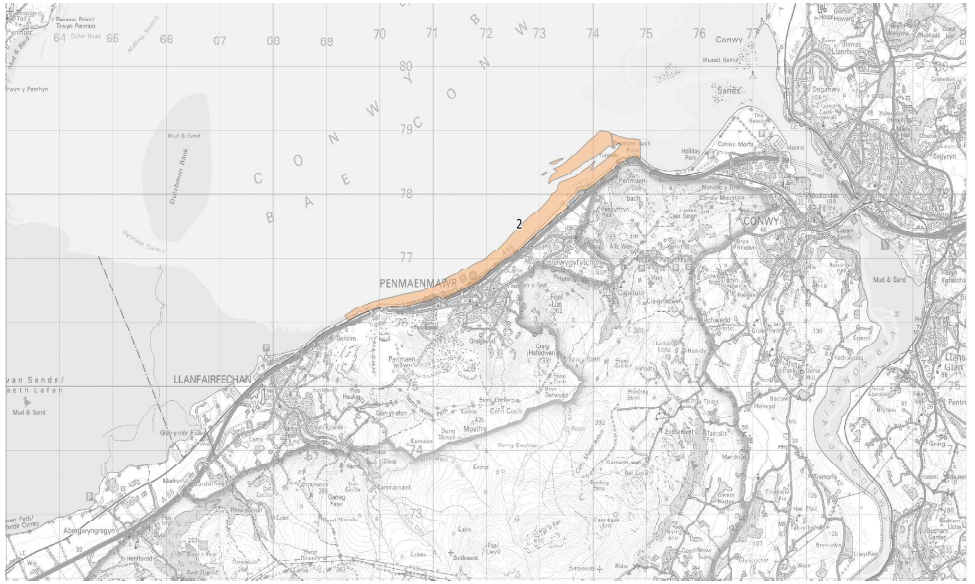
Map inset



Representative photograph

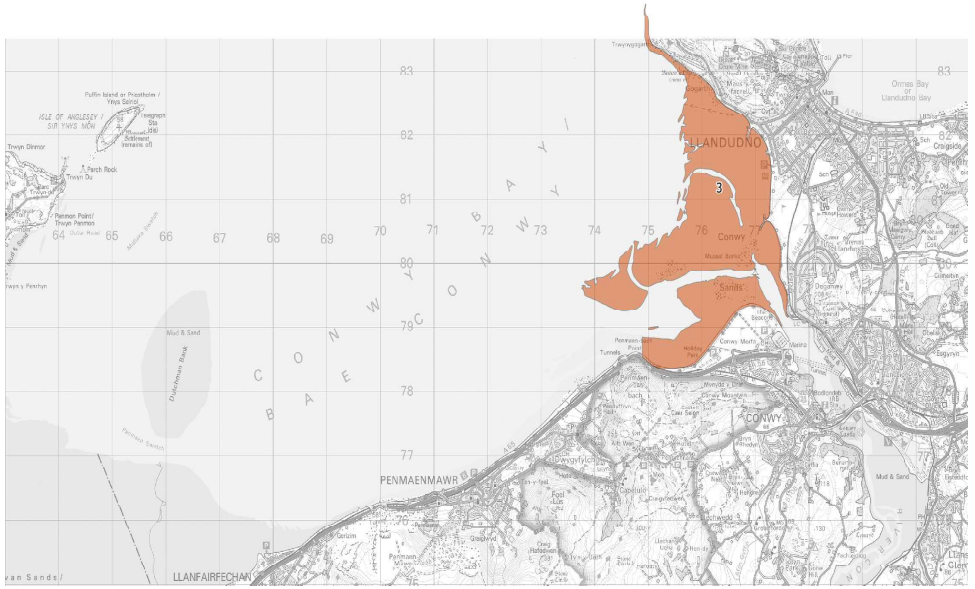


LCA2 – Penmaenmawr Beach		
Category	Coastal	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/Penmanemawr	
General Description and Designations		
General Description	Extensive coastal and intertidal area stretching from Penmaenmawr east to Penmaen-bach headland with mainline Holyhead to Chester railway and A55 road corridor defining the southern edge. Area of intertidal level ground made up of beaches of sand and shingle on the coast of the community of Penmaenmawr (Penmaenan, Pant-yr-afon and Capelulo). Large scale landscape with an open and exposed aspect. Organised pattern determined by tide levels with a moderate texture.	
Designations:	Aber Afon Conwy SSSI: Menai Strai and Conwy Bay SAC: Liverpool Bay SPA: Traeth Lafan LNR	
Physical Characteristics		
Built environment	Buildings are clustered at the promenade. Sea defence walls, railway embankment and concrete retaining walls form a southern boundary, groynes and slipways split the beach.	
Landform, geology and hydrology	Flat area of beach and mudflats that changes with tidal conditions.	
Landcover and vegetation	Beach and promenade area. Some ornamental planting along promenade in raised planters.	
Perceptual Characteristics		
Scale and Appearance	Expansive area to the north stretching across intertidal areas to the east and west.	
Scenic quality	Excellent scenic quality looking north across seascape of Conwy Bay to Anglesey, Penmon Lighthouse, Puffin Island and Great Orme. Backdrop of villages Penmaenmawr and Dwygyfylch with mountains and quarries above.	
Tranquillity	A55 road and rail corridor prevent any levels of tranquillity due to noise and visual intrusion.	
Discordant/intrusive features	A55 road and rail corridor intrusive visual elements. Sewage Treatment works on coastal strip near Penmaen-bach Point.	
Night-time light sources	A55 road corridor lit along full length.	
Cultural/Social		
Historic features and elements	None recorded	
Human Interaction	Popular promenade area with beach café and outdoor play area. Beach is used by sailing club, kayakers, anglers and bait diggers at low tide.	
Landscape Value		
Penmaenmawr beach and promenade are highly valued by the local community and used for general amenity and recreation. Tourism use during the summer months with beach café and play areas popular venues. The inter-tidal area is valued as a recreational and designated for nature conservation. The area is of good scenic quality and well maintained. Overall landscape value is detracted by proximity of road and rail corridor.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High



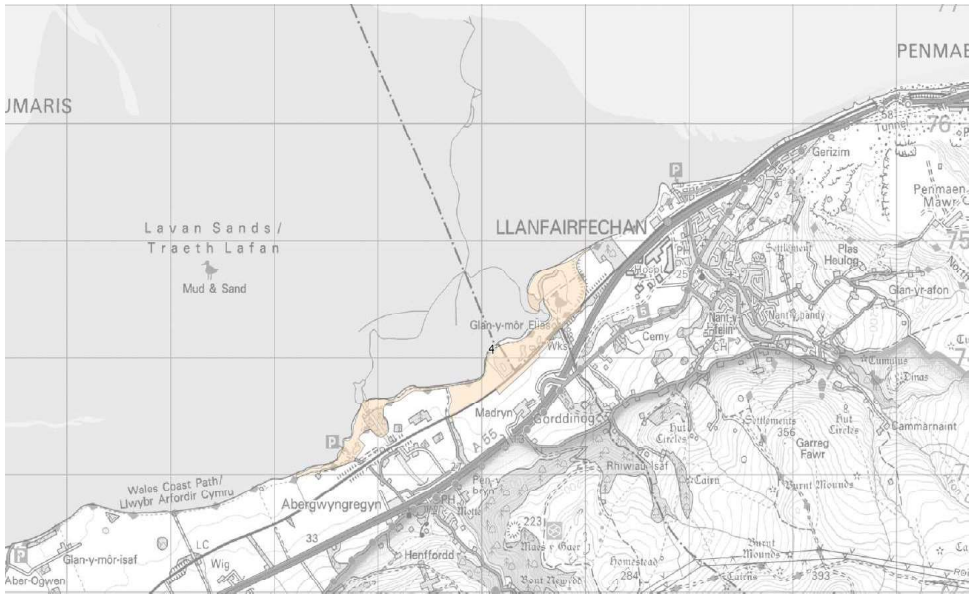


LCA3 – Conwy Estuary		
Category:	Coastal	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	CNWVS051 – Conwy Sands	
General Description and Designations		
General Description	Conwy Sands is an extensive inter-tidal area encompassing Conwy Estuary as it enters into Conwy Bay. The area is a dynamic environment with high tidal range with exposed sand banks and mussel banks at low tide. The setting of the area is open with a backdrop of hills to the south and West Shore and the Great Orme to the north and east. Distant views across open sea west towards Anglesey and Puffin Island. The estuary contains international ecological and maritime designations.	
Designations	Aber Afon Conwy SSSI: Menai Strait and Conwy SAC: Liverpool Bay SPA: Great Orme Heritage Coast: Local Nature Reserve: Conwy and Creuddyn Historic Landscape: Deganwy Castle SAM (setting).	
Physical Characteristics		
Built environment	Coastal defences at Conwy Morfa and West Shore. Marker buoys at entrance to estuary.	
Landform, geology and hydrology	Coastal with high tidal range, sand dunes at Conwy Morfa and West Shore.	
Landcover and vegetation	Sandbanks, beaches and mudflats.	
Perceptual Characteristics		
Scale and Appearance	Open, expansive and consistent, constantly changing with tide.	
Scenic quality	High scenic quality with open sea, beaches and estuary with backdrop of mountains.	
Tranquillity	Quite tranquil but Conwy Estuary used frequently by boats and sailing craft particularly during the summer months.	
Discordant/intrusive features	No significant discordant features.	
Night-time light sources	Residential area of West Shore and Deganwy lit at night.	
Cultural/Social		
Historic features and elements	Submerged peat deposits and fish weirs.	
Human Interaction	Mouth of Conwy Estuary navigable and a popular venue for maritime recreation.	
Landscape Value		
Very high landscape value with several marine habitats designated as international importance. Overall a dynamic and scenic landscape with spectacular coastal setting. Valued for its maritime recreational use together with long distance coastal path and cycle route along coast. Conwy Golf Course on southern boundary and adjacent marina and holiday park popular seasonal attractions.		
Quality	**Condition**	**Overall Landscape Value**
Excellent	High	Very High



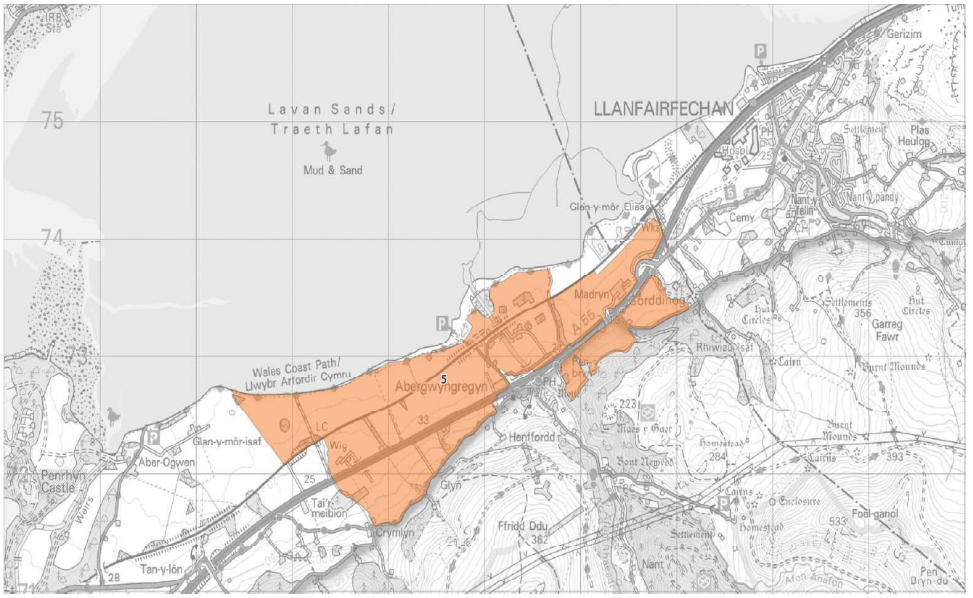


LCA4 – Aber and Felin-fach Salt Marsh			
Category:	Coastal		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	GWNDDVS004 Wig, SNPVS074 – Llanfairfechan/ Penmaenmawr		
General Description and Designations			
General Description	Area of coastal wild land at the mouths of Afon Aber and Nant-y-Felin-Fach watercourses. It spans a part of the coastal strip of Aber and Llanfairfechan (Bryn). The landscape is of medium scale with an open aspect. It consists of a mixture of scrub-woodland, salt-marsh, rough-grassland, waterbodies, sand and mud, with a moderate texture.		
Designations	Aber Afon Conwy SSSI: Menai Strait and Conwy SAC and Traeth Lavan SPA:Morfa Aber and Morfa Madryn Glan-y-Mor Elias LNR: North Arllechwedd Historic Landscape.		
Physical Characteristics			
Built environment	Scattered individual dwellings are located near to the railway line, which forms a southern boundary to this character area. Boundaries are a mixture of stone walls and stock-proof fences.		
Landform, geology and hydrology	Flat and generally even ground. Some wetland areas.		
Landcover and vegetation	Rough grassland and scrub.		
Perceptual Characteristics			
Scale and Appearance	Open and expansive to the north with good views over the nature reserve out towards the Menai Strait and Anglesey, and inland towards the Pen-y-clip promontory and northern foothills of the Carneddau uplands.		
Scenic quality	Good scenic quality with attractive coastal elements.		
Tranquillity	The tranquillity of the area is affected by the frequent passing trains on the Chester to Holyhead railway line.		
Discordant/intrusive features	No discordant features.		
Night-time light sources	Trains on adjacent Chester Holyhead mainline.		
Cultural/Social			
Historic features and elements	Pair of cottages north of railway - Grade II Listed		
Human Interaction	The Wales Coast Path follows the coastline with circular routes to follow within the nature reserve. A popular area for local walks.		
Landscape Value			
The area has several designations primarily for its bird life and is valued by the local community for circular walks and for its wildlife interest. The landscape is scenic and coastal with a rural backdrop and of good quality. It lies on the edge of internationally recognised ecological designations but is more renown locally as an area for birds and the Glan-y-Mor Elias Local Nature Reserve.			
Quality	**Condition**	**Overall Landscape Value**	
Good	Good	Very High	





LCA5 – Aber Farmland		
Category:	Flat Lowland	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	GWNDDVS0004 – Wig; GWNDDVS008 Abergwyngregyn	
General Description and Designations		
General Description	The character area is a coastal strip of low-lying farmland located between the busy A55 road corridor and the quiet coast of the Lavan Sands. The landscape is of medium scale locally but open and expansive to the north. The landcover is predominantly pasture with small pockets of restored ancient woodland.	
Designations:	North Arllechwedd Historic Landscape	
Physical Characteristics		
Built environment	Settlement is limited within the area with a few scattered farms, a University Farm Training Centre and Sewage Works	
Landform, geology and hydrology	Low lying with Afon Rhaeadr discharging into Traeth Lafan.	
Landcover and vegetation	Plantation woodlands possibly as trials as part of University College Farm. Otherwise open grassland set to pasture. Restored Ancient Woodland site in adjacent LCA4.	
Perceptual Characteristics		
Scale and Appearance	Predominantly rural in appearance and moderate in scale. More expansive area of Lafan Sands to the north.	
Tranquillity	Mainly peaceful coastal area but passing trains audible and lessens feeling of tranquillity. A55 not readily audible during fieldwork.	
Discordant/intrusive features	Farm buildings and sileage towers.	
Night-time light sources	No significant night-time light sources – traffic on A55.	
Cultural/Social		
Historic features and elements	Non known	
Human Interaction	Car parking area popular with walkers and bird spotters. Wales Coast Path.	
Landscape Value		
The landscape is considered to be generally of good quality and in good condition, well managed as farmland and with some scenic qualities. The A55 detracts from its' overall amenity value, especially east of Abergwyngregyn where the road corridor defines the southern boundary of the area. The coastal strip north of the railway is high landscape value as it lies adjacent to internationally designated area Traeth Lafan Sands and a popular amenity area set within an area of high scenic quality that could not be easily substituted. This area is also tranquil but disturbed by the railway line (noise) and traffic on the A55 (visual).		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High



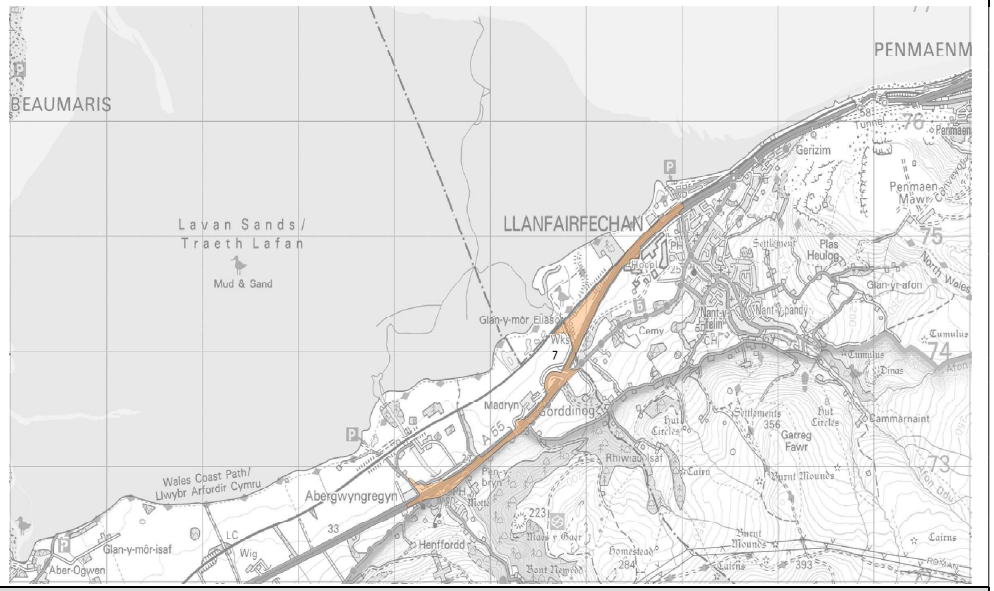


LCA6 – Tyddyn-y-coed Mosaic		
Category:	Flat lowland	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/Penmaenmawr	
General Description and Designations		
General Description	An area of coastal plain on the western fringe of Llanfairfechan Town and promenade and north of the Holyhead Chester mainline and A55 road corridor. The area is of mixed use, predominantly grassland with wooded plantation, allotments and some residential properties off West Shore Road.	
Designations:	Grade II Listed Buildings off Shore Road. Area lies adjacent to Aber Afon Conwy SSSI: Menai Strait and Conwy SAC.	
Physical Characteristics		
Built environment	Sea defence walls and promenade: Grade II Listed cottages along Shore Road with attractive garden frontages in arts and craft style. Allotment gardens to the south-west adjacent to railway line. Sewage treatment works at south-western boundary of the area.	
Landform, geology and hydrology	Flat low lying – geology unknown but lies on the coastal plain	
Landcover and vegetation	Mixed land use and cover. Open low-lying grassland inland from beach frontage with hedgerow/scrub boundaries. Some blocks of mixed woodland plantation.	
Perceptual Characteristics		
Scale and Appearance	Open coastal area set mainly to grassland with woodland plantation and allotments on the western fringe of Llanfairfechan	
Scenic quality	The area has some scenic quality particularly to the north, west and east. South, the area is contained by shore Road and Holyhead Chester mainline.	
Tranquillity	The area is generally a peaceful landscape but exposed to the north and influenced by the rail and road corridor to the south.	
Discordant/intrusive features	Sea defence walls in poor repair. Sewage Pumping Station adjacent to railway and at end of West Shore road detracts visually from the area.	
Night-time light sources	A55 and trains on Holyhead Chester mainline	
Cultural/Social		
Historic features and elements	Grade II Listed properties on Shore Road (Arts and Crafts)	
Human Interaction	The area lies on the western fringe of Llanfairfechan and is a popular amenity area for general activities such as rambling and dog walking.	
Landscape Value		
This is a small scale but complex landscape with a variety of land uses and landscape receptors. The coastal zone is highly scenic and a popular amenity area valued by the local community. The Grade II Listed buildings are key features and are attractive features in view from the coastal path. Inland from the coast the landscape quality deteriorates into a more fragmented condition and is increasingly influenced by the road and rail transport corridor of the A55.		
Quality	**Condition**	**Overall Landscape Value**
Medium	Medium	Moderate



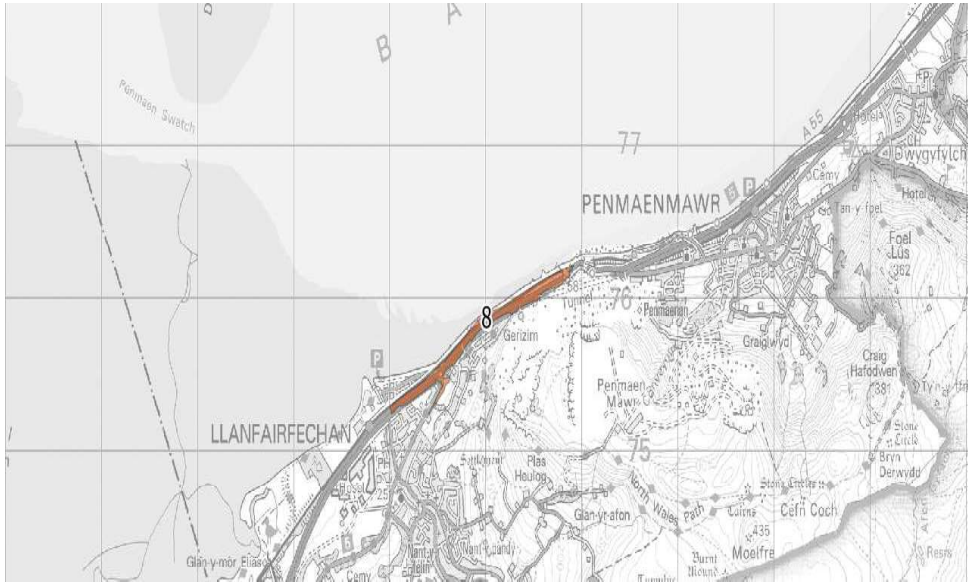


LCA7 – A55 Abergwyngregyn to Llanfairfechan		
Category:	Transport Corridor	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	GWNDDVS004 – WIG, SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	This section of the A55 and North Wales Coast Railway transport corridor runs through low-lying level ground from Abergwyngregyn to Afon Llanfairfechan in the east. There is roadside mitigation planting crossing the pastoral and parkland landscape of Aber and Llanfairfechan-Bryn communities. Boundaries are a mixture of metal and concrete barriers, timber fences, stone walls, plantations and managed hedges. The road corridor contains a number of structures such as overbridges and signage. The landscape is of medium scale, well maintained and for the majority enclosed by vegetation.	
Designations	Snowdonia National Park boundary runs along the southern verge of the road corridor between Abergwyngregyn (Junction 13) and Llanfairfechan (Madryn) (Junction 14). Some plantations between road and railway, and between road and parkland area restored ancient woodland sites.	
Physical Characteristics		
Built environment	Road corridor containing typical roadside infrastructure of acoustic barrier fences, concrete parapets, vehicle restraint systems, VMS signs and lighting columns in central reserve at junctions.	
Landform, geology and hydrology	The road corridor is effectively a linear plateau set amongst gently sloping land as it meets the coastal plain. Drainage is	
Landcover and vegetation	The road corridor is well vegetated with well-established soft estate along both east and west bound verges.	
Perceptual Characteristics		
Scale and Appearance	A road corridor set within a highly scenic coastal and rural setting	
Scenic quality	Good scenic quality with open views to the north across coastal plain to Lafan Sand and Conwy Bay. Eastbound views eclipsed by Pen-y-clip promontory, westbound Carneddau uplands and surrounding pastoral landscape.	
Tranquillity	The road corridor is set within a largely peaceful landscape but moving traffic is a highly disruptive element.	
Discordant/intrusive features	Concrete parapets and junctions detract from what is otherwise a road corridor within a scenic setting.	
Night-time light sources	Road corridor is lit at junctions. Road traffic headlights at night.	
Cultural/Social		
Historic features and elements	Llanfairfechan Railway Station is the only building within this area. Lies within the *North Arllechwedd* Historic Landscape	
Human Interaction	The transport corridors carry a significant amount of traffic which affects the visual tranquillity with constant movement of traffic and numerous high sided vehicles.	
Landscape Value		
The road corridor is set within an area of generally high scenic quality with the upland areas of Snowdonia National Park to the south and coastal plain to the north. Attractive views out both east and westbound. Well established soft estate clearly defines road corridor and creates green corridor. Some discordant features such as concrete parapets and acoustic barrier fencing on approaches to Llanfairfechan. Moving traffic major detractor, especially high sided vehicles.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	Moderate



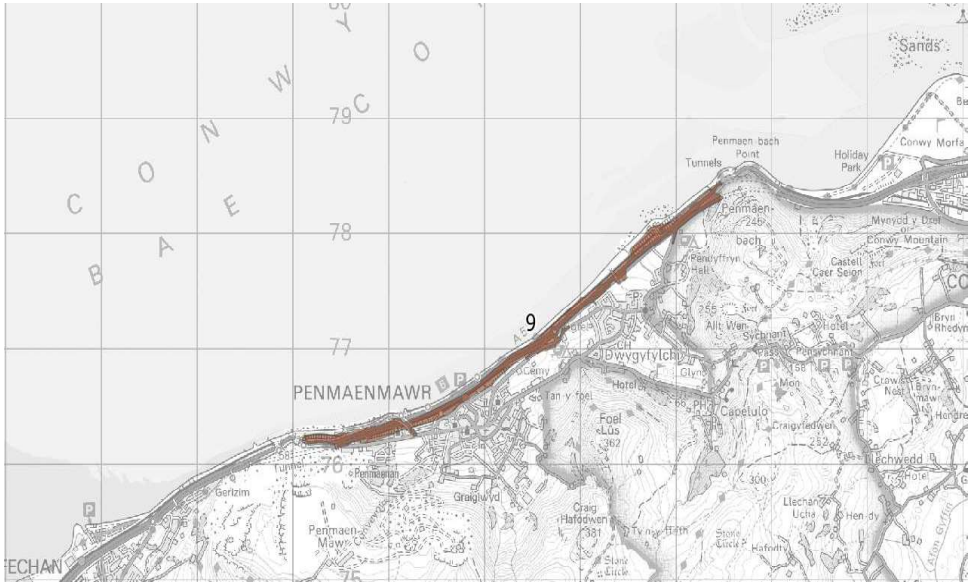


LCA8 – A55 Llanfairfechan to Pen-y-Clip			
Category:	Transport Network		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr, SNPVS075 – Penmaen Mawr Quarry		
General Description and Designations			
General Description	This section of the A55 and North Wales Coast Railway transport corridor runs from Llanfairfechan to Pen-y-clip tunnel, crossing Llanfairfechan-Lafan community. This is a busy transport corridor which provides access to the nearby settlement of Llanfairfechan from the A55 Llanfairfechan roundabout (Junction 15). This area is a flat, narrow low-lying corridor with some mature roadside plantations. Boundaries are a mixture of metal barriers, concrete barriers, timber fences and stone walls. Within this section of the A55 are pedestrian overbridges, signage and lighting. The landscape is of medium scale and open and well maintained.		
Designations:	Buildings near to Junction 15 (outside the character area) are within the *Llanfairfechan Town Centre* Conservation Area. Section of railway retaining wall to east of Promenade Road in Llanfairfechan forms a boundary to *Aber Afon Conwy* SSSI, *Menai Strait and Conwy* SAC, *Traeth Lavan* SPA and *Traeth Lafan* LNR.		
Physical Characteristics			
Built environment	Road corridor containing typical roadside infrastructure of acoustic barrier fences, concrete parapets, vehicle restraint systems, VMS signs and lighting columns in central reserve at junctions. Road corridor at split level east of J15 with high retaining wall and soil nails and cyclepath overbridge.		
Landform, geology and hydrology	Urban landform with numerous structures.		
Landcover and vegetation	Limited soft estate due to topography and constrained nature of road corridor. Established plantations adjacent to Junction 15.		
Perceptual Characteristics			
Scale and Appearance	Harsh urban landscape within coastal setting		
Scenic quality	Very poor scenic quality with structure within road corridor detracting from coastal setting		
Tranquillity	None. Roads traffic loud and threatening within road corridor and areas immediately adjacent (verges) and on overbridges		
Discordant/intrusive features	Overhead gantries. Pedestrian footbridge and ramped approaches east of J15 and yellow rumble strips on approaches to junction. Large engineering structures		
Night-time light sources	Road corridor is lit at junctions. Road traffic headlights at night.		
Cultural/Social			
Historic features and elements	Pen-y-clip tunnel and headland		
Human Interaction	Users of road corridor and adjacent footpath/cyclepath links		
Landscape Value			
The road corridor within this LCA is highly urban in character with some significant engineering features and structures such as overbridges, signs and gantries. The road corridor together with the railway line, effectively divides the town of Llanfairfechan in two and truncates connectivity with the promenade and beach area. The road corridor is well used and supports over XXXX vehicles per day. The soft estate either side of Junction 15 is a significant landscape feature that provides visual screening of the road corridor from nearby properties. The eastbound approaches towards Pen-y-Clip headland are dominated by large scale engineering structures. Although the A55 may be valued by the local community as a transport corridor and commuting route, the overall landscape value is considered low due to the number of detracting elements.			
Quality	**Condition**	**Overall Landscape Value**	
Poor	Moderate	Low	





LCA9 – A55 Trunk Road and Railway (Pen-y-clip to Penmaenbach)			
Category	Transport Route		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS075 – Penmaen Mawr Quarry, SNPVS074 Llanfairfechan/ Penmaenmawr		
General Description and Designations			
General Description	This medium scale, low-lying section of the A55 and North Wales Coast Railway transport corridor runs from Pen-y-clip tunnel to the Penmaenbach tunnel. There is mitigation planting crossing the coastal landscape of Penmaenmawr communities. Boundaries comprises mixture of metal barriers, concrete barriers, timber fences and stone walls. Access to the settlements of Penmaenmawr and Dwygyfylchi are provided from the A55 Puffin Roundabout (Junction 16). Penmaenmawr can also be accessed off the A55 east bound carriageway via a vehicular overbridge and Dwygyfylchi via a junction off the westbound carriageway. The Puffin Café and Shell garage can be accessed via the westbound carriageway.		
Designations:	Eastern limits adjoin Snowdonia National Park boundary at Penmaenbach Tunnel. Small area at western end crosses *North Arllechwedd* Historic Landscape.		
Physical Characteristics			
Built environment	Western portal of Pen-y-Clip Tunnel dominated by reinforced rock face and overbridge of cyclepath. Overbridge at Junction 15A. Quarry buildings and associated structures west of Junction 16.		
Landform, geology and hydrology	Rocky headland at Pen-y-Clip with road corridor urban in character with numerous structures.		
Landcover and vegetation	Well established soft estate largely along southern verge with some at Junction 15A on the northern verge.		
Perceptual Characteristics			
Scale and Appearance	Harsh urban landscape within coastal setting		
Scenic quality	The road corridor itself is generally of low scenic quality, there are however good outward views across Conwy Bay to the Great Orme from elevated sections of road (eastbound) west of Penmeanmawr and inland towards the Penmaenbach and Pen-y-Clip headlands and Penmaenmawr Quarries.		
Tranquillity	The transport corridors carry a significant amount of traffic which affects the visual tranquillity with constant movement of traffic and numerous high sided vehicles. Traffic headlights also cause light pollution within the character area. The audible tranquillity is very low.		
Discordant/intrusive features	Overbridges and overhead gantries. Pedestrian footbridge and ramped approaches west of J15A and yellow rumble strips on approaches to junction. Large engineering structures		
Night-time light sources	Road corridor is lit at junctions. Road traffic headlights at night.		
Cultural/Social			
Historic features and elements	Pen-y-Clip Tunnel		
Human Interaction	Users of road corridor and adjacent footpath/cyclepath links		
Landscape Value			
The road corridor within this LCA is highly urban in character with some significant engineering features and structures such as overbridges, signs and gantries. The road corridor sits within the context of Penmaenmawr, a former quarry town with clear evidence of quarrying as a previous industry. The road corridor is elevated and is a dominant element above the Penmaenmawr beach frontage that is highly valued by the local community as an area for amenity and recreation. East of Junction 16 roundabout and towards Penmaenbach headland, the road corridor is at a more even level as it runs parallel to the railway across the coastal plain.			
Quality	**Condition**	**Overall Landscape Value**	
Medium	Medium	Low	



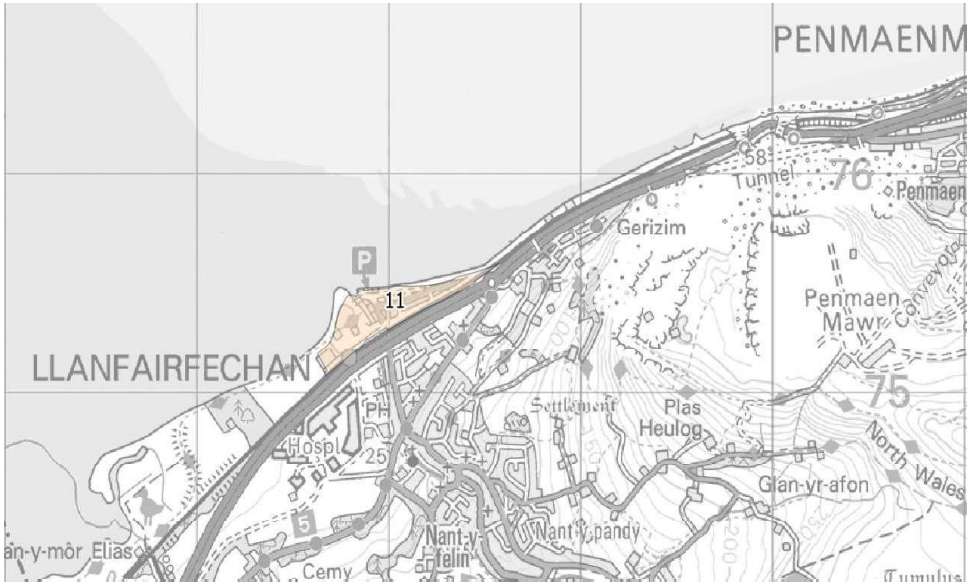


LCA10 – Pendyffryn Pasture and Parkland			
Category:	Rolling lowland		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 Llanfairfechan/ Penmaenmawr; SNPVS078 Penmaenbala		
General Description and Designations			
General Description	This character area lies to the north of Dwygyfylchi and south of the A55 and Junction 16A(Dwygyfylchi) to the west of Penmaenbach headland. Glan-Yr-Afon road runs in a southwest direction from the A55 flanked by hedgerows towards Dwygyfylchi. The area is predominantly open lowland set to pasture with seasonal caravan and camping land uses and a field used for events such as circuses and fairgrounds.		
Designations:	Adjoins Snowdonia National Park		
Physical Characteristics			
Built environment	Pendyffryn Hall and caravan site accessed off Glan-Yr-Afon road. Residential development has encroached on open pastureland to the north-west.		
Landform, geology and hydrology	Low lying area with Afon Gyrach the main watercourse draining northwards beneath the A55 via a culvert before discharging into the sea. The river sits within a small and wooded river valley that dissects the coastal plain.		
Landcover and vegetation	Landcover comprises pasture, temporary amenity fields and some blocks of woodland (Coed Pendyffryn) at the foothills of Allt Wen. Field boundaries are of medium scale and are enclosed by well-established hedgerows and mature trees. Natural stone boundary walls on approaches to village of Dwygyfylchi either side of narrow Glan-Yr-Afon road.		
Perceptual Characteristics			
Scale and Appearance	Views east are contained by the hillsides of Penmaen-bach and Allt Wen and to the south by Foel Lus. Views from the western part of the character area overlook the A55 and out towards the coast.		
Scenic quality	The backdrop to this LCA is dramatic with the rocky scree slopes of Penmaenbach and Allt-Wen rising steeply above lower heavily wooded slopes. The lowland area itself has moderate scenic quality that is diminished by proximity of the A55 road corridor and expanding residential fringes of the village further to the south-west.		
Tranquillity	Tranquillity particularly along the northern part of the character area is low.		
Discordant/intrusive features	Few discordant elements but presence of A55 and proximity of Shell Garage and overbridge noticeable detractors.		
Night-time light sources	A55 road corridor and settlements of Dwygyfylchi and eastern perimeter of Penmaenmawr.		
Cultural/Social			
Historic features and elements	None known		
Human Interaction	Pendyffryn Hall caravan site for statics and seasonal pitches with another field used for seasonal camping pitches. Adjacent field is used for circuses and fairs. Regular seasonal visitors occupy static caravans during summer months and highly valued.		
Landscape Value			
The overall landscape value of Pendyffryn pasture and parkland is considered to be medium due to its lack of cohesiveness and the erosion of its rural character due to the encroachment of residential development. The proximity of the A55 road corridor, although concealed by localised topography and hedgerow boundaries in some place, is a detractor with noise of passing vehicles and lighting a detractor. However, the setting to the south and east still remains of good scenic quality.			
Quality	**Condition**	**Overall Landscape Value**	
Medium	Medium	Moderate	



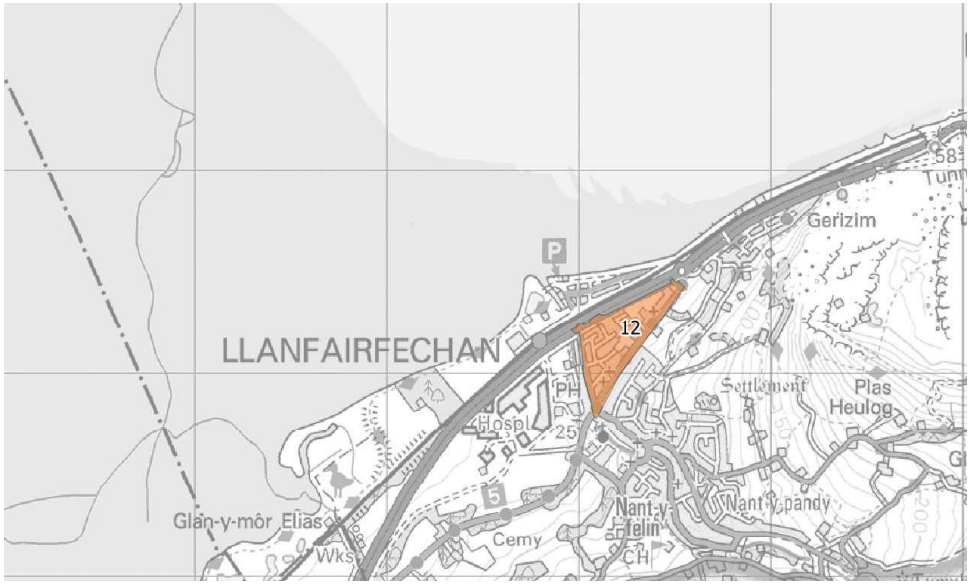


LCA11 – Llanfairfechan Promenade			
Category:	Built land		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr		
General Description and Designations			
General Description	The promenade is the original sea frontage to the Victorian seaside resort of Llanfairfechan, a wide area of public realm with a parade of three storey residential properties painted in a pastiche of seaside colours. The promenade has several facilities ranging from cafes and restaurants to toilets, play area, skatepark and boating pool. The promenade can be accessed via Shore Road East to the east and Station Road to the west both of which have to pass beneath the railway line with height restrictions of 1.8 and 3.0 metres respectively.		
Designations	Sea defence wall forms the boundary to Aber Afon Conwy SSSI, Menai Strait and Conwy SAC, Traeth Lavan SPA and Traeth Lafan LNR.		
Physical Characteristics			
Built environment	Wide area of public realm with parade of three-story townhouses defining southern edge. Sea defences and slipways, car parking and and toilet facilities		
Landform, geology and hydrology	Wide flat area of public realm with sea defences.		
Landcover and vegetation	Ornamental planting areas within park areas and mown grassland.		
Perceptual Characteristics			
Scale and Appearance	A coastal promenade with attractive beach frontage that sweeps in a gentle arc eastward towards Penmaenmawr where the rocky headland descends steeply to the sea.		
Scenic quality	Spectacular scenic quality that varies considerably due to tidal and weather conditions.		
Tranquillity	The coastal zone and inter-tidal area has some tranquil qualities but the busy promenade area is also heavily influenced by the A55 and rail transport corridor that diminishes feeling of peacefulness.		
Discordant/intrusive features	No significant detractors. Coastal defence wall is a functional structure but with little aesthetic quality.		
Night-time light sources	Properties along frontage of promenade and A55/Rail corridor.		
Cultural/Social			
Historic features and elements	Established as holiday resort in the 19th Century taking advantage of improved connectivity with the arrival of Telford's road and Stevenson's railway. There are two Grade II listed buildings within the promenade area, 'The Towers' and 'Gwynfor'. The buildings that form the main parade are not listed and do not fall within a Conservation Area		
Human Interaction	There is a significant amount of human interaction within the promenade area with a wide range of activities undertaken by the local community and visitors to the area. There is also a wide range of interest groups that use the promenade from casual ramblers and dog walkers to bird spotters and anglers and local sailing club. The beach has blue flag status.		
Landscape Value			
The promenade is highly valued by the local community and is a significant seaside attraction for visitors and day trippers. It is a popular venue for day trippers and less able-bodied people as the space is flat, hard surfaced and with open access and free car parking. The promenade has a spectacular coastal and mountainous setting at the foothills of Snowdonia.			
Quality	**Condition**	**Overall Landscape Value**	
Good	Good	Moderate	





LCA12 – Llanfairfechan Town Centre		
Category:	Built land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	The area lies between the A55 road corridor and Penmaenmawr Road to the east of Llanfairfechan Town Centre. Penmaenmawr Road is one of the two principal routes in and out of Llanfairfechan from the east and the existing Junction 15 roundabout. The area is principally urban with a number of community facilities such as the local school (former Ysgol Canol now Ysgol Pant y Rhedyn), former council buildings (Infrastructure Services at the Heath) and church/chapel. The road is generally well used with bus stops either side. There are several residential properties in the eastern section that overlook the A55 road corridor and beyond towards Anglesey and Puffin Island. The soft estate of the A55 provides screening of the road from these properties and the school grounds of Ysgol Pant y Rhedyn.	
Designations:	Llanfairfechan Town Centre Conservation Area that runs along south-west of Shore Road East and includes buildings along the north side of Penmaenmawr Road towards the town centre and east off Station Road.	
Physical Characteristics		
Built environment	Eastern edge of town centre with variety of stone and rendered buildings along Penmaenmawr lying within Llanfairfechan Town Centre Conservation Area.	
Landform, geology and hydrology	Open and gently sloping streetscape with road drainage.	
Landcover and vegetation	Streetscape with some grass verges and some significant roadside trees and within curtilage of properties. Some street trees and ornamental planting within public realm close to Junction 15 roundabout and junction.	
Perceptual Characteristics		
Scale and Appearance	Orderly streetscape with some attractive stone buildings set within the Conservation Area	
Scenic quality	Largely pleasant streetscene with wide carriageway that once formed part of the A55 North Wales Coast road, hence the more than average width.	
Tranquillity	A busy main road into the town centre and therefore no tranquil qualities.	
Discordant/intrusive features	The A55 road corridor is a physical barrier and disconnects the area from the promenade. The only remaining connection is via Shore Road East	
Night-time light sources	Street lighting and passing cars and other vehicles	
Cultural/Social		
Historic features and elements	Route of old A55. Historic buildings in Conservation Area.	
Human Interaction	Penmaenmawr Road is a buy road with several community and private assets including residential properties close to the existing A55 with others overlooking the road corridor to the north from rear of properties.	
Landscape Value		
The area is designated as a Conservation Area and has some distinctive qualities notably in the range and quality of building types although none are listed. The building frontages are focussed along the streetscape of Penmaenmawr Road, the rear of the properties overlook the A55 road corridor and soft estate and beyond to open sea and the shores of Anglesey and Puffin Island. The mixed woodland plantations of the soft estate to the rear of the residential properties provide good screening of the road corridor and have matured since being planted circa 1990 to also obscure views of the sea. The area is generally of good quality, but the general setting is eroded by the presence of the road corridor and condition poor.		
Quality	**Condition**	**Overall Landscape Value**
Good	Medium	Moderate



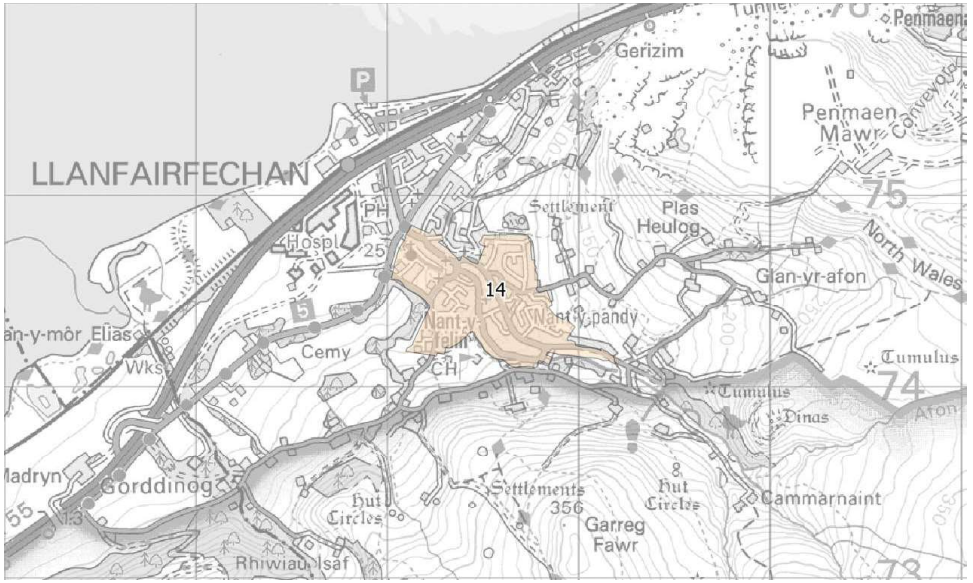


LCA13 – Llanfairfechan Drycin		
Category:	Built land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr; SNPVS073 Abergwyngregyn	
General Description and Designations		
General Description	The land-use is residential set on steeply sided and elevated land above the A55 road corridor. Properties are set out along roads primarily in an east to west linear pattern and inter-connected by steeply sloping roads. Elements and spaces are of a moderate scale with an open aspect. The Wales Coastal Long-distance footpath and cycle route passes within the character area along Penmaenmawr road.	
Designations	Southern outskirts are located within North Arllechewedd Historic Landscape.	
Physical Characteristics		
Built environment	The houses types are a mix of 20th century semi-detached properties of varying styles and 19th century terraced stone-built properties. Boundaries are a mixture of traditional stone and modern materials. A55 road corridor has significant retaining walls, overbridges and overhead gantries, signs and lighting.	
Landform, geology and hydrology	Set on steep sided hillside and scree at foot of Penmaenmawr mountain and above A55 road corridor. The west and eastbound carriageways are set at different levels and separated by a large retaining wall.	
Landcover and vegetation	Residential land with limited vegetation. Some areas of soft estate adjacent to A55 road corridor.	
Perceptual Characteristics		
Scale and Appearance	Small scale and compact residential area perched on lower mountainside.	
Scenic quality	Low scenic quality. Dense mass of roofscapes set within context of road corridor with retaining walls, overhead gantries and footbridge.	
Tranquillity	The area is exposed to onshore winds and constant noise from traffic on A55.	
Discordant/intrusive features	Structures within A55 road corridor are prominent and discordant elements	
Night-time light sources	A55 road corridor is lit with residential properties above.	
Cultural/Social		
Historic features and elements	Historic features of former quarrying activity on hillside above	
Human Interaction	Established residential area with cycle path passing through lower section.	
Landscape Value		
This is an established residential area with an open aspect to the north and with far reaching open views out to sea towards Anglesey and the Great Orme. There are few landscape elements of individual value that contribute to the landscape character. The limited areas of soft estate do mitigate some of the adverse effects of the A55 on some of the nearby properties. The A55 road corridor is a major discordant feature in this particular section of the route as it approaches the Penmaenmawr headland and tunnel with split level carriageways, significant retaining wall structures and overbridges. The residential area overlooks this section and is heavily influenced by the noise, appearance and operational aspects of the road corridor. Above the residential area, rock scree rises towards the rock outcrop of Penmaenmawr headland with naturally regenerating woodland scrub scattered across the slopes. This area has been seriously affected by the construction of the A55 in the 1990's and any legibility and unity that once may have existed has been lost.		
Quality	**Condition**	**Overall Landscape Value**
Poor	Poor	Poor



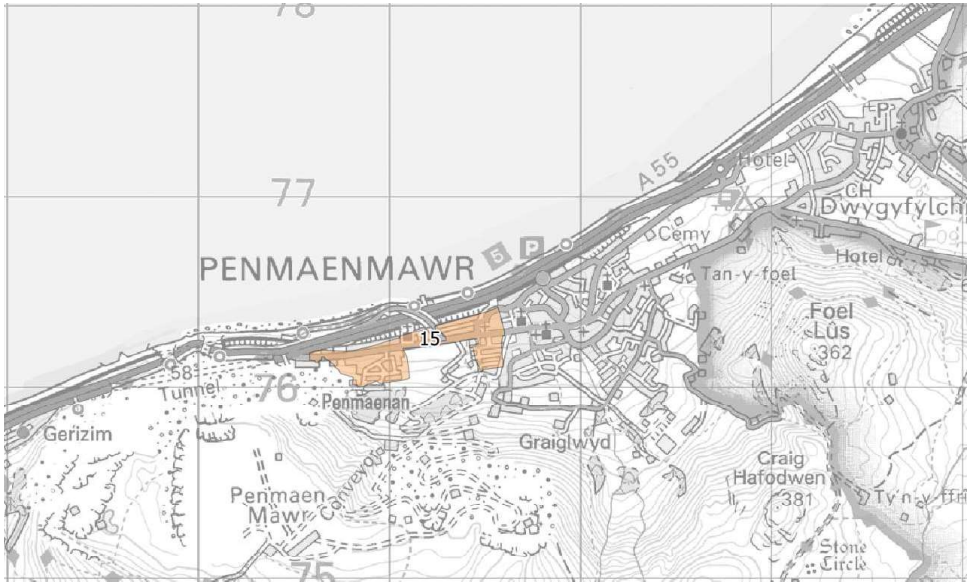


LCA14 – Llanfairfechan Uchaf		
Category:	Built land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	The town of Llanfairfechan continues east off Penmaenmawr Road onto Village Road where there are facilities such as shops, post office, public house, church and school. The Close is a Conservation area designated for its collection of residential properties built in the art and craft style by Herbert Luck North. The remaining areas are largely 20th century residential development consisting of bungalows, semi-detached properties and terraced housing. Boundaries predominantly stone walls, but brick and concrete block used for modern developments. Elements are of small scale with an enclosed aspect.	
Designations	Llanfairfechan Town Centre Conservation Area; and The Close Conservation Area. Numerous listed buildings in Arts and Crafts style set within the Close.	
Physical Characteristics		
Built environment	Centre of Llanfairfechan village clustered around Village Road and adjoining streets. Collection of attractive and historic buildings with some new development	
Landform, geology and hydrology	Village centre set within wooded river valley of the Afon Llanfairfechan.	
Landcover and vegetation	Wooded river valley of the Afon Llanfairfechan is an important landscape element that contributes to the townscape character.	
Perceptual Characteristics		
Scale and Appearance	An attractive town centre, rural in character and buildings of good aesthetic value.	
Scenic quality	Attractive town centre along Village Road with enclosed aspect.	
Tranquillity	An attractive and safe environment with village atmosphere but not tranquil due to busy town centre location.	
Discordant/intrusive features	Some modern development detracts from aesthetics of adjoining Conservation Area.	
Night-time light sources	Town centre location, street lighting.	
Cultural/Social		
Historic features and elements	There are several listed buildings within the town centre, primarily Grade II Listed for a variety of reasons but primarily associated with the Close. The Close is an estate of houses designed by the Arts and Crafts architect Herbert Luck North (1871-1941), who lived and worked in Llanfairfechan from c.1901.	
Human Interaction	Town centre location with several shops and facilities leading to high degree of human activity, a bustling town centre location with a village atmosphere.	
Landscape Value		
This area is a highly valued townscape constantly used by the local community and an attractive environment with many high-quality buildings set within the wooded valley of the Afon Llanfairfechan. There are few elements that are significant detractors from the feeling of unity and cohesiveness.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	Moderate



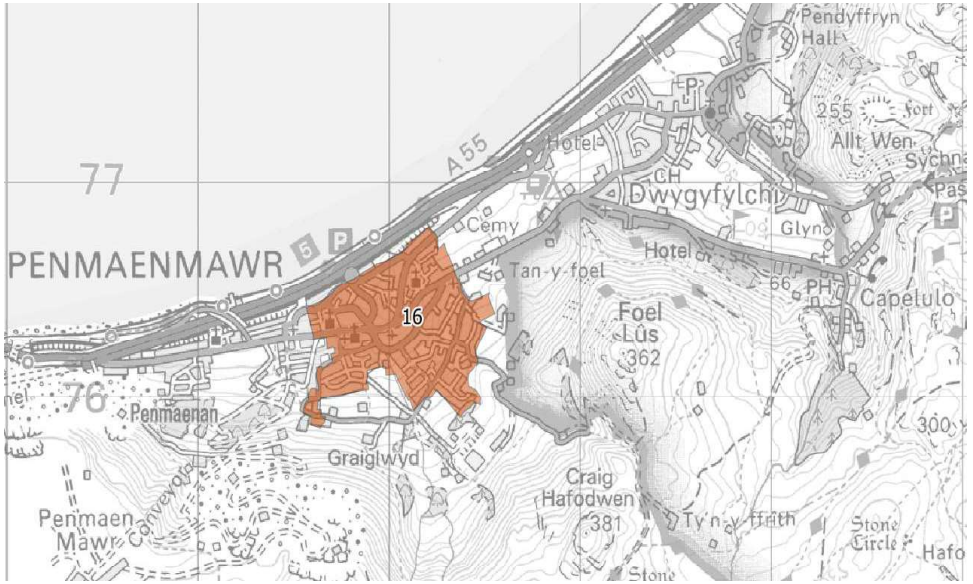


LCA15 – Penmaenmawr Penmaenan			
Category:	Built land		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr		
General Description and Designations			
General Description	Penmaenan is a residential area west of Penmaenmawr set on a series of streets above the High Street and on the lower slopes of Penmaenmawr mountain. The area lies to the south of the A55 road and rail corridor and either side of the High Street, a wide road and formerly the main A55 coast road. Pen-y-Clip Tunnel lies to the west of Penmaenan with steep rock and scree rising above the eastern portal. To the east is Penmaenmawr Town Centre. The High Street forms the spine of the character area and runs parallel and above the railway and A55. Located on the High Street are several businesses including a garage, hotel and St Paul's Church. Residential areas are interconnected by steep roads and boundaries are predominantly constructed of traditional stone.		
Designations:	The area includes three Conservation Areas in part or in whole namely; Penmaenmawr Town Centre; Penmaenmawr, St Davids Road/Bell Cottages and Penmaenan.		
Physical Characteristics			
Built environment	Built environment either side of the High Street with residential properties, a combination of stone and pebble dash two storey properties. The A55 road corridor has had a significant impact on the area elevated on concrete structures. Elements and spaces at a small scale with an open aspect north.		
Landform, geology and hydrology	The steep sided landform has been developed over time into a series of linear plateaus or terraces in order to build residential properties and highway infrastructure.		
Landcover and vegetation	Existing woodland lies on the hillside above the A55 road and rail corridor to the north, the hillside that rises above the High Street is also largely wooded.		
Perceptual Characteristics			
Scale and Appearance	A western arm of Penmaenmawr set against the wooded lower slopes of Penmaenmawr mountain with open views across the sea to the north. The southern aspect is enclosed by woodland and steeply rising ground of rock and scree.		
Scenic quality	Scenic quality of the area has been significantly affected by the A55 road corridor and now remains fragmented. A combination of quarrying activities and engineering of the A55 has eroded the scenic quality.		
Tranquillity	The area is heavily influenced by the noise and presence of the A55 road and rail corridor and current quarrying activity with quarry wagons using the High Street to access the A55 (westbound). Access to the quarry is off the High Street.		
Discordant/intrusive features	Quarrying activities and the engineering legacy from the A55 remain discordant and intrusive features.		
Night-time light sources	A55 and street lighting along the High Street.		
Cultural/Social			
Historic features and elements	Conservation Areas and traditional quarrymen's cottages set on steep sided hillside.		
Human Interaction	Primarily a residential area either side of the High Street that is also used for commercial traffic.		
Landscape Value			
Overall the landscape value of this area is low. There are some important landscape elements, the steep sided mountainside is a significant feature with scars of former quarrying activity. The lower slopes are heavily wooded and help to screen the road and rail corridor from sections of the High Street. The A55 road and rail corridor is a significant detractor from the area and ongoing quarrying activity and traffic also detractors.			
Quality	**Condition**	**Overall Landscape Value**	
Medium/Poor	Medium	Moderate	



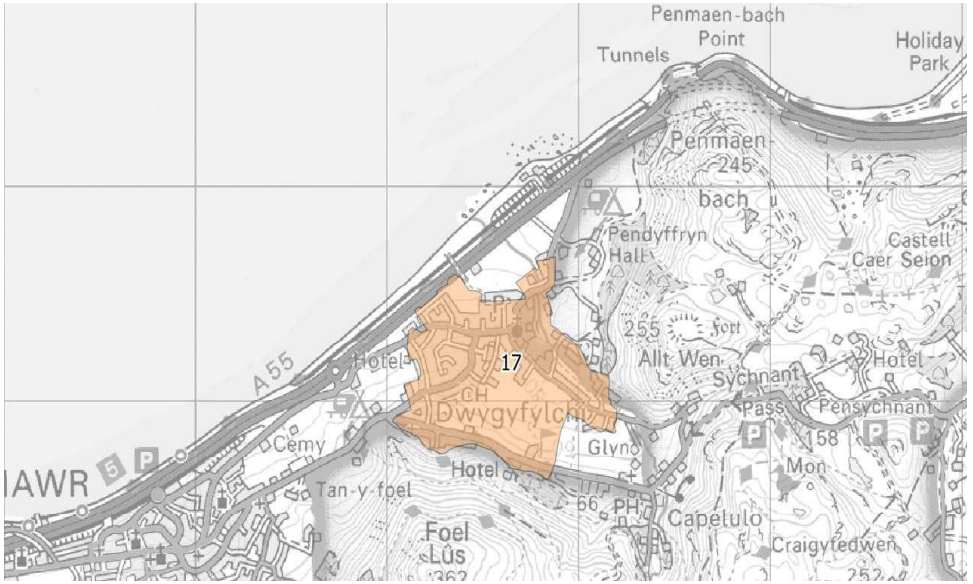


LCA16 – Penmaenmawr Pant-yr-afon		
Category:	Built Land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	Penmaenmawr town centre is centred around Conwy Road, the former north Wales Coast Road prior to the A55 being constructed in the 1990's. This is the hub of the town with several shops and community facilities lining the street, some have been refurbished with ornate glass canopies contributing to the streetscene and public realm. Station Road runs north and downhill to Penmaenmawr train station and an underpass beneath the A55 road corridor connects to the promenade. South of Conwy Road, a series of roads lead to residential areas and beyond to a caravan park and isolated farms.	
Designations	There are three Conservation Areas; Penmaenmawr Town Centre, Pen-y-Cae and St David's Road Conservation Areas. Several Grade II Listed buildings including Penmaenmawr Railway Station and Gladstone Monument. Section south of Graiglwyd Road is located within North Arllechwedd Historic Landscape.	
Physical Characteristics		
Built environment	Urban core with linear development radiating from village centre along Bangor Road (eastern part of Penmaenmawr). 19th century stone built and 20th century pebble dashed terraced housing is located on steeper slopes nearest to Penmaenmawr quarries. Less densely spaced 20th century detached dwellings in the south-eastern half of the area.	
Landform, geology and hydrology	Town centre set on steeply sloping land that descends towards the coastal plain.	
Landcover and vegetation	Woodland and scrub vegetation colonise the steep banks between development plateaus and road network within the town centre.	
Perceptual Characteristics		
Scale and Appearance	Medium scale with some open areas. Properties of varying periods and appearance and condition.	
Scenic quality	Area itself is not particularly scenic but from certain locations within such as Station Road East the scenic quality is very good with open elevated views across railway line and A55 towards the open sea and be=yond to Anglesey and Puffin Island.	
Tranquillity	Not a tranquil area, frequent activity in town centre location.	
Discordant/intrusive features	No significant discordant features	
Night-time light sources	General street lighting and residential properties.	
Cultural/Social		
Historic features and elements	The Grade II Gladstone Monument is located on an island at the cross-roads with Paradise Road, immediately north of the main street, Pant-yr-Afon/Conwy Road. It is a bronze bust of a polished granite obelisk, erected in 1899 in memory of W E Gladstone, Prime Minister who was, a frequent visitor to the town due to his friendship with the quarry-owning Derbyshire family.	
Human Interaction	Town centre with frequent human interaction.	
Landscape Value		
The town centre is composed of many smaller areas defined as cul-de-sacs or closes that vary in quality and condition. The overall quality of the town centre is medium with some areas of historic interest and some valued by the local community. The overall landscape rating is therefore considered to be of medium value.		
Quality	**Condition**	**Overall Landscape Value**
Medium	Medium/Poor	Moderate



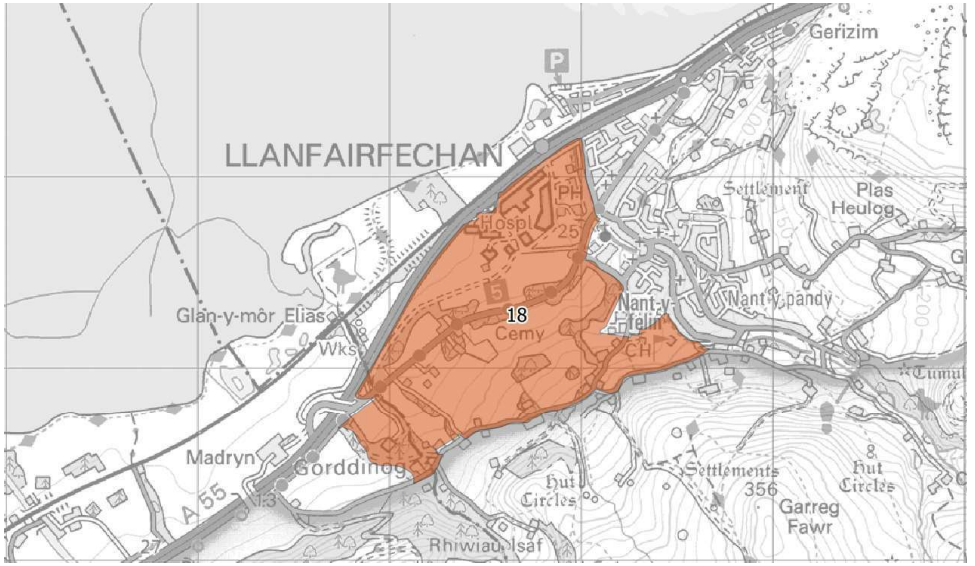


LCA17 – Dwygyfylchi		
Category:	Built land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	Village of Dwygyfylchi set on coastal plain at foothills of Allt Wen and Foel Lus in Snowdonia National Park with A55 road corridor to the north and north west. The village is predominantly residential with caravan sites and a golf course on land to the west and south. The centre of the village lies St Gwynan's Church, an attractive church with an elegant spire and a local landmark. Adjacent to the church lies a cemetery of Commonwealth War Graves.	
Designations:	Snowdonia National Park lies immediately to the south and east. Horeb Capel is a 19th century Grade II listed building located off Conwy Old Road.	
Physical Characteristics		
Built environment	The village contains a variety of largely residential building types and a mixture of stone, rendered and more recently brick-built properties.	
Landform, geology and hydrology	The Afon Gyrach flows along the eastern boundary of the village and has been prone to some flooding in the past (Flood Zone 2). The river crosses the coastal plain before passing beneath the A55 and railway in a culvert and discharging out to sea.	
Landcover and vegetation	Varied. Lower slopes of Allt Wen wooded with heather and scree. Golf course and caravan sites intensely managed close mown grassland.	
Perceptual Characteristics		
Scale and Appearance	The historic core of the village around St Gwynan's Church is small scale and intimate with the outskirts having as more fragmented and open appearance.	
Scenic quality	The area is set within the context of surrounding high scenic quality. From more elevated parts of the village there are open views across the sea to Anglesey and Puffin Island.	
Tranquillity	The r=area is generally peaceful but not tranquil with frequent activity along the local road network and distant audible hum of the A55.	
Discordant/intrusive features	The nearby Shell Garage and Puffin Café appear as discordant elements together with some elements of the A55 road corridor but these are not significant.	
Night-time light sources	Local residential properties and road network. A55 road corridor lit at night.	
Cultural/Social		
Historic features and elements	Few historic features and elements. The Parish Church of St Gwynan's stands on the crossroads of ancient trackways and has been the site of a church since the 18th century.	
Human Interaction	Human interaction is complex. There are permanent residences and also permanent seasonal pitches within the caravan parks. There are also seasonal visitors using nearby recreational facilities and the local public footpath network.	
Landscape Value		
The landscape within this area varies in quality but is generally in good condition. There are no designations, but it is located adjacent to the Snowdonia National Park and the surrounding areas is highly scenic. There are elements of the landscape that are valued by the local community and some visitors have long associations with the area through use of the caravan parks. Recent development has led to fragmentation of settlement edge.		
Quality	**Condition**	**Overall Landscape Value**
Medium	Good	Moderate



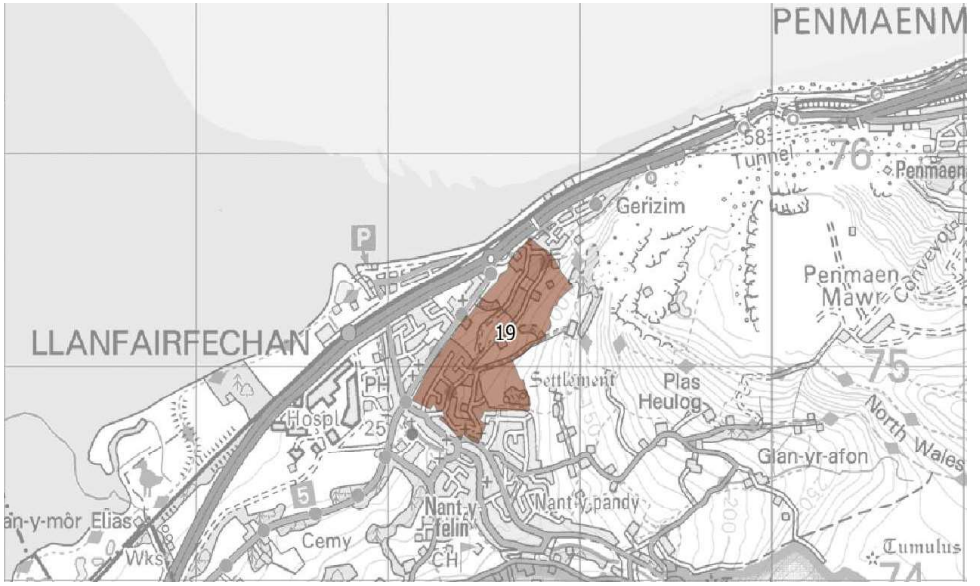


LCA18 – Llanfairfechan Parkland		
Category:	Developed land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 – Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	The area lies to the west of Llanfairfechan town centre either side of Aber Road, the former A55 coast road prior to the construction of the A55 Llanfairfechan By-Pass that opened in 1989. Remnants of the parkland remain, with mature parkland trees and woodland copses. Some areas of parkland are now grazed and used for horsiculture. Part of the remaining parkland south of Aber Road is now a strategic site in the emerging CCBC Local Development Plan for residential and mixed-use development.	
Designations:	Bryn – y – Neuadd Grade II Historic Park and Garden; Grade II Listed Buildings within the grounds of Bryn-y-Neuadd; Llanfairfechan Conservation Area adjoins area to the east; Snowdonia National Park boundary adjoins area to the south.	
Physical Characteristics		
Built environment	Bryn-y-Neuadd Hospital remains an operational hospital, the original park lodge remains at the entrance. Stone boundary walls remain alongside Aber Road. The A55 road corridor defines the northern boundary of the area.	
Landform, geology and hydrology	The area slopes gently down towards Aber Road from the south and then evens out into the coastal plain. There are no significant watercourses but indications of poor drainage in places.	
Landcover and vegetation	Mature parkland landscape with mature trees and woodland. Plantation woodland forms the northern boundary adjacent to the A55.	
Perceptual Characteristics		
Scale and Appearance	The area is typical parkland with mature parkland trees and woodland that restrict views. Aber Road is wide and belies its former status as the main North Wales coast road and now partly used for car parking.	
Scenic quality	Scenic quality is generally good with much of the parkland still intact and with views towards the hills of Snowdonia to the south. Tyne extent of the parkland is not readily perceived due to the mature vegetation and restricted access to the hospital.	
Tranquillity	Aber Road and the entrance to the hospital are frequently used by cars and pedestrians but generally quiet.	
Discordant/intrusive features	The sheltered accommodation of Llys y Coed off Caeffynnon Road appears as an incongruous element within the trees in the southern half of the area.	
Night-time light sources	Aber Road and Bryn-y-Neuadd Hospital.	
Cultural/Social		
Historic features and elements	The park and gardens of Bryn-y-Neuadd date back to the mid-19th century and in the 1960's became a hospital for people with learning difficulties with villa style accommodation that remains today.	
Human Interaction	Aber Road is the main entrance into Llanfairfechan from the west. Hospital grounds are private.	
Landscape Value		
The parkland area remains reasonably intact, but access is restricted and therefore amenity value also limited to hospital guests and visitors. Parkland areas south of Aber Road appear fragmented and poorly maintained with recent modern development detracting the parkland setting. The allocation of the southern half of the area as a strategic development site is likely to further erode the parkland landscape with the progressive encroachment of Llanfairfechan town centre to the west.		
Quality	**Condition**	**Overall Landscape Value**
Good	Poor	Moderate



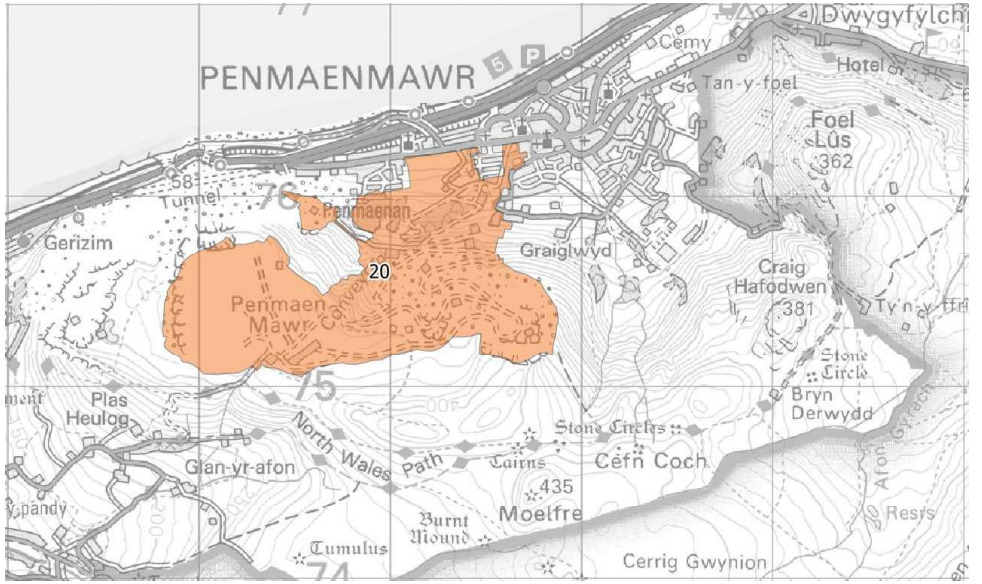


LCA19 – Penmaen Park		
Category:	Developed Land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	Penmaen Park lies on the eastern fringe of Llanfairfechan town centre on sloping land overlooking the A55 road corridor and Junction 15 roundabout. There are extensive views across the coastal strip to Anglesey and Puffin Island. The area partially includes two Conservation Areas and open parkland to the north-east with residential properties on the lower slopes. The remaining parkland has mature parkland trees and is set to rough grazing with public rights of way and the long-distance North Wales path crossing the side long ground.	
Designations:	Llanfairfechan Conservation Area; The Close Conservation Area; Grade II* Listed Building: Wern Isaf (formerly Rose Briars) Eastern part of character area lies within the North Arllechwedd Historic Landscape.	
Physical Characteristics		
Built environment	Buildings within Llanfairfechan town centre and The Close and the Grade II Listed arts and craft property of Wern Isaf. Residential properties on Penmaen Park.	
Landform, geology and hydrology	Steeply sloping land on the north west facing lower slopes of Penmaen Mawr. Indication of a spring at Wern Isaf with wells and sinks on hillside above.	
Landcover and vegetation	Mature parkland trees are key landscape elements in the area with small blocks of woodland along the south western and eastern boundaries of the park. Roadside plantations along southern verge of Penmaenmawr road west of Junction 15 roundabout junction form part of the wider A55 soft estate.	
Perceptual Characteristics		
Scale and Appearance	The north west facing parkland is of a moderate scale, open in aspect with far reaching views to the north and north-west	
Scenic quality	The views from within the parkland are generally highly scenic with far reaching views to the north and north-west across Lafan Sands towards Anglesey and Puffin Island. Views are compromised in places by A55 road corridor and moving vehicles and, in particular, high sided commercial traffic a detracting element.	
Tranquillity	The parkland is generally a peaceful landscape compromised by the constant noise of traffic on the A55 and at the approaches and exit from the Junction 15 roundabout.	
Discordant/intrusive features	The A55 road corridor and associated traffic	
Night-time light sources	A55 road corridor and traffic	
Cultural/Social		
Historic features and elements	Wern Isaf a Grade II* Listed Building by Herbert Luck North, it has also been designated as a Historic Park and Garden (PGW (Gd) 9 (CON).	
Human Interaction	Public rights of way and long-distance path well used routes. Popular with local residents and highly valued as an area for general amenity. The remaining parkland is currently allocated as a contingency housing site (for 45 dwellings) of 2.43 hectares in the emerging LDP.	
Landscape Value		
Penmaen Park is an area of remnant parkland on the outskirts of Llanfairfechan. It is used by the local community and visitors for general recreation and valued as an area of informal amenity. Wern Isaf is distinctive piece of domestic architecture and one of the most exceptional houses of its date and style in Wales. It has invaluable cultural connections through associations with the architect Herbert Luck North. The parkland is also an area of essential setting for Wern Isaf that encompasses the whole of the hillside.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	Moderate



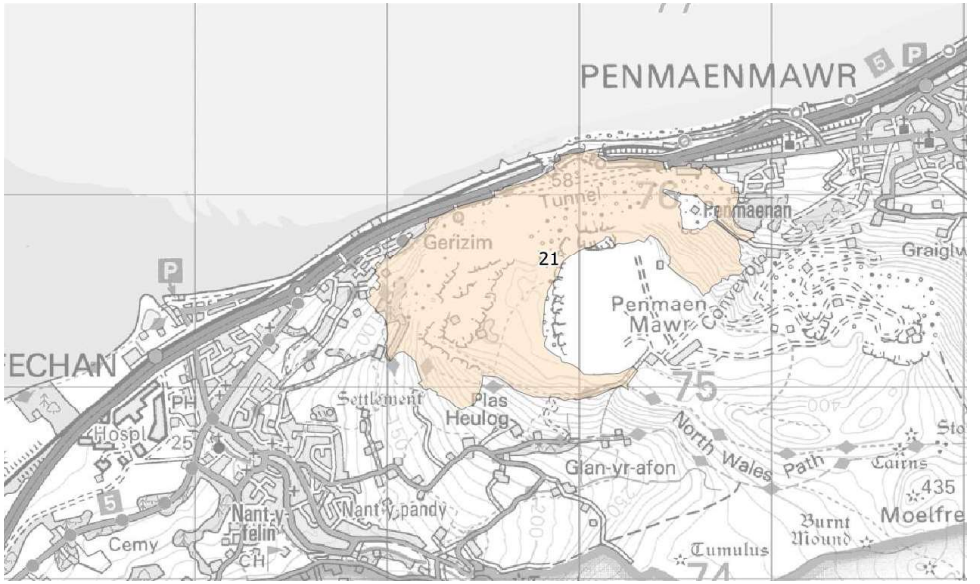


LCA20 – Penmaenmawr Quarries (active)		
Category	Developed land	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS075 Penmaen Mawr quarry, SNPVS074 Llanfairfechan/ Penmaenmawr	
General Description and Designations		
General Description	Penmaenmawr Quarry is an operational quarry managed by Hanson Aggregates. It is an extensive open cast quarry set on a series of levels and inclines that remain largely hidden from view from the town and surrounding area of Penmaenmawr. The most significant period of historical connections is seen to relate to quarrying activity and the development of the town during the 19th century.	
Designations:	No designations. Snowdonia National Park lies approximately 1 kilometre to the south of the quarry.	
Physical Characteristics		
Built environment	Operational quarry with associated buildings, processing plant and conveyor belts.	
Landform, geology and hydrology	The landform resulting from the quarrying activity is spectacular in its scale and form. The excavation of granite has been undertaken as a series of levels with inclines formed for the transportation of the excavated rock.	
Landcover and vegetation	There is little or no vegetation within the area of the operational quarry. Side slopes of the remaining mountain side are colonised with a combination of heath, scrub and woodland.	
Perceptual Characteristics		
Scale and Appearance	Large scale open cast quarry that has over time effectively removed the peak from the mountain and excavated down from within. The resulting shape and form has been likened to an extinct volcano.	
Scenic quality	Poor scenic quality when confined within the quarry.	
Tranquillity	An operational quarry with excavation and blasting activities.	
Discordant/intrusive features	Operational quarry with heavy industrial scale quarrying activities.	
Night-time light sources	None known but unlikely to be visible from town and lower levels.	
Cultural/Social		
Historic features and elements	The quarry dates back to the 1830's to meet the growing demand for granite setts. However, granite axe heads have been found dating as far back as Neolithic times.	
Human Interaction	The quarry is highly significant in the establishment and development of Penmaenmawr town centre. There are also significant cultural associations between the quarry and the town.	
Landscape Value		
The physical landscape value of the quarry is distinct to quarrying activities. The scale of the operation and the resultant landform is spectacular, an illustration of mans' interaction (or exploitation) with the natural environment. The social and cultural associations between the quarry and town are hugely significant and are important on both a local and regional scale. Therefore, the overall landscape value is considered to be low but with some important social and cultural associations.		
Quality	**Condition**	**Overall Landscape Value**
Unique	Operational quarry	Low



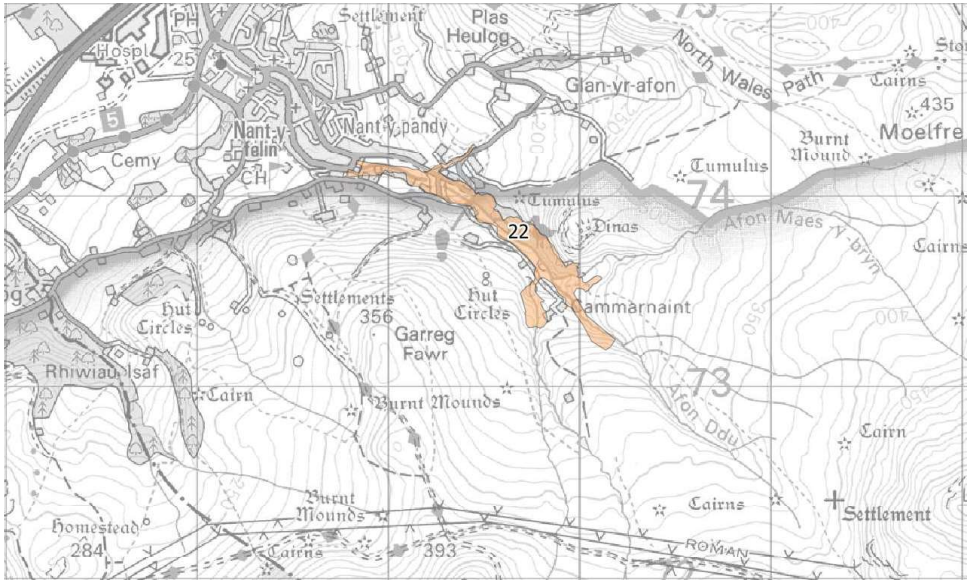


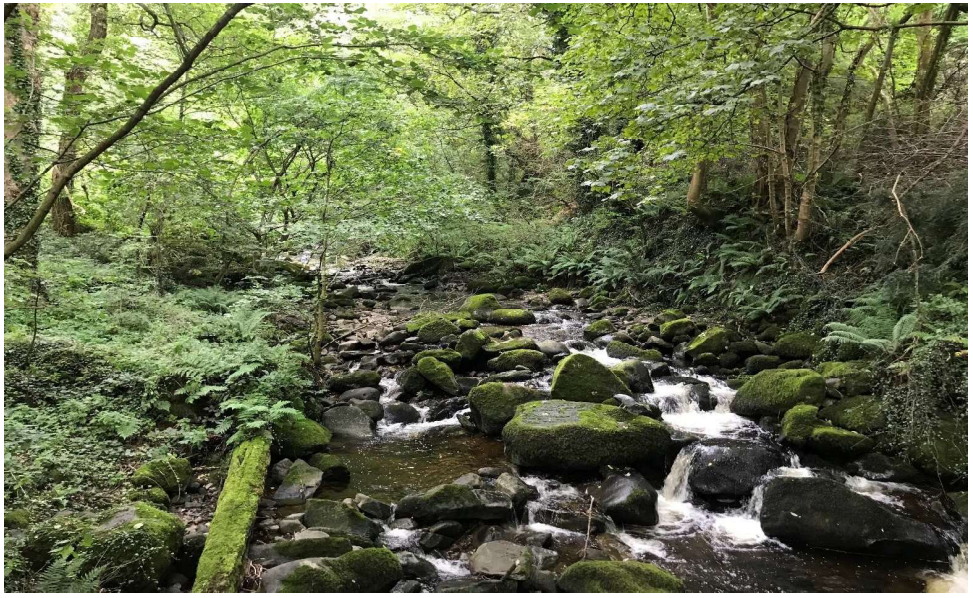
LCA21 – Penmaenmawr Quarries (disused)			
Category:	Hillside Slopes		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS075 Penmaen Mawr quarry, SNPVS073 Abergwyngregyn		
General Description and Designations			
General Description	The northern face of Penmaenmawr mountain rises precipitously above the sea and is a spectacular landmark on the North Wales coast. The bare rock face is light grey with scree on the lower slopes with woodland colonised on the lower slopes. The mountainside shows scars of previous quarrying activity with old quarry buildings and a series of inclines on the lower slopes above the former village of Garizim.		
Designations:	North Arllechwedd Registered Historic Landscape		
Physical Characteristics			
Built environment	Former quarry buildings now derelict.		
Landform, geology and hydrology	Igneous rock (diorite but more commonly referenced as granite) outcrop with scree on lower slopes.		
Landcover and vegetation	Naturally colonised mixed woodland on lower slopes with areas of heath on upper slopes.		
Perceptual Characteristics			
Scale and Appearance	Extensive upland area, exposed with few features.		
Scenic quality	High scenic quality with spectacular coastal views.		
Tranquillity	A peaceful area, open and expansive but A55 road corridor audible and traffic visible. Movement of traffic detected by peripheral vision.		
Discordant/intrusive features	A55 road corridor.		
Night-time light sources	A55 road corridor.		
Cultural/Social			
Historic features and elements	Former quarry building and inclines of historic interest.		
Human Interaction	Penmaenmawr was a little collection of farms and houses supporting agriculture and herring fishing prior to the opening of its' quarries in the first half of the 19th century. Industrial quarrying of diorite at Penmaenan began in 1830 with the opening of the independent Penmaen Quarry. Now, the area is popular with ramblers and paragliders.		
Landscape Value			
The area contains significant evidence of the former quarrying activity at Penmaenmawr and is an attractive upland landscape with scenic views across the Snowdonia mountain range to the south and open sea to the north. It is valued by some for informal amenity and is reasonably tranquil, but value is lessened by proximity and influence of the existing A55 road corridor.			
Quality	**Condition**	**Overall Landscape Value**	
Good scenic quality	Good	Moderate	



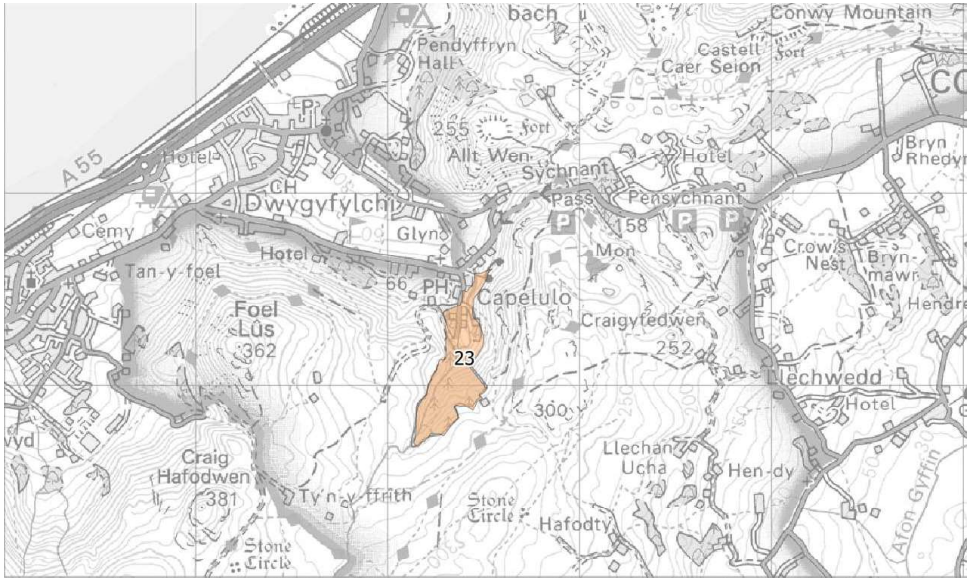


LCA22 – Y Teiryd Valley		
Category:	Upland Valley	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 Llanfairfechan/ Penmaenmawr, SNPVS073 Abergwyngregyn, SNPVS072 Carneddau uplands	
General Description and Designations		
General Description	The Y Teiryd valley is a narrow-wooded valley above and south-east of Llanfairfechan, it is now generally known as Nant-y-Coed Nature Reserve. The area covered by this Local Nature Reserve was once part of the Newry estate and leased to a local businessman who developed it foe recreational purposes. The estate was sold in 1923 and is now owned and managed by Conwy County Borough Council. A network of paths and guided trails run through the woodland and ab towards to the upland areas around Foel Lwyd and Tal y Fan.	
Designations:	Snowdonia National Park Nant-y-Coed Local Nature Reserve	
Physical Characteristics		
Built environment	No built environment. Man-made elements include gates, stiles, interpretive panels and signs.	
Landform, geology and hydrology	The upper reaches of the Afon Llanfairfechan runs through the narrow valley.	
Landcover and vegetation	The river valley is densely wooded with deciduous trees. Ancient woodland of Nant-y-Coed.	
Perceptual Characteristics		
Scale and Appearance	Small scale and enclosed wooded river valley.	
Scenic quality	Highly scenic with views enclosed and restricted by surrounding woodland and topography.	
Tranquillity	A peaceful wooded valley with sound of river and bird life quite tranquil.	
Discordant/intrusive features	No discordant features	
Night-time light sources	None	
Cultural/Social		
Historic features and elements	There are several historic features on the hills above the valley such as hut circles, cairns and settlements.	
Human Interaction	There are a series of walks around the nature reserve of varying lengths. The public are encouraged to visit the nature reserve with a number of leaflets and self-guided walks available online.	
Landscape Value		
Nant-y-Coed is a local nature reserve set within a nationally valued landscape of Snowdonia National Park. It is a popular area for general amenity and wildlife related activities and visited generally by local people. The area is a small-scale landscape valued by the local community. It is a peaceful area with a high degree of tranquillity and is therefore considered to be of a high landscape value.		
Quality	**Condition**	**Overall Landscape Value**
Outstanding	Good	Very High



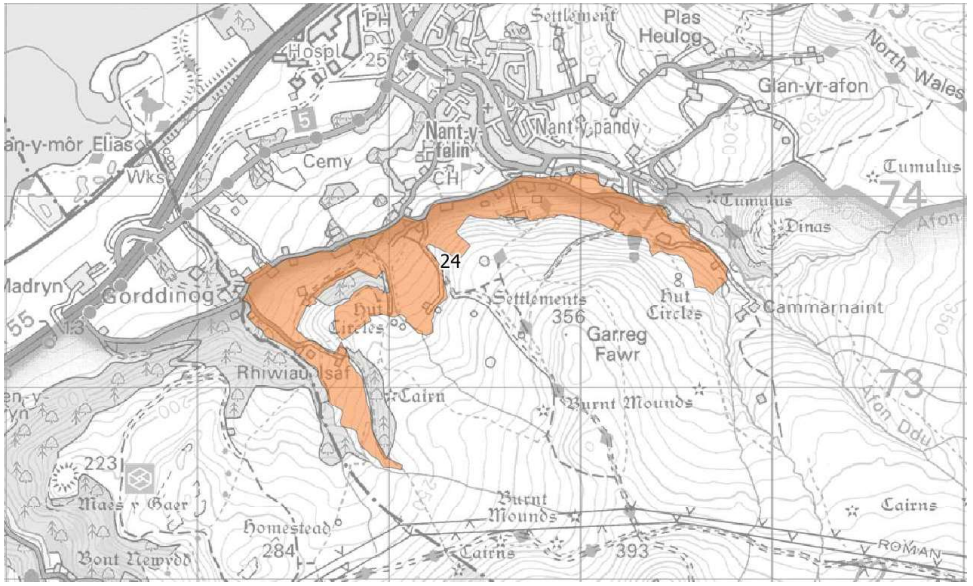


LCA23 – Fairy Glen Valley		
Category:	Upland Valley	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS076 - Capelulo Valley	
General Description and Designations		
General Description	Fairy Glen Valley is a steep sided narrow wooded valley south of the village of Capelulo. The upper reaches of Afon Gyrach flow through the valley that is known for its waterfalls. The valley is popular with ramblers and walkers with a series of circular walks passing through the valley. The North Wales Path skirts the upland areas above the valley.	
Designations:	Snowdonia National Park The southern part of the character area is located in North Arllechwedd Historic Landscape.	
Physical Characteristics		
Built environment	Residential dwellings in the form of detached properties and terraced cottages to the northern part of the character served by the Fairy Glen single track road Dry stone walls along field boundaries, footbridges across river.	
Landform, geology and hydrology	Deeply incised river valley.	
Landcover and vegetation	Heavily wooded river valley with mature oaks and mixed woodland. There are areas of restored ancient woodlands and plantations on ancient woodland sites.	
Perceptual Characteristics		
Scale and Appearance	Small scale and intimate river valley with contained views.	
Scenic quality	High scenic quality and set within the foothills of Snowdonia National Park.	
Tranquillity	Very peaceful valley with the sound of the river an attractive element. Very tranquil but can be popular with walkers and ramblers.	
Discordant/intrusive features	None	
Night-time light sources	None	
Cultural/Social		
Historic features and elements	None known but the upper reaches of the valley contain evidence of former settlements.	
Human Interaction	Popular area for walkers and ramblers. Circuitous walks take in village of Capelulo where there is a public house serving drinks and food and a local bus service.	
Landscape Value		
The wooded valley of Fairy Glen is set within the foothills of Snowdonia National Park. It is a highly scenic area and popular with walkers and ramblers. The valley is sheltered and peaceful, enclosed and secluded but is popular during peak holiday periods.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High



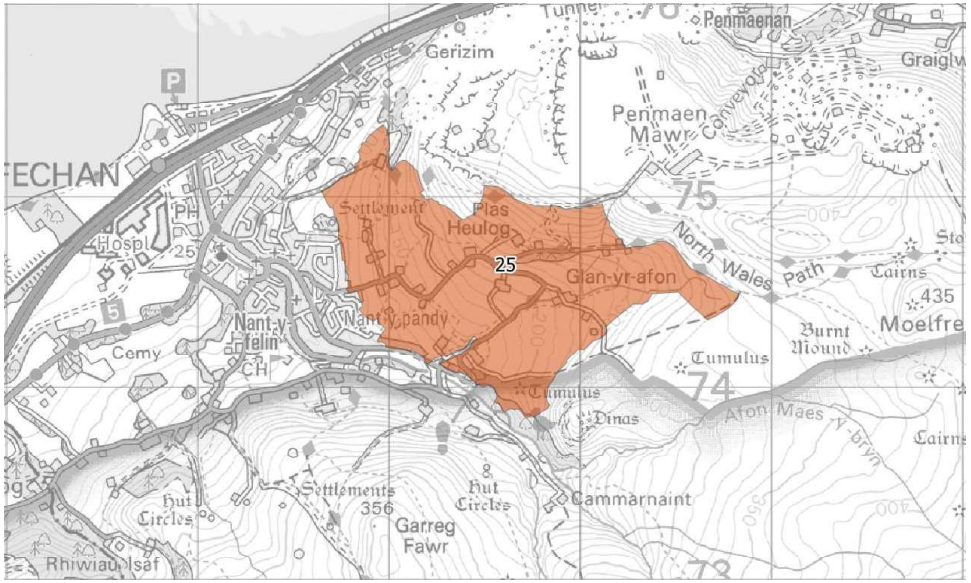


LCA24 – Nant-y-Felin Pasture		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS073 – Abergwyngregyn, SNPVS072 Carneddau uplands	
General Description and Designations		
General Description	The landscape character area is located to the south of Llanfairfechan and along the hillside slopes of Garreg Fawr. Land cover is predominantly pasture. The western part of the character area towards Rhiwiau is enclosed by woodland plantations of Coed Gorddinog to the west and Coed y Rhiwiau in the east. The north and eastern parts of the character area are open and exposed. Boundaries comprise stone walls and hedgerows.	
Designations:	The area lies just within the northern boundary of Snowdonia National Park. The area lies within the North Arllechwedd Historic Landscape. Tan yr Allt Isaf is a Grade II listed building located off Terrace Walk.	
Physical Characteristics		
Built environment	Within the character area are scattered residential properties comprising farms and cottages. The main roads within the character area are Gwyllt Road and Terrace Walk which are single track road with stone wall boundaries. There are several footpaths and the North Wales Path cuts across part of the character area.	
Landform, geology and hydrology	Steep sided northern slopes of Garreg Fawr.	
Landcover and vegetation	Open pasture	
Perceptual Characteristics		
Scale and Appearance	Open north facing aspect	
Scenic quality	High scenic quality with open views north across coastal plain to Lafan Sands and the coast of Anglesey beyond.	
Tranquillity	The area is generally peaceful but the distant noise of the A55 road corridor a detractor.	
Discordant/intrusive features	No significant discordant or intrusive features.	
Night-time light sources	A55 road corridor	
Cultural/Social		
Historic features and elements	There are several sites of historic features nearby including hut circles, enclosures and homesteads in the upland areas to the south.	
Human Interaction	The area is crossed several public footpaths that lead to the higher ground and the North Wales Path.	
Landscape Value		
The area is set on elevated land south and above the western edge and parkland landscape of Llanfairfechan with open views north across Conwy Bay towards Anglesey. Views are restricted due to dense roadside vegetation and dry-stone walls along Gwyllt Road and Llanerch Road.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High



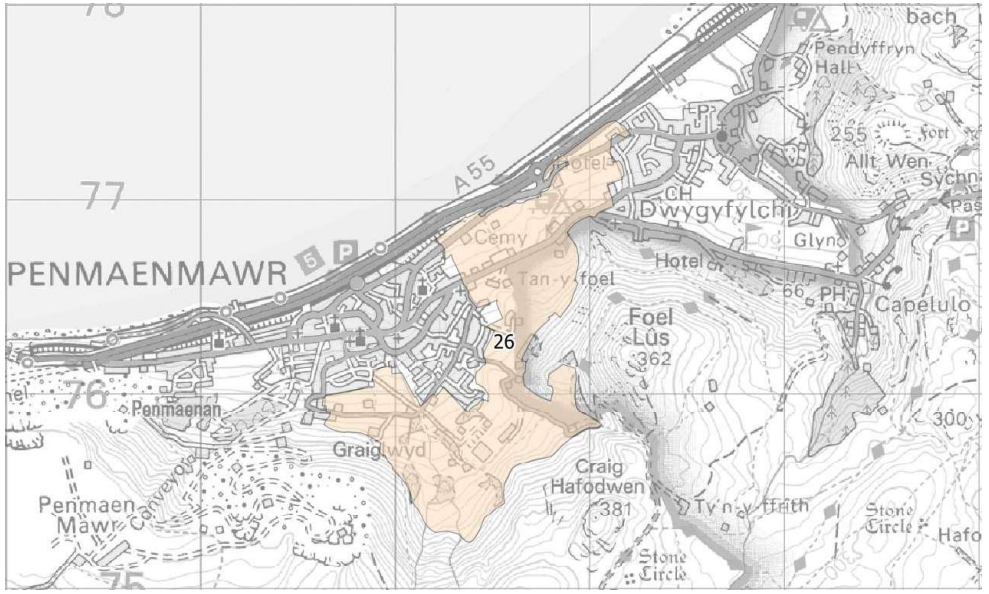


LCA25 – Nant-y-pandy Pasture		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 Llanfairfechan/ Penmaenmawr, SNPVS073 – Abergwyngregyn, SNPVS075 Penmaen Mawr quarry	
General Description and Designations		
General Description	Nant-y-Pandy pasture lies to the east of Llanfairfechan on the western and southern flanks of Penmaenmawr mountain and above the wooded river valley of the Afon Llanfairfechan and Y Teiryd Valley. The landscape is a patchwork of arable and rough grazing land with scattered farms served by local lanes and minor roads. Fields are defined by a network hedgerows and stone walls. There are blocks of mixed woodland often associated with farmsteads and settlements.	
Designations:	North Arllechwedd Historic Landscape. The Lodge and Glan-yr-Afon Farmhouse are Grade II Listed Buildings located off Glan-Yr-Afon Road.	
Physical Characteristics		
Built environment	Farms and individual properties.	
Landform, geology and hydrology	Gently sloping land descending from Penmaenmawr mountain with a west facing aspect. Land falls towards the river valley of the Afon Llanfairfechan.	
Landcover and vegetation	Blocks of mixed woodland with some plantations adjacent to farmsteads. Well established network of hedgerow field boundaries.	
Perceptual Characteristics		
Scale and Appearance	The area appears as well managed farmland with an open aspect to the west.	
Scenic quality	Good scenic quality with an attractive patchwork of fields interspersed with woodland, mature hedgerows and hedgerow trees. Distant views across lower slopes and the town of Llanfairfechan to the west and beyond to Lafan Sands and the coast of Anglesey.	
Tranquillity	The area is generally peaceful and tranquil.	
Discordant/intrusive features	No significant discordant or intrusive features	
Night-time light sources	Individual farms and homesteads and the town of Llanfairfechan.	
Cultural/Social		
Historic features and elements	There is evidence of several historic features in the area including cairns, hut circles and settlements. Dinas Camp Scheduled Monument lies just outside the area to the east.	
Human Interaction	The area appears as well managed pastoral land and is a popular area for walking and rambling with both the North Wales Path and Wales Coast Path passing through the higher area near the properties Plas Heulog and Blaen Llwyn.	
Landscape Value		
The landscape is of good quality and appears well managed pastoral land. It has good scenic quality and lies outside but on the fringes of Snowdonia National Park. It is an interesting landscape with intact field boundaries and features of historic interest. The setting is peaceful and with open scenic views across the coastal plain towards the sea and beyond to Anglesey.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High



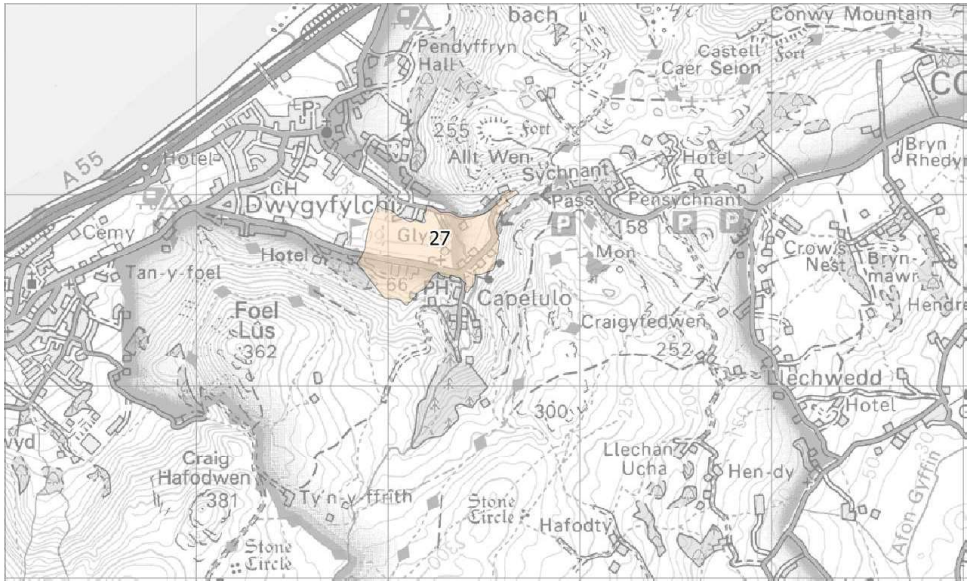


LCA26 – Pant-yr-Afon Pasture			
Category:	Hillside slopes		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS074 Llanfairfechan/ Penmaenmawr, SNPVS073 – Abergwyngregyn, SNPVS075 Penmaen Mawr quarry SNPVS072 Carneddau uplands		
General Description and Designations			
General Description	The Pant-yr-Afon pasture lies between Penmaenmawr and Dwygyfylchi on the lower hillside slopes of Foel Lus and Craig Hafodwen and the coastal plain adjacent to the A55 road corridor. There are a variety of land uses in this area outside and on the fringes of the two settlement boundaries. Camping and caravan parks occupy the elevated ground and overlook the coastal plain and A55 road corridor. Other land uses include a cemetery, recreation and sports ground with some areas of rough grazing.		
Designations:	North Arllechwedd registered Landscapes of Outstanding and of Special Interest in Wales. Grade II Listed Farmhouse and Barn of Graiglwyd.		
Physical Characteristics			
Built environment	The northern part of the character area borders the A55. South of the A55 Junction 16 and Conwy Road are sports fields, The Gladstone Public House, cemetery and residential properties. Conwy Old Road runs parallel and on more elevated land and connects Penmaenmawr with Dwygyfylchi and provides access to the caravan parks.		
Landform, geology and hydrology	Gently sloping land leading down towards the coastal plain		
Landcover and vegetation	There is a variety of landcover that reflects the wide range of land uses. Plantations of the A55 soft estate are important landscape elements that screen the A55 road corridor from elevated land to the south. Elsewhere there are some mature trees along Ysguborwen Road that are significant local landscape elements		
Perceptual Characteristics			
Scale and Appearance	The area has a number of land uses that has led to the fragmentation of its landscape character.		
Scenic quality	Generally poor scenic quality with some visual detractors such as the A55 road corridor.		
Tranquillity	The area is not tranquil with traffic on the local road network and the influence of the A55 road corridor.		
Discordant/intrusive features	The A55 road corridor is the most significant discordant and intrusive feature.		
Night-time light sources	A55 road corridor plus traffic on local road network, residential areas on the fringes and caravan parks.		
Cultural/Social			
Historic features and elements	Grade II Listed Farm and Barn at Graiglwyd.		
Human Interaction	There are several pathways of human interaction along the local road network that serves the settlements of Penmaenmawr and Dwygyfylchi and the seasonal land uses of the caravan parks.		
Landscape Value			
The landscape character of this area is fragmented with several different land uses falling between the two settlement boundaries of Penmaenmawr and Dwygyfylchi. While there are some open views across the coastal plain to the open sea, these are compromised and heavily influenced by the A55 road corridor. The area holds no statutory designations, but some landscape elements may be valued by the local community.			
Quality	**Condition**	**Overall Landscape Value**	
Poor	Poor	Moderate	



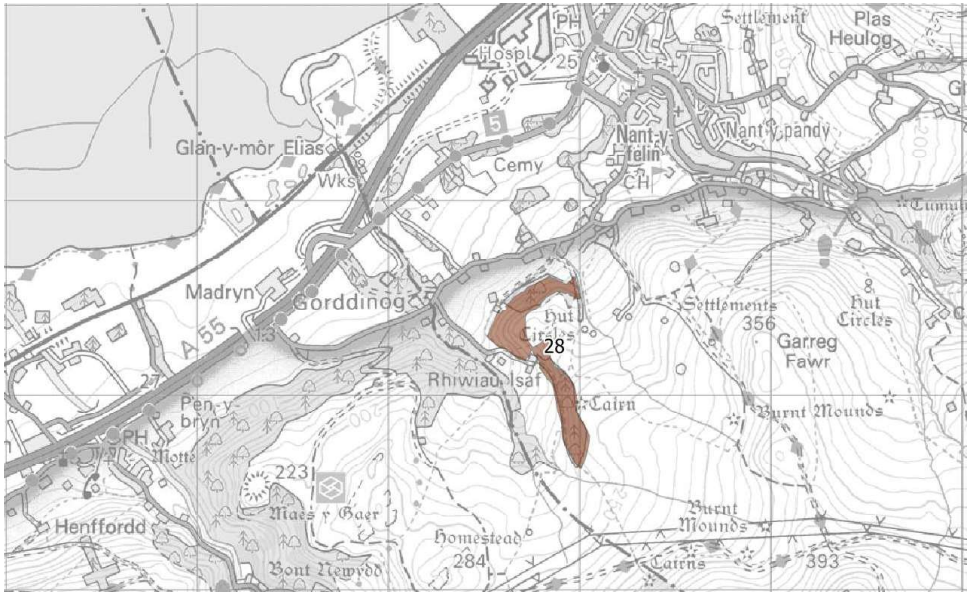


LCA27 – Capelulo Pasture		
Category:	Hillside slopes and lowland plain	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS073 Abergwyngregyn	
General Description and Designations		
General Description	The area lies adjacent to the village of Capelulo at the base of Sychnant Pass and forms part of the coastal plain that extends east from the village of Dwygyfylchi. The area is defined by Old mill Road to the north and Sychnant Pass Road to the south. The area is sheltered and heavily wooded alongside the valley of the Afon Gwyrach. The North Wales path runs alongside the river connecting the two roads to the north and south. Adjacent fields are small scale and used for grazing.	
Designations	Snowdonia National Park (part) North Arllechwedd Historic Landscape	
Physical Characteristics		
Built environment	The village of Capelulo is a cluster of residential properties with a public house and restaurant. The property of Glyn lies in the central part of the area. A small play area is on the north side of Sychant Pass Road adjacent to the river.	
Landform, geology and hydrology	Lowland plain with Afon Gyrach descending from Fairy Glen valley and crossing the lowland plateau in a northerly direction.	
Landcover and vegetation	Plantation woodland on an ancient woodland site and Llys-y-gwynt covert is a restored ancient woodland.	
Perceptual Characteristics		
Scale and Appearance	Small scale and sheltered with enclosed views.	
Scenic quality	Good scenic quality with river flowing through dense woodland. Scree slopes of Allt Wen rise to the north giving sense of enclosure and protection.	
Tranquillity	The area is generally peaceful with some tranquil qualities such as the sound of the river. Occasional noise of traffic on local road network.	
Discordant/intrusive features	No significant discordant or intrusive elements.	
Night-time light sources	Properties within village of Capelulo and vehicles on local road network.	
Cultural/Social		
Historic features and elements	None known.	
Human Interaction	The area is popular with walkers and ramblers with Capelulo the base for several circular walks. The Wales Coast Path passes through the area.	
Landscape Value		
The area and its' setting is highly scenic and lies (partly) within the Snowdonia National Park. It is a popular area for general amenity for both the local community and visitors to the area. The play area is valued by the local community. The landscape elements of the woodland and river combine to form an attractive landscape within a sheltered landscape setting at the eastern most part of the coastal plain.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High





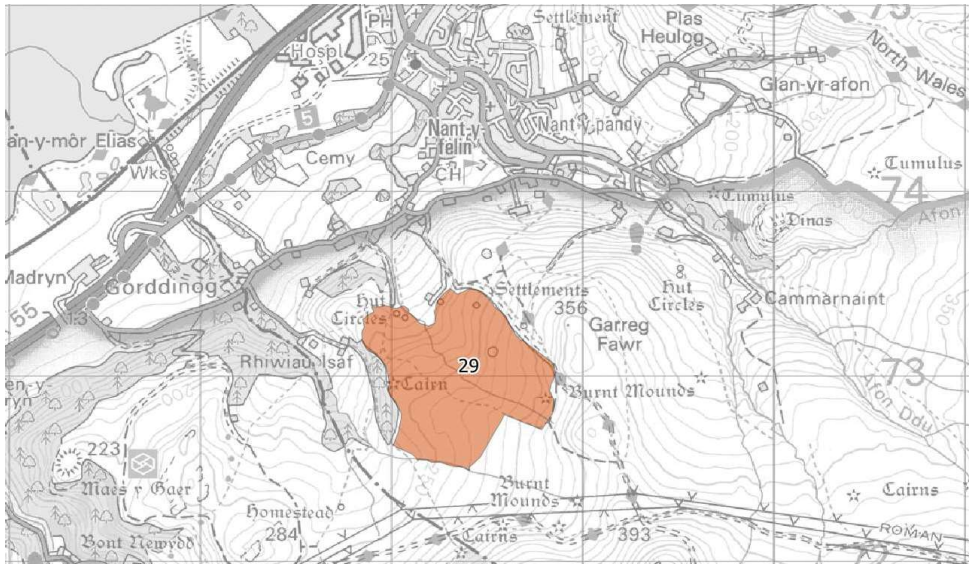
LCA28 – Coed y Rhiwiau		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS073 Abergwyngregyn	
General Description	Coed y Rhiwiau and Llys-y-Gwynt Covert are wooded areas on the lower north and west facing slopes of Garreg Fawr approximately 1-kilometre south-west of Llanfairfechan	
Designations:	Snowdonia National Park North Arllechwedd Historic Landscape.	
Physical Characteristics		
Built environment	None	
Landform, geology and hydrology	Steep sided north and west facing slopes	
Landcover and vegetation	Mixed woodland plantations	
Perceptual Characteristics		
Scale and Appearance	Small scale woodland plantations with open aspect to north and west.	
Scenic quality	Set within generally good scenic quality.	
Tranquillity	Moderate tranquillity. Peaceful but noise of A55 a detractor but not significant.	
Discordant/intrusive features	A55 as minor detractor	
Night-time light sources	A55 road traffic and local road network.	
Cultural/Social		
Historic features and elements	Coed – y Rhiwau plantation on ancient woodland site. Llys y Gwynt restored ancient woodland site Hut circles and Cairns on upland area nearby.	
Human Interaction	Public rights of way pass alongside perimeter of woodlands.	
Landscape Value		
The areas of woodland plantation are significant landscape elements occupying the lower slopes of Garreg Fawr. The plantations contribute to the wider landscape and setting together with the neighbouring woodland plantations of Coed Gorddinog and Coed Tan yr allt to the west.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	High





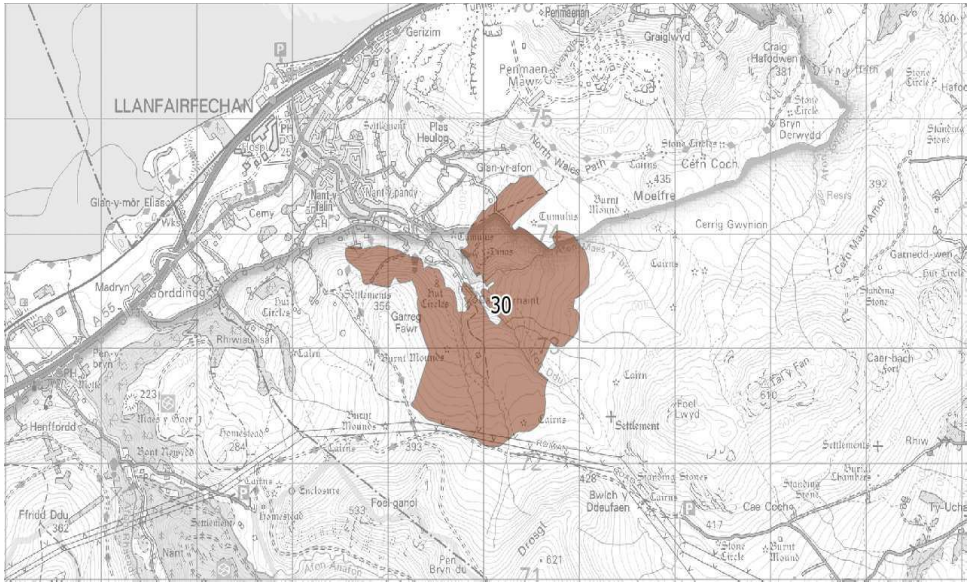
LCA29 – Cae'r Haidd Mountain Pasture	
Category:	Hillside slopes
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands
General Description	An upland area south of Llanfairfechan on the western slopes of Garreg Fawr and above the woodland plantations of Coed-y-Rhiwiau and Llys-y-Gwynt covert. Open aspect to the north-west with views across Lavan Sands towards Anglesey.
Designations:	Snowdonia National Park. Lies within the North Arllechwedd Historic Landscape. Garreg Fawr Scheduled Ancient Monument which has been designated for its hut groups, ancient fields and Cairns is located towards the north eastern corner of the character area.
Physical Characteristics	
Built environment	Evidence of ancient hut circles, dry stone walls.
Landform, geology and hydrology	North-west facing slopes of Garreg Fawr.
Landcover and vegetation	Open heath and rough grassland
Perceptual Characteristics	
Scale and Appearance	Open aspect, large scale, some expansive and unlimited views.
Scenic quality	High scenic quality. Expansive views across Snowdonia to the south and west, spectacular coastal views across Lavan Sands.
Tranquillity	Sense of remoteness and tranquillity
Discordant/intrusive features	Pylons on horizon to the west. High sided vehicles and moving traffic on A55 to the north-west circa 2 kilometres distant.
Night-time light sources	Views of traffic on of A55 road corridor.
Cultural/Social	
Historic features and elements	Cae'r Haidd Deserted Rural Settlement Scheduled Monument is just one of many sites of historic interest in the area with several other hut circles, cairns and enclosures nearby.
Human Interaction	The area is crossed by public right of way that connects to the North Wales Path.
Landscape Value	
The area is part of a wider open and highly scenic landscape within the Snowdonia National Park. It contains several features of historic interest including the Scheduled Monument Cae'r Haidd Deserted Rural Settlement. The landscape is of high quality and in good condition and part of a nationally valued landscape. The overall landscape value is therefore considered to be high.	

Quality	Condition	Overall Landscape Value
Good	Good	Very High



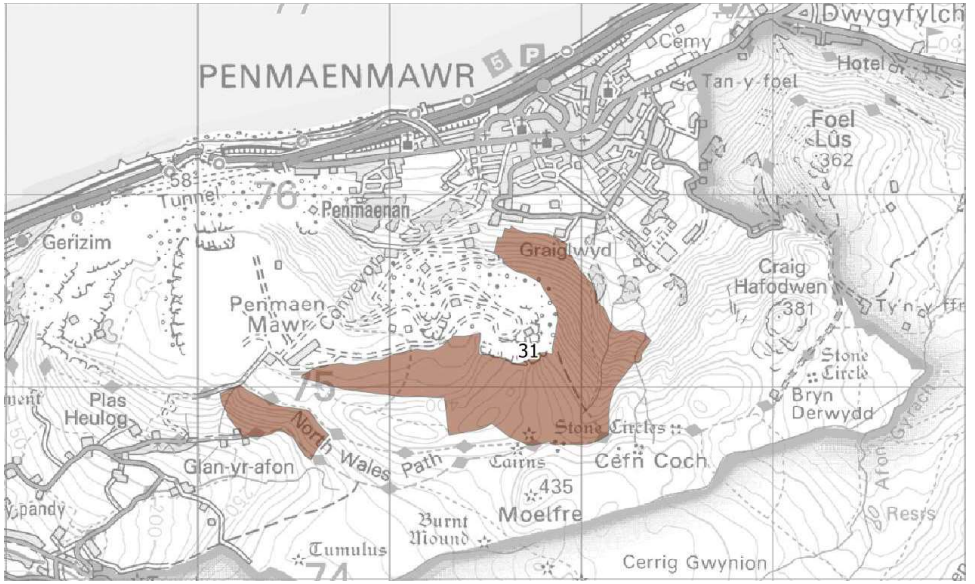


LCA30 – Y Teiryd Mountain Pasture		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands; SNPVS073 Abergwyngregyn	
General Description	Upland hillside slopes located to the south east of Llanfairfechan. There are several rivers running through the character area, most notably the Afon Ddu which has formed the Y Teiryd Valley. The topography slopes up towards the east and west along the valley sides. To the north of the character area is Dinas, a rounded hill fort with a flat top. The land use is predominantly upland grazing. The landscape is open and exposed with dry stone wall boundaries and some trees defining irregular shaped fields.	
Designations:	Snowdonia National Park. Lies within the North Arllechwedd Historic Landscape. Scheduled Monuments of; • Garreg Fawr Hut Groups, Ancient Fields and Cairns;' • Pont y Teiryd Hut Group and Ancient Fields; and • Dinas Camp.	
Physical Characteristics		
Built environment	Evidence of ancient built environment appears as hut groups and ancient fields as evidenced by Scheduled Monuments	
Landform, geology and hydrology	Upland landscape with a number of incised river valleys that confluence in the valley of the Afon Llanfairfechan to the north west and above the town.	
Landcover and vegetation	Open and exposed rough grassland and heath.	
Perceptual Characteristics		
Scale and Appearance	Open and expansive, large scale.	
Scenic quality	High scenic quality, barren and remote.	
Tranquillity	Peaceful and remote. Sense of remoteness enhanced by barrenness; a spiritual landscape. High degree of tranquillity.	
Discordant/intrusive features	Pylons on horizon to the south.	
Night-time light sources	None	
Cultural/Social		
Historic features and elements	Scheduled Monuments and Roman Road	
Human Interaction	Historic human influences. Public rights of way lead to open access land for informal recreation.	
Landscape Value		
The area lies within Snowdonia National Park and contains several Scheduled Monuments that catalogue man's association and interaction with the landscape. The area is highly scenic, a barren upland area with open access and popular with walkers and ramblers, the North Wales Path passes nearby and connects to several other public rights of way. The landscape is of high quality and in good condition and part of a nationally valued landscape. The overall landscape value is therefore considered to be high.		
Quality	**Condition**	**Overall Landscape Value**
Good	Good	Very High



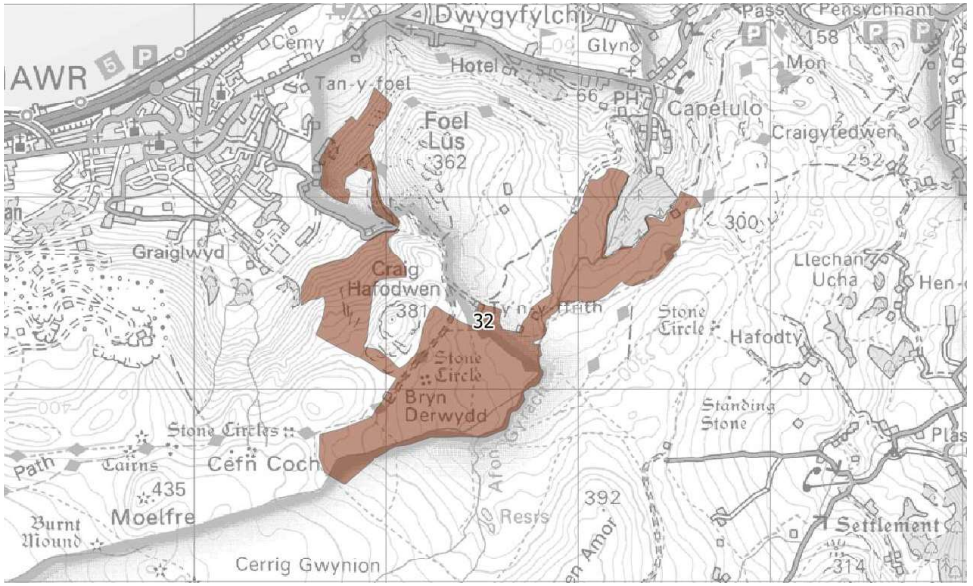


LCA31 – Graig Lwyd Mountain Pasture		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands; SNPVS075 Penmaen Mawr quarry	
General Description	The area lies on the northern slopes of Moelfre above the town of Penmaenmawr and immediately east and adjacent to the active quarry. North Wales Path and Wales Coast Path pass along southern and upper reaches of area close to the peak of Moelfre.	
Designations:	Scheduled Monuments of; • Hut Circles at Clip yr Orsedd; • Penmaenmawr Stone Circle; • Grade II Listed Building: Sett makers hut at New Bank within disused Graiglwyd Quarry workings at top of incline just outside area to the west.	
Physical Characteristics		
Built environment	Remnant stone walls of old field boundaries.	
Landform, geology and hydrology	Adjacent to operational quarry, some areas of scree	
Landcover and vegetation	Open grassland with areas of bracken and scattered scrub. Pockets of woodland on eastern slopes outside area to the east.	
Perceptual Characteristics		
Scale and Appearance	Open upland area.	
Scenic quality	Good scenic quality to south and Snowdonia but north is compromised by active quarry workings.	
Tranquillity	Sense of remoteness due to open aspect and exposed conditions but not tranquil due to presence of quarry.	
Discordant/intrusive features	Operational quarry.	
Night-time light sources	None	
Cultural/Social		
Historic features and elements	Scheduled Monuments of hut circles and stone circles.	
Human Interaction	Landscape heavily influenced by operational quarry. Craiglwyd Hall Caravan Park nearby.	
Landscape Value		
The landscape value of this area is heavily influenced by the adjoining quarry, some of which remains operational, other parts are now disused. There remain signs of man's interaction with the area through the evidence of hut circles and stone circles. The area falls outside Snowdonia National Park and is considered to be of medium importance and rarity. The overall landscape value is therefore considered to be of good value.		
Quality	**Condition**	**Overall Landscape Value**
Medium	Medium	Moderate



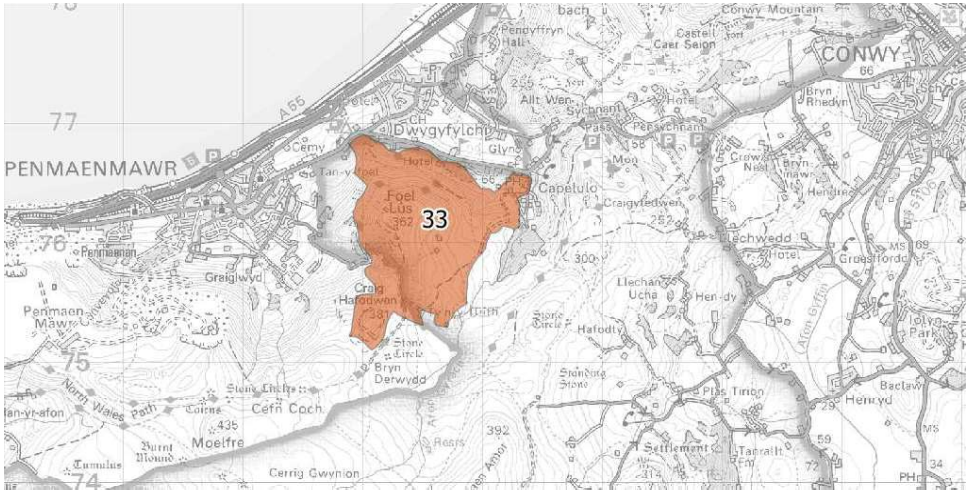


LCA32 – Maen Crwn Mountain Pasture		
Category:	Hillside slopes	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands	
General Description	The area is composed of an upland plateau and western slopes of Foel Lus and Craig Hafodwen set above the town and village of Penmaenmawr and Dwygyfylchi. The Wales Coast Path traverses the mid slope of Foel Lus and passes through the area to the south.	
Designations:	Snowdonia National Park (Partly) Lies within the North Arllechwedd Historic Landscape Scheduled Monuments thought to be from the Bronze age of; • Bryn Derwydd stone circle • Maen Crwn standing stone	
Physical Characteristics		
Built environment	Isolated dwellings including farm of Ty'n-y-frith. Livestock Pens. Boundaries largely comprise dry stone walls.	
Landform, geology and hydrology	Open hillside slopes	
Landcover and vegetation	Rough grazing with woodland slopes	
Perceptual Characteristics		
Scale and Appearance	Open and barren moorland	
Scenic quality	Highly scenic withy open views across sea towards Puffin Island and Anglesey	
Tranquillity	Generally tranquil with some levels of traffic noise and other minor disturbance	
Discordant/intrusive features	No significant discordant or intrusive features.	
Night-time light sources	None apart from north west aspect overlooking Penmanenmawr and A55 road corridor.	
Cultural/Social		
Historic features and elements	Scheduled Monuments dating back to Bronze Age.	
Human Interaction	Isolated farms and homesteads. Long distance paths used for informal amenity.	
Landscape Value		
This is generally a remote landscape that connects to the wider Carneddau uplands. The area is primarily of rough pasture and used for rough grazing sheep and ponies. It is a popular area for informal recreation and lies along the route of the Wales Coast Path that connects to several other public rights of way and open access land. The area lies within and on the fringes of Snowdonia National Park and is a high-quality upland landscape with qualities of remoteness and tranquillity.		
Quality	**Condition**	**Overall Landscape Value**
High	Good	High



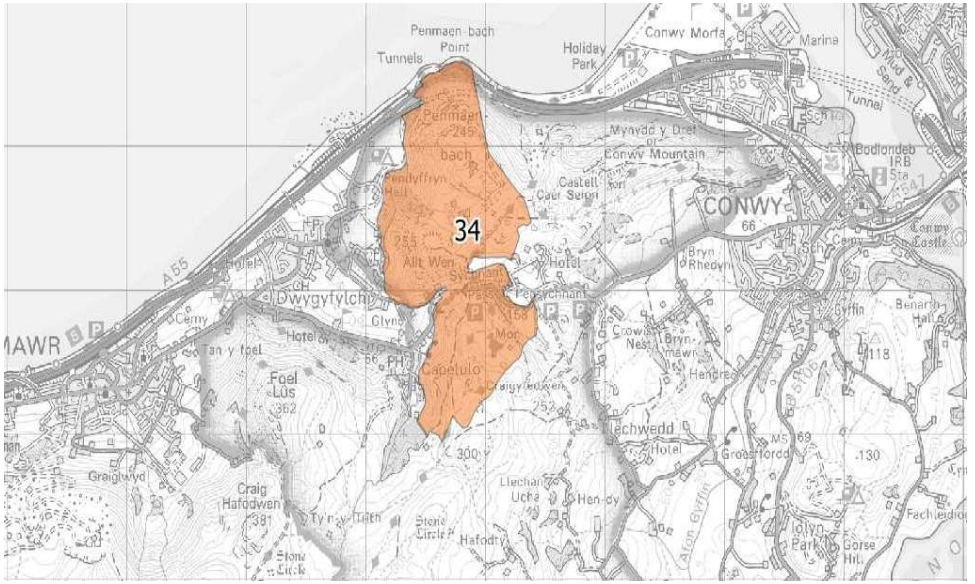


LCA33 – Foel Wen Moorland		
Category:	Exposed upland	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands	
General Description	Located on the Foel Lus hillside to the south of Dwygyfylchi and above the village of Capelulo. The landcover occupies an exposed upland position around the peak of Foel Lus with steeply side slopes with upland heath, grass, rocky outcrops, and scattered scrub and trees. The landscape is open and exposed with boundaries comprising drystone walls.	
Designations	Snowdonia National Park. North Arllechwedd Historic Landscape. Grade II Listed building of Horeb Capel on Conwy Old Road	
Physical Characteristics		
Built environment	Village of Capelulo lies along Sychnant Pass road that forms the northern boundary of the area.	
Landform, geology and hydrology	Peak of Foel Lus with open scree and rock outcrops.	
Landcover and vegetation	Heath and rough grassland	
Perceptual Characteristics		
Scale and Appearance	Open upland of the northern Carneddau range.	
Scenic quality	Highly scenic uplands with extensive panoramic views across Carneddau mountain range to the south and coastal plain and open sea to the north.	
Tranquillity	Remote and tranquil. A spiritual landscape.	
Discordant/intrusive features	No significant detractors	
Night-time light sources	None.	
Cultural/Social		
Historic features and elements	Old farmsteads and settlements nearby.	
Human Interaction	Upland area with long distance footpath of Wales Coast Path encircling peak of Foel Lus.	
Landscape Value		
The area is part of the wider Carneddau upland landscape, a highly scenic area with expansive panoramic views across mountains and sea. The area is remote and tranquil and lies within Snowdonia National Park. This is a nationally valued landscape with no potential for substitution, it is therefore considered a landscape of high value.		
Quality	**Condition**	**Overall Landscape Value**
Outstanding	Good	Very High



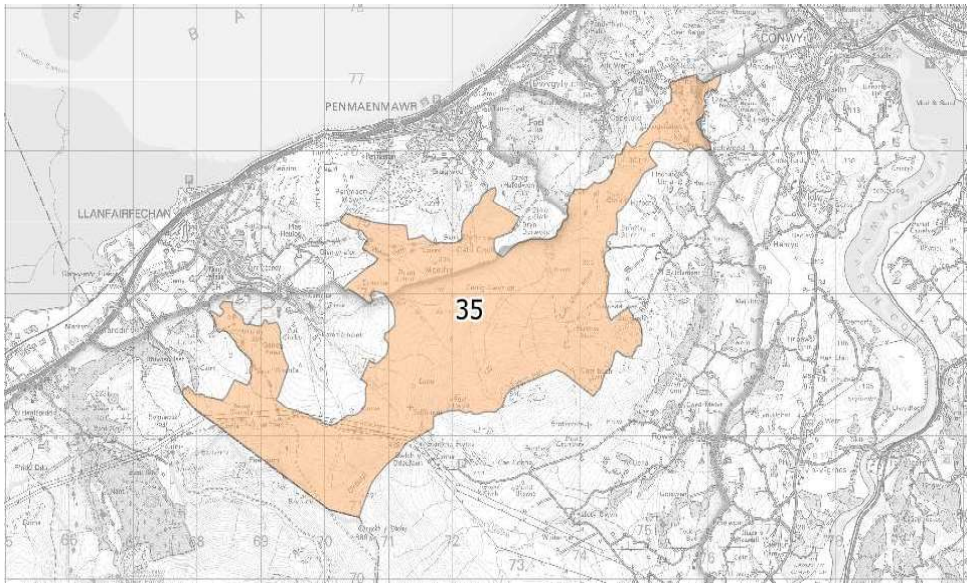


LCA34 – Allt Wen Moorland		
Category:	Exposed upland	
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS078 Penmaenbala; SNPVS076 Capelulo valley; SNPVS072 Carneddau uplands	
General Description	The area extends from the rocky headland of Penmaenbach south to include the peak of Allt Wen, Sychnant Pass and the upland area of Maen Esgob above the village of Capelulo.	
Designations:	Snowdonia National Park. North Arllechwedd Historic Landscape. Scheduled Monuments of; • Gwern Engan Concentric Enclosed Hut Circle; and • Hut Circle Settlement at Gwern Engan south east of Sychant Pass	
Physical Characteristics		
Built environment	Isolated farm buildings such as Pen-pyra with access tracks to local road network. Sychnant Pass road with stone estate boundary walls. Car parking areas at Sychnant Pass.	
Landform, geology and hydrology	Rock outcrops with scree. Small lakes.	
Landcover and vegetation	Rock, scree and heath with rough grassland. Some isolated trees along boundaries and around farmsteads.	
Perceptual Characteristics		
Scale and Appearance	Open and extensive area with extremely varied topography.	
Scenic quality	Highly scenic with panoramic and framed vistas.	
Tranquillity	Peaceful and remote. High degrees of tranquillity. Traffic audible on Sychnant Pass road slight detractors. A55 also audible from some vantage points.	
Discordant/intrusive features	A55 road corridor from northern vantage points, not significant elsewhere.	
Night-time light sources	A55 road corridor from northern vantage points.	
Cultural/Social		
Historic features and elements	Scheduled Monuments, stone wall field boundaries.	
Human Interaction	Popular area for walkers and ramblers. Also, mountain bikers and paragliders.	
Landscape Value		
The area is extremely scenic and of outstanding quality. It has a coastal setting and is also part of the wider Carneddau upland landscape, a highly scenic area with expansive panoramic views across mountains and sea. The area is remote and tranquil and lies within Snowdonia National Park. It is a popular area for residents and visitors enjoying walking and rambling activities. This is a nationally valued landscape with no potential for substitution, it is therefore considered a landscape of very high value.		
Quality	**Condition**	**Overall Landscape Value**
Outstanding	Good	Very High





LCA35 – Moelfre Upland Moorland			
Category:	Exposed upland		
LANDMAP Aspect Areas Overlap (Visual and Sensory)	SNPVS072 Carneddau uplands		
General Description			
General Description	Vast area exposed upland area encompassing Garreg Fawr Moorland, Waun Llanfair Moorland, Waen Gyrach Moorland, Cefn Maen Amor and Cefn Llechan. Topography steadily rises towards the hillsides of Tal y Fan and Foel Lwyd in the south and Garreg Fawr in the west. There are a number of watercourses including the Afon Ddu, Afon Maes-y-bryn and Afon Gyrach. Land use is mainly upland grazing and is open and exposed, with boundaries comprising drystone walls.		
Designations:	Snowdonia National Park. There are several Scheduled Monuments including; Roman Road N of Llannerch Fedw; Bwlch y Ddeufaen Standing Stones; Cerrig Gwynion cairn. North Arllechwedd Historic Landscape and parts of the character area along the southern boundary are located within the Lower Conwy Valley Historic Landscape		
Physical Characteristics			
Built environment	Field boundaries of dry-stone walls; Pylons cross southern part of area.		
Landform, geology and hydrology	There are a number of watercourses including the Afon Ddu, Afon Maes-y-bryn and Afon Gyrach.		
Landcover and vegetation	Landcover comprises upland heath, grass, rocky outcrops, and scattered scrub and trees.		
Perceptual Characteristics			
Scale and Appearance	Extremely open and exposed area.		
Scenic quality	High scenic quality with some areas featureless and barren.		
Tranquillity	High level of tranquility and feeling of remoteness.		
Discordant/intrusive features	Pylons are a discordant feature but not significant from some angles and vantage points.		
Night-time light sources	None		
Cultural/Social			
Historic features and elements	The area contains several features of historic interest dating back to the Bronze Age. Some are Scheduled Monuments and others remain undesignated with potential for further sites to be discovered.		
Human Interaction	Little human interaction apart from use of the area by walkers and ramblers for informal recreation.		
Landscape Value			
The area is part of the wider Carneddau upland landscape, a highly scenic area with expansive panoramic views across mountain range. The area is remote and tranquil and lies within Snowdonia National Park. There is a wealth of historic features and elements. This is a nationally valued landscape with no potential for substitution, it is therefore considered a landscape of high value.			
Quality	**Condition**	**Overall Landscape Value**	
Outstanding	Good	Very High	





APPENDIX 9.4
REPRESENTATIVE VIEWPOINTS

Viewpoint A

Llanfairfechan Promenade



National Grid Reference:	SH 68249, 75493
Date/ Time:	2nd July 2019 (17:??hrs)
Weather Conditions/ Visibility:	Sunny/ Clear
Altitude:	2m
Viewing Angle	95° E
Nearest Visible Proposed Feature:	Overbridge, 275m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View from Llanfairfechan Promenade eastwards towards Pendalar and Penmaen Park and location of existing roundabout at Junction 15. Representative of receptors using Public Open Space and Promenade area for general amenity

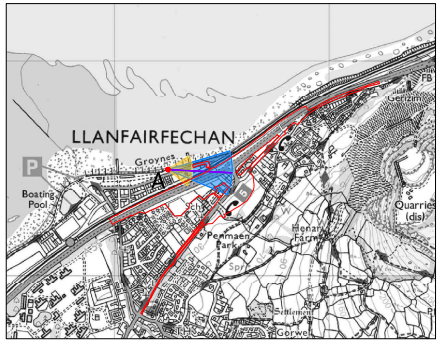
Component of View

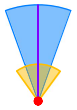
A typical coastal scene with expansive views across Lavan Sands and Conwy Bay to Anglesey, Puffin Island and the Great Orme. Near and middle-distance views of the promenade with play area and skatepark and colourful Victorian terrace. Views south and east to railway and high stone retaining wall with former quarry building and split section of A55 with concrete walls and lighting columns. Residential properties of Pendalar appear clustered and rise steeply above the A55 with Penmaenmawr mountain rising spectacularly above with woodland on lower slopes dispersing into scree and rock outcrops.

Anticipated Change in View

The proposed scheme would appear clearly visible and within 100 metres for a number of sensitive receptors of various types on the promenade resulting in a moderate large adverse effect. The new junction and retaining wall would be clearly visible set at a significantly higher level (circa 9.5 metres) than the existing carriageway at the same location. The retaining wall would reach its highest point close to the properties of St Seiriols and St Elyn and obscure southerly views from the promenade towards the wooded slopes of Penmaen Park. The slip road would taper down either side of the junction and become less visible progressively to the east and west and would be visible above the railway line to the south of the skatepark and public park. The overbridge would be highly visible at its highest point and due to its north facing aspect, create a dark, shady area compared to the existing open aspect. High sided vehicles using the eastbound slip roads would be highly visible and elevated above the existing railway line.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint B

Llanfairfechan Beach



National Grid Reference:	SH 68347, 75521
Date/ Time:	2nd July 2019 (17:00hrs)
Weather Conditions/ Visibility:	Sunny/ Clear
Altitude:	0m
Viewing Angle	125° SE
Nearest Visible Proposed Feature:	Slip road 50-100m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View from inter-tidal area of Llanfairfechan Beach south towards A55 road corridor representative of people using beach area for informal recreation.

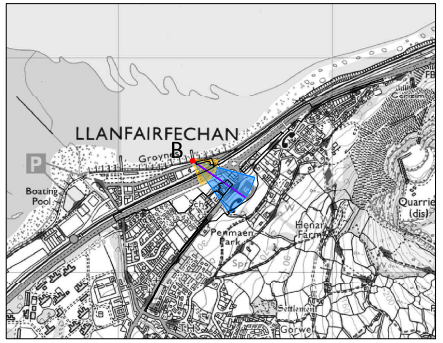
Component of View

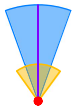
View from the inter-tidal zone of the beach with a similar aspect to Llanfairfechan Promenade with expansive seaward views and contained views inland. Beach and frontage in foreground with varying textures of sand and pebbly beach with timber groynes and sea defence walls. Above the retaining wall of the railway line and A55 visible with overhead gantries and signs Residential properties of Pendalar appear clustered on lower slopes with scrub woodland and scree rising above. Properties of Penmaen Park visible amongst wooded hillside with Henar Farm visible isolated on upper slopes.

Anticipated Change in View

The view from the beach is similar to that from the Promenade but is less oblique and applies to a wide range of visual receptors. The visual receptors are likely to be engaged in outdoor activities and therefore are considered to be of medium sensitivity. As with the Promenade viewpoint, the junction of the proposed scheme would be clearly visible from the beach area but appear more in context with the rural backdrop of Penmaen Park and the wooded slopes beyond. The junction and associated slip roads would appear elevated above the two properties St Seiriols and St Elyn. Views of the lower wooded slopes and the residential properties east of the existing roundabout would be partially lost, screened by the overbridge, associated parapets and adjacent structures. Vehicles using the eastbound slip road, particularly high sided commercial traffic would be highly visible.

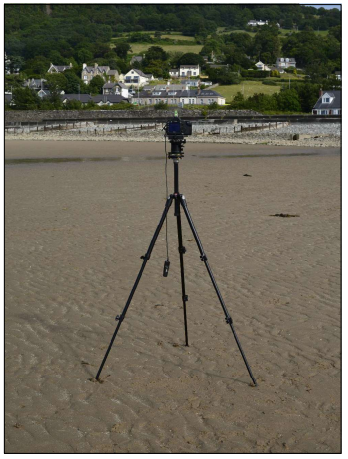
Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint C

Penmaenmawr Road Footbridge



National Grid Reference:	SH 68773, 75681
Date/ Time:	2nd July 2019 (10:37hrs)
Weather Conditions/ Visibility:	Bright and cloudy / Clear
Altitude:	23m
Viewing Angle	235° SW
Nearest Visible Proposed Feature:	N/A within road corridor
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View west from top of existing Penmaenmawr Road Footbridge representative of Non - motorised users, pedestrians and cyclists.

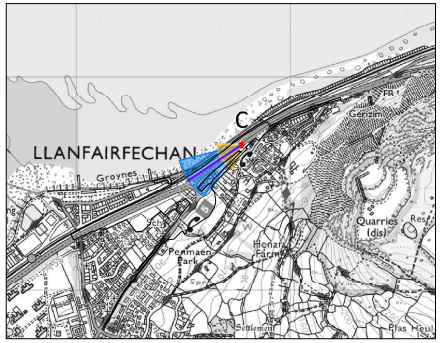
Component of View

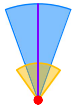
Open views across A55 road corridor with distant views of hills (Moel Wnion), Bangor, the coast of Anglesey and Puffin Island. View dominated by moving traffic on the A55 with the road corridor characterised by overhead gantries signs and lighting columns. Well established trees south of the A55 and beyond roundabout to the west screen views of road corridor from properties on Penmaenmawr Road. Open views across railway line to Llanfairfechan Promenade and beach. Footbridge on reverse view not readily visible from promenade set against backdrop of properties in Pendalar.

Anticipated Change in View

The new junction and overbridge would eclipse views to the east and dominate the middle distance, views towards the promenade would also be partially obscured by the overbridge and eastbound on and off slips. Parapets of the overbridge and eastbound slip road will accentuate the height of the structure and the wing walls either side of the overbridge will create a tunnel effect. The new junction would be lit, and the approaches signed. The overall visual effect would be a further urbanisation of the existing road corridor and the introduction of a new collection of structures at higher elevations than the existing.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint D

Penmaenmawr Road (East)



National Grid Reference:	SH 68672, 75537
Date/ Time:	2nd July 2019 (11:05hrs)
Weather Conditions/ Visibility:	Bright and cloudy / Clear
Altitude:	15m
Viewing Angle	230° SW
Nearest Visible Proposed Feature:	Junction & realigned Penmaenmawr Road 50m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View west towards existing Junction 15 roundabout and representative of views from local residents and users of Penmaenmawr Road.

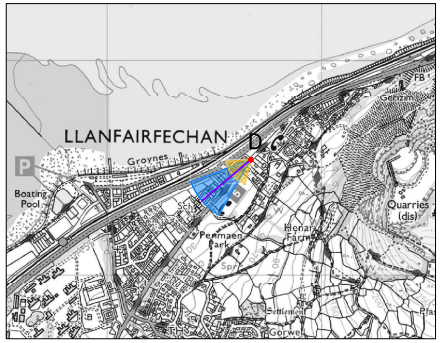
Component of View

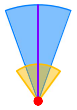
The view extends along the wide Penmanemawr Road that leads west towards the existing Junction 15 roundabout. Traditional properties lie to the south of Penmaenmawr Road set on rising land with extensive gardens and stone boundary walls. A terrace of three-story properties stand on the northern side of the road with a terrace of more recent properties of Ferndale adjacent and screen the A55 from view. East of the properties and roundabout views to the A55 are concealed by plantation of trees and shrubs. Mixed shrub/woodland planting also screens A55 in the vicinity of the existing roundabout and properties on Shore Road East from view.

Anticipated Change in View

The scheme proposals would involve the re-alignment of Penmaenmawr Road close to the existing junction and the widening of the southern footway to provide an improved cycle route. The new junction will require the western end of Penmaenmawr Road to be more elevated on the approaches to the overbridge. Two properties on Shore Road East (8 & 9 Penmaen View) visible in the middle distance would be demolished and the existing soft estate to the east removed. Properties to the east of the existing roundabout would remain. There would be some deterioration in the view with the removal of the existing vegetation and the realignment of Penmaenmawr Road. The widening of the southern footway is considered to not have a significant change in the view. The landscape character would not change significantly and therefore the overall effects are considered to be slight to moderate adverse.

Location Plan





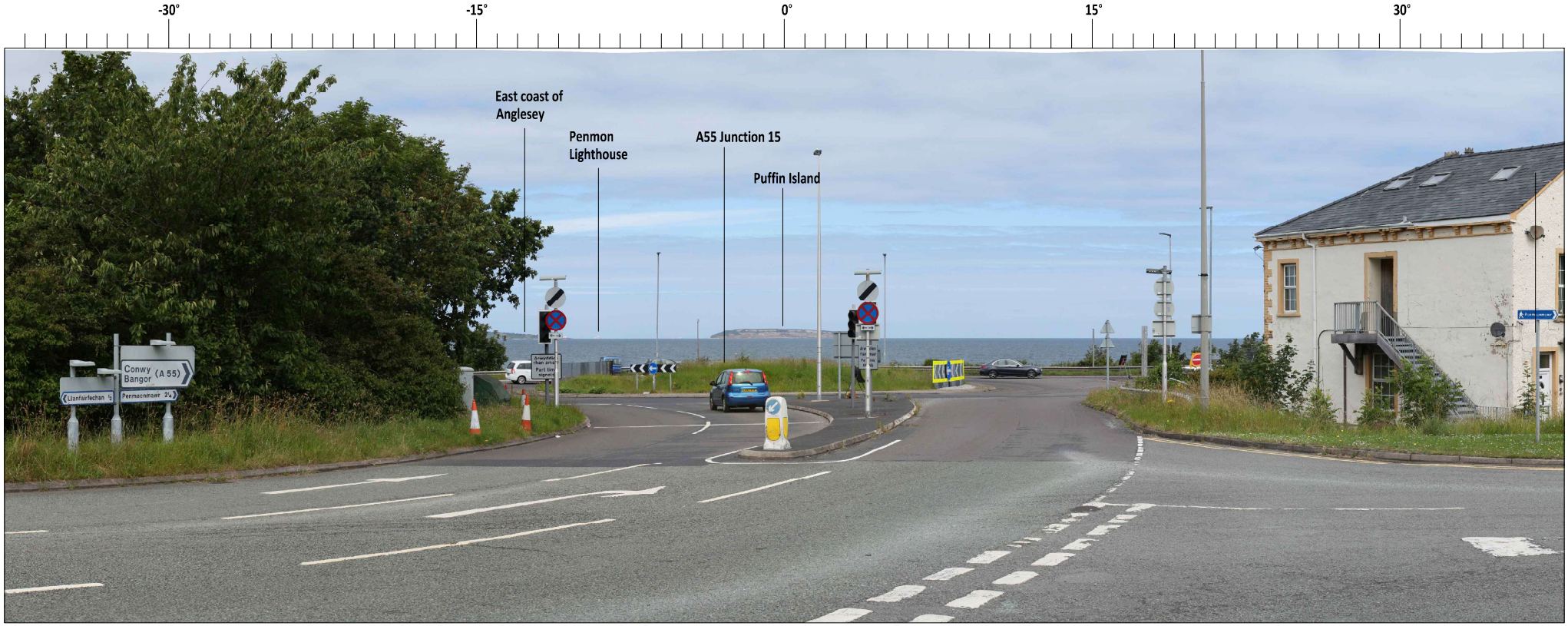
Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint E

Shore Road East



National Grid Reference:	SH 68574, 75424
Date/ Time:	2nd July 2019 (11:50hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	13m
Viewing Angle	319° NW
Nearest Visible Proposed Feature:	N/A within road corridor
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

The view is across the existing Junction 15 roundabout across open sea to Puffin Island and the east coast of Anglesey and Penmon Lighthouse.

Component of View

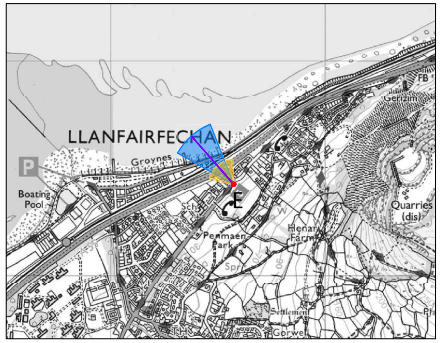
Views are contained by properties along Penmaenmawr Road and plantation planting to the west of the roundabout. Enclosed views to the east and west along Penmaenmawr Road characterised by wide road (the former A55) with stone properties and well-established trees. To the south, well; established roadside vegetation of trees and shrubs on a steep cutting contains views to the south.

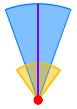
Anticipated Change in View

The existing view across the roundabout and beyond to open sea and Puffin Island would be completely lost due to the scheme proposals. The new junction would dominate the view with the overbridge rising approximately 9.5 metres above the existing roundabout. All roadside vegetation would be lost including planting on the southern verge of Penmaenmawr Road.

The scheme proposals for the new junction are concentrated in this area and therefore a very large adverse effect is unavoidable and expected. The new junction would be a significant structure at a much higher elevation with the approaches rising tom form connections to the local road network. Views from the properties on Penmaenmawr Road are also predicted to be very large adverse.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint F

Penmaenmawr Road (West)



National Grid Reference:	SH 68451, 75299
Date/ Time:	2nd July 2019 (12:20hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	14m
Viewing Angle	30° NNE
Nearest Visible Proposed Feature:	N/A immediately adjacent to road
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View east along Penmaenmawr Road from footpath on southern verge. A representative view of pedestrians, cyclists and users of public transport.

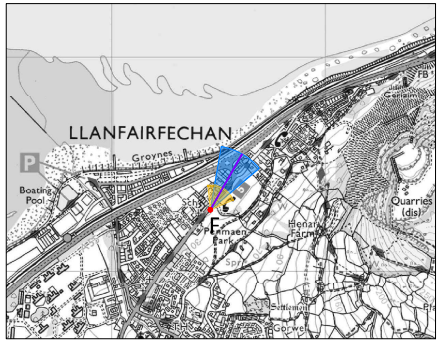
Component of View

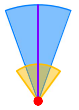
Penmaenmawr Road road is the main route into Llanfairfechan from the east and is busy with frequent traffic, it is also a well-used bus route. The northern verge is defined by a collection of stone buildings of mixed uses with some residential. The buildings contain views to the north and the A55 road corridor. The southern verge is well vegetated with mature trees and shrubs forming a dense visual barrier. East towards the Junction 15 roundabout is an enclosed vista terminating in views of the Penmaenmawr road junction with numerous lighting columns and signs. The woodland plantation on Penmaenmawr Road is a visual barrier and screens the A55 road corridor. Above are views of the overbridge with glimpsed views of the Great Orme on the horizon.

Anticipated Change in View

There would be very large adverse visual effects as a result of removing the soft estate and regrading of the southern verge. The landscape character of Penmaenmawr Road would change significantly and become more urban. Visual receptors on elevated land to the south would be exposed to views of the road and building along the northern verge. Views along the road to the east would be eclipsed by the new junction arrangement. Properties visible on Shore Road East would be demolished and replaced with views of new junction and overbridge.

Location Plan





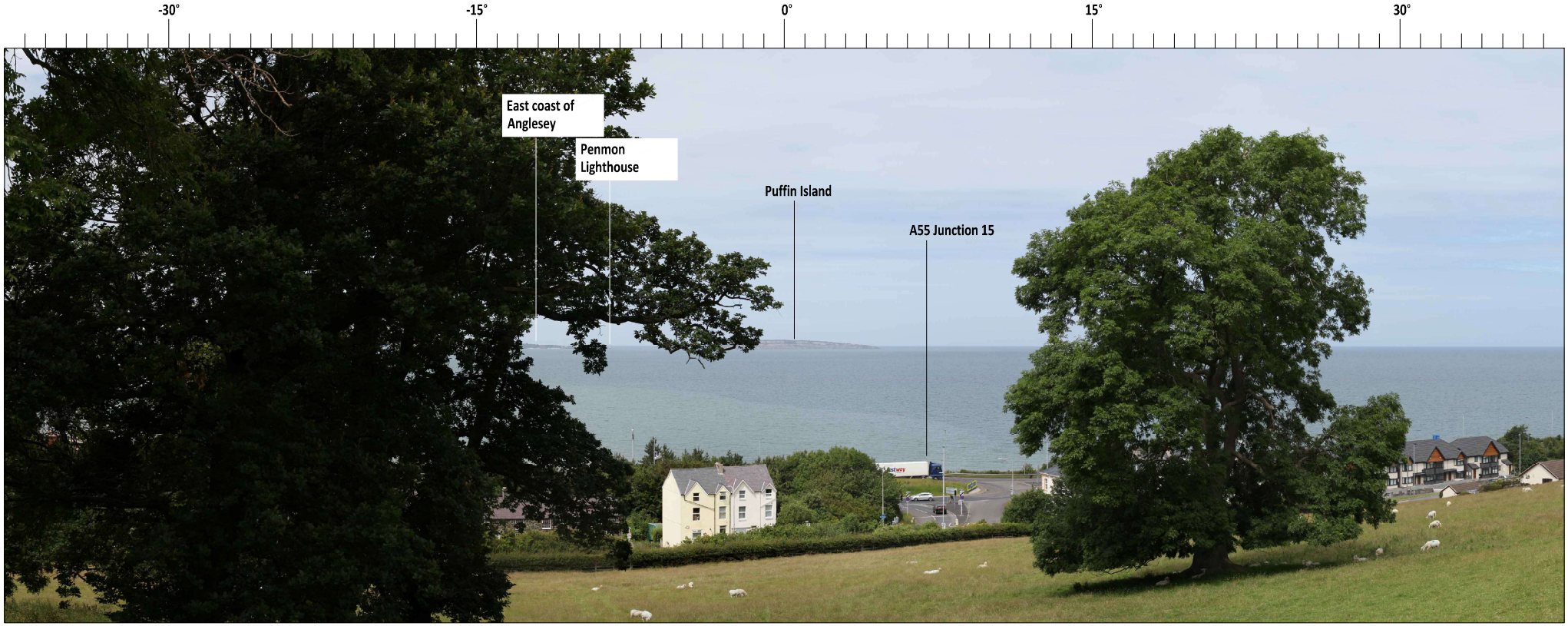
Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint G

Penmaen Park



National Grid Reference:	SH 68625, 75277
Date/ Time:	2nd July 2019 (13:40hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	57m
Viewing Angle	337° NNW
Nearest Visible Proposed Feature:	Junction 15 overbridge 200m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

A representative view north across remnant parkland and across A55 road corridor towards Anglesey and Puffin Island from the residential area of Penmaen Park.

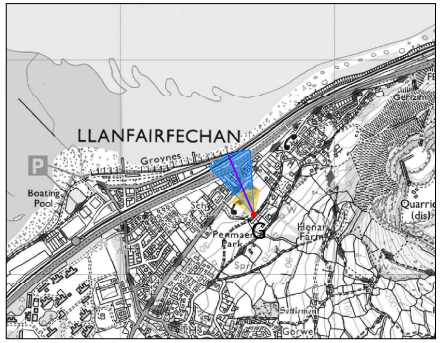
Component of View

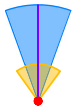
Penmaen Park is a residential area of largely detached dwellings set on the hillside above the A55 road corridor adjacent to an area of former parkland. Views are generally open over a steeply sloping field and the A55 road corridor and beyond across the sea towards Anglesey and Puffin Island. The A55 and roundabout junction together with properties on Penmaenmawr Road are clearly visible with the road being concealed by localised topography and vegetation. Roadside plantations properties on Shore Road East screen the A55 road corridor. Mature parkland trees in foreground obscure views to the north from some vantage points.

Anticipated Change in View

The scheme proposals are for a new junction arrangement and overbridge at the location of the existing roundabout and to the realignment of Penmaenmawr Road. There would be significant loss of existing vegetation that would open up views to the existing road corridor. The new junction would become the focal feature in the view, existing properties (8 & 9 Penmaen View) that conceal the existing road corridor would be demolished resulting in open views to the new junction and overbridge.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint H

Maes Dolfor



National Grid Reference:	SH 68294, 75278
Date/ Time:	2nd July 2019 (14:07hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	10m
Viewing Angle	3° N
Nearest Visible Proposed Feature:	Westbound slip embankment 50m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View from the entrance to the Maes Dolfor estate off Penmaenmawr Road and used frequently by local residents.

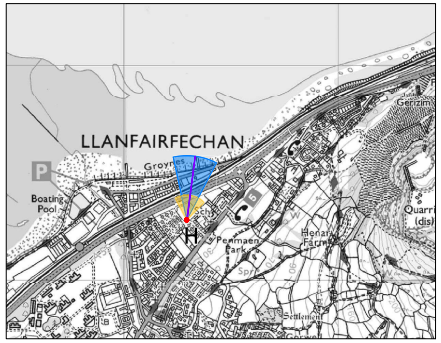
Component of View

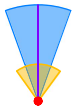
Maes Dolfor is a residential area immediately south of the existing A55 road corridor and west of the existing Junction 15 roundabout. The area is low lying with open views across a recreation field towards the A55 that stands on embankment to the north east. The embankment is heavily vegetated with mixed woodland plantation well established and understood to have been planted in circa 1990 when the A55 Llanfairfechan By-Pass was completed.

Anticipated Change in View

The construction of the new road and westbound slip requires extensive site clearance of the soft estate, an important landscape element that contributes to the landscape character of the area. Removal of the existing vegetation would expose sensitive receptors to light from traffic using the carriageway and construction traffic. The scheme would have a very large adverse effect on the viewpoint and expose the views towards the new road and westbound on slip.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location

Viewpoint I

Henar Farm



National Grid Reference:	SH 68938, 75173
Date/ Time:	2nd July 2019 (14:45hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	122m
Viewing Angle	297 WNW
Nearest Visible Proposed Feature:	A55 westbound slip road 600m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View from the residential property of Henar Farm and the Wales Coast Path.

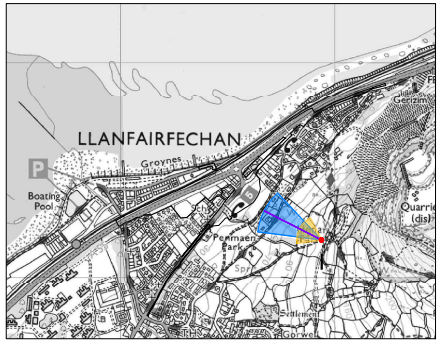
Component of View

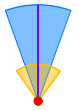
Henar Farm is visible from the promenade and beach area set high on the hillside above Penmaen Park amongst trees and woodland on the western slopes of Penmaenmawr mountain. Views from the farm and Wales Coast Path (that runs past the entrance to the property) are open and expansive across the sea to the coast of Anglesey and Puffin Island. The A55 road corridor is just visible above the trees with and properties on the Promenade more clearly visible. Mature deciduous trees in the foreground obscure views towards Llanfairfechan and Penmaen Park.

Anticipated Change in View

The scheme would, represent a minor or negligible change in the view due to the distance, elevated aspect, topography and intervening vegetation. The overall significance is therefore considered to be slight adverse during the winter months and negligible during the summer when the trees are in leaf.

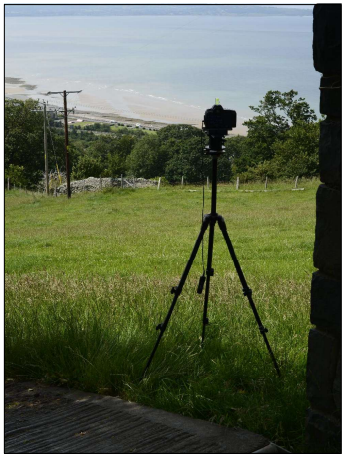
Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint J

Wern Isaf



National Grid Reference:	SH 68573, 75125
Date/ Time:	2nd July 2019 (14:07hrs)
Weather Conditions/ Visibility:	Sunny / Clear
Altitude:	51m
Viewing Angle	333° NNW
Nearest Visible Proposed Feature:	A55 West of Junction 15 650m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

View from Penmaen Park and the public footpath network that leads past the historic house and garden of Wern Isaf.

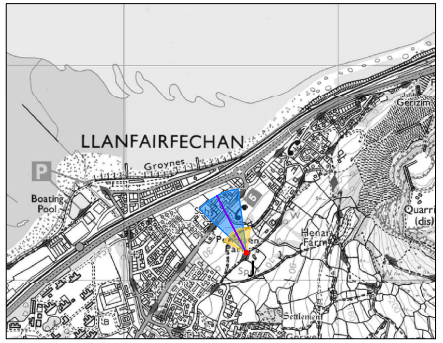
Component of View

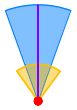
Wern Isaf is a Grade II* Listed Building and garden stands in the fields and upper sections of Penmaen Park. The parkland is crossed by well used footpaths and is a popular area for informal amenity used by local people. Views from the parkland are open and attractive with no significant visual detractors. The steep sloping topography obscures view of properties along Penmaenmawr Road with some roofs visible. The A55 is obscured by mature roadside vegetation above and beyond which appear the roofs of properties on the Promenade. Beyond the Promenade are open views to Anglesey, Puffin Island and Penmon Lighthouse.

Anticipated Change in View

The scheme would remove much of the existing trees and expose the A55 road corridor as a noticeable feature within the view. The new section of carriageway west of the junction would be slightly elevated and views of traffic, in particularly high sided vehicles are likely to be visible.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



Viewpoint K

Garreg Fawr SAM



National Grid Reference:	SH 68501, 73655
Date/ Time:	2nd July 2019 (16:05hrs)
Weather Conditions/ Visibility:	Sun, some cloud / Clear
Altitude:	228m
Viewing Angle	2° N
Nearest Visible Proposed Feature:	A55 Junction 15 1850m
Camera & Lens:	Canon EOS 5D MKII - 50mm lens
Horizontal Field of View:	75°
Camera Height	1.5m
Recommended Viewing Distance:	300mm

Existing 75° Stitched Panoramic Image

Important Viewing Instructions

This is a composite image made up of 3.75No. 50mm prime lens photographs, joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye.

For correct perspective viewing, this image must be viewed at an exact distance of 300mm with one eye whilst curving the image in an exact arc of 90°. This image should only be assessed in the real landscape from the same viewpoint.

Viewing Position

The view is from the lower slopes of Garreg Fawr and enclosed hut circle of the Gareg Fawr (Hut Groups Monuments and Cairns) Scheduled Monument.

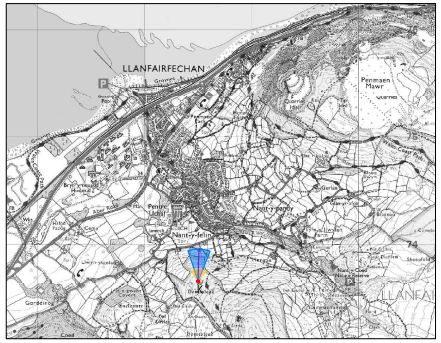
Component of View

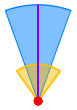
Views are highly scenic across the mountains of Snowdonia and coastal plain and beyond towards Bangor and the Menai Strait and Lavan Sands and Anglesey. The town of Llanfairfechan appears in the middle-distance set amongst trees that line the main roads and the parkland of Bryn-y-Neuadd Hospital. The south-eastern residential part of the town is clearly visible on the upper slopes. Above stands the rocky outcrops of Penmaenmawr mountain with former quarry buildings visible on the horizon. The A55 is not readily visible apart from moving high sided vehicles and is faintly audible although this is likely to change depending on climatic conditions. Pylons that cross the mountainside of Foel-ganol to the west are the only visual detractors.

Anticipated Change in View

The A55 is not readily visible from this distance and obscured by existing vegetation. Vegetation clearance along the southern verge of the A55 may cause a slight change in the view but this is not likely to be significant due to distance.

Location Plan





Red dot - Viewpoint
Purple line - Single frame image bearing
Orange - Panoramic image field of view (75°)
Blue 50mm lens single image field of view (39.6°)

Camera Location



APPENDIX 9.5
VISUAL EFFECTS SCHEDULES

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP01	Linden, Victoria Terrace, Promenade Llanfairfechan, Conwy LL33 0BY Sensitivity: High Distance from Scheme: 40m	Victoria Terrace is a parade of three storey Victorian properties overlooking the promenade and Llanfairfechan Beach. The primary view from Victoria Terrace and the promenade is northwards across the open sea of Conwy Bay towards Puffin Island and the Great Orme. The existing A55 road corridor is visible to the east and from the rear of the properties to the south. The main view of the road is of high sided vehicles on the eastbound section of carriageway elevated above the promenade.	There would be significant construction activities associated with the new road junction elevated above the existing alignment of the A55 to the east and south of the properties. Construction activity would be disruptive to the general amenity value of the area due principally to noise levels. Construction traffic such as cranes and piling rigs are likely to be significant visual elements during the construction phase. However, views to the east are oblique and not the focus of the view. Views south from the rear of the properties are also not the focus of the view. Magnitude: **Moderate Adverse** Effect: **Moderate Adverse**	The operational period would follow immediately after the construction period and the impact and visual effects would remain the same. High sided vehicles would be more visible elevated above the existing carriageway on the eastbound off slips. The main carriageway would not be visible from the properties due to the eastbound off slip road rising to the overbridge. Magnitude: **Moderate Adverse** Effect: **Moderate Adverse**	The Scheme affords no opportunity for mitigation due to the restricted space of the Scheme in relation to the existing road corridor and proximity of the railway. The adverse visual effects experienced by the properties therefore remains the same as during the construction and operational periods. Magnitude: **Moderate Adverse** Effect: **Moderate Adverse**	Linden is the eastern most property on the Promenade and the property most likely to be affected. However, construction activity may also affect other properties along the Promenade to the west, some of which are guest houses and hotels. Adverse visual effects would be restricted to the southern aspect of the properties. There would be some increase in noise levels of circa +1 to +3 decibels to the general amenity of the promenade and beach area with mitigation in place. Refer to Chapter 13 Noise and Vibration for more details.
RP02	St Seiriols and St. Elyn, The Promenade, (north of Shore Road East) Llanfairfechan, Conwy LL33 0PG Sensitivity: High Distance from Scheme: Circa 20m	The properties are detached two storey dwellings at the northern end of Shore Road East. The properties have a north facing aspect and overlook the promenade and beach to the north. Immediately to the south of the properties runs the Chester – Holyhead railway line at approximately first floor level. The existing A55 road corridor runs further south and elevated above the properties at approximately the same level as the roof lines of the properties.	The properties would experience a major change in view to the south and south-east and general amenity due to proximity and elevated nature of the construction activities. The principal view from the properties to the north would not be affected but from other aspects and from within the curtilage of the properties the visual effects would be very large adverse throughout the construction phase. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	The operational phase would not be as disruptive as the construction phase. Operationally there would be less disruptive noise. However, the construction of the viaduct, a significant structure approximately 12 metres higher than the existing road to the rear of the properties would affect the general setting and visual amenity. The new junction arrangement and overbridge would result in traffic and especially high sided vehicles to be visible at a much higher level on the slip road. Magnitude: **Moderate Adverse** Effect: **Large Adverse**	The Scheme affords no opportunity for mitigation due to the restricted space of the Scheme in relation to the existing road corridor and proximity of the railway. The adverse visual effects experienced by the properties therefore remains the same as during the construction and operational periods. The finish and aesthetic quality of the retaining wall could be improved but would not change the magnitude or significance of effect. Magnitude: **Moderate Adverse** Effect: **Large Adverse**	The new overbridge and structure of the viaduct to support the new eastbound off/on slips would be a significant structure overshadowing the properties and gardens of the two properties. The structure would be highly urban in appearance and land beneath open with new access for Network Rail. The effects of noise may be a significant detriment to the general amenity of the properties and their curtilage.
RP03	1-2 St Brendas, Sunny Bank, Glan Meurig, Glan Seiriol, Fern Bank, Penmaenmawr Road, (East of existing roundabout) Llanfairfechan, Conwy LL33 0PL Sensitivity: High Distance from Scheme: 3 metres	The properties are three storey terraced dwellings understood to support several households. The properties currently lie immediately south of and adjacent to the existing A55 road corridor. The A55 lies elevated above the properties and roughly at the same level as the first-floor windows. The views from the ground floor windows of the properties are contained by the A55. The first, second and third floor windows have open views across the sea to the north. To the south the properties have open views across Penmaenmawr Road and to the rising land and hills beyond.	There would be significant adverse effects on the general visual amenity of the properties during the construction period with plant and machinery within the curtilage and immediately outside the properties. The two-year construction period would be highly disruptive to the everyday lives of the residents. The Scheme would cause further loss of views and from receptors of high sensitivity that already experience adverse effects of the A55 during operation. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	The extents of the Scheme would encroach within the curtilage of the properties and be at a higher level than the existing road (4.4m). Views from the first and second floor of the properties will be become increasingly obscured to the north and west by the Scheme with a three-metre-high acoustic barrier fence along the southern edge of the slip road and the parapet of the viaduct beyond. Finishes of the retaining wall and parapet could improve the aesthetic quality of the structure but is not considered to make a significant change. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	There is little room for any effective landscape mitigation to significantly reduce adverse visual effects. Views to the north towards the sea would be compromised by the acoustic barrier fence and the parapet of the viaduct and overbridge. However, the bank above the retaining wall would be planted with low shrubs that would screen views of the acoustic barrier (likely to be timber). Therefore, although the impact on the general visual amenity would remain as per year 15, there would be some improvements to the visual amenity immediately outside the properties. Magnitude: **Major Adverse** Effect: **Large Adverse**	The properties lie immediately adjacent to the existing road corridor. As the Scheme is effectively a widening scheme at this location to accommodate a new junction near to the properties, adverse effects are inevitable and due to the available space and levels difficult to mitigate against. The main carriageway would be further away from the properties, but the slip road would be closer and higher. Existing roadside vegetation would be lost and replaced with new semi-ornamental shrub planting on the embankment above the retaining wall.

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP04	Fernbank Estate, Penmaenmawr Road Llanfairfechan, Conwy LL33 0PL Sensitivity: High Distance from Scheme: 5 – 7.5 m	Fernbank is a new development of two storey terraced properties constructed in 2018 off Penmaenmawr Road and adjacent to and very similar in aspect and circumstance to those described above (RP03). The existing A55 is visible from the northern aspect of the properties and is elevated above the ground floor with first floor views across the A55 to the open sea beyond. Ground floor views to the north are contained by existing embankment of the A55. Views to the north are over Penmaenmawr Road and to the rising land and hills beyond.	Existing vegetation that partially obscures views to the A55 road corridor would be lost. There would be significant adverse effects on the general visual amenity of the properties during the construction period with plant and machinery within the curtilage and immediately outside the properties. The two-year construction period would be highly disruptive to the everyday lives of the residents. Magnitude: **Moderate** Effect: **Large Adverse**	Views from the first-floor windows to the north would be obscured by the rising westbound off slip road acoustic barrier and parapets. Vehicles using the slip road would be highly visible. Vehicles using the main A55 through route would be partially obscured by the westbound off slip. Magnitude: **Moderate** Effect: **Large Adverse**	The magnitude and significance of effect would not change from Year 1 to Year 15. There are no opportunities for landscape mitigation to significantly reduce the magnitude of impact due to the proximity of the Scheme to the receptors at Fernbank. Magnitude: **Moderate** Effect: **Large Adverse**	The recent development at Fernbank was constructed in 2018 and lies close to the existing A55 road corridor. The northern aspect of the properties face directly onto the A55 with the first-floor windows overlooking the A55 and associated traffic. The change or magnitude of impact as a result of the Scheme is therefore considered over and above the baseline scenario as moderate rather than large or very large adverse.
RP05	Properties South of Penmaenmawr Road – West of Penmaen Park (Earlfield, Plas Tirion, Caerwylon,Tri Saeth, Awel Menai, Ty Gwyn, Bryn Tirion, Bryn Derwen, Rehoboth) Llanfairfechan, Conwy LL33 0RL Sensitivity: High Distance from Scheme: 70-140m	The residential properties occupy rising land south of Penmaenmawr Road overlooking the Fernbank estate and the A55 road corridor with views towards Anglesey and Puffin Island. The properties are primarily stone built and detached of two or three stories and set in large gardens. More recent single storey properties have been built within the grounds of the larger older residences.	The most prominent views of the scheme would be towards the north-west and the existing Junction 15 roundabout. Properties of Fernbank (RP04) and terrace to the west (RP03) generally obscure views of A55, particularly from those properties on the lower slopes. There would be a moderate change in the view to the north-west from the more elevated properties, less so for those further east that have a more northern aspect. Magnitude: **Moderate** Effect: **Moderate Adverse**	The scale and height of the new overbridge would remain a noticeable feature in Winter Year 1 from the more elevated properties with views to the north-west. Lower lying properties such as Earlfield and Rehoboth would experience a lesser magnitude of change compared to more elevated properties such as Caewylan and Tri Saeth. Vegetation within the ground of some properties would obscure views to the north-west. Magnitude: **Moderate** Effect: **Moderate Adverse**	The lower sections of the new junction would be visible from the more elevated properties but planting on the approaches to the new junction would establish to lessen the impact of the lower sections of the structures and sections of new road. Planting on the cut face south of Penmaenmawr Road would establish to lessen views towards the junction but vehicles crossing the overbridge would remain readily visible. Magnitude: **Minor** Effect: **Slight Adverse**	The more western properties may choose to plant or erect screens along the western boundaries to obscure views towards the new junction yet retain open views across the A55 to open sea and beyond to Puffin Island. Off-site planting by agreement could aid in providing some further mitigation outside the scheme proposals.
RP06	Properties South of Penmaenmawr Road – East of Penmaen Park (Penmaen Lodge, Bryn Celyn Hotel, Chatham House, Bryn Awelon, Osbourne House, Trevor Villa, Bridge House Myrtlewood, Sussex Villa,Fern Villa, Westcliffe) Llanfairfechan, Conwy LL33 0PN Sensitivity: High Distance from Scheme: 70m	The residential properties are similar in aspect to RP05 in that they overlook Penmaenmawr Road and across the existing A55 road corridor towards open sea towards Anglesey and Puffin Island. The Pendalar footbridge that crosses the A55 is a prominent feature is clearly visible. The properties are imposing three storey buildings some with large bay windows and extensive gardens leading down to Penmaenmawr Road.	The properties overlook the existing A55 road corridor that will be improved as part of the scheme proposals. There would be some disruption to the view during the construction period, but the main works will be circa 250 metres further west and views in this direction would be peripheral and partially obscured by the properties immediately east of the existing roundabout. The Pendalar footbridge would be replaced as part of the works.The change in view is therefore considered to be minor. The Magnitude: **Minor** Effect: **Slight Adverse**	Disruption during the construction period will cease once the scheme is completed. The existing view would remain largely the same on Year 1 of opening but there would be glimpsed views of the completed new junction to the west. Mitigation measures would make no significant amendments to the view from the location of these properties as they are elevated above the existing road corridor. Magnitude: **Minor** Effect: **Slight Adverse**	By Year 15 the Scheme would be well established and the receptors accustomed to any slight adverse effects towards the west in the direction of the new overbridge and junction. To the north would be views across the A55 road corridor and the replacement Pendalar footbridge, much as there is at present and therefore there would be no perceptible change in the view. Magnitude: **Minor** Effect: **Neutral**	

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP07	Properties South of Penmaenmawr Road – East of Tyddin Drycin (Sussex Villa, Fern Villa, Westcliffe) Llanfairfechan, Conwy LL33 0PN Sensitivity: High Distance from Scheme: 10-15m	Four semi-detached properties overlooking the A55 road corridor and the existing Pendalar footbridge and beyond to open sea, Anglesey and Puffin Island. The properties have front gardens that are elevated above Penmaenmawr Road and contains some ornamental hedging and plants. Views of the existing A55 road corridor are partially screened by roadside plantations and timber fence. These would be lost as part of the Scheme and replaced with the realigned Wales Coast Path and National Cycle Route Network (5) that runs along Penmaenmawr Road and across the replacement Pendalar footbridge.	There would be disruption during the construction phase and during the replacement of the Pendalar Footbridge. Areas of roadside plantation would be lost including areas of self-seeded sycamore and ash. Although this is likely to be over a limited period of time, the magnitude of change would be moderate as the existing bridge is a prominent feature in the view. The removal of existing vegetation would also expose views of passing traffic and in particular high sided vehicles to the receptor. Magnitude: **Moderate** Effect: **Moderate Adverse**	The Scheme does not replace the roadside plantation and therefore the magnitude of impact would remain the same as during the construction period although there would be less disruption. The new footbridge would replace the existing Pendalar footbridge but would be a typical element of the road corridor and not alter the overall balance of the features and elements in the existing view. Magnitude: **Moderate** Effect: **Slight Adverse**	The Scheme does not replace the roadside plantation and therefore the magnitude of impact will remain the same as Year 1 Magnitude: **Moderate** Effect: **Slight Adverse**	
RP08	Pendalar (1-14), Penmaenmawr Road, Llanfairfechan, Conwy LL33 0RA Sensitivity: High Distance from Scheme: 10-15m	These properties are semi-detached two storey properties elevated above the existing road corridor and accessed to the front via Penmaenmawr Road. There are views over the existing road corridor to the north across open sea towards Anglesey, Puffin Island and the Great Orme. Elements of the road corridor are currently in view including lighting columns and roadside parapets. Westbound traffic is most visible with the lower eastbound carriageway partially obscured from view to the difference in levels. Existing roadside plantation partially screens views of the A55 and passing traffic.	The overall aspect of these properties would not change significantly during construction. The westbound carriageway would be raised slightly and existing roadside vegetation would be lost. Penmaenmawr Road would effectively be widened to provide enough space for the new shared use route that would be supported on a new retaining wall with solid parapet adjacent to the road corridor. There would be disruption to general amenity of the properties during the construction period resulting in a slight adverse effect. Magnitude: **Minor** Effect: **Slight Adverse**	The overall balance of features and elements in the view would not change significantly. Views over the sea towards Anglesey and Puffin Island will remain, the A55 road corridor would be screened at street level by roadside parapet. Views from the first and second floor of the properties would not change significantly. Magnitude: **Minor** Effect: **Slight Beneficial Effect**	The overall balance of features and elements in the view would not change significantly as in Year 1. Views over the sea towards Anglesey and Puffin Island will remain, the A55 road corridor would be screened at street level by roadside parapet. Views from the first and second floor of the properties would not change significantly. Mitigation planting along Penmaenmawr Road opposite properties 1-6 would enhance the public realm. Other roadside planting would be at the base of the retaining wall and be visible from the A55 road corridor only. Magnitude: **Negligible** Effect: **Slight Beneficial Effect**	Should additional noise mitigation that was identified as a Priority Area under END be implemented as part of the proposals, then a clear glass acoustic barrier is recommended adjacent to the cycle track would retain open views across the sea. Refer to Chapter 13 (para 6.1.4) Noise and Vibration for more details.
RP09	Mona Terrace (1-20) plus semi-detached properties 81 -84 and detached property 85, Penmaenmawr Road, Llanfairfechan, Conwy LL33 0RE Sensitivity: High Distance from Scheme: 10m	The properties on Mona Terrace are largely of two storey traditional stone-built properties. The terrace has a similar aspect to Pendalar (RP08) although positioned slightly higher above the A55 road corridor. As with Pendalar there are open views across the sea towards Anglesey, Puffin Island and the Great Orme. The A55 is partially screened by roadside plantation of ornamental shrubs. There is evidence of these being pruned to retain views of the sea from the ground floor of the properties and street level.	The Scheme would entail the removal of the roadside plantation and construction of a retaining wall to enable the widening of Penmaenmawr Road for the provision of a 2-metre-wide shared use/non-motorised way. There would be significant loss of amenity due to the proximity of the scheme to the properties and removal of roadside plantation. The view from the first floor of the properties would remain largely unaffected. However, views from the ground floor and at street level would change significantly. Magnitude: **Moderate** Effect: **Large Adverse**	On completion of the Scheme in Year 1, there would be a 2-metre-high closed aspect parapet adjacent to the shared use route that would obscure views across the sea from street level and the first-floor windows of the properties. However, this would also screen views of westbound traffic including high-sided vehicles. Magnitude: **Moderate** Effect: **Moderate Adverse**	The Scheme does not contain any landscape mitigation along this section as the space is extremely limited. The closed aspect parapet would contain views northwards from the ground floor of the properties and from the street level. Views from the first floor of the properties would remain unaffected by the Scheme. Magnitude: **Moderate** Effect: **Moderate Adverse**	Roadside parking currently obscures views north across the open sea from street level. This would remain unaffected by the Scheme proposals. Should additional noise mitigation that was identified as a Priority Area under END be implemented as part of the proposals, then a clear glass acoustic barrier is recommended adjacent to the cycle track would retain open views across the sea. Refer to Chapter 13 (para 6.1.4) Noise and Vibration for more details.

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP10	Penmaen Park (y Ddol, Rhiwen, Manora, Hafod y Coed, Farnaby, Y Bwthyn Bach, Crud-yr-awel, Tanglewood and Pen-y-Coed. Also, Hafod -y-coed, Bryn Onnen) Llanfairfechan, Conwy LL33 0RN Sensitivity: High Distance from Scheme: 75-120m	These visual receptors are largely detached properties on Penmaen Park road with a north-west facing aspect overlooking sloping parkland that descends to Penmaenmawr Road and the existing Junction 15 roundabout. Beyond there are open views across Traeth Lafan Sands towards Anglesey and Puffin Island. Views of the A55 road corridor are partially screened by properties on Penmaenmawr Road and roadside vegetation along the southern verge of the A55. Many of the properties have first floor balconies that take advantage of the scenic views across the sea to Anglesey and Puffin Island.	Site clearance operations during the construction phase would entail the demolition of two properties on Penmaenmawr Road immediately west of the existing roundabout (8 & 9 Penmaen View) and the removal of roadside vegetation immediately west of the roundabout and roadside vegetation further west towards Maes Dolfor. The Scheme would also remove existing roadside vegetation south of Penmaenmawr Road and the roundabout and excavation of a cutting into the parkland below Penmaen Park road. During construction the Scheme would become the dominant or focal feature of the view due to construction activity and the scale and magnitude of change. Magnitude: **Major** Effect: **Very Large Adverse**	In Winter Year 1 the Scheme would represent be a significant change in the view. The new junction and overbridge would appear as a significant feature between the properties on Penmaenmawr Road. The elevated nature of the receptors along Penmaen Park road means that the Scheme would be overlooked with the overbridge and westbound slip roads particularly visible in the middle distance of the view. Traffic using the main carriageway would be largely screened by the wing walls of the slip road. In Year 1 mitigation planting would have had no time to establish and the magnitude would remain as a major change and the and a major discordant feature in the view due to its elevated position above the shoreline and in line views across the sea to Puffin Island. Magnitude: **Major** Effect: **Large Adverse**	In summer Year 15, the mitigation planting on the cut slope south of Penmaenmawr Road and around the approaches to the overbridge junctions and westbound slip roads would have had time to establish. This would reduce the level of magnitude to moderate, but the overbridge and associated traffic would remain visible and perceptible to the view from sensitive receptors in the area of Penmaen Park. Magnitude: **Moderate** Effect: **Moderate Adverse**	The Scheme would not lead to the removal of any of the parkland trees. Existing roadside planting is circa 30 years old and the assessment of growth at Year 15 has assumed a similar establishment rate commensurate with the existing. Some of the properties above Penmaen Park such as Hafod-y-Coed and Bryn Onnen have a similar aspect and views but have grounds with mature trees that partially screen the existing A55 from view.
RP11	Wern Isaf, Penmaen Park, Llanfairfechan, Conwy LL33 0RN Sensitivity: High Distance from Scheme: 200m	Wern Isaf is a Grade II* Listed Building and garden stands in the fields and upper sections of Penmaen Park. Views from the property are obscured by existing trees and vegetation within the grounds of the property. Outside the curtilage of the property, views are open and attractive with no significant visual detractors. The steep sloping topography obscures view of properties along Penmaenmawr Road with some roofs visible. The A55 is obscured by mature roadside vegetation above and beyond which appear the roofs of properties on the Promenade. Beyond the Promenade are open views to Anglesey, Puffin Island and Penmon Lighthouse.	There would be no change to the existing view during the construction phase. Vegetation within the curtilage of the property and the intervening topography renders results in no perceptible change in the view. Magnitude: **No Change** Effect: **Neutral**	As per the construction phase. Magnitude: **No Change** Effect: **Neutral**	As per the construction phase and Year 1. Magnitude: **No Change** Effect: **Neutral**	
RP12	Parc Isaf (No.s 1 -22) Llanfairfechan, Conwy LL33 0AH Sensitivity: High Distance from Scheme: 320m	Parc Isaf is a cul-de-sac and residential area of single storey dwellings on the eastern edge of Llanfairfechan and south of Penmaenmawr Road. The estate lies adjacent to St Winifreds Close. The area is generally well covered by mature trees along the edge of Penmaen Park and Penmaenmawr Road.	There would be no change to the existing view during the construction phase. The main Scheme is distant from the receptors and screened by existing mature trees and vegetation. There would be no change to the existing view. results in no perceptible change in the view. Magnitude: **No Change** Effect: **Neutral**	As per the construction phase. Magnitude: **No Change** Effect: **Neutral**	As per the construction phase and Year 1. Magnitude: **No Change** Effect: **Neutral**	The realignment of the National Cycle Route (5) and the Wales Coast Path along Penmaenmawr Road may require some minor works such as crown lifting to existing trees along the southern verge. This is considered to be outwith the Scheme extents for the purposes of the LVIA.

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP13	Properties on site of former Economy Car Centre site, Penmaenmawr Road, Conwy LL33 Sensitivity: High Distance from Scheme: Circa 200m	The three detached two storey properties face onto Penmaenmawr Road opposite the junction with Maes Dolfor that runs north towards the A55. There are enclosed views towards the existing road corridor along Maes Dolfor over the school sports field to the A55 and that is obscured from view by roadside planting on embankment. The roofs of properties on the Promenade are visible above the roadside planting.	The view along Maes Dolfor from this elevated position towards the existing A55 would change significantly. The realignment of the A55 main carriageway to the south and the construction of the new westbound slip road would result in the removal of roadside vegetation and expose views of the A55 and rear of the properties on the Promenade. The school sports field in view adjacent to Maes Dolfor would also be re-profiled as part of flood compensation measures. The overall magnitude of change would be major resulting in a large adverse visual effect and due to the elevated position of the viewpoint, be difficult to mitigate against. Magnitude: **Major** Effect: **Large Adverse**	Mitigation planting on the A55 embankment would take time to establish and therefore the magnitude of change would remain major in Winter Year 1 on opening. The flood compensation area would be re-profiled and treated with a general amenity grass seed that would also take some time to establish depending on the timing of its application. The magnitude of impact would lessen slightly from the construction period due to the completion of earthworks and removal of plant. The overall visual effect would remain as significant. Magnitude: **Moderate** Effect: **Moderate Adverse**	In Year 15 the planting on the embankment would be established and afford some screening of the westbound slip road. Some high side vehicles are likely to be visible but the main dual carriageway and vehicles would be screened by the slip road. The Scheme would not replace the existing roadside vegetation in its entirety nor be as extensive due to drainage and access requirements. There would remain a deterioration to the existing view but this would be moderate and result in a slight adverse visual effect to the properties that have northerly views down Maes Dolfor of the A55. Magnitude: **Minor** Effect: **Slight Adverse**	
RP14	Bryn-y-Mor and Dolfor, Penmaenmawr Road, Llanfairfechan, Conwy LL33 0PA Sensitivity: High Distance from Scheme: Circa 85-145	The properties are detached two storey dwellings fronting on to Penmaenmawr Road with extensive gardens to the rear and north containing mature trees and shrubs. The garden boundary lies approximately 85 metres from the Scheme with the properties lying some 60 metres further to the south. Views from the first floors of the properties are likely to have partial views of the existing A55 road corridor screened by existing roadside vegetation. Views from the ground floor are likely to be limited by garden vegetation.	The properties would experience a major magnitude of change from within the garden curtilage and views from first floor windows as a result of removing the existing roadside vegetation and general construction activity. However, the magnitude of change would be limited by garden vegetation and views restricted from some locations. Magnitude: **Moderate** Effect: **Large Adverse**	The completion of construction activity would lessen the magnitude of change slightly. However, the A55 would remain visible in Year 1 as the mitigation planting starts to establish. Magnitude: **Moderate** Effect: **Large Adverse**	In Year 15 the planting on the embankment would be established and afford some screening of the westbound slip road. Some high side vehicles are likely to be visible but the main dual carriageway and vehicles would be screened by the slip road. The Scheme would not replace the existing roadside vegetation in its entirety nor be as extensive due to drainage and access requirements. Existing garden vegetation would continue to mature (assuming its retention) and provide additional screening but outside the Scheme extents. Magnitude: **Minor** Effect: **Moderate Adverse**	Views from the properties are not accessible from public areas or footpaths and therefore the assessment has been made from observations made on site and from aerial photography.

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP15	Maes Dolfor (East) (1-7 and 37-46) Llanfairfechan, Conwy LL33 0RP Sensitivity: High Distance from Scheme: Circa 90m	Maes Dolfor is a residential area of brick-built dormer bungalows on land adjacent to and south of the A55 and north off Penmaenmawr Road. Several of the properties (7, 42, 43 – 46) have open views towards the existing A55 road corridor across the school sports field. Views of the A55 road corridor are now largely concealed by the roadside vegetation that has established following completion of the Llanfairfechan By-Pass in 1989/90 to provide a dense screen that diminishes slightly in the winter months when the deciduous trees are not in leaf.	The realignment of the A55 main carriageway to the south and the construction of the new westbound slip road would result in the removal of the roadside vegetation on the existing embankment. Some of the existing trees at the foot of the embankment and on the adjacent playing field would be retained and protected during the construction period. The school sports field adjacent to Maes Dolfor would be re-profiled as part of flood compensation measures as would an area to the rear of the Heath car park. The car park of the Heath would be used as a site compound area. The magnitude of change resulting from the construction activity on the residential area and receptors of Maes Dolfor would be major. Loss of roadside vegetation would expose the new carriageway and the westbound slip road. The Scheme would lead to a major deterioration in the view from a receptor of high sensitivity Magnitude: **Major** Effect: **Large Adverse**	The disruption caused by general construction activity will cease on completion. Planting of native shrubs on the newly formed embankment and the construction of a 3m wide access track at the foot of the embankment completed. The mitigation planting would not not be effective for some years until well established and therefore the magnitude of change would be moderate. The change in view would be a deterioration of the existing view but an improvement to the view experienced during the construction period. Retention of the existing trees at the foot of the embankment would lessen the magnitude of impact to the view. Magnitude: **Moderate** Effect: **Moderate Adverse**	In Year 15 the planting on the embankment would be established and afford some screening of the westbound slip road. Some high side vehicles are likely to be visible but the main dual carriageway and vehicles would be screened by the slip road. The Scheme would not replace the existing roadside vegetation in its entirety nor be as extensive due to drainage and access requirements. There would remain a deterioration to the existing view but this would be moderate and result in a slight adverse visual effect to the more sensitive receptors in the Maes Dolfor residential area. Magnitude: **Moderate** Effect: **Slight Adverse**	The residential properties of Mases Dolfor lie immediately adjacent to the A55 road corridor and were constructed around the same time as the Llanfairfechan By-Pass in circa 1990. Therefore, the existing roadside vegetation is roughly the same age as the properties the residents of which will have become accustomed to the A55 road corridor.
RP16	Maes Dolfor (West) (8-36) Llanfairfechan, Conwy LL33 0RP	Properties 8, 20 and 21-26 lie within 10-55 metres of the Scheme and have open views towards the existing A55 on embankment currently screened by roadside vegetation. Other properties within this area have glimpsed views of the road corridor obscured by adjacent properties and limited by aspect.	The magnitude of change resulting from the construction activity on the residential area and receptors of Maes Dolfor would be major. Loss of roadside vegetation would expose the new carriageway and the westbound slip road. The Scheme would lead to a major deterioration in the view from a receptor of high sensitivity Magnitude: **Major** Effect: **Large Adverse**	Mitigation planting on the A55 embankment would take time to establish and therefore the magnitude of change would remain major in Winter Year 1 on opening. Magnitude: **Major** Effect: **Large Adverse**	In Year 15 the planting on the embankment would be established and afford some screening of the westbound slip road. Some high side vehicles are likely to be visible but the main dual carriageway and vehicles would be screened by the slip road. The Scheme would not replace the existing roadside vegetation in its entirety nor be as extensive due to drainage and access requirements. There would remain a deterioration to the existing view but this would be moderate and result in a slight adverse visual effect to the more sensitive receptors in the Maes Dolfor residential area. Magnitude: **Moderate** Effect: **Slight Adverse**	

No/Ref	Residential Properties (RP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
RP17	Maes y Glyn (1-12) Llanfairfechan, Conwy LL33 0BN Sensitivity: High Distance from Scheme: Circa 30m (No.12)	Maes y Glyn is a residential area and cul-de-sac off Station Road and immediately adjacent to the existing A55. The properties are single storey rendered bungalows that lie below the level of the A55. The boundary of the A55 is defined by well-established roadside vegetation where space allows and at the end of the cul-de-sac by close boarded fence and retaining wall structures. No. 12 is the easternmost property and screened from the A55 by dense planting on embankment that disguises the close boarded fence and retaining wall.	The extent of the Scheme passes close to the easternmost property (No.12) but does not directly affect the property. Existing roadside vegetation would be removed to the north-east and rear of the property to form a new access/maintenance road. Disruption caused by construction activity would have some indirect and temporary adverse effects on the amenity of the property. The receptor would experience some limited change in view to the rear aspect of the property. Magnitude: **Minor** Effect: **Moderate Adverse**	Year 1 the visual receptor would experience a negligible change in the view that would be barely noticeable. Existing roadside vegetation retained as part of the original scheme would remain to provide a visual screen but some may be lost to the east resulting in the A55 being more visible. However, disruption due to general construction activities would be abated. Magnitude: **Minor** Effect: **Slight Adverse**	Year 15 and the retained existing roadside vegetation would continue to mature and provide a visual screen to the properties at Maes-y-Glyn and in particular to No. 12. Magnitude: **No Change** Effect: **Neutral**	Long term management plans for the soft estate would be prepared by North Mid Wales Trunk Road Agent (NMWTRA) to ensure effective growth and function as a visual screen is maintained on behalf of Welsh Government.
RP18	1-2 Bodfair, Penmaenmawr Road, Llanfairfechan, Conwy LL33 0PA Sensitivity: High Distance from Scheme: Circa 15 – 50m	The two residential properties are set back from Penmaenmawr Road and lie between Ysgol Pant Y Rhedyn and The Heath. They have a low-lying aspect with gardens to the north that extend to within 15 metres of the Scheme extents. The gardens contain dense vegetation and mature trees that connect to the existing roadside vegetation and other existing vegetation in the grounds of The Heath. The existing car park of the Heath would be used as a site compound.	A combination of the existing garden vegetation and low-lying nature of the two properties provides a dense visual screen that obscures views of the A55. Existing roadside vegetation reinforces the visual screen particularly in the winter months. It is considered that there would be a minor degree of change resulting from the Scheme providing that the garden vegetation remains as existing. Some existing trees adjacent to the Heath car park would be removed as part of the Scheme. The site compound would be visible from some locations adjacent to No.2. Magnitude: **Minor** Effect: **Slight Adverse**	The completion of construction activity and removal of the site compound would lessen the magnitude of change slightly. Magnitude: **Negligible** Effect: **Slight Adverse**	In Year 15 the planting on the embankment would be established and the existing garden vegetation if maintained and managed would further mature and continue to provide a dense screen resulting in no change. Magnitude: **No Change** Effect: **Neutral**	Views from the properties are not accessible from public areas or footpaths and therefore the assessment has been made from observations made on site and from aerial photography.
RP19	Penmaenmawr Road (west) 1-7 Penmaen View, Heath Cottage, Llanfairfechan, Conwy LL33 0PH Sensitivity: High Distance from Scheme: Circa 30m (No.12)	These residential properties that front on to Penmaenmawr Road, the main entrance to Llanfairfechan and the route of the former North Wales coast road. Llanfairfechan By-Pass, now the A55, was constructed in circa 1990 and is now a significant element to the north and rear of the properties. The properties also fall within the Llanfairfechan Conservation Area and are mainly two-three storey stone-built dwellings. Some of the more elevated properties (e.g. 1-7 Penmaen View) have views over the A55 across the sea to Anglesey and Puffin Island with the A55 being screened by existing roadside planting.	The Scheme would result in the removal of the existing roundabout and roadside vegetation on the existing embankment. The new overbridge would be significantly higher (circa 9.5 metres) than the existing alignment. The magnitude of change resulting from the construction activity on the residential area and receptors of would be major. Loss of roadside vegetation would expose the new carriageway and the westbound slip road to view, long distance views across the sea would be lost. The Scheme would lead to a major deterioration in the view from several receptors of high sensitivity. Magnitude: **Major** Effect: **Large Adverse**	In Year 1 of completing the Scheme, the visual impact on the visual receptors would remain as a large adverse effect. Limited space for effective landscape mitigation and the scale of the new junction and slip road would constitute a major change and a major discordant feature in the view. This is primarily due to the loss of the existing roadside vegetation that since circa 1990, has matured to provide a very effective screen of the existing road corridor. Magnitude: **Major** Effect: **Large Adverse**	In Year 15 the mitigation planting on the upper sections of the new embankment that supports the westbound slip road would have established and started top provide some visual screen. Planting around the base of the retaining wall east of Shore Road East would also be established and aid in the landscape integration of the structure. Despite the planting the scale and height of the new junction would remain as a noticeable feature or element in the view and therefore represent a moderate degree of change to a sensitive receptor. Magnitude: **Major** Effect: **Moderate Adverse**	Two properties 8 & 9 Penmaen View would be demolished as part of the Scheme. These properties lie just outside the Llanfairfechan Conservation Area.

No/Ref	Non-Residential Properties (NRP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
NRP01	Garisim Chapel, Penmaenmawr Road, Llanfairfechan, Conwy LL33 0PA Sensitivity: Moderate Distance from Scheme: Circa 125m	Garisim Chapel fronts on to Penmaenmawr Road and lies immediately west of Ysgol Pont y Rhedyn that shares access to the side of the chapel to the adjacent school playground and playing field.	The realignment of the A55 west of the existing roundabout and construction of the new westbound slip road and overbridge, would result in removal of the existing roundabout and roadside vegetation on the existing embankment to the rear of the Chapel. However, there is no evidence to suggest the Chapel uses the lawned area to the rear and the focus of the receptors would be within the walls of the Chapel. During construction it is likely that, due to the proximity of the Scheme, there would be some loss of visual amenity and deterioration in the view for those visiting the Chapel. Magnitude: **Minor** Effect: **Slight Adverse**	In Year 1 of completing the Scheme, the visual impact on the visual receptors would remain as a slight adverse effect although there would be no visual disturbance due to plant and machinery or loss of amenity. Magnitude: **Minor** Effect: **Slight Adverse**	In Year 15 the mitigation planting on the upper sections of the new embankment that supports the westbound slip road would have established and started to provide some visual screen. Despite the planting the scale and height of the new junction would remain as a noticeable feature or element in the view and therefore represent a slight adverse visual effect. Magnitude: **Minor** Effect: **Slight Adverse**	There may be some noise impact that would affect the users of the Chapel during the construction phase. This is reported in the noise and vibration Chapter 13.
NRP02	Ysgol Pont y Rhedyn, Penmaenmawr Road, Llanfairfechan, Conwy LL33 0PA Sensitivity: Moderate Distance from Scheme: School – 70m School Grounds – 15m	The main access to the school is off Penmaenmawr Road to the south with a side access for cyclists to the west and alongside the Garisim Chapel. The school building and grounds directly overlook the existing A55 to the north. The school sports field lies immediately to the west of the school playground and south of the existing A55. The sports field would be excavated and lowered for flood attenuation purposes. The site compound would be located on adjacent land to the east in the grounds of the Heath.	The realignment of the A55 west of the existing roundabout and construction of the new westbound slip road and overbridge, would result in removal of the existing roundabout and roadside vegetation on the existing embankment to the rear of the school grounds. Overall the construction period would be highly disruptive to the general amenity of the school grounds. The magnitude of change of views to the north would be major with the removal of existing roadside vegetation and clear views of plant and machinery during the construction of the new westbound slip road and realignment of the A55. Magnitude: **Major** Effect: **Large Adverse**	In Winter Year 1 there would remain a significant change to the existing view. The disruptive nature of the construction period would be complete but the newly formed embankment and westbound slip road would be a major component in the view. The site compound may also still be in operation during Year 1 of opening. Landscape mitigation would not yet be established and not provide any screening benefit. Vehicles using the westbound slip road would be highly visible. The change in view would remain major and the effect large adverse compared to the baseline conditions. Magnitude: **Major** Effect: **Large Adverse**	In Year 15 the mitigation planting on the upper sections of the new embankment that supports the westbound slip road would have established and started to provide some visual screen. However, this would not be as well established by Year 15 as the existing roadside plantation and therefore would remain a moderate adverse visual effect on the receptors within the school and school grounds. Magnitude: **Moderate** Effect: **Moderate Adverse**	The school sports field would be regraded for flood attenuation purposes and therefore may not be available for use by the school during the construction period. The area would be regraded and re-seeded and remain unusable for some time until the grass seeding becomes an established sward. The area may become saturated at times of year after heavy rain and there may be a risk that it unusable as a sports field during these periods.
NRP03	The Heath Ysgol Pont y Rhedyn, Penmaenmawr Road, Llanfairfechan, Conwy LL33 OPA Sensitivity: Currently Vacant Distance from Scheme: Building – 65m Car Park Area – Within the Scheme extents	The Heath was originally opened as a convalescence home in 1897 and requisitioned as an auxiliary hospital in 1940. After the war it reverted to a convalescence home but numbers declined in the 1960's and it eventually closed in the 1980's. Conwy County Borough Council bought the property and opened it as offices in 1997. Following the council's property rationalisation in 2018/19 the Heath closed again and remains empty.	There are currently no known receptors in the Heath and therefore an assessment of visual significance cannot be undertaken. However, the car park of the Heath will be used as a Site Compound during the construction period. It is assumed therefore that there will be no occupation of the Heath during this period. Conwy County Borough Council are owners of the building and are currently considering the future use of the property.			

No/Ref	Non-Residential Properties (NRP) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
NRP04	The Split Willow, Penmaenmawr Road, Llanfairfechan, Conwy LL33 OPA Sensitivity: Medium Distance from Scheme: Circa 150m	The Split Willow is a detached three storey stone-built property that operates as a function venue hosting weddings and other celebratory occasions. The property has a car parking area to the west and a garden area to the north. The property has open views north towards the existing A55 and beyond to open sea and the coast of Anglesey.	The property overlooks the residential area of Maes Dolfor to the north but views are restricted by garden vegetation to the rear of the properties in an area north of the Split Willow garden area. There would be views from the first and second floor of the property of the existing road corridor and this would become more visible following the removal of roadside vegetation. However, the main facilities of the Split Willow are understood to be on the ground floor and within the garden curtilage. From these locations the view would not change significantly as a result of the Scheme. Magnitude: **Negligible** Effect: **Slight Adverse**	As per the Construction Phase. Magnitude: **Negligible** Effect: **Slight Adverse**	There is likely to be views of the Scheme from the first and second floor windows of the property and from these vantage points the A55 would be visible. By Year 15 planting mitigation on the embankment would have established to provide an element of screening and therefore reduce potential visual effects from a slight adverse to No Change and a Neutral Visual Effect. Magnitude: **No Change** Effect: **Neutral**	
NRP05	Penlan Garage Sensitivity: Low Distance from Scheme: Circa 150m	Penlan Garage is adjacent to and east of The Split Willow and fronts on to Penmaenmawr Road. To the rear of the property is an area of hardstanding and a static caravan. There is one window on the northern façade of the property.	The Scheme would have no visual effects on the property that operates as a garage. Magnitude: **No Change** Effect: **Neutral Effect**	Magnitude: **No Change** Effect: **Neutral Effect**	Magnitude: **No Change** Effect: **Neutral Effect**	

No/Ref	Public Rights of Way (PRoW)) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
18/02	Llanfairfechan Footpath 02 (Penmaen Park) Sensitivity: High Distance from Scheme: 65m	The PRoW runs through Penmaen Park on elevated ground overlooking the existing Junction 15 roundabout. The path is a popular route for local residents with an open aspect and views across the A55 towards Anglesey and Puffin Island.	The Scheme would be highly visible during the construction period from several locations along the PRoW, in particular the section along the local road network that connects to Penmaen Park. Views from the PRoW would directly overlook the works to the new Junction 15. Movement of construction vehicles would attract the view and lead to a major deterioration in the view. Magnitude: **Major** Effect: **Large Adverse**	With the construction period complete, the movement of construction vehicles and cessation of construction activities the Scheme would be less readily visible. However, the new junction and overbridge would remain a noticeable element in the view from elevated sections of the PRoW. Magnitude: **Moderate** Effect: **Moderate Adverse**	The Scheme would remain a significant component in the view with the mitigation measures in place. The elevated aspect of the visual receptor means that the scheme would be difficult to mitigate against from this aspect and movement of passing traffic would attract the view in the peripheral vision. The Scheme would therefore remain as a moderate adverse visual effect. Magnitude: **Moderate** Effect: **Moderate Adverse**	
18/03	Llanfairfechan Footpath 03 (Penmaen Park) Sensitivity: High Distance from Scheme: 130m	This PRoW runs through Penmaen Park past the property of Wern Isaf and connects Park Road and The Close to the local road network above Penmaen Park. Many sections of the path have a similar aspect to 18/02 but slightly more elevated and distant. Where the path joins the local road network, boundary walls and vegetation contain the views to the north and across the A55 towards Anglesey and Puffin Island.	The Scheme would be highly visible during the construction period from several locations along the PRoW, in particular the section along the local road network that connects to Penmaen Park. Views from the PRoW would directly overlook the works to the new Junction 15. Movement of construction vehicles would attract the view and lead to a major deterioration in the view. Magnitude: **Major** Effect: **Large Adverse**	With the construction period complete, the movement of construction vehicles and cessation of construction activities the Scheme would be less readily visible. However, the new junction and overbridge would remain a noticeable element in the view from elevated sections of the PRoW as it crosses Penmaen Park. Views from other sections of the PRoW would be partially screened by existing properties, vegetation and boundary walls. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	The Scheme would remain a significant component in the view with the mitigation measures in place. The elevated aspect of the visual receptor means that the scheme would be difficult to mitigate against from this aspect and movement of passing traffic would attract the view in the peripheral vision. The Scheme would therefore remain as a moderate/slight adverse visual effect. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	

No/Ref	Public Rights of Way (PRoW)) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
18/48	Llanfairfechan Footpath 48 (Park Road to Henar Farm) Sensitivity: High Distance from Scheme: 220m	The PRoW runs along the access track to Henar Farm through fields and on rising ground. Dry stone walls define the track that has extensive open views across the A55 towards Anglesey and Puffin Island to the north and north-west.	The Scheme would be visible during the construction period from several locations along the PRoW, but views would be partially mitigated by distance and intervening topography and mature trees. Some views from the lower sections of the PRoW would directly overlook the works to the new Junction 15. Movement of construction vehicles would attract the view and lead to a moderate deterioration in the view. Magnitude: **Moderate** Effect: **Moderate Adverse**	With the construction period complete, the movement of construction vehicles and cessation of construction activities the Scheme would be less readily visible. However, the new junction and overbridge would remain a noticeable element in the view from elevated sections of the PRoW. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	The Scheme would remain a significant component in the view with the mitigation measures in place. The elevated aspect of the visual receptor means that the scheme would be difficult to mitigate against from this aspect and movement of passing traffic would attract the view in the peripheral vision. The Scheme would therefore remain as causing a moderate/slight adverse visual effect. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	
18/04	Llanfairfechan Footpath 04 (Pendalar) Sensitivity: High Distance from Scheme: 150m	The PRoW runs through the residential area of Pendalar and connects to the local road network close to Penmaen Park.	There would be limited locations along the PRoW where the Scheme would be readily visible with the views largely obscured by the residential properties on the slopes of Pendalar. There would however be some vantage points in the western sections of the PRoW from where the Scheme would be readily visible, particularly during construction activities. Magnitude: **Minor** Effect: **Slight/Moderate Adverse**	With the construction period complete, the movement of construction vehicles and cessation of construction activities the Scheme would be less readily visible. However, the new junction and overbridge would remain a noticeable element in the view from some sections of the PRoW. Magnitude: **Minor** Effect: **Slight/Moderate Adverse**	The Scheme would be a component in the view but seen in the context of the wider road corridor in the view with the mitigation measures in place. The movement of passing traffic on the elevated overbridge and slip roads would attract the view in the peripheral vision. The Scheme would therefore remain as causing a moderate/slight adverse visual effect. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	
18/06	Llanfairfechan Footpath 06 Penmaen Park and inland Wales Coast Path Sensitivity: High Distance from Scheme: 170+m	The PRoW rises above the residential area of Pendalar through Drws y Coed towards Henar Farm.	There would be limited locations along the PRoW where the Scheme would be readily visible with the views largely obscured by mature woodland on the slopes above Pendalar. There would however be some vantage points in the western sections of the PRoW from where the Scheme would be readily visible, particularly during construction activities. Magnitude: **Minor** Effect: **Slight/Moderate Adverse**	With the construction period complete, the movement of construction vehicles and cessation of construction activities the Scheme would be less readily visible. However, the new junction and overbridge would remain a noticeable element in the view from elevated sections of the PRoW. Magnitude: **Minor** Effect: **Slight/Moderate Adverse**	The Scheme would be a component in the view but seen in the context of the wider road corridor in the view with the mitigation measures in place. The movement of passing traffic on the elevated overbridge and slip roads would attract the view in the peripheral vision. The Scheme would therefore remain as causing a moderate/slight adverse visual effect. Magnitude: **Moderate/Minor** Effect: **Moderate/Slight Adverse**	

No/Ref	Land with Public Access (LPA) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
LPA 1	Llanfairfechan Promenade Sensitivity: High Distance from Scheme: 40+m	Views from the eastern sections of the Promenade are extensive and stretch across Conwy Bay towards the Great Orme and the Penmaenmawr headland. Residential properties of Pendalar appear clustered and rise steeply above the A55 with Penmaenmawr mountain rising spectacularly above with woodland on lower slopes dispersing into scree and rock outcrops.	Views from the Promenade would be significantly affected by the Scheme elevated above the properties St Seiriol's and St Elyn and a major adverse and a dominant discordant feature in the view. Construction activities would further diminish the visual amenity of the Promenade area. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	The magnitude of change would remain as major adverse in Winter Year 1. Although construction activities would have ceased by day 1 of opening the structure of the new viaduct would remain major discordant and adverse feature in the view. High sided vehicles using the eastbound slip roads would be visible and a moving element that would attract the eye of visual receptors on the Promenade. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	Visual mitigation of the viaduct from the Promenade area is restricted due to the proximity of the railway. There is no opportunity for landscape mitigation to reduce the visual effect of the viaduct. The mass of the viaduct would remain silhouetted against the backdrop of Penmaenmawr mountain. Surface treatments of the viaduct structure may improve the aesthetics of the structure but would be unlikely to reduce the very large adverse visual effects experienced by users of the Promenade. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	Refer to Representative Viewpoints A and B in Appendix 9.4.
LPA2	Penmaen Park Sensitivity: High Distance from Scheme: Within Scheme extents	Views from within Penmaen Park have a northern aspect across with highly scenic views across the A55 and existing roundabout junction towards Anglesey, Penmon Lighthouse and Puffin Island. The park is crossed by PROW 18/02 and 18/03 with park benches alongside and a popular area of general amenity for local residents. Penmaen Park is also an area of essential setting for Wern Isaf, a Grade II* Listed Building and on the Register of Parks and Gardens.	Site clearance works will remove the existing vegetation along the southern boundary of Penmaenmawr Road and the existing roadside plantations adjacent to and west of the existing roundabout. The two properties of 8 and 9 Penmaen Park would be demolished. The result would be unmitigated and open views of the A55 road corridor that would become the dominant feature in the view. The ensuing construction period would see high levels of activity throughout the duration that would be highly visible to residents resulting in a large adverse effect. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	There would be open views of the new junction and overbridge particularly during the winter months when the parkland trees are not in leaf. Mitigation planting on the southern side of the Penmaenmawr Road and on upper levels of the cutting would be undertaken during this phase but would take time to establish. The cutting with a maximum depth of 8 metres, would screen the views of traffic along Penmaenmawr Road. Magnitude: **Major Adverse** Effect: **Very Large Adverse**	Tree and shrub planting on upper levels of the cutting would establish and screen views of Penmaenmawr Road and sections of the new junction. However, the overbridge and upper sections of the slip road would remain visible and be perceptible to sensitive visual receptors Magnitude: **Moderate Adverse** Effect: **Large Adverse**	Refer to Representative Viewpoint G Penmaen Park in Appendix 9.4. For details on Wern Isaf refer to Chapter 9 para 9.5.30 and Chapter 10 Archaeology and Cultural Heritage.

No/Ref	Local Road Network (LRN) Description Sensitivity and Distance from Scheme	Existing View	Magnitude of Impact and Significance of effect during Construction Phase	Magnitude of Impact and Significance of effect Winter Year 1 (without mitigation)	Magnitude of Impact and Significance of effect Summer Year 15 (with mitigation)	Explanatory Notes/Comments
LRN01	A55 Users Sensitivity: Low Distance from Scheme: Within Scheme extents	The view from the existing A55 is focussed along the road corridor to the east and west with overhead gantries, signs and lighting typical elements within the road corridor. To the west views are contained by roadside planting with backdrop views to Snowdonia hills. To the east views are contained by the hillside of Penmaenmawr mountain and retaining walls of the A55 eastbound carriageway Views from the existing Junction 15 roundabout are open to the north with views of the Anglesey and Puffin Island.with open views across the sea towards the Greta Orme. To the south views are contained by the adjacent flats and properties with a backdrop of mountains with the existing roadside vegetation screening views to the south-west.	There will be significant disruption to the view of the existing road users during the Construction Period. Plant and machinery, temporary road diversions and lane closures will all be significant and focal points in the view. Road users are likely to be operating at reduced speeds and may be stationary at time during construction. Where areas of existing roadside vegetation is lost due to site clearance operations, views will become more open towards adjacent residential properties, particularly to the south and either side of the existing roundabout. The construction of the new overbridge and associated slip roads would mean the views from the road constantly changing during the 18-24 month period and deterioration in the view with far reaching scenic views being compromised by works within the road corridor. Magnitude: **Major Adverse** Effect: **Moderate Adverse**	The completed overbridge and slip roads would contain views to within the road corridor. Open views to the north would be restricted by the new viaduct and 2-metre-high noise barrier fencing, views east and west would become dominated by the overbridge. Views south would be contained by retaining walls. The overall effect would be a moderate adverse change in the view for receptors of low sensitivity over a short distance in the vicinity of the junction. Users of the road would be travelling at speed through this section of the completed Scheme. Users of the slip roads and overbridge would have open views to the east and west, similar to the existing but elevated by circa 7.0 metres. Views north would be contained by the bridge parapet (1.4 metres high) for average cars, users of high sided vehicles and other commercial vehicles would have views north across the open sea towards Anglesey and Puffin Island. For users of the eastern slip roads views would be contained by bridge parapets 1.4 – 2.4 metres high. Users of west bound slip roads would have clear views of the upper stories of properties to the south. Magnitude: **Moderate Adverse** Effect: **Slight Adverse**	The views of the completed scheme after 15 years would remain similar to Winter Year 1. Planting on the southern verge would be partially screened from view by 2.5 metre high noise barrier west of the junction. There would be no significant change in view for road users from Winter Year 1 and therefore the visual effects as a result of the Scheme would remain as Slight Adverse. Magnitude: **Moderate Adverse** Effect: **Slight Adverse**	Refer to Representative Viewpoint C Penmaenmawr Footbridge in Appendix 9.4.
LRN02	Penmaenmawr Road Sensitivity: Low Distance from Scheme: Within Scheme extents	Penmaenmawr Road will remain as the principal route into Llanfairfechan from the east. The road would be modified and realigned as part of the Scheme where it connects to the new overbridge. West of Junction 15, current views for users of the road corridor are generally contained by properties and buildings to the north and existing vegetation to the south. East of Junction 15, views are more open with the A55 screened by properties of Fernbank and scrub vegetation to the north with residential properties and Penmaen Park to the south.	Views for users of Penmaenmawr Road would inevitably change significantly close to the new junction. Either side the views would remain very similar to the existing. There would be some tree and shrub clearance for the construction of the cycleway on the eastern approaches to the town centre but this is not considered to be significant. Close to the new overbridge and junction the change in view would be major adverse but his would be localised and limited to during the Construction Period. Magnitude: **Moderate Adverse** Effect: **Slight Adverse**	Winter Year 1 and the principal change in view to users of the road would be the new junction with overbridge and slip roads. This would not significantly change the or alter the overall view for users of the road. The magnitude of change would therefore be moderate adverse Resulting in an overall slight adverse visual effect due to the size and scale of the new junction. Magnitude: **Moderate Adverse** Effect: **Slight Adverse**	The verges of the junction would become established with tree and shrub planting and replace the existing roadside vegetation. Magnitude: **Slight Adverse** Effect: **Slight Adverse**	

ES Chapter 10 Appendices	
10.1	Location of Designated Sites
10.2	Designated Sites within 5km
10.3	Archaeology and Heritage Desk based Assessment
10.4	Scheduled Monuments in the vicinity of Junction 15
10.5	Geophysical Survey Report
10.6	List of Assets: Value, Impact and Significance
10.7	Heritage Impact Assessment

APPENDIX 10.1
LOCATION OF DESIGNATED SITES

Junction 15 Chapter 10 Appendix 10.1

PRN	Name	Community	NGR	Date	Condition	SAM	SAM ref	LB ref	LB 1	LB2*	LB2	Local List	P&G 1	P&G2*	P&G2	P&G3	HL	HL NumberHL Grade		CA	Info
SAM																					
255	Gwern y Plas Hut Group	Llanfairfechan	SH68657484	Roman	Poor 2018	x	CN072														
Listed																					
11575	Wern Isaf; Rosebriars	Llanfairfechan	SH6861075110	Post Med				3567		x					x						
66707	No.1 Bryn Haul	Llanfairfechan	SH6844374662	Post Med				3521			x										
66706	No.3 Bryn Haul	Llanfairfechan	SH6846474658	Post Med				3523			x										
66690	No.4 Bryn Haul	Llanfairfechan	SH6847374655	Post Med				3524			x										
66691	Former Stable Block at Bryn-y-Neuadd Hospital	Llanfairfechan	SH6773274659	Post Med				3516			x										
66692	GREENHILLS	Llanfairfechan	SH684957488	Post Med				3551			x										
66693	Post Box	Llanfairfechan	SH6837574696	Post Med				3540			x										
66694	Grey Gables	Llanfairfechan	SH6850374840	Post Med				3549			x										
5839	Grey Gables	Llanfairfechan	SH6845274662	Post Med				3522			x										
66695	Northfield	Llanfairfechan	SH6831674738	Post Med				3526			x										
66703	Northfield	Llanfairfechan	SH6829074748	Post Med				3558			x										
66696	Neuadd Wen	Llanfairfechan	SH6849274913	Post Med				3552			x										
66698	Paragon Electrical Shop	Llanfairfechan	SH6806474893	Post Med				5840			x										
66699	Fron Goch	Llanfairfechan	SH6837074542	Post Med				3572			x										
66700	Garden Fountain in grounds at Bryn-y-Neuadd Hospital	Llanfairfechan	SH6760374564	Post Med				3517			x										
66701	Carreg Wen	Llanfairfechan	SH6832974530	Post Med				5839			x										
3521	Gorsefield	Llanfairfechan	SH6769875184	Post Med				5847			x										
66709	Hilcroft	Llanfairfechan	SH6843374719	Post Med				3535			x										
66710	Maes Aled	Llanfairfechan	SH6845274712	Post Med				3536			x										
66718	Rose Lea	Llanfairfechan	SH6839274724	Post Med				3533			x										
66731	Trewen	Llanfairfechan	SH6840274688	Post Med				3539			x										
66732	Bryn Ffawydd	Llanfairfechan	SH6846974759	Post Med				3544			x										
66711	Plas Farmhouse (Henblas Farm	Llanfairfechan	SH6833774804	Post Med				3559			x										
66717	Plas Farm Outbuildings (Henblas Farm Outbuildings)	Llanfairfechan	SH6833874773	Post Med				3560			x										
66714	Granary/Cartshed	Llanfairfechan	SH6829574774	Post Med				3564			x										
66712	Hillcrest	Llanfairfechan	SH6848674826	Post Med				3548			x										
66713	Parciau	Llanfairfechan	SH6846974702	Post Med				3537			x										
66725	Araulfan	Llanfairfechan	SH6848174688	Post Med				3538			x										
66745	Slate Fence To Se Of Araulfan	Llanfairfechan	SH6848274679	Post Med				3542			x										
66728	Carreg Frau	Llanfairfechan	SH6849674721	Post Med				3543			x										
66730	Bolnhurst	Llanfairfechan	SH6834074753	Post Med				3530			x										
66734	Brooklands	Llanfairfechan	SH6832774720	Post Med				3527			x										
66737	Beamsmoor	Llanfairfechan	SH6844874941	Post Med				3563			x										
66739	The Haven	Llanfairfechan	SH6836174693	Post Med				3529			x										
66740	Dwyfor	Llanfairfechan	SH6850074865	Post Med				3550			x										
66742	Aey y Gwynt	Llanfairfechan	SH6846774791	Post Med				3545			x										
66743	Acorn Cottage	Llanfairfechan	SH6852474798	Post Med				3546			x										
66753	Whilome	Llanfairfechan	SH6837174730	Post Med				3532			x										
66744	Talfor	Llanfairfechan	SH6770575189	Post Med				5846			x										
66752	Woodcot	Llanfairfechan	SH6835974742	Post Med				3531			x										
66748	Efrydfa	Llanfairfechan	SH6843774686	Post Med				3541			x										
66760	Ty Hwnt Yr Afon	Llanfairfechan	SH6841474725	Post Med				3534			x										
66756	Coedfa	Llanfairfechan	SH6834374706	Post Med				3528			x										
66757	Plas Llanfair Cottage	Llanfairfechan	SH6818274798	Post Med				5843			x										
66755	White Friars	Llanfairfechan	SH6766775160	Post Med				5848			x										
66749	Carreg Llwyd	Llanfairfechan	SH6853574836	Post Med				3547			x										
3568	Church Men's Club (Church Institute)	Llanfairfechan	SH6830774820	Post Med				3566			x										
66721	Church Institute	Llanfairfechan	SH6830874796	Post Med				3565		x											
66733	Church Cottages	Llanfairfechan	SH6813274731	Post Med				3514			x										
66715	Llanfair Arms Ph	Llanfairfechan	SH6838174602	Post Med				3556			x										

66716	B & H Stores	Llanfairfechan	SH6833974646	Post Med				5845			x											
66719	Pont-y-Pentre	Llanfairfechan	SH6837374623	Post Med				3568			x											
66722	Church Cottages	Llanfairfechan	SH6812974724	Post Med				3513			x											
66723	Christ Church	Llanfairfechan	SH681377468	Post Med				3512			x											
6991	Llanfairfechan Parish Church	Llanfairfechan	SH6829074570	Post Med				3571			x											
66724	Preswylfa	Llanfairfechan	SH6840374792	Post Med				3561			x											
66746	Slate Fence To N Of Lodge To Preswylfa	Llanfairfechan	SH6834174859	Post Med				3562			x											
66726	The Towers	Llanfairfechan	SH6791975391	Post Med				3525			x											
66727	Slate Fence Opposite Ne Corner Of Beamsmoor	Llanfairfechan	SH6847774966	Post Med				3553			x											
66729	Bryn-Y-Neuadd Farmhouse, Including Attached Dairy	Llanfairfechan	SH6799174777	Post Med				3518		x												
66759	Dutch Barn At Bryn-Y-Neuadd Farm	Llanfairfechan	SH6804274848	Post Med				3520			x											
66751	Courtyard Ranges Of Agricultural Buildings At Bryn-Y-Neuadd Farm	Llanfairfechan	SH6798674825	Post Med				3519			x											
66735	Bronrardd	Llanfairfechan	SH6802174920	Post Med				5841			x											
66736	Bodafon	Llanfairfechan	SH6842974602	Post Med				3555			x											
66747	The Original Fish & Chip Shop	Llanfairfechan	SH6836474594	Post Med				3570			x											
66750	War Memorial, Llanfairfechan	Llanfairfechan	SH6809774758	Post Med				3515			x											Designed by North
66754	Cottage At Pont-Y-Pentre	Llanfairfechan	SH6836274613	Post Med				3569			x											
66758	Plas Newydd	Llanfairfechan	SH6823174752	Post Med				5844			x											
69003	Nant,	Llanfairfechan	SH6865874319	Post Med				87665			x											
74906	Gwynfor	Llanfairfechan	SH6800875370	Modern 20th							x											
P&G																						
4407	Bryn-y-neuadd Hospital Grounds	Llanfairfechan	SH67707470	rden Post Med											x							
4475	Wern Isaf; Rosebriars	Llanfairfechan	SH68007500	rden Post Med											x							
HL																						
15814																	North Arllechwedd	12	Outstanding			
CA																						
62440	Llanfairfechan CA	Llanfairfechan	SH6846674852																x			
62441	Llanfairfechan Town Centre	Llanfairfechan	SH6834975202																x			
HER																						
24736	Stone AxeCaerhun		SH69167515	Neolithic																		
67414	Stone axe findspot	Llanfairfechan	SH6855474268	Neolithic																		
67330	Stone Axe Working Area, Ffridd Tan y Graig	Llanfairfechan	SH69157518	Neolithic																		
67415	Stone axe roughout findspot, Ffridd Tan y Graig	Llanfairfechan	SH69187517	Neolithic																		
67641	Stone axe roughout, Tyddyn Drain	Llanfairfechan	SH68877478	Neolithic																		
67642	Stone axe roughout, Ffridd Tan y Graig	Llanfairfechan	SH6912775210	Neolithic																		
67644	Stone axe roughouts, N of Henar	Llanfairfechan	SH6902875327	Neolithic																		
67779	Stone axe roughout,	Llanfairfechan	SH684747	Neolithic																		
67783	Stone axe roughout, Ffridd Tan y Graig	Llanfairfechan	SH69167515	Neolithic																		
67782	Stone axe-hammer, Park Nant	Llanfairfechan	SH6874074277	Bronze Age																		
4094	Graig Lwyd Roughout	Llanfairfechan	SH68487482	Prehistoric																		
4096	Coin Hoard	Llanfairfechan	SH68907550	Roman																		
31690	Hut Circle, Possible, Tyddyn Drain	Llanfairfechan	SH68907483	Roman																		
62315	Rectory,	Llanfairfechan	SH6816474615	Post Med																		
62317	Benarth House	Llanfairfechan	SH6808475084	Post Med																		Belgian Refugees
62304	Plas Llanfair (Y Plas	Llanfairfechan	SH6833574945	Post Med	Built over																	
56317	Crushing Mill	Llanfairfechan	SH6901875574	Post Med																		
56318	Footbridge, NE of Tyddyn Drycin	Llanfairfechan	SH6899975643	Post Med																		
56316	House, Bryn Goleu	Llanfairfechan	SH6879875466	Post Med	Demolished																	
33361	English Wesleyan Methodist Church	Llanfairfechan	SH6814274904	Post Med								BSLI/059										

62369	Clergy House of Rest	Llanfairfechan	SH6872275619	Post Med	Under A55																Belgian Refugees
31691	Graffitied Stones, Tyddyn Drain	Llanfairfechan	SH68907486	Post Med																	
77131	Milestone, Nant-y-Felin	Llanfairfechan	SH67807435	Post Med	TelfordA5																
77190	Training Camp,	Llanfairfechan	SH6786075300	Modern	reation grd now																
62354	Electric Motor, Penmaenmawr Quarry	Penmaenmawr	sh69627528	Modern																	
6389	St. Winifred's School Chapel	Llanfairfechan	SH68307490	Modern																	
24157	Figurine Fragment	Llanfairfechan	SH68977567	Modern																	
58782	Line of the Post Road, Conwy to Bangor	Llanfairfechan	SH6803974682	Multi Period																	
32070	Ffynnon Fair,	Llanfairfechan	SH68247468	Unknown																	
34623	Felin-henLlanfairfechan		SH6901474365	Unknown																	
34625	Nant Upper Mill	Llanfairfechan	SH6855274358	Unknown	Built over																
34630	Mill, Ye Olde Mill Stores	Llanfairfechan	SH6841074580	Unknown																	

APPENDIX 10.2
DESIGNATED SITES WITHIN 5KM

Junction 15 Designated Sites within 5km Appendix 10.2

Cadw No	Name	Date	GR	SAM	LISTED	Value	Impact	Significance
CN 072	Gwern y Plas ancient village	Prehistoric	SH 68680 74830	x		High	Minor	Moderate/Slight
CN 250	Hut Circles near Wern Newydd	Romano/British	SH 6733574126	x		High	Minor	Moderate/Slight
CN 330	Cae'r Haidd Deserted Rural Settlement	Medieval	SH 68072 73155	x		High	Negligible	Slight
CN185	Garreg Fawr Hut Groups, Ancient Fields and Cairns	Prehistoric	SH 68520 73425	x		High	Negligible	Slight
CN184	Pont y Teiryd Hut Group and Ancient Fields	Prehistoric	SH 69526 73554	x		High	Negligible	Slight
CN049	Dinas Camp	Prehistoric	SH70017 73832	x		High	Negligible	Slight
CN351	Waun Llanfair barrow	Prehistoric	SH 70521 74126	x		High	Negligible	Slight
CN283	Hut Circles at Clip yr Orsedd	Prehistoric	SH 71091 75018	x		High	Negligible	Slight
CN024	Penmaenmawr Stone Circle	Prehistoric	SH 72114 74606	x		High	Negligible	Slight
CN340	Maen Crwn Standing Stone	Prehistoric	SH 73101 74991	x		High	Negligible	Slight
CN339	Bryn Derwydd Stone Circle	Prehistoric	SH 73226 75055	x		High	Negligible	Slight
CN352	Bryniau Bugellydd Cairns	Prehistoric	SH 71835 74030	x		High	Negligible	Slight
CN350	Cerrig Gwynion Cairn	Prehistoric	SH 72257 74030	x		High	Negligible	Slight
CN349	Foel Llwyd, Cairn to N	Prehistoric	SH 71983 73343	x		High	Negligible	Slight
CN348	Foel Llwyd, Cairn to NW	Prehistoric	SH 71389 72740	x		High	Negligible	Slight
CN306	Hut Circles West of Foel Llwyd	Prehistoric	SH 71347 72403	x		High	Negligible	Slight
CN129	Bwlch y Ddeufaen Standing Stones	Prehistoric	SH 71450 71812	x		High	Negligible	Slight
CN131	Barcloddiad-y-Gawres Round Cairn	Prehistoric	SH 71730 71607	x		High	Negligible	Slight
CN341	Yr Orsedd, cairn to NNW of	Prehistoric	SH 69096 72119	x		High	Negligible	Slight

Junction 15 Designated Sites within 5km Appendix 10.2

CN342	Foel Dduarth, Cairn to NE of	Prehistoric	SH 68339 72029	x		High	Negligible	Slight
CN122	Foel Dduarth Enclosure	Prehistoric	SH 68004 71745	x		High	Negligible	Slight
CN138	Carnedd y Saeson & Neighbouring Cairns NW of Foel Dduarth	Prehistoric	SH 67841 71759	x		High	Negligible	Slight
CN123	Hut Group W of Foel Dduarth	Prehistoric	SH 67720 71608	x		High	Negligible	Slight
CN286	Hut Circle and Rectangular Hut N of Wern y Pandy	Prehistoric	SH67550 71825	x		High	Negligible	Slight
CN135	Hut Group 180m NW of Hafod-y-Gelyn	Prehistoric	SH 67469 71436	x		High	Negligible	Slight
CN308	Meuryn Isaf Cairn	Prehistoric	SH 67123 70908	x		High	Negligible	Slight
CN244	Hut Circle E of Afon Rhaeadr Fawr	Prehistoric	SH 66641 71050	x		High	Negligible	Slight
CN038	Maes y Gaer Camp (Hillfort)	Prehistoric	SH 66323 72505	x		High	Negligible	Slight
CN136	Hut Group 750m SE of Bod Sillin	Prehistoric	SH 67758 72276	x		High	Negligible	Slight
CN285	Enclosed Hut Circle Settlement SE of Bod Sillin	Prehistoric	SH 67666 72240	x		High	Negligible	Slight
CN402	Roman Road NW of Llanerch Fedw	Roman	SH 70630 72017	x		High	Negligible	Slight
CN137	Medieval Homestead 400m SE of Maes y Gaer	Medieval	SH 66683 72275	x		High	Negligible	Slight
CN218	Enclosure & Associated Structures at Pen-y-Bryn	Medieval	SH 65805 72779	x		High	Negligible	Slight
CN007	Aber Castle Mound (Pen-y-Mwd)	Medieval	SH 65668 72640	x		High	Negligible	Slight
CN061	Bont-Newydd	Post Medieval/Modern	SH 66260 72007	x		High	Negligible	Slight
16521	Incline Drumhouse at Middle Bank	Post Med/Industrial	SH6955474664		II	Medium	Negligible	Neutral/Slight
3557	The Lodge	Post Med	SH6955474664		II	Medium	Negligible	Neutral/Slight
3554	Glan-yr-Afon Farmhouse	Post Med	SH6996174452		II	Medium	Negligible	Neutral/Slight
5842	Tan yr Allt Isaf	Post Med	SH6852073956		II	Medium	Negligible	Neutral/Slight
5850	One of a pair of Cottages	Post Med	SH6673974253		II	Medium	Negligible	Neutral/Slight

Junction 15 Designated Sites within 5km Appendix 10.2

22910	Gatehouse range including stabling, cowhouses and walls enclosing yard to south at Madryn Farm	Post Med	SH6645873546		II	Medium	Negligible	Neutral/Slight
22917	Cart shelter, barn, granary and smithy at Madryn Farm	Post Med	SH6646873498		II	Medium	Negligible	Neutral/Slight
22916	Stable range in yard at Madryn Farm	Post Med	SH6644073520		II	Medium	Negligible	Neutral/Slight

APPENDIX 10.3
ARCHAEOLOGY AND HERITAGE DESK BASED ASSESSMENT

A55 Junction 15

Archaeology and Heritage Desk Based Assessment

1. Introduction:

1.1 This Archaeology and Heritage Desk-Based Assessment has been prepared by Fiona Gale, Consultant Archaeologist, RML Ltd, as part of the assessment process leading to the Environmental Impact Assessment for proposed Junction alteration at Junction 15 on the A55 North Wales.

Fiona Gale is an Associate member of the Chartered Institute for Archaeologists (CIfA).

2. Aims and Objectives:

2.1 This assessment has been carried out in accordance with the Chartered Institute for Archaeologists (CIfA) standard definition of a desk-based assessment (Standard and Guidance for Historic Environment Desk-Based Assessment, 2014):

Desk-based assessment will determine, as far as is reasonably possible from existing records, the nature, extent and significance of the historic environment within a specified area. Deskbased assessment will be undertaken using appropriate methods and practices which satisfy the stated aims of the project, and which comply with the Code of Conduct and other relevant regulations of CIfA. In a development context, desk-based assessment will establish the impact of the proposed development on the significance of the historic environment (or will identify the need for further evaluation to do so), and will enable reasoned proposals and decisions to be made whether to mitigate, offset or accept without further intervention that impact.

This study examines the cultural heritage potential of the proposed development site and the surrounding area. The aim of the study is to:

- Identify recorded cultural heritage sites within the site boundary and assess its heritage significance/value;
- Identify the potential for previously unrecorded sites to be present within the site;
- Identify potential impacts and mitigation strategies where appropriate; and
- Make recommendations for further work where required.

Cultural heritage within this context includes all buried and upstanding archaeological remains, built heritage sites, historic landscapes and any other features that contribute to the archaeological and historic interest of the area.

This baseline assessment considers the cultural heritage potential within the site itself, the surrounding area and wider local and regional context. This assessment does not attempt to plot and review every archaeological find and monument; rather it aims to examine the distribution of evidence and to use this to predict the archaeological potential of the study area and the likely impact of the development proposals upon those remains. See Figure 10.1 and 10.2)

2.2 Site Description

The A55 is the key route across North Wales, known as the North Wales Expressway it links into the ferry terminal at Holyhead and thus across to Ireland. The route was improved by Thomas Telford in the 1820s, the route has been upgraded to its current Expressway status in the intervening years with the most recent improvements to the east at Conwy/Colwyn Bay and Rhuallt Hill in the 1980s and 90s and the west across Anglesey. Junction 15, located at SH 6855 7550 is currently served by a roundabout.

The Site is Coastal the railway and sea to the north and land rising steeply to the south. There is extensive quarrying in the land to the south of the A55, where extremely hard granite has been quarried notably in the 19th and 20th centuries. In the location of Junction 15 the underlying bedrocks are Nant Ffrancon Sedimentary Siltstones dating to the

Ordovician period with overlying glacial tills from the Quaternary. (http://www.bgs.ac.uk/data/mapViewers/: accessed March 2019).

2.3 Development Proposals

Junction 15 on the A55 North Wales Expressway is currently served by a roundabout. There are proposals to remove the roundabout and alter the exit to one with slip roads. See plan in Appendix 1

3. Methodology

3.1 Impact assessment has been carried out through the consideration of baseline conditions in relation to the elements of the scheme that could cause cultural heritage impacts. Baseline conditions are defined as the existing environmental conditions and in applicable cases, the conditions that would develop in the future without the scheme. In accordance with best practice this report assumes that the scheme will be constructed, although the use of the word 'will' in the text should not be taken to mean that implementation of the scheme is certain.

No standardised method of evaluation and assessment is provided for the general assessment of impact significance upon cultural heritage although in May 2017 Cadw issued guidance on ' *Heritage Impact Assessment*' particularly applying to listed building, conservation area and scheduled monument when seeking consent for change. Principles outlined in this will be applied here.

Amalgamating guidance from the 'Heritage Impact assessment' and the Secretary of State's criteria for Scheduling Monuments (Scheduled Monument Statement, Annex 1), Design Manual for Roads and Bridges, Volume 11, Part 3, Section 2, HA 208/07 and Transport Analysis Guidance (TAG Unit 3.3.9, Heritage of Historic Resources Sub-Objective) has been used to assess impact. Professional judgment is also used in conjunction with these criteria to undertake the impact assessment.

3.2 Sources Consulted

A study area of a 1km radius from the centre of the proposed development has been examined to assess the nature of the surrounding heritage sites, and to place these sites within their archaeological and historic context. The sources consulted were:

- Gwynedd Regional Historic Environment Record (HER);
- Cadw and Local Planning Authority for designated sites;
- Caernarfonshire Archives;
- Historic mapping and aerial photographs including early Ordnance Survey maps; and LiDAR data
- Appropriate documentary sources and archaeological journals.
- Including:
- National Library Wales
- Royal Commission on Ancient and Historic Monuments Wales

A site walkover survey was undertaken on the June 11 2019 to identify potential unrecorded heritage assets within the development site and to assess the suitability for mitigation measures. The site visit also assessed the potential impact of the development upon recorded heritage assets and their settings.

4. Legislation and Planning Policy Context

4.1 Ancient Monuments and Archaeological Areas Act 1979.

Scheduled Monuments are designated by the Welsh Ministers on the advice of Cadw as selective examples of nationally important archaeological remains. Under the terms of Part 1 Section 2 of the Ancient Monuments and Archaeological Areas Act 1979 it is an offence to damage, disturb or alter a Scheduled Monument either above or below ground without

first obtaining permission from the Welsh Ministers. This Act does not allow for the protection of the setting of Scheduled Monuments.

4.2 Planning (Listed Buildings and Conservation Areas)Act 1990

The act outlines the provisions for designation, control of works and enforcement measures relating to Listed Buildings and Conservation Areas. Section 66 of the Act states that the planning authority must have special regard to the desirability of preserving or enhancing the character or appearance of Conservation Areas.

4.3 Historic Environment (Wales) Act 2016

The Act amends the two pieces of UK legislation — the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990 — that currently provide the framework for the protection and management of the Welsh historic environment. It also contains new stand-alone provisions relating to historic place names; historic environment records and the Advisory Panel for the Historic Environment in Wales. It has three main aims:

- to give more effective protection to listed buildings and scheduled monuments;
- to improve the sustainable management of the historic environment; and
- to introduce greater transparency and accountability into decisions taken on the historic environment.

4.4 Planning Policy Wales Edition 10 Chapter 6 (Distinctive and Natural Places - Historic Environment) December 2018

Planning Policy Wales, Chapter 6, sets out the policies with regards to the historic environment and planning. The policies also contain guidance for local authorities to consider when developing local plans, including the effect of the re-use or new developments on historic areas and buildings. The policies outline the Welsh Government's objectives to protect, conserve, promote and enhance the historic environment as a resource for the general well-being of present and future generations. and specifically to:

- Protect the Outstanding Universal Value of the World Heritage Sites in Wales:
- Conserve archaeological remains, both for their own sake and their role in education, leisure and the economy;
- Safeguard the character of historic buildings and manage change so that their special architectural and historic interest is preserved;
- • Preserve or enhance the character or appearance of conservation areas, whilst the same time helping them remain vibrant and prosperous;
- • Preserve the special interest of sites on the register of historic parks and gardens in Wales; and
- • Protect areas on the register of historic landscapes in Wales.

The duties of the Welsh Ministers to the historic environment of Wales are exercised through the Welsh Government's historic environment service (Cadw).

Section 6.1 contains advice on development management policies for making informed decisions on any proposed developments that may impact the historic environment. If development is likely to effect archaeological remains, throughout the guidance, the need for early consultation between developers and planning authorities, plus the need for an archaeological assessment to be carried out early in the process is heavily stressed.

The historic environment refers to all surviving physical remains of past human activity. The conservation of archaeological remains is a material consideration in determining a planning application. Where nationally important archaeological remains and listed buildings and their settings are likely to be affected by the proposed development, there should be a presumption in favour of their physical protection in situ. In cases involving less significant archaeological remains, local planning authorities will need to weigh the relative importance of the archaeological remains and their settings against other factors,

including the need for the proposed development. The needs of archaeology and development may be reconciled if development discuss their proposal with the local planning authority at an early stage in pre-application discussions. Where it is not feasible to preserve remains in situ, an acceptable alternative may be to arrange prior excavation and recording of archaeological remains and the publication of the results by means of granting planning permission subject to a negative condition.

There should be a general presumption in favour for the preservation of Listed Buildings and their settings that may be affected by the proposed development. The primary material consideration is to the statutory requirement to have special regard to the desirability of preserving the building, its setting or any features of special architectural or historic interest it possesses. The continuation or reinstatement of the original use should be the first option, but there should be flexibility in order to secure a building's survival or provide it with a sound economic future. Justification for alteration or demolition of Listed Buildings should be provided with applications. Conditions may be imposed for the recording of historic buildings.

There should be a presumption in favour for the preservation or enhancement of the character or appearance of Conservation Areas or their setting. Consideration of proposed developments in a conservation area should be made on the basis of a full application. There will be a strong presumption against the granting of planning permission for proposed developments, including advertisements, which damage the character or appearance of a conservation area or its setting. Preservation or enhancement of a conservation area can be achieved by a development which either makes a positive contribution to an area's character or appearance or leaves them unharmed.

World Heritage Sites and their settings (including their buffer zone, if applicable) are a material consideration in determining applications and the impacts of proposals. Cadw is a statutory consultee on planning applications likely to have an impact on the Outstanding Universal Value of a World Heritage Site.

When the local planning authority has identified historic assets of local interest, and included a policy in its development plan for their preservation and enhancement, any supporting supplementary planning guidance will be a material consideration when determining a planning application.

In relation to Parks, Gardens, on the first part of the Register of Landscapes, Parks and Gardens of Special Historic Interest, local planning authorities should protect and conserves parks and gardens and their settings included on this register. Cadw must be consulted on all planning applications where the proposed development is likely to affect the site of a historic park or garden or its setting, and the effect of the proposed development should be a material consideration in the determination of a planning application.

In relation to Historic Landscapes, on the second part of the register, should be considered by local planning authorities in considering the implications of developments which meet the criteria for Environmental Impact Assessment. Cadw must be consulted on development within a registered historic landscape area that requires an Environmental Impact Assessment.

PPW is underpinned by Technical Advice Note (TAN) 24, The Historic Environment (2017) (https://gweddill.gov.wales/topics/planning/policy/tans/tan-24/?lang=en) and a series of best practice guidance documents which cover the following issues:

Heritage Impact Assessment in Wales

Managing Change in World Heritage Sites in Wales

Managing Change to Listed Buildings in Wales

Managing Change to Registered Historic Parks and Gardens in Wales

Managing Conservation Areas in Wales

Managing Historic Character in Wales

Managing Listed Buildings at Risk in Wales

Managing Lists of Historic Assets of Special Local Interest in Wales

Setting of Historic Assets in Wales

4.5 Wellbeing of Future Generations Act (Wales) 2015

The Wellbeing of Future Generations Act (Wales) 2015, which came into force on April 1st 2016, requires public bodies to consider not only the present needs of local communities but also how decisions might affect people in the future. There are seven well-being goals identified: A prosperous Wales; A resilient Wales; A healthier Wales; A more equal Wales; A Wales of cohesive communities; A Wales of vibrant culture and thriving Welsh language and A globally responsible Wales. Particularly relevant to the historic environment is the goal concerning 'A Wales of vibrant culture….' *A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.*

4.6 Local Policy and Guidance

4.6.1 Conwy Local Development Plan 2007 -2022

The Conwy Local Development Plan (LDP) was adopted in October 2013 and is currently beginning the process of review. The current LDP states:

STRATEGIC POLICY CTH/1 – CULTURAL HERITAGE The council is committed to protecting and, where appropriate, enhancing its cultural and heritage assets. This will be achieved by:

a) Ensuring that the location of new development on both allocated and windfall sites within the Plan Area will not have a significant adverse impact upon heritage assets in line with Policies CTH/2 – 'Development Affecting Heritage Assets', DP/3 – 'Promoting Design Quality and Reducing Crime' and DP/6 – 'National Planning Policy and Guidance';

b) Recognising and respecting the value and character of heritage assets in the Plan Area and publishing Supplementary Planning Guidance to guide development proposals;

c) Seeking to preserve and, where appropriate, enhance conservation areas, Conwy World Heritage Site, historic landscapes, parks and gardens, listed buildings, scheduled ancient monuments and other areas of archaeological importance in line with Policy DP/6;

d) Protecting buildings and structures of local importance in line with Policy CTH/3 – 'Buildings and Structures of Local Importance';

e) Enhancing heritage assets through heritage and regeneration initiatives;

f) Preserving and securing the future of heritage assets by only permitting appropriate enabling development in line with Policy CTH/4 – 'Enabling Development'; g) Ensuring that development is compatible with the long-term viability of the Welsh Language in line with Policy CTH/5 – 'The Welsh Language'.

Policy CTH/2 states

DEVELOPMENT AFFECTING HERITAGE ASSETS Development proposals which affect a heritage asset listed below (a-f), and/or its setting, shall preserve or, where appropriate, enhance that asset. Development proposals will be considered in line with Policy DP/6, where applicable and Policy DP/3.

a) Conservation Areas

b) Conwy World Heritage Site

c) Historic Landscapes, Parks and Gardens

d) Listed Buildings

e) Scheduled Ancient Monuments

f) Sites of archaeological importance

Policy CTH/3, relating to buildings states:

BUILDINGS AND STRUCTURES OF LOCAL IMPORTANCE Development proposals affecting buildings or structures which make an important contribution to the character and interest of the local area will only be permitted where the building's distinctive appearance, architectural integrity and its setting would not be significantly adversely affected.

4.6.2 Supplementary Planning Guidance (SPG)

Associated with the Conwy LDP are a number of supplementary planning guides which set out, in greater detail, the approach to be taken with particular areas of interest. LDP8 (adopted February 2014) relates to Buildings and Structures of Local Importance and the development of a Register of locally important buildings and structures. The SPG provides the criteria for selection of sites which appear on the Register.

http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf

SPG LDP14 relates to Conservation Areas and was adopted in July 2015. This document provides generic guidance relating to the approach to development in Conservation |Areas and will be itself supplemented by detailed individual Conservation Area Management Plans.
https://spp.conwy.gov.uk/upload/public/attachments/645/LDP14_Conservation_Areas_SPG.pdf

SPG LDP42 gives detailed guidance for the approach to be taken to development within the World Heritage Site of The Castles and Town Walls of King Edward in Gwynedd and effectively adopts the WHS Management Plan and Action Plan as SPG.
https://spp.conwy.gov.uk/2017doc.asp?cat=12368&doc=38661

4.7 Priorities for the Historic Environment of Wales

In September 2018 the Welsh Government issued a statement outlining its priorities for the Historic Environment. The introduction notes *'The historic environment is the physical manifestation of Wales' cultural heritage; a precious inheritance that we must care for and pass on to our children to love, cherish and enjoy……..Caring for and appreciating our historic environment is not a marginal activity. It can play a key role in realising wider Welsh Government objectives. It contributes to all four themes of the National Strategy, Prosperity for All, by helping to deliver a more prosperous, active, learning and united nation. It can help underpin the ambitions set out in our Economic Action Plan by recognising the special places that form the backbone of our local economies. But most of all, it is at the heart of our well-being goals and our sense of pride as a nation……There is now a real opportunity for our outstanding heritage to be positioned at the centre of our future well-being. Heritage contributes so much to so many of our goals: a healthy and active lifestyle, our economic vitality, opportunities for lifelong learning and skills, a sustainable environment and resilient communities. And of course, returning to where I started, the historic environment sits at the very centre of our cultural identity as a nation. It tells the story of Wales' place in the world, from its early beginnings to its role at the heart of the making of the modern world.'*

5 Baseline Data

5.1 Designated Sites

5.1.1 World Heritage Sites

There are no World Heritage Sites (WHS) within the immediate environment of Junction 15, however the WHS, The Castle and Town Walls of Edward 1 in Gwynedd, includes Conwy Castle which is around eleven kilometres to the east and Caernarfon, 30.5 km to the west. Despite the relative proximity of Conwy Castle to the proposed junction alterations, the topography is such that highland separates the two locations and Conwy Castle is not impacted by the A55 as it is currently and this will not change with proposed alterations.

5.1.2 Scheduled Ancient Monuments

One scheduled monument lies within one kilometre of Junction 15, Gwern y Plas ancient village CN 072 Llanfairfechan SH 68680 74830, is a prehistoric settlement of nine or ten round huts and associated stone walls. The hut walls are predominantly grass covered. The site is within a small copse.

A further seven scheduled monuments (SAM) are within a 2 kilometre distance of the proposed junction changes at Junction 15. These include both prehistoric and medieval features. Prehistoric hut circles, CN 250, are located at SH 67335 74126 near Wern Newydd and are a rare survival in a low lying area. The remaining SAMs are within the upland area and include Garreg Fawr Hut Groups, Ancient Fields and Cairns CN 185 at SH 68520 73425, this prehistoric settlement is poorly preserved. Nearby is the Pont y Teiryd Hut Group and Ancient Fields CN 184 located at SH 69526 73554, also dates to the prehistoric period and is much better preserved. A fine barrow is preserved at Waun Llanfair, CN351, SH 70521 74126 dating to the Bronze Age while there is an Iron Age hillfort, Dinas, CN 049, protected as a SAM at SH70017 73832, although there has been much stone robbing in the past it is still possible to see a central enclosure with possibly three huts within. Partial excavation by Harold Hughes and Bezant Lowe took place in the 1920s when traces of at least 14 roundhouses were found. Hut Circles at Clip yr Orsedd, CN283, dating to the Iron Age/Roman period are noted at SH 71091 75018, the houses, associated field banks and clearance cairns were possibly linked to the now destroyed hillfort of Braich y Dinas as well as other prehistoric sites which have been destroyed by extensive quarrying in the area. A Medieval site is also protected as a SAM, that is Cae'r Haidd Deserted Rural Settlement, CN 330, at SH 68072 73155. The well preserved site which looks towards Anglesey and the Menai Straights is made up of three platform houses and three associated rectangular houses cut into the hillslope. (See Appendix 2)

5.1.3 **Listed Buildings**

There are 69 listed buildings within one kilometre of the junction proposals. All but three are graded Grade 2, with three at Grade 2*. All date to the Post Medieval period or later. Of these 33 are houses designed by the architect Herbert Luck North and his business partner Perceval Padmore. Herbert Luck North is a renowned Arts and Crafts architect, who was born in Leicester in 1871 but spent much of his childhood visiting Llanfairfechan where his grandparents lived from 1856. Trained as an architect in Cambridge and London his interest in domestic architecture and the Arts and Crafts movement was fostered by his working in Edwin Lutyens' practice in the late 1890s. From the early 1900s Luck North moved to Llanfairfechan and built his own house, Wern Isaf (LB 3567) where he also designed the garden, and began to develop the area now known as The Close which contains many of North's buildings as well as the Church Institute (LB 3565) and Men's Institute (LB3566) which he designed. The concentration of important Arts and Crafts buildings in Llanfairfechan is extremely important in Wales. Sadly St Winifred's schools in Llanfairfechan which North also designed was demolished in 1970 and replaced by housing. The three Grade 2* listed buildings in the Llanfairfechan area are all designed by Herbert Luck North.

The remaining listed buildings within a kilometre of the Junction proposals are predominantly 19th century buildings and include buildings associated with Bryn y Neuadd, a now demolished house which was built in the 1850s by industrialist John Platt (LB 3516, LB 3517, LB 3518, LB 3519, LB 3520). The site is now a hospital but contains several listed structures associated with the house and estate. Also listed are some commercial buildings, a post box and several lengths of traditional slate walling.

Within a two kilometre distance of Junction 15 are several more listed buildings in the upland areas. These include Glan yr Afon (LB 3554) farmhouse (SH 69961 74452) Listed Grade 2 and noted for being an unspoilt 19th century vernacular farmhouse and the Lodge (LB 3557) at Plas Heulog (SH 69554 74664) another North building graded at Grade 2. (See Appendix 2)

5.1.4 Conservation Areas

There are two Conservation areas in Llanfairfechan, one covering the Town Centre and one The Close. The listed buildings within the settlement are predominantly located in these two conservation areas. Until the 19th century Llanfairfechan was a small pastoral community. The settlement developed once Telford improved the coastal road route in the 1830s and then the railway station which opened in the 1860s. This along with growth of the quarries and of Llanfairfechan as a holiday destination led to the development of the area. Many of the buildings in the Town Centre Conservation area date to the mid 19th century, like Eglwys y Santes Fair and several of the estate buildings. While The Close Conservation Area is dominated by Herbert Luck North Arts and Crafts houses. (See Appendix 2)

5.1.5 Parks and Gardens

Within two kilometres of Junction 15 there are two sites noted on the Register of Parks and Gardens, both are within a short distance of the A55. Wern Isaf (or Rosebriars) is located at SH 6861 7508, just south of Junction 15. It is a Grade 2 Park and Garden which surrounds the house Wern Isaf (Grade 2*) which Herbert Luck North designed for himself in 1900. North designed the garden himself and it is virtually unchanged.

Bryn y Neuadd Park and Garden (SH 6743 7452) is also Grade 2 and was laid out in the Italianate style by the eminent Victorian garden designer Edward Milner in the 1850s as a garden for John Platt, a wealthy Oldham Industrialist who was developing the estate house and associated buildings. Although the house no longer survives some of the associated buildings do, and despite the site being developed as a hospital many of the original garden features survive. The grand house built by Platt became a hospital as early as 1898, linked to the North Wales Hospital in Denbigh. The mansion was destroyed and a new purpose built unit built in 1971 but many of the garden features including a French cast-iron fountain made by Brabezat and Cie in the 1850s remain. The garden is 600 metres to the west of Junction 15 and it's southern boundary is followed by the A55. (See Appendix 2)

5.1.6 Historic Landscapes

The North Arllechwedd Registered Historic Landscape surrounds the settlement of Llanfairfechan. The Register describes the geographical extent of this historic landscape as 'This area comprises the narrow coastal strip, uplands and dissected northern flanks of the Carneddau ridge in north Snowdonia. The topography is markedly varied with the south west half of the area deeply dissected by the valley of the Rivers Anafon and Aber up to the watershed summits of Gyrn, Drosgol, Garnedd Uchaf, Foel Fras and Drum which rise to between 580 and 926m above OD. In the east half, the narrow coastal strip gives way to coastal slopes and headlands that rise steeply to an upland plateau between 250 and 450m above OD, extending from the Aber valley to Dwygyfylchi. In the south east, the Bwlch y Ddeufaen pass provides a natural route to the Conwy valley which is outside the area (pp. 81–83), whilst Lavan Sands (Traeth Lafan), crossed by the line of the historic route from Anglesey, has been included on the north west of the area. ' The area contains remains from the prehistoric, Roman and Medieval periods and includes the site of

Neolithic axe factories as well as 'one of the most important concentrations of Bronze Age funerary and ritual monuments in western Britain'. The southern boundary of the Historic Landscape for a short distance follows the line of the A55 linking with the road at 1200 metre east of Junction 15. The Historic Landscape extends south to Garnedd uchaf in the Carneddau.

Historic Landscape Characterisation has taken place across the Historic Landscape and for completeness includes the whole coastal strip. The area close to Junction 15 falls into Area 12, Llanfairfechan, Area 13, Fieldscape around Gorwel and Area 14, Bryn y Neuadd and Coastal Plain. The characterisation notes that there was little development along the coastal strip until the nineteenth century. Llanfairfechan is 'Planned resort town, esplanade and shops, Art-and-Crafts style' which from the 16th century to the mid 19th was in the ownership of the Bulkeley family of Baron Hill and then sold to Richard Luck (Herbert Luck North's maternal grandfather) and the Platts of Bryn y Neuadd. Area 14, the Bryn y Neuadd estate and coastal plain is dominated by parkland features linked to the estate and 'To the south of the main road, improved pasture predominates, and the area is visibly still a highly managed landscape which preserves the feel of a Victorian estate, such as the fenced copses in the fields. Field boundaries are made up either of locally quarried stone or fences of purple slate slab'. (See Appendix 2)

5.2 Undesignated Data from the Historic Environment Record Data (see Appendix 2) and other sources

A total of 31 undesignated sites are known within one kilometre of Junction 15. These range in date from the Neolithic to the Modern period, with one multi period site and four sites of unknown date.

5.2.1 Prehistoric HER

Eleven sites in the HER data date to the prehistoric period. Unsurprisingly these all relate to the Graig Lwyd axe factory and are either finished axes or roughouts. The Graig Lwyd axe factory is sited on the highland south of Llanfairfechan/Penmaenmawr. The axe 'factory' was discovered by Hazeldine Warren[i] in June 1919 and 'explored' in 1920. Recent work by Jane Kenney, drawing together work by local expert Mr David Jones and identifying new stone sources in the area to the south of Llanfairfechan, has demonstrated that 'Instead of a single stone source it represents an extensive and complex landscape comparable to that at Great Langdale, Cumbria, including several stone sources and numerous working sites. (Kenney 2017).

5.2.2 Roman HER

The Roman route from Chester (Deva) to Caernarfon (Segontium) runs along the coastal area but from Conwy to Bangor it follows the higher land to the south of the coastal strip. The HER does however note a possible Romano British hut circle at Tyddyn Drain 700 metres to the south of Junction 15. The upper levels at the site indicate a much later sheepfold was added, no Roman material has come to light although Post Medieval pottery has been found in the surrounding area. A Hoard of Roman coins however was found at the foot of Penmaenmawr mountain, 370 metres to the south east of Junction 15. When found 30 of the coins were examined by Hubert Savory and predominantly dated to the 3rd century. Apparently some were deposited in Bangor Museum although there is now no record of them.

5.2.3 Medieval HER

No previously identified sites in the study area are known to date to the Medieval period, despite the location of the massively strong Conwy Castle and town eleven kilometres to the east. Nearby to the west Abergwyngregin was an important Llys site and it may be that modern development has obliterated much of the medieval remains, perhaps reflecting that Llanfairfechan has developed as a settlement in recent times.

5.2.4 Post Medieval and Modern HER

Fourteen of the sites noted on the HER date to the Post Medieval and Modern period. The majority of these are buildings both domestic and religious and include features like St Winifred's Chapel, designed by Herbert Luck North which was demolished in 1970, as well as a crushing Mill, English Weslyan Methodist Church, a WWI Training camp (now the Recreation ground) and a milestone located on Telford's early 19th century coastal route. Also noted are a Clergy House of Rest, presumed to have been destroyed in earlier road improvements along the A55.

5.2.5 Unknown Date HER

Three Mills are noted within the Llanfairfechan area, all of unknown date. The three mills appear to have been 'industrial' mills, most likely for corn. Ye Olde Mill Stores in the centre of the village has a millstone within the grounds but there is no other evidence of a Mill. None of these sites are close to the Junction or A55.Fynnon Fair is thought to have been a Holy Well, filled in in about 1874 although it is not noted in *Holy Wells of Wales* by Francis Jones, 1954.

5.2.6. Royal Commission Data

The catalogues of the Royal Commission on Ancient and Historic Monuments Wales (RCAHMW) have been examined. Much of the information repeats sites already noted on the HER. There are more chapels and 19th/20th century buildings noted but these do not materially alter the information already noted.

5.2.7 General Discussion

Llanfairfechan has developed in the post medieval period linked to both quarrying and to tourism. Visitors came predominantly once the Railway was in existence and holidaying at the coast became fashionable. The *Gossiping Guide to Wales* of 1885 describes Llanfairfechan as ' another pleasant watering place' and says that' Llanfair has grown with great rapidity of late years, and is now a long line of lodging houses, some of them facing the sea and some of them facing the mountains…..The sands make a favourite promenade, there are facilities for boating and bathing' It goes on to describe 'delightful walks in every direction'. By 1908 the *Gossiping Guide* describes more facilities in the settlement, including a recreation ground, tennis and golf links and the pleasant park and mansion of Bryn y Neuadd are highlighted. The Francis Ffrith collection (https://www.francisfrith.com/llanfairfechan/photos) includes a photograph of the beach at Llanfairfechan when the guest houses are beginning to be built and the settlement beginning to grow. By 1908 photographs of Station Road show a busy street with well stocked shops. At the coast is a terrace of large villas overlooking the sea most likely built as accommodation for visitors. The main street south from the coast has a well preserved series of shop fronts dating to the early 20th century, indicating a prosperous shopping experience to serve tourists and residents alike as shown in the Francis Ffrith images.

The London Midland and Scottish Railway (LMS) produced a poster promoting Llanfairfechan, The Gem of North Wales, in the 1930s. It shows many of the attractions of the town; people playing tennis, boating in the lake and the sea, swimming and strolling along the promenade; the sweep of guest houses facing the sea and beach huts at the shore and despite promoting the railway, it is hard to pick out the line.



LMS Railway poster promoting Llanfairfechan in the 1930s

The above illustration of Llanfarfechan was produced to advertise the coastal railway line, and the places along the route which it was possible to visit. It was produced at a time when the A55 in its current route did not exist and even the Railway line itself is hard to pick out within the illustration. It shows the sweep of 'boarding houses' along the 'front' in Llanfairfechan and Penmaenmawr Road behind. The green area between is where the A55 is now located.

Architecture in Llanfairfechan uses both local stone from the Penmaenmawr quarries and brick, easily brought in once the railway existed. The Arts and Crafts houses designed by Herbert Luck North are rendered, generally painted white although his own house, Wern Isaf, is left the natural grey colour. Alongside the 19th and early 20th century development there has been much building in the later years of the 20th century and early 21st, and a sense that many of these residents commute to work. The 2011 census identifies a greater than average percentage (19%) of retired people living in Llanfarfechan. The historic development of the town is reflected in the Conservation Area designations.

6 Historic Mapping Survey

6.5 Enclosure maps and estate maps

In checking the online database of Enclosure Awards compiled by Kain, Chapman and Oliver, there is no records of Enclosure maps and schedules existing for the Llanfairfechan area. Very often in areas where Tithe maps exist Enclosure awards are lacking and vice versa. http://enclosuremaps.data-archive.ac.uk/

6.6 Tithe maps

Payment of Tithes was a long established tradition whereby one tenth of a person's annual produce (crops, stock wool etc) were paid over to support the parish church. Payments in kind had sometimes been negotiated but this often led to disagreements between individual tithe payers and the local clergy. In August 1836 The Tithe Commutation Act was passed by Parliament. The Act established the Tithe Commission. Commissioners were responsible for producing reports on the agricultural potential of each area and for signing off the tithe award for each parish. The Commissioner with responsibility for north Wales was Aneurin Owen. There were no good maps at this time so Commissioners undertook surveys and mapped areas. Linked to the maps was an apportionment document which listed the name of the owner, occupant and size of all fields, often the name of the field was also given and what it was used for. The purpose of the documents was to set rates for the payment of tithe in money not in kind. Tithe maps were all produced between 1838 and 1850.

The Railway came to the north Wales coast in 1847 and this is shown in the Tithe maps for Llanfairfechan of the same year as an area of land set aside. The settlement itself is very small, with much of the land being owned by Sir Richard Bulkeley and the main use being agricultural.

The coastal road runs through east-west through the centre of the small settlement not right on the coast.

The upland area, later to be developed for quarrying is noted as waste, and the occupier noted as 'Common to the tenants', land which many of the local tenant farmers would have had rights to graze etc.

The National School (owner Sir Richard Bulkeley) and the Church are marked and a number of small properties around the school and church, to the south of the main road through Llanfairfechan (now Penmaenmawr Road).

Between Penmaenmawr Road and the railway a small house is noted as Bryn y Neuadd, in all likelihood a precursor to the later mansion built on the site. There is no road link between Penmaenmawr Road and the mouth of the river and the area to the east of the river in this location is noted as waste occupied in common.

The area to the seaward side of the railway at the mouth of Afon Llanfairfechan is undeveloped and noted as either arable, or pasture close to the railway.

To the east of the estuary, where Penmaenmawr Road originally began to run parallel to the coast (c. SH688757) a small property is shown and the surrounding land is owned by Sir Richard Bulkeley.

The area where Junction 15 is now located is completely undeveloped and is arable land owned by Sir Richard Bulkeley and occupied by William Jones. The field boundary which forms the western boundary of field one in the geophysical survey (Section 8) is shown.

https://places.library.wales/browse/53.259/-3.972/17?page=1&alt=



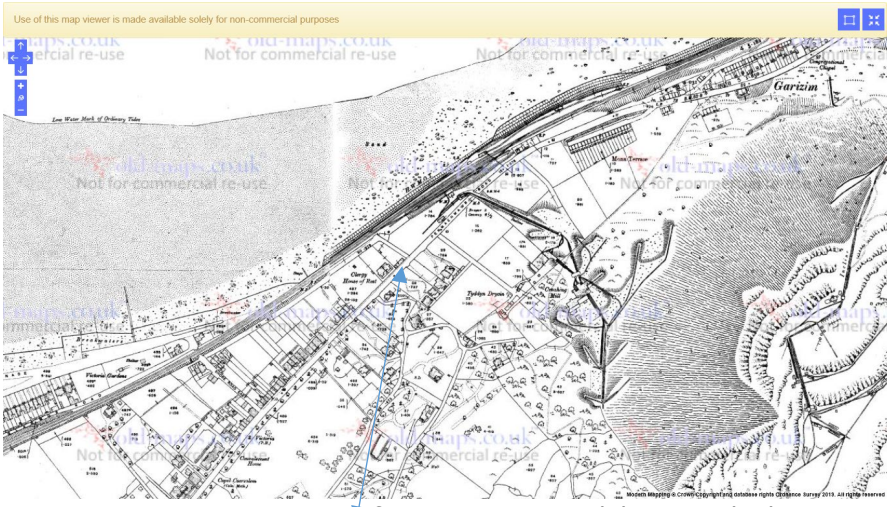
Tithe map Llanfairfechan, 1847 Location Of roundabout at Junction 15

6.7 Ordnance Survey mapping

The First Edition OS maps, 1:2500 series, dating to the mid 1880s with revisions following in 1898-1900 show the main development at Llanfairfechan largely following the river, Afon Llanfairfechan up towards Nant y Felin. There are houses along the promenade, but also a Sheepfold immediately at the coast, just to the east of the mouth of the river, perhaps indicating that it is early days in the development of Llanfairfechan as a seaside resort. The house Plas Llanfair, in the centre of the village, was built in 1857 for Mr and Mrs Richard Luck who were the grandparents of Arts and Crafts architect Herbert Luck North. Luck North himself altered the house in 1900.The house Bryn-y-Neuadd, is standing

complete with extensive glasshouses and an aviary. It is thought to have been built in the 1850s and was in 'Gothic-Italian' style. This is now the site of Bryn-y-Neuadd hospital whose grounds are noted on the Parks and Gardens Register. The mansion became a hospital for 'lunatics' in 1898. The main coast road route runs through the centre of Llanfairfechan following Penmaenmawr road. The buildings which are now immediately to the east of Junction 15 and are likely to be demolished are shown on this first edition , late 1880s map.

The second edition map of 1913 shows the Clergy House of Rest building which was demolished as part of the road and Junction 15 development and also shows development of the extraction tramways from the quarries and crushing mill above and to the south of Llanfairfechan. There are sidings to the railway which must have been linked to the quarry growth. The main east west route still follows the main road through Llanfairfechan. The second edition map also shows Rosebriar (now Wern Isaf) the house that Herbert Luck North designed for himself. This edition also shows the Convalescent Home, now The Heath owned by Conwy County Borough Council. The building is not shown on the 1900 map.



OS Map 1913 Location of Junction 15 roundabout marked.
(Different version of map needed to allow for commercial use)

The 1953 map still shows the coastal route following through the centre of Llanfairfechan. There are still routes from the quarries to the railway, and it is possible to see St Winifred's school buildings and The Close, the Herbert Luck North Arts and Crafts buildings which are such a feature of Llanfairfechan and were built throughout first third of the 20th century.

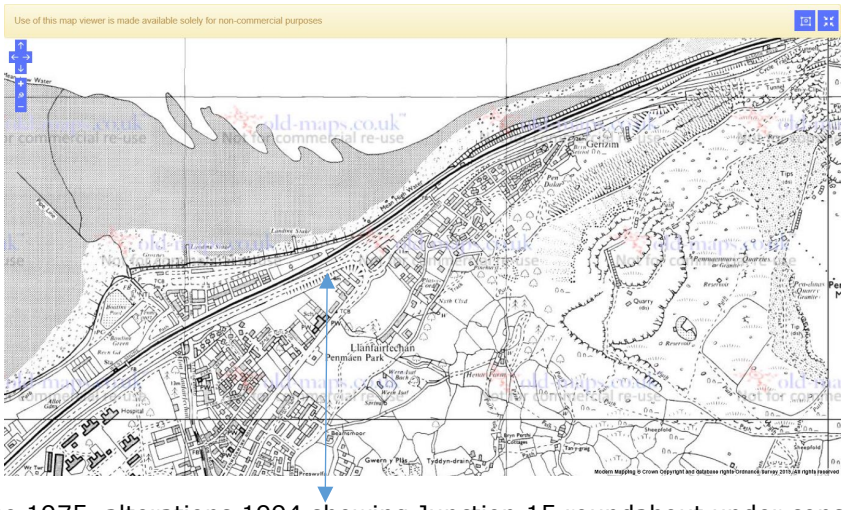
By 1963 the incline from the quarry is marked as disused, the development along Penmaenmawr Road is little altered and this route is still the main coastal route through the settlement.

The 1969 map shows housing development to the west of Junction 15 and east of Gerizim which appears to be in the process of construction in 1963.

The 1975 base shows the house, Bryn y Neuadd still standing, with hospital buildings developed in the grounds although records of the hospital kept in the People's Collection indicate that the mansion was demolished in 1971, indicating that revisions carried out to the map were not completely thorough.

In 1994 the OS mapping shows the coastal road route running parallel to the railway rather than through the centre of Llanfairfechan along Penmaenmawr Road, and shows, with a dashed line, that the roundabout is under construction. These are later alterations

on the 1975 base map. Revisions also show that by this time the house Bryn y Neuadd has been demolished although some of the associated buildings are still standing.



OS Map base 1975, alterations 1994 showing Junction 15 roundabout under construction

7 Aerial Photography

Vertical aerial photographs dating back to the 1940s are held by the RCAHMW. Those from the 1940s were undertaken by the Royal Air Force (RAF) while those dating to the later decades were commissioned from private companies. The Commission also holds some on shore oblique photographs taken by the RAF in the 1940s and 50s, these are 4" contact prints taken from glass negatives.

Aerial photographs from the following runs were examined:

RAF
Sheet 107, 58/2196 Frames 94-98 and 184-192
Sheet 107, 54/38 Frames 3018- 3025
Sheet 107,CPE/UK/1996 Frames 4102 -4107
OS
84 - 075 Fr 08,09,10,12,13,14,15,16
90 – 045 Fr 06-013
92 – 289 Fr 03 – 013
94 – 336 Fr 20 – 25

Also photographs from Meridian coverage were examined.

Through examination of the aerial photographs it is possible to see the development of Llanfairfechan and the A55. In the early 1940s and 1950s the coastal road goes through the centre of Llanfairfechan. The house Bryn y Neuadd is still standing and the grounds have not been developed into the hospital that now exists. The core of the settlement in the 1940s and 1950s is much as it is in the 2010s, with the Arts and Crafts houses of Herbert Luck North fully developed although his buildings at St Winifred's girl's school were still in existence. As time goes on it is possible to see the building of more housing both east and west of the main street north south in the settlement and between Penmaenmawr Road and the railway and the railway and the coast (compare Meridian photo 006, taken 31.07.1992 to RAF 13 Squadron, 71 Group, runs A1 to A24, 03.02.1941) and that St Winifred's school is replaced by housing. Aerial photographs of 1990 show the roundabout and slip roads at Junction 15 being constructed and by 1992 the junction is complete. By comparing the RAF run of 1941 and the later photographs of 1992 it is also

possible to see that although there is housing that has been constructed within that 50 year span, the construction of the Junction 15 and the roundabout with associated slip roads necessitated the removal of a number of buildings both immediately adjacent to the railway in the location of the roundabout and also along Penmaenmawr Road to accommodate the slip road to link in with Penmaenmawr Road.

8 LiDAR Data

LiDAR data has been collected for parts of Wales and is available online via Natural Resources Wales. Data at 1m resolution is available for the coastal area of Llanfairfechan. LiDAR data has the potential to highlight previously unknown features which are not visible to the naked eye but may be visible through very small changes in the local topography. Some of these features can be archaeological and relate to previously undiscovered sites or features.

The LiDAR data in the vicinity of Junction 15 and surrounding area does not indicate the presence of features or anomalies that have not been previously identified either within the Historic Environment Record or by the Geophysical Survey.

9 Site Walkover Survey

9.1 Initial discussion

A field survey was undertaken on June 16th 2019, all open areas in the vicinity of the Junction and proposed alterations were examined. The weather was clear when this survey was undertaken. Much of the open area has been heavily managed in recent years and it was impossible to know whether there are archaeological (buried) features present. Areas immediately adjacent to the current route of the A55 to the west of the roundabout at Junction 15. Areas at c SH683754, to the north of Ysgol Pant y Rhedyn, are currently sports pitches and have been levelled to accommodate this. While the embankments to the south of the A55 and west of the roundabout are overgrown and it is impossible to examine these areas. Fields to the south of Penmaenmawr Road are pasture and easily examined. (Appendix 3)

9.2 Results of Field Survey

Number	Site Name	Grid Ref SH	Description	Period	Survival	Condition	Significance
001	Wern Isaf Track	68507510	Metalled Track, hints of tarmac on parts of the surface but mainly stone. Track associated with Wern Isaf the Herbert Luck North designed house. Track in use as routeway, part of the rights of way network and on a promoted route	Post Medieval	Good	Good	Local
002	Wern Isaf Track 02	68607520	Metalled Track, hints of tarmac on parts of the surface but mainly stone. Track to drive of Wern Isaf the Herbert Luck North designed house. Track in use as routeway, part of the rights of way network and on a promoted orute	Post Medieval	Good	Good	Local

Number	Site Name	Grid Ref SH	Description	Period	Survival	Condition	Significance
003	Old Boundary near Wern Isaf	68497525	Disused boundary, partly made up of large boulders/erratics east west across the field and joining with track 001 which traverses the field	Post Medieval	Moderate	Poor	Local
004	Drain 1	68597538	Drain adjacent to Track 001, where small stream has been culverted under the track. Still in use	Post Medieval	Good	Good	Local
005	Drain 2	68507505	Drain adjacent to start of Track 001, where small stream has been culverted under the track. Still in use	Post Medieval	Good	Good	Local
006	Mound	68687535	Mound made up of large stones (Field clearance?) and modern rubble, still used as a dumping area, ringed in trees, includes modern building rubble and agruicultural refuse	Post Medieval	Moderate	Good	Local
007	Disused Boundary	68687535	Boundary/Lynchet links to Mound 006	Post Medieval	Moderate	Fair	Local
008	Slate Boundary Fence near Wern Isaf	68707540	Slate boundary fence, like those built by Herbert Luck North in the Close, it is very close to his own house of Wern Isaf	Post Medieval	Good	Good	Local
009	Enclosed Wood	68727519	Enclosed woodland copse, dry stone wall enclosure	Post Medieval	Moderate	Fair	Local

Table 1 List of features noted during Field Survey





Features noted during the field survey. Left: 004 Drain and right: 008 Slate boundary wall

All of the features noted during the field survey date to the Post Medieval period and are located away from the direct route proposals.

10 Geophysical Survey

10.1 Introduction

A geophysical survey across the main accessible open areas associated with Junction 15 was undertaken by Tigergeo during May 2019. Survey was undertaken using GNSS-tracked non-gradiometric arrays of caesium vapour magnetometers on non-magnetic platforms, including handcart and ATV based systems. The full report can be found in Appendix 4. As noted in the report 'Geophysical survey is reliant upon the detection of

anomalous values and patterns in physical properties of the ground, e.g. magnetic, electromagnetic, electrical, elastic, density and others. It does not directly detect underground features and structures and therefore the presence or absence of these within a geophysical interpretation is not a direct indicator of presence or absence in the ground. Specific points to consider are:

- some physical properties are time variant or mutually interdependent with others;
- for a buried feature to be detectable it must produce anomalous values of the physical property being measured;
- any anomaly is only as good as its contrast against background textures and noise within the data.'

However it is considered that overall the data quality is high despite the high potential for ferrous contamination throughout. In some fields close to the existing trunk road there is the expected transient interference from passing traffic but this has not unduly limited the potential of the data. (Appendix 4)

10.2 Results

The area of Fields 1 was surveyed close to Junction 15. The data is dominated by strongly magnetic till deposits with signs of cross-contour erosion structures, probably from water action over a prolonged period. Similar observations have been made elsewhere in Wales and have indicated re-working of the till deposits. A pipeline crosses parallel to the northern boundary of the field. Aside from this there appears to be nothing of an archaeological nature within the field however a small area in the north east of the field was not surveyed as it is too steep. The results are summarised below.

ID	Data Class	Anomaly Class	Form Class	Feature Class	Feature Subclass	Comments	Field
1	TMI	Strong Variable	Linear-Continuous	Utility		Probable Service	1
2	TMI	Strong Variable	Area	Fill		Area of debris and highly magnetized soils.	1

Table 2 List of geophysical survey anomalies

Feature ID 1 will be affected by the proposals and is likely to be a utility service possibly associated with the buildings along Penmaenmawr Road. Feature ID 2 is unlikely to be directly affected by the proposals and is perhaps an area of rubbish disposal or deposits associated with previous construction episodes.

11 Potential for previously unrecorded archaeological remains and Potential impacts

There is always the potential for previously unknown archaeological remains of past land use or other disturbance to be located which has not been identified through thorough desk based, field survey or geophysical work.. By studying the evidence for previously known information included on the Historic Environment Record, looking at early maps and documents and conducting a geophysical survey, the aim is to minimise this possibility of previously unknown features coming to light. However this can never be completely ruled out. The aim is to reduce the risk of unknown features being identified at a late stage within the process, and to minimise the impact on them. Dependant on the nature of possible previously unknown features identified the impact of proposals can range from minimal impact to serious/high impact.

Immediately to the south and east of the roundabout at Junction 15 there is a terrace of five houses. These buildings are not noted on the HER and are not within the Conservation Area of Llanfairfechan Town Centre, however the structures are noted on the first edition Ordnance Survey maps of the mid 1870s. Should these (or any other buildings) be

demolished the structures should be recorded to prior to demolition. (*Understanding Historic Buildings A Guide to Good Recording Practice* Historic England 2016).

In examining the information from the HER, the historical mapping, the field survey and the geophysical survey it is possible to see a gradual development of the coastal area both in terms of transport, with firstly the railway coming in in the 1840s and then the coast road diverting to hug the coast and the railway in the 1990s and in terms of the building of more structures such that Llanfairfechan grows from a small settlement at the time of the Tithe in the 1840s to both a seaside resort and an industrial settlement exploiting the 'granite' like rock in the hills immediately to the south. This gives a good indication of what to expect from possible below ground archaeological remains which in the main are likely to relate to post medieval structures and land use. As the A55 developed in the 1980s and 90s some buildings were demolished to make way for the new coastal route The boreholes which were carried out as part of the overall A55 Junction 15 and 16 work, identified peat at a depth of between 2.5m and 3m in several locations and this suggests possible archaeological/palaeoenvironmental evidence may be present. The draft report of borehole results indicates that peat was present in two boreholes close to Junction 15; boreholes 102 and 114. In these peat was located at a depth of 2.40m to 2.50m BH 102 and 2.70m to 3m BH 114.

The geophysical survey in particular identifies below ground anomalies which may have relate to archaeological features. One area, Field 1 was surveyed by geophysical survey, the report states '*The data is here dominated by strongly magnetic till deposits [2] with signs of cross-contour erosion structures, probably from water action over a prolonged period. Such strongly magnetic deposits have been observed elsewhere in Wales where reworking of the till has occurred. A stream, partly piped, may once have had varying courses across this field. A pipeline [1] passes just south of the northern field boundary*. *Nothing of archaeological interest was seen in this field but small discrete features may not be magnetically detectable against the natural background*.'

Previously unknown features identified as anomalies within the geophysical survey will be examined by the excavation of archaeological evaluation trenches, prior to the final design of the scheme, such that their nature, date and importance can be assessed and fed into the design process. Curatorial advice will, in all likelihood, recommend evaluation of a broader area to test the results of the geophysical survey.

Ensuring that as part of any development work there is an initial strip of the area and archaeological examination, with follow up recording or excavation as necessary the potential impact on currently unknown archaeology can be controlled and minimised such that preservation by record is ensured.

The impact of the alterations to Junction 15 on known cultural heritage is likely to be related to alterations in the sound of the road as much as direct physical impact. The sound of the road is noticeable throughout the settlement of Llanfairfechan and impacts on the tranquillity of the Conservation Areas.

There are two Conservation Areas in Llanfairfechan. Llanfairfechan Conservation Area comprises The Close, a development of houses designed in the Arts and Crafts Style by Herbert Luck North; Llanfairfechan Town Centre Conservation Area includes shops and buildings along Station Road and Penmaenmawr Road. The Town Centre Conservation Area extends eastwards along Penmaenmawr Road, including the Heath, once a Convalescent home now Council Offices, to within 100 metres of the roundabout at Junction 15. Any proposed alterations have the potential to impact upon the setting of this Conservation Area at its eastern end. This impact potentially is both physical and an impact on the setting of the Conservation Area.

Two Registered Parks and Gardens are within the study area. Wern Isaf, Herbert Luck North's Arts and Crafts house and garden are noted as well as the grounds of Bryn y Neuadd to the west of Llanfairfechan and immediately adjacent to the A55. Both are noted as Grade II.

The Mansion Bryn y Neuadd was demolished in the later 20th century and the grounds contain hospital buildings but enough features of the garden remain to warrant protection. The gardens were laid out by Edward Milner in the mid-19th century when the earlier 17th century house was being replaced by the Victorian mansion. There is a formal Italianate garden and an extensive kitchen garden. Pulham & Son constructed artificial pools and rockwork features in a stream by the former Grand Lodge. The site is 1km to the west of Junction 15 and proposed changes to the road layout should not directly physically impact the site, however noise is an issue. The site is currently screened from the A55 by vegetation.

Wern Isaf is a small but basically unchanged Arts and Crafts-style house and garden dating from the early-20th century. The house and garden were designed by the architect and original owner Herbert Luck North. There are formal terraces around the house and a wild area, which consists of a woodland garden with a spring. It is located in a raised location, south of the A55 and almost directly above Junction 15. Proposed alteration would be unlikely to have a direct physical impact on the site, the gardens are well screened from the road however the proposals include removal of much of the current roadside vegetation which would alter the views experienced from Wern Isaf. The impact of noise from the Junction and road are currently extensive and have the potential to be worsened by proposed changes.

Listed buildings in the study area are predominantly of 19th and 20th century in origin. Of particular note are the many Arts and Craft houses designed by the locally based architect Herbert Luck North. These include the area known as The Close, which is also a Conservation Area, and the architect's own house now known as Wern Isaf (Grade II*) but known as Rosebriar by the architect. None are likely to be directly physically impacted but a change in sound will impact their setting (see Appendix xx). Wern Isaf is in an elevated position which looks northward towards the Junction and the A55, the view from the house is screened by trees and hedges but there remains a possibility of a visual impact on the Listed Building from the proposed Changed layout. The houses in The Close do not have a direct line of sight of the road and Junction.

There is one scheduled monument within the study area. Gwern y Plas Hut Group (CN255) is located within a small copse on the edge of the Gorwel modern housing estate. It is described as being in a poor condition in 2018. It is highly unlikely that the site would be directly physically impacted by the proposed Junction alterations but the noise of the road is clear currently before any alterations take place and it is important that this impact is not increased and ideally is lessened. There are a number of scheduled monuments within two kilometres of the study area (Appendix 5). These include a number of prehistoric monuments which are located in the uplands to the south and east of Llanfairfechan and Junction 15, monuments which are visited a great deal by walkers exploring the prehistoric landscape of the Registered Historic Landscape of North Arllechwedd. The setting of many of these monuments is protected by the topography as they are located south of the upland quarrying areas.

The quarries themselves, although neither listed nor scheduled, do form part of the North Arllechwedd Historic Landscape. The visible quarrying relate to the late Victorian period through to the 1960s however the area was also exploited for stone in the Neolithic period when it was quarried and made into polished axes which are found across Britain. The proposals for Junction 15 are will not directly physically impact on the quarrying remains and there is already an impact from the noise of the A55 and Junction as they are before any proposed alteration. There is a potential impact from a change in the noise from the road brought about by the proposed alteration in layout of the Junction.

One of the largest impacts of the A55 at present is noise. The route is well screened by woodland but noise permeates, although at the distance of 500m Gwern y Plas (SAM CN255) the noise is lessened. Removal of the roundabout could result in less slowing and changing of gear which may alter the pitch of noise and thus alter the impact of noise.

12 Proposed Mitigation Measures and Recommendations

An initial phase of archaeological evaluation of some of the key anomalies located as part of the geophysical survey is recommended should take place. In this way it would be possible to understand the nature, date and importance of these features and assess whether they should be preserved *in situ*, fully excavated or rapidly recorded. This information would feed into the detailed design stage of the scheme.

The results of the above piece of work will further inform the design process. Should nationally important remains be located which ideally should be preserved *in situ* the design should incorporate this. If remains are regionally important it may be necessary to completely excavate them prior to the scheme progressing.

As part of the proposed Junction alterations it is recommended that areas of ground which would be affected by new roadways, compounds and other features associated with the proposed scheme should be stripped of topsoil and an archaeological scheme of works should take place. Incorporated within this would be the recording by excavation of previously unknown features which may come to light. In this way any remains should be preserved by record.
Aside from direct physical impact on the archaeology and cultural heritage, sites located outside the area of this direct physical impact are already impacted by noise coming from the carriageway. This includes impacts on Listed Buildings, SAMs, Conservation Areas, Parks and Gardens and known sites noted on the HER. Proposed alterations to Junction 15 have the potential to change the noise impact on these sites. It is recommended that noise reduction surfacing and screening should be used to both lessen the impact of noise brought about by proposed changes to Junction 15, but also lessen the overall noise generated by the roadway to enhance and improve the setting of these sites.

13 Conclusions

This desk based assessment has been prepared in support of the Environmental Impact assessment relating to proposed changes to Junction 15 on the A55 north Wales.

Data was collected from the HER of the Gwynedd Archaeological Trust as well as other databases and documentary sources to inform the assessment. A geophysical survey and an archaeological walkover survey were completed. There is one scheduled monument within the study area, 69 listed buildings, 2 conservation areas in Llanfairfechan, two registered Parks and Gardens noted within the study area and one registered historic landscape.

Non designated recorded heritage assets in the study area range in date from the Neolithic to the Post Medieval periods, although nothing specifically Medieval is noted. Map regression has indicated that as the A55 has developed a number of buildings have been demolished to make way for various phases of road improvements particularly in the area of Junction 15 where, when the roundabout was constructed in the late 1980s early 1990s, buildings were demolished. Further demolition is proposed as part of the current changes, should this take place any buildings demolished should be recorded.

Geophysical survey has identified anomalies along the line of proposed changes to Junction 15 in Field 1.

Field survey has identified few within the study area.

There is the potential for there to be negative impact upon any below ground remains which may survive within the areas affected by proposed development. Recommendations noted above in Section 10 should be adhered to.

Those sites, both designated and non designated which are not directly impacted physically by proposed changes to Junction 15 have the potential to be impacted visually

or more particularly by changes in the noise levels. As noted above in Section 10.5, screening and noise reduction surfacing should be employed to minimise this impact.

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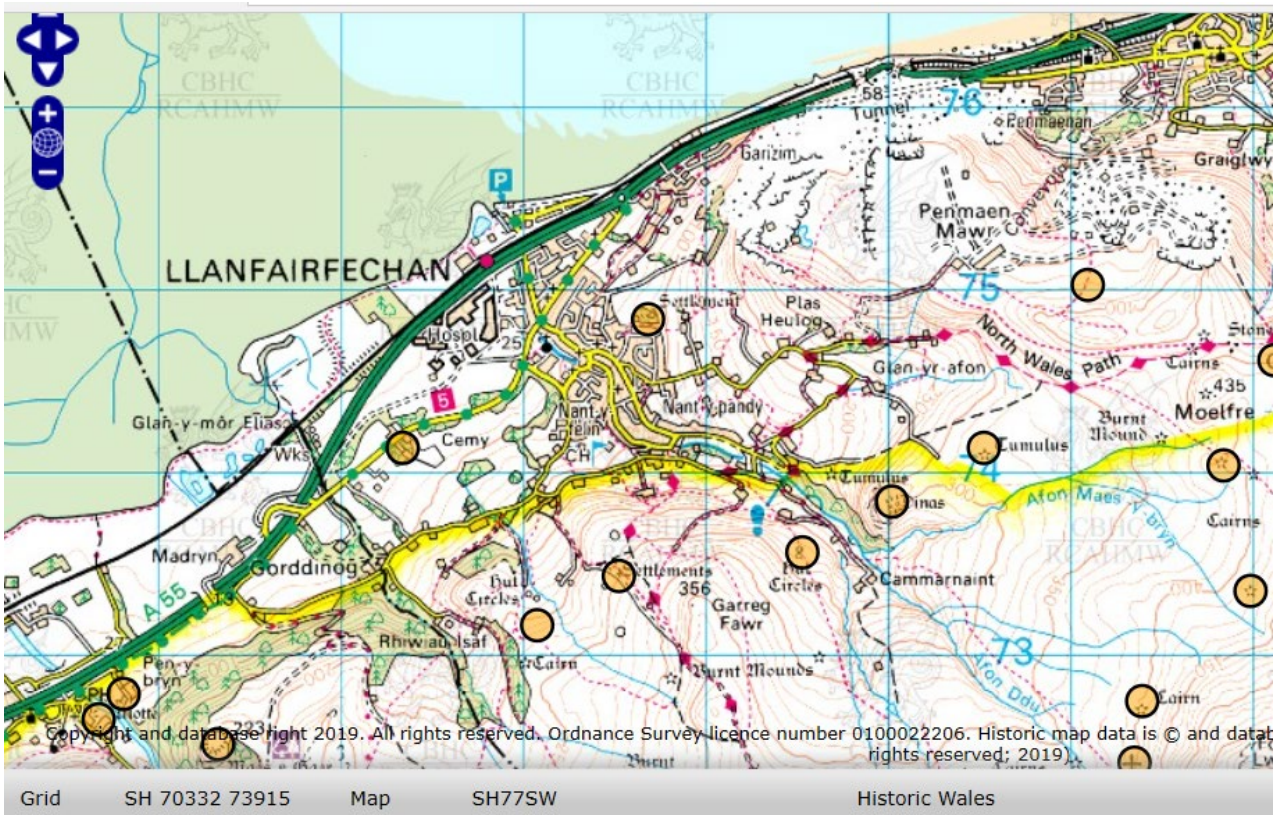
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Appendices

1. Site proposals plan refer to Appendix 2.6 Environmental Masterplans
2. Geophysical Survey Report refer to Appendix 10.5
3. List of SAMs within 5km refer to Appendix 10.2 and Appendix 10.4
4. HER data refer to Appendix 10.1

[i] Distribution of the Graig Lwyd Axe and its Associated Cultures by T A Glenn, Archaeologia Cambrensis 1935

APPENDIX 10.4
SCHEDULED MONUMENTS IN THE VICINITY OF JUNCTION 15



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SAM

Junction 15

1. **Gwern y Plas ancient village CN 072 Llanfairfechan SH 68680 74830**

Prehistoric

The following provides a general description of the Scheduled Ancient Monument. A settlement of nine or ten round huts with associated stone walls. The site is confined to a small copse, which is surrounded by cultivated fields on three sides and a housing estate on the fourth. The ground slopes to the west, and a small stream runs through the settlement. The enclosure walls are defined by rough lines of boulders, or very low grass covered banks. The hut walls are generally grass covered, but where visible are of two orthostatic faces with a rubble core. The monument is of national importance for its potential to enhance our knowledge of prehistoric settlement and defence. It retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits. The structures themselves may be expected to contain archaeological information concerning chronology and building techniques. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

2. **Hut Circles near Wern Newydd CN 250 Llanfairfechan, SH** 67335 74126 **Hut Circles near Wern Newydd** (Near Cemy on map)

The following provides a general description of the Scheduled Ancient Monument. The monument comprises the remains of a compact farmstead settlement of at least six hut circles. The monument probably dates to the Iron Age or Romano-British period (c. 800 BC - AD 400).

The remains are low but clearly visible and the huts vary in size with one particularly large example measuring 10m across. Associated stony banks, possibly defining small paddocks can also be identified. The site is a rare survival in a lowland area where early settlements have often been removed by agricultural, commercial and domestic development. In spite of these dangers this monument has survived in good condition and is still relatively complete. It retains significant archaeological potential and there is a strong probability that structural evidence has survived, together with internal and external floor surfaces and other archaeological deposits. It is of national importance for its potential to enhance our knowledge of later prehistoric domestic construction practices. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

3. **Cae'r Haidd Deserted Rural Settlement CN 330 Llanfairfechan SH 68072 73155** (near and left of Rhiwiau isaf on map)

The following provides a general description of the Scheduled Ancient Monument. The monument consists of a well-preserved medieval deserted rural settlement. The settlement comprises a group of three platform houses (I-III), levelled areas of ground on which houses are built, aligned SW-NE along the contour and an adjacent group of three rectangular house platforms (IV-VI), all cut deeply into the hill slope. The site stands on a sheltered, north-facing shelf with spectacular views across the Menai Straits and eastern Anglesey and forms an important element in a wider medieval upland landscape. The monument is of national importance for its potential to enhance our knowledge of settlement organisation. It retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits, including preserved medieval ground surfaces below the monuments and intact palaeo-environmental remains. The structure itself may be expected to contain archaeological information concerning chronology and building techniques. A platform house may be part of a larger cluster of monuments and their importance can be further enhanced by their group value. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

4. **Garreg Fawr Hut Groups, Ancient Fields and Cairns CN185 Llanfairfechan SH 68520 73425** (on map on top of word Settlements)

The following provides a general description of the Scheduled Monument. The site lies on ground sloping to the west; part of it on open mountain, and the remainder on enclosed grazing land. The settlements are very poorly preserved, but the field banks and terraces survive to a substantial height, some of the terraces are 2.4m high, although they are more commonly 1m high. Other field systems are visible to the west of the site, and the enclosed homestead with associated field system at Pont y Teiryd lies a short distance to the east. A number of hut settlements lie to the north of Garreg Fawr. Archaeological Item # CN185A A large oval enclosure 55m N-S and 43m W-E, with walls of grass-covered small stone with orthostatic facing. The walls are generally 0.5m high, and 2m wide, although the stone spread is 4m wide. The entrance is a simple gap in the E side, the walls thicken slightly as they approach the entrance. The internal remains are poorly preserved, and do not present a coherent plan. There is a circular hut overlying the N wall, and possible hut remains on the S and W sides. Another hut may underlie the shelter on the NE side. Other banks and wall foundations are visible as marked on the plan. Field walls adjoin the W, E and S sides of the enclosure. Archaeological Item # CN185B A levelled platform, 38m in diameter, is formed from 3m-high terraces on the W and E sides. The terraces continue to form adjacent enclosures. Two huts occupy the interior. Hut A is 8m in diameter, levelled into the slope and marked by low grass banks. Hut B is 7.5m in diameter, lying against the N enclosure wall. Three large boulders form part of the revetment on the W side, other boulders are visible through the grass. A line of boulders runs from the NE corner of the enclosure past the E side of hut A. Archaeological Item # CN185C A roughly oval enclosure, 28m N-S by 23m W-E; the N side is irregular. It is bounded by a 2m high terrace on

the E, which contains a row of large stones set on edge to form a revetment. The W side is bounded by a 1m high field terrace, which curves around the site. There are no huts visible inside the enclosure. Archaeological Item # CN185D The probable remains of a round hut 6m in diameter. A level platform in ground sloping to the NW. The terraces are 0.6m high on the NW side and 0.5m high on the SE side. No walls remain. Grass and gorse covered stone. Archaeological Item # CN185E Site of a round hut on ground sloping steeply to the NW. Roughly circular platform 8m in diameter with some orthostatic walling around the perimeter. A hollow in the ground may be the site of another round hut 50m NNE. Archaeological Item # CN185F An oval mound 8-9m long NW-SE, 6m wide and 0.75m high. The interior of the cairn has been removed and built up around the outside to form a sheep shelter. A slight ridge may represent the remains of a field boundary running N from the cairn. Archaeological Item # CN185G A mound of small stone, 6m in diameter and 0.5m high. Covered with grass and gorse. No kerb visible. Archaeological Item # CN185H A grass and gorse covered stone mound, 6m by 4m by 0.75m high. On ground sloping to N. The monument is of national importance for its potential to enhance our knowledge of prehistoric settlement and funerary practices. It retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits. The structures themselves may be expected to contain archaeological information concerning chronology and building techniques. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

5. **Pont y Teiryd Hut Group and Ancient Fields CN184 Llanfairfechan SH 69526 73554** (on map on top of word hut circles)

The following provides a general description of the Scheduled Ancient Monument. The monument comprises the remains of a well preserved enclosed hut circle settlement, which probably dates from the first millennium BC. It is situated in an unimproved field, on a natural shelf sloping to the NE. A small stream passes close to the S side of the site. The remains appeared as consisting of seven round huts with thick walls, many of them built into the enclosure wall. A modern stone walled sheep fold overlies a hut on the SW side, but the hut seems well preserved underneath, sitting on a platform some 1m above the level of the courtyard to the NE. Field walls associated with the enclosure extend W, SE and N. The monument is of national importance for its potential to enhance our knowledge of prehistoric domestic life and social organisation. It retains significant archaeological potential, with a strong probability of the presence of structural evidence and associated archaeological features and deposits. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

6. **Dinas Camp CN049 Llanfairfechan SH70017 73832** (marked on map as Dinas)

The following provides a general description of the Scheduled Monument. A defended settlement, situated on the top of a rounded hill. The sides of the hill fall away steeply on all sides but the NE. The remains are visible as very low grass-covered stone banks, generally less than 0.3m high, with occasional orthostats. The site has been heavily robbed of stone in the past, obscuring much of the detail. There is a central enclosure, 36m in diameter, containing the remains of at least three round huts. There are remains of a single rampart N of this enclosure, and of two ramparts to the S. Nine or more huts lie scattered between the ramparts. The outer banks do not fully enclose the site, and the easiest approach appears to be left open. Further excavation may explain more fully the line of the outer banks. There are a series of quarry scoops on the SW side of the site, and a rock-cut pit on the NE side. Terraced fields, more round huts, and a single long hut lie to the NE, outside the scheduled area. The monument is of national importance for its potential to enhance our knowledge of prehistoric settlement and defence. It retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits. The structures themselves may be expected to

contain archaeological information concerning chronology and building techniques. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

7. **Waun Llanfair barrow CN351 Llanfairfechan SH 70521 74126** (on map on top of word Tumulus)

The following provides a general description of the Scheduled Ancient Monument. The monument comprises the remains of a fine round barrow, probably dating to the Bronze Age (c.2300 BC - 800 BC) and situated within well-drained open moorland on the summit of a prominent rounded ridge at the NW-facing edge of Waun Llanfair. The grass-covered barrow is circular on plan and measures about 7m in diameter and up to 0.6m in height; a turf-halo surrounds the barrow, visible as a shallow ditch up to 1.5m in width. The site boasts excellent views of the Lavan Sands and Conwy Bay. The monument is of national importance as an important relic of a prehistoric funerary and ritual landscape and for its potential to enhance our knowledge of prehistoric burial and ritual. The monument retains significant archaeological potential, with a strong probability of the presence of both intact burial or ritual deposits and environmental and structural evidence, including traces of a buried prehistoric land surface underneath. The area to be scheduled comprises the remains described and an area around them within which related evidence may be expected to survive. It is circular and measures 17m in diameter.

8. **Hut Circles at Clip yr Orsedd CN283 Penmaenmawr SH 71091 75018** (south of quarry)

The following provides a general description of the Scheduled Monument. The monument comprises a small, well-preserved unenclosed hut circle settlement of the Iron Age or Romano-British period (c. 800 BC - AD 400). The settlement consists of the foundation walls of three hut circles, which are the foundations of round houses, one displaying an annexe. Also present are several, probably associated, clearance cairns and field banks. It is possible that the hut settlement was contemporary with the period of occupation of a Romano-British period hillfort which stood at Braich-y-Dinas, above Penmaenmawr, which no longer survives. The archaeological significance of the site is enhanced by its survival in an area which was probably well settled during this period, but where remains have not always been preserved. The monument is of national importance for its potential to enhance our knowledge of prehistoric domestic life and social organisation. It retains significant archaeological potential, with a strong probability of the presence of structural evidence and associated archaeological features and deposits, including internal and external floor levels. The scheduled area comprises the remains described and areas around them within which related evidence may be expected to survive.

APPENDIX 10.5
GEOPHYSICAL SURVEY REPORT

TIGERGEO

A55 Junctions 15 and 16 Improvements

Geophysical Survey Report
(Caesium vapour magnetometry – Archaeology)
Version 1.0

Project code: APW191

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REGISTERED ORGANISATION CIfA

6th June 2019

Environmental Geophysics – Survey, Research and Consultancy

TIGERGEO

A55 Junctions 15 and 16 Improvements

Digital data

Item and version	Sent to	Sent date
CAD – Vector Elements 1.0	Fiona Gale and Andrew Sumner (RML); Mike Smith (Ramboll)	6th June 2019

Audit

Version	Author	Checked	Date
Interim			
1.0	ACK Roseveare	ACK Roseveare, MJ Roseveare	6th June 2019

Project metadata

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Client	Ramboll UK
Fieldwork Dates	16-17, 28-30 May 2019
Field Personnel	MJ Roseveare, ACK Roseveare
Data Processing Personnel	J Smith, ACK Roseveare
Reporting Personnel	ACK Roseveare, MJ Roseveare, J Smith
Report Date	6th June 2019
Report Version	1.0

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Non-Technical Summary

A survey was commissioned by Ramboll UK to prospect land near Junctions 15 and 16 of the A55 for buried structures of archaeological interest. Survey was undertaken using GNSS-tracked non-gradiometric arrays of caesium vapour magnetometers on non-magnetic platforms, including handcart and ATV-based systems.

Good coverage of the route was achieved with only very small areas not able to be surveyed, usually through steepness of slopes or in one case, the presence of horses. Little of archaeological interest was seen in the survey data, although relict cultivation was detected in many areas, including on the steeper slopes. A small number of ditch fills seem likely to relate to unknown field boundaries or drainage. In three fields areas of landfill were mapped, two of them previously known but not accurately located and the third a new discovery. There is generally an enhanced quantity of magnetic debris in fields close to Junction 16, i.e. within the vicinity of the Victorian expansion of the village, but this is less evident at Junction 16A except where a previous construction compound is suspected. At Junction 15 the ground was found to be especially magnetic, from natural geological and hydrological causes.

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Drawing	Title
DWG 01a-b	Site Location
DWG 02a-f	Magnetic Data - TMI
DWG 03a-f	Interpretation
DWG 04a-f	Interpretation - Vector

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1 Introduction

TigerGeo was commissioned by Ramboll UK to undertake a geophysical survey of land near junctions 15, 16 and 16a of the A55, near Penmaenmawr and Dwygyfylchi in North Wales.

Survey was undertaken using an array of caesium vapour magnetometers to prospect for buried features possibly of archaeological interest, across multiple fields.

Country	Wales
County	Gwynedd
Nearest Settlement	Llanfairfechan (J15), Penmaenmawr and Dwygyfylchi (J16/16a)
Central Co-ordinates	268600,375370 (J15), 273380,377500 (J16/16a)

1.1 Geology

Fields	**01**	**02**	**03**	**04-10**	**11**	**12-15**	**16**	**17**
Soilscapes Classification	Freely draining slightly acid loamy soils (class 6)	unclassified (class 29), likely similar to class 13			Freely draining acid loamy soils over rock (class 13)			
Superficial 1:50000 BGS	Till, Devensian – Diamicton (TILLD)						Till, Devensian – Diamicton (TILLD), small area Peat (PEAT)	
Bedrock 1:50000 BGS	Nant Ffrancon Subgroup – Siltstone (NFR)	Conwy Rhyolite Formation – Mudstone (COR)	Conwy Rhyolite Formation – Rhyolite (COR)					Unnamed Igneous Intrusion, Ordovician – Rhyolite (UIIO)

1.2 Other Environmental Factors

Fields	**01**	**02**	**03**	**04-06**	**07-09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Topography	slopes down to NW	slopes down to NW						gentle slope down to SE (with made ground)		gentle slope down to SW	almost flat		slopes down to SW
Hydrology	free draining	free draining, culverted stream in 02		free draining	damp, stream	free draining			free draining, stream between 13 and 14			free draining apart from small area (peat) at NW end stream	
Current Land Use	pasture	pasture					recreational	waste ground	pasture				
Historic Land Use	pasture	land fill	mixed agricultural						land fill	mixed agricultural			
Vegetation Cover	short grass	short grass			weedy grass		short grass	weedy grass	short grass				
Sources of Interference	none	fencing		traffic, fencing			none	traffic, electro-magnetic interference E end fields 12 and 13		traffic			

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1.3 Heritage

The specification prepared by the client (Gale, 2019) contains a summary of the recorded archaeological knowledge (Historic Environment Record):

In the general vicinity of both Junction 15 and 16 there are a number of archaeological features noted on the Historic Environment Record. On the hills to the south there are many important prehistoric remains (many scheduled). These hills also contain extensive 19th and 20th century quarrying.

Little is already known about the areas to be directly impacted by the proposals although first edition maps show a Gas works in the area of Junction 16, Coflein records that part of a wall related to this survives (NPRN 401850 noted in 2003). The HER notes a site, PRN 62369, Convalescent Home which is marked on the first edition Ordnance Survey mapping, as being under the carriageway of the A55 in the area of Junction 15.

No archaeological information arising from the recent sewer construction in field 13 or housing immediately south of field 11/13 is known of.

1.3.1 Review of Ordnance Survey mapping

Field 01 remains essentially unchanged throughout OS mapping from the 1880s to the current day.

Field 02-03 were truncated by the roundabout construction; field 02 is shown as a tip on the 1975 edition.

The boundaries of fields 04-10 are mostly unchanged. A small stub of old road crosses field 04 and there is a small building or structure (1901 map only) against a boundary crossing this field, which also disappears by 1913. The narrow strip of community garden appears from 1913. A well is marked fairly centrally to fields 07-09 (this is on the current stream course that divides them) in 1901 but not on any later mapping.

Field 12 shows buildings and additional boundaries to rear of Rosecroft / Orme View Bungalow from 1966 (now site of Puffin Cafe). The eastern end of field 13 is shown from 1913 to 1964 as rough ground enclosed by a boundary, approximately coincident with the visible landfill location. The 1913 mapping shows a possible depression within this.

Fields 14 to 17 are unchanged within the survey area, with the exception of additional field boundaries and a small building shown within field 16 on the 1992 edition only.

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2 Discussion

The following paragraphs represent an interpretive summary of the survey. The numbers in square brackets refer to individual anomalies described in detail in the catalogue below and shown on DWG 03 onwards.

2.1 Data Quality and Coverage

Overall the data quality is high and despite the high potential for ferrous contamination throughout. In some fields close to the existing trunk road there is the expected transient interference from passing traffic but this has not unduly limited the potential of the data. In a couple of fields survey stopped slightly short of the road to avoid problems but usually steel sheep mesh fencing and roadside furniture was already becoming evident in the data.

There is some evidence for electromagnetic interference in fields 12 and 13, so close to the Puffin Cafe services, but this area is dominated by strongly magnetic landfill so there has been no effect upon the archaeological result.

Elsewhere there are the usual fencing and buried utilities that have the potential to mask more weakly magnetic sources in their vicinity. Away from these, data quality is high and with moderately high contrast throughout.

2.2 Geological Context

The till here is invariably magnetic and soils over it can also be strongly, and usefully, magnetic. At the eastern end, so Junctions 16 and 16a, there is less sign of the magnetic element within the till whereas it dominates the results at Junction 15 below Penmaen Mawr. However, it is still present and provides the dominant character of the natural texture.

At the eastern end, so directly below the slopes of Penmaenbach, the ground once again becomes more magnetic overall, as at Junction 15, suggesting a correlation between this and the harder rock of the northwards projecting spurs. The presence of accumulated hill wash in lower areas may be muting the magnetic character of the till deposits beneath.

Throughout the route the soils seem to be fairly magnetic and the presence of anomalies from ridge and furrow would suggest other negative or cut features would produce detectable anomalies in the absence of magnetising processes like heat.

2.3 Land Use and Archaeology by Field

Very few signs of former field layouts were seen and nothing that predates the series of historic OS mapping. In some fields there are weak signs of former ridge and furrow type cultivation and the occasional land drain; examination of satellite imagery suggests the presence of non-magnetic drains in some fields.

There is a large amount of magnetic debris buried within many of the fields, presumably from casual disposal, agricultural practices and material left over from modern house building. There are two known landfills, in fields 02 and 13, plus an unknown one in field 04.

2.3.1 Field 01

The data is here dominated by strongly magnetic till deposits [2] with signs of cross-contour erosion structures, probably from water action over a prolonged period. Such strongly magnetic deposits have been observed elsewhere in Wales where reworking of the till has occurred. A stream, partly piped, may once had varying courses across this field. A pipeline [1] passes just south of the northern field boundary.

Nothing of archaeological interest was seen in this field but small discrete features may not be magnetically detectable against the natural background.

A small area at the northeast end of the field was not surveyed as it is dangerously steep.

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2.3.2 Field 02

Most of this field is affected one way or another by a former landfill [3], with waste being apparently buried in rectangular pits or cells. A small stream flows into this, within an area [4] of different magnetic character, before re-emerging near the foot of the slope.

It is unlikely that anything of archaeological interest could be present in this field.

2.3.3 Field 03

Unlike its western neighbour, this field was not part of the former landfill and retains a natural character of moderately magnetic till deposits, much less magnetic that further west, e.g. within field 01. Nothing of interest was seen, although it is notable that this is one of the few fields within the survey to retain at least some of its original boundaries.

The southern part of this field, actually a separate field uphill of a lynchet, contained horses and was not surveyed.

2.3.4 Field 04

The result from this field was a surprise, being dominated by strongly magnetic debris [5] throughout, with the exception of the small detached western area, the other side of the former road [10]. The topographic profile of the field is not what would be expected for this location and it seems likely that at least the raised southern part is a landfill, although of what date and purpose is not known.

2.3.5 Fields 05 and 06

In contrast, field 05 has the expected gently sloping topography and is devoid of strongly magnetic debris, with signs [6] of former ridge and furrow type cultivation.

Field 06 is a narrow strip used as a community garden and could not be surveyed.

2.3.6 Fields 07, 08 and 09

Again in contrast to its neighbour, field 07 is laced with magnetic debris which seems to cross a ditch and small stream into field 09. There is nothing visible in either field, so whether this is material introduced to infill the wet ground, for land improvement in general or just buried debris is not known. It is most prevalent at the highest part of the field, closest to the the road and the community garden.

Field 08 was boggy and overgrown and was not surveyed.

In field 09 there are signs of ridge and furrow type cultivation [7], aligned with the present field boundaries that predate the 1800s OS mapping.

2.3.7 Field 10

The upper half of this field is rich in buried magnetic debris [9] for no obvious reason. It extends right across the field so is not from the adjacent houses and maybe also not from their construction. Whether this is another informal rubbish dump, similar perhaps to the upper part of field 07, is uncertain.

In the lower part there is ridge and furrow type cultivation [8] parallel to that in adjacent field 09 and maybe once part of the same cultivated area. Encroachment by housing means it is not possible to be certain whether this is parallel to the original field boundaries. It seems likely that this extended the full length of the field but is hidden by debris.

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2.3.8 Field 11

Like all the fields, this contains an area of strongly magnetic debris [11], here most likely left over from recent house construction immediately adjacent. Unlike many of the other fields, it contains a linear feature [30] that may be ditch fill and one unrelated to any known former field boundary. It could also be a drain, not least as the fill appears to contain discrete magnetic elements that could be debris.

The goal posts in the field have been moved and the western set appear to have previously been at [31] where the structure to support them remains buried and is probably a pair of steel tubes.

2.3.9 Fields 12 and 13

Field 12 has, over the years, been encroached upon, dumped upon and generally modified and when tested for magnetic character was found to be too debris laden to continue survey for archaeological purposes. The northeast end is made ground, extending the ground level of the services in that direction. However, magnetic debris was found everywhere, except a small part of the southwest corner which was instead populated with thorny bushes.

The northern part of field 13 is a known landfill, thought to have been a wartime refuse dump but actually visible plotted on a 1913 OS map so it is clearly older than this. As expected, it is all strongly magnetic [15] and appears to have a northern part and a southern extension bounded by the present earthworks. The stream has been diverted eastwards past this area in antiquity but presumably once flowed in the valley bottom now occupied by the landfill.

Inserted into the landfill is a modern sewer [14] and there may be connections into this at [12] and [13], unless, in the case of [13], this is a separate pipe turning parallel to [14].

There is nothing of obvious archaeological interest visible in the data from the rest of this field.

2.3.10 Field 14

This field contains a range of magnetic anomalies potentially of interest, with a reduced field linear [16] that might be an unknown former field boundary (wall footings?) or maybe a drainage structure like a culvert. Parallel to this are signs of former cultivation [17].

In the higher northwest end of the field there are two fairly narrow (4m wide) bands of reduced magnetic intensity [18] and [19], neither of which appear to be natural. Some disruption of the natural soil profile seems to have occurred and their angle precludes any obvious association with present boundaries or land use. They may be of archaeological interest but could also be the line of non-magnetic utilities, e.g. connections to the sewerage works immediately of the field. If not, then it is possible that these are former parkland features associated with Pendyffryn Hall.

A pair of very narrow linear anomalies [27] and [28] may be ditch fills but they could also be land drains, e.g. ceramic pipes. The fact that [27] appears to be parallel to [18] may be relevant given the previous observation that these features do not align with the present field boundaries.

It is not certain whether some of the mostly strongly magnetic discrete sources here may form part of an organised layout, e.g. a shallow curve passing northwards through the central part of the field.

2.3.11 Field 15

Nothing of archaeological interest was seen within this field with the exception of an area [20] of former cultivation.

The magnetic texture is here uniform across fields 14, 15 and 16 and all share a similar geomorphological situation of slightly undulating land away, except at the eastern end, from steep slopes. Of all the fields surveyed, these could be considered to have the highest potential for past activity and it is therefore of interest that little has been seen.

There is disruption of the till deposits in the northern part of the field although whether due to extraction or through natural processes is unclear.

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2.3.12 Field 16

Debris [21] is present across much of this field and it is thought that there was once a construction compound somewhere within it, which might account for some of the material. There is also evidence for buried steel structures at [26] although whether these are also from previous construction is not known.

It seems likely that there is also former cultivation within the field but it is not clear against the background of significantly more magnetic debris. If there are other features of archaeological interest they are likewise not detectable.

2.3.13 Field 17

Little of archaeological interest was detected within this field, although there are signs [24] of former cultivation and land drains at [23] and [25].

There is a possible ditch fill at [22], maybe with debris within its fill so possibly not of any great age. There is nothing, e.g. former field boundaries, depicted here on old OS map editions.

2.4 Catalogue

ID	Data Class	Anomaly Class	Form Class	Feature Class	Feature Subclass	Comments	Field
1	TMI	Strong variable	Linear - continuous	Utility		Probable service	1
2	TMI	Strong variable	Area	Fill		Area of debris and highly magnetised soils	1
3	TMI	Strong variable	Area	Debris		Known landfill	2
4	TMI	Observation	Linear - continuous	Highlight		Field observation - path of stream / water course	2
5	TMI	Strong variable	Area	Debris		Probable landfill - possible debris from old Gas Works and road destruction/construction	4
6	TMI	Enhanced	Linear - continuous (group)	Agricultural	Cultivation	Probable ridge and furrow	5
7	TMI	Enhanced	Linear - continuous (group)	Agricultural		Probable ridge and furrow, see [6]	9
8	TMI	Enhanced	Linear - continuous (group)	Agricultural		Probable ridge and furrow, see [6] and [7]	10
9	TMI	Strong variable	Area	Debris		Possibly debris from surrounding structures or construction / agricultural activity	10
10	TMI	Strong variable	Area	Highlight		Known road as seen on 1975 OS map	4
11	TMI	Strong variable	Area	Debris		Possibly debris from surrounding structures or construction / agricultural activity, similar to [9]	11

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ID	Data Class	Anomaly Class	Form Class	Feature Class	Feature Subclass	Comments	Field
12	TMI	Strong variable	Linear - continuous	Utility		Probable service	13
13	TMI	Strong variable	Linear - continuous	Utility		Probable service	13
14	TMI	Strong variable	Linear - continuous	Utility		Known service - sewer	13
15	TMI	Strong variable	Area	Debris		Known landfill as seen on 1913 OS map. It is thought that the stream may once have flowed below this region	13
16	TMI	Reduced	Linear - continuous	Agricultural?	Ditch?	Possible unknown field boundary	14
17	TMI	Enhanced	Linear - continuous (group)	Agricultural		See [6], [7] and [8]	14
18	TMI	Reduced	Area	Highlight?	?	Uncertain, maybe natural but could also be agricultural origin	14
19	TMI	Reduced	Area	Highlight		See [18], this example is slightly less well defined	14
20	TMI	Enhanced	Linear - continuous (group)	Agricultural		See [6], [7], [8] and [17]	15
21	TMI	Strong variable	Area	Debris		Probable debris from temporary structures and boundaries, only seen on 1992 OS map	16
22	TMI	Strong variable	Linear - continuous	Fill		Known field boundary as seen on OS maps between 1913 - 1975. Appears to be partially filled with modern debris	17
23	TMI	Enhanced	Linear - continuous (group)	Agricultural	Drain		17
24	TMI	Enhanced	Linear - continuous (group)	Agricultural		See [6], [7], [8], [17] and [20]	17
25	TMI	Reduced	Linear - continuous (group)	Agricultural	Drain	Similar to [23]	17
26	TMI	Strong variable	Area	Ferrous	Structure	A series of perhaps four underground probable ferrous elements to an unknown structure	16
27	TMI	Enhanced	Linear - continuous	Fill		Possible ditch or land drain	14
28	TMI	Enhanced	Linear - continuous	Fill		Possible ditch or land drain	14

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ID	Data Class	Anomaly Class	Form Class	Feature Class	Feature Subclass	Comments	Field
29	TMI	Strong variable	Area	Debris		Landfill or construction debris	12
30	TMI	Enhanced	Linear - continuous	Fill		Possible ditch or drain	11
31	TMI	Strong enhanced	Discrete (group)	Ferrous	Structure	Base of former goal posts	11

2.5 Conclusions

Overall the quantity of anomalies that could represent features of archaeological interest is low and although small discrete features can be masked by the till deposits there are no signs of former field systems or settlement, so no evidence for an organised landscape. There are also no ring ditches or other indicators of funerary practice, although this, if it exists, might be expected more on the higher ground. The hillsides are generally more magnetic than the lower laying land, the latter maybe because of accumulated hill wash over the till, which, remains evident throughout to varying degrees.

The non-natural components within the result are limited to former cultivation, land drains, debris, utilities and areas of landfill. Two of the last were known but not mapped while the third, in field 04, was previously unknown.

There are generally large quantities of magnetic debris in the central area, so close to the village but there is notably less within the former parkland of Pendyffryn Hall. This may suggest that much of the debris is due to informal refuse disposal from the village, something that would not have been happening within the grounds of the Hall.

2.6 Caveats

Geophysical survey is reliant upon the detection of anomalous values and patterns in physical properties of the ground, e.g. magnetic, electromagnetic, electrical, elastic, density and others. It does not directly detect underground features and structures and therefore the presence or absence of these within a geophysical interpretation is not a direct indicator of presence or absence in the ground. Specific points to consider are:

- some physical properties are time variant or mutually interdependent with others;
- for a buried feature to be detectable it must produce anomalous values of the physical property being measured;
- any anomaly is only as good as its contrast against background textures and noise within the data.

TigerGeo will always attempt to verify the accuracy and integrity of data it uses within a project but at all times its liability is by necessity limited to its own work and does not extend to third party data and information. Where work is undertaken to another party's specification any perceived failure of that specification to attain its objective remains the responsibility of the originator, TigerGeo meanwhile ensuring any possible shortcomings are addressed within the normal constraints upon resources.

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3 Methodology

3.1 Magnetic Principles

3.1.1 Physical concepts

Magnetic survey for any purpose relies upon the generation of a clear magnetic anomaly at the surface, i.e. strong enough to be detected by instrumentation and exhibiting sufficient contrast against background variation to permit diagnostic interpretation. The anomaly itself is dependent upon the chemical properties of a particular volume of ground, its magnetic susceptibility and hence induced magnetic field, the strength of any remanent magnetisation, the shape and orientation of the volume of interest and its depth of burial. Finally the choice and configuration of measurement instrumentation will affect anomaly size and shape.

Sites present a complex mixture of these factors and for some the causative affects are not known. However, depth of burial and size are usually fairly constrained and background susceptibility can be estimated (or measured). The degree of remanent magnetisation is harder to predict and depends on both the natural magnetic properties of the soil and any chemical processes to which it has been subjected. Fortunately heat will raise the susceptibility of most soils and topsoil tends to be more magnetic than subsoil, by volume.

It is hard to draw reliable conclusions about what sort of geology is supportive of magnetic survey as there are many factors involved and in any case magnetic response can vary across geological units as well as being dependent upon post-deposition and erosional processes. In general a relatively non-magnetic parent material contrasting with a magnetisable erosion product, i.e. one which contains iron in the form of oxides and hydroxides, will allow archaeological structures to exhibit strong magnetic contrast against their surroundings and especially if the soil has been heated or subjected to certain processes of fermentation. In the absence of either, magnetic enhancement becomes entirely reliant upon the geochemistry of the soil and enhancement will often be weaker and more variable.

Analysis of the British Geological Survey (BGS) Geochemical Atlas (G-Base) for total soil iron reveals that for England and Wales 50% of the samples (the interquartile range) lie between 1.9% and 3.6% percentage iron with the median at 2.7%.

The principal magnetic iron mineral is the oxide magnetite which sometimes occurs naturally but is more often formed during the heating of soil. Subsequent cooling yields a mixture of this, non-magnetic oxide haematite and another magnetic oxide, maghaemite. Away from sources of heat, other magnetic iron minerals include the sulphides pyrite and greigite while in damp soils complex chemistry involving the hydroxides goethite and lepidocrocite can create strong magnetic anomalies. There are thus a number of different geochemical reaction pathways that can both augment and reduce the magnetic susceptibility of a soil. In addition, this susceptibility may exhibit depositional patterns unrelated to visible stratigraphy.

Most structures of archaeological interest detected by magnetic survey are fills within negative or cut features. Not all fills are magnetic and they can be more magnetic or less magnetic than the surrounding ground. In addition, it is common for fills to exhibit variable magnetic properties through their volume, basal primary silt often being more magnetic than the material above it due to the increased proportion of topsoil within it. However, a fill containing burnt soil may be much more magnetic than this primary silt and sometimes a feature that has contained standing water can produce highly magnetic silts through mechanical depositional processes (depositional remanent magnetisation, DRM).

A third structural factor in the detection of buried structures is the depth of topsoil over the feature. As fills sink, the hollow above accumulates topsoil and hence a structure can be detected not through its own magnetisation but through the locally deeper topsoil above it. The volume of soil required depends upon the magnetic susceptibility of the soil but just a few centimetres are often sufficient. Such a thin deposit can, however, easily be lost through subsequent erosion by natural factors or ploughing.

3.1.2 Instrumentation

The use of the magnetic sensors in non-gradiometric (vertical) configuration avoids measurement sensitisation to the shallowest region of the soil, allowing deeper structures, whether natural or otherwise to

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be imaged within the sensitivity of the instrumentation. This also allows the detection of shallow broad variations in magnetic susceptibility that might have archaeological significance. Suppression of ambient noise and temporal trends is reduced and therefore need reduction during processing.

The theoretical slightly reduced lateral resolution inherent to using non-gradiometric sensor arrays is practically not an issue and especially if processing includes a vertical pseudo-gradient conversion. The non-gradiometric system is thus overall a more capable configuration than the short gradiometers often used for archaeological studies.

Caesium instrumentation has a greater sensitivity than fluxgate instruments, however, at the 10 Hz sampling rate used here this increase in sensitivity is limited to about one order of magnitude. Greater benefit is obtained from a better signal-to-noise ratio meaning that sub-nanoTesla measurement is more practically achieved.

The array system is designed to be non-magnetic and to contribute virtually nothing to the magnetic measurement, whether through direct interference or through motion noise.

3.2 Magnetic Survey

3.2.1 Technical equipment

Measured variable	Magnetic flux density / nT (Total Magnetic Intensity / nT after removal of regional trend)
Instrument	Array of Geometrics G858 Magmapper caesium magnetometers
Configuration	Non-gradiometric transverse array, ATV towed (4 sensors) and handcart (2 sensors)
Sensitivity	0.03 nT @ 10 Hz (manufacturer's specification)
QA Procedure	Continuous observation
Spatial resolution	1.0m between lines, 0.25m mean along line interval

3.2.2 Monitoring & quality assessment

The system continuously displays all incoming data as well as line speed and spatial data resolution per acquisition channel during survey. Rest mode system noise is therefore easy to inspect simply by pausing during survey, and the continuous display makes monitoring for quality intrinsic to the process of undertaking a survey. Rest mode test results (static test) are available from the system.

3.3 Magnetic Data Processing

3.3.1 Procedure

All data processing is minimised and limited to what is essential for the class of data being collected, e.g. reduction of orientation effects, suppression of single point defects (drop-outs or spikes) etc. The processing stream for this data is as follows:

Process	**Software**	**Parameters**
Measurement & GNSS receiver data alignment	Proprietary	
Temporal reduction, regional field suppression	Proprietary	Bandpassed 0.3 – 10.0s
Gridding	Surfer	Kriging, 0.25m x 0.25m
Smoothing	Surfer	Gaussian lowpass 3x3 data (0.75m)

Potential field processing procedures are used where possible on gridded data from the above processing, allowing simulation of vertical gradient data, separation of deep and shallow magnetic sources, etc. The initial processing uses proprietary software developed in conjunction with the multisensor acquisition system. Gridded data is ported as data surfaces (not images) into Manifold GIS for final imaging, contouring and detailed analysis. Specialist analysis is undertaken using proprietary software.

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3.4 Magnetic Interpretation

3.4.1 Introduction

Numerous sources are used in the interpretive process, which takes into account shallow geological conditions, past and present land use, drainage, weather before and during survey, topography and any previous knowledge about the site and the surrounding area. Old Ordnance Survey mapping is consulted and also older sources if available. Geological information (for the UK) is sourced only from British Geological Survey resources and aerial imagery from online sources. LiDAR data is usually sourced from the Environment Agency or other national equivalents, SAR from NASA and other topographic data from original survey.

Information from nearby surveys is consulted to inform upon local data character, variations across soils and near-surface geological contexts. Published data from other surveys may also be used if accompanied by adequate metadata.

Interpretation of magnetic data is undertaken using total intensity data, vertical pseudo-gradient and where relevant, shallow field, component models in parallel although for clarity only a subset of these may be presented in the report.

3.4.2 The contribution from geology and soils

On some sites, e.g. some gravels and alluvial contexts, there will be anomalies that can obscure those potentially of archaeological interest. They may have a strength equal to or greater than that associated with more relevant sources, e.g. ditch fills, but can normally be differentiated on the basis of anomaly form coupled with geological understanding. Where there is ambiguity, or relevance to the study, these anomalies will be included in this category.

Not all changes in geological context can be detected at the surface, directly or indirectly, but sometimes there will be a difference evident in the geophysical data that can be attributed to a change, e.g. from alluvium to tidal flat deposits, or bedrock to alluvium. In some cases the geophysical difference will not exactly coincide with the geological contact and this is especially the case across transitions in soil type.

Geophysical data varies in character across areas, due to a range of factors including soil chemistry, near surface geology, hydrology and land use past and present. These all contribute to the texture of the data, i.e. a background character against which all other anomalies are measured.

3.4.3 Agricultural inputs

Coherent linear dipolar enhancement of magnetic field strength marking ditch fills, narrow bands of more variable magnetic field or changes in apparent magnetic susceptibility, are all included within the category of former field boundaries if they correlate with those depicted on the Tithe Map or early Ordnance Survey maps. If there is no correlation then these anomaly types are not categorised as a field boundaries.

Banded variations in apparent magnetic susceptibility caused by a variable thickness of topsoil, depositional remanent magnetisation of sediments in furrows or susceptibility enhancement through heating (a by product of burning organic matter like seaweed) tend to indicate past cultivation, whether ridge-based techniques, medieval ridge and furrow or post medieval 'lazy beds'. Modern cultivation, e.g. recent ploughing, is not included.

In some cases it is possible to identify drainage networks either as ditch-fill type anomalies (typically 'Roman' drains), noisy or repeating dipolar anomalies from terracotta pipes or reduced magnetic field strength anomalies from culverts, plastic or non-reinforced concrete pipes. In all cases identification of a herring bone pattern to these is sufficient for inclusion within this category.

3.4.4 Features of archaeological interest

Any linear or discrete enhancement of magnetic field strength, usually with a dipolar character of variable strength, that cannot be categorised as a field boundary, cultivation or as having a geological origin, is classified as a fill potentially being of archaeological interest. Fills are normally earthen and include an often

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invisible proportion of heated soil or topsoil that augments local magnetic field strength. Inverted anomalies are possible over non-earthen fills, e.g. those that comprise peat, sand or gravel within soil. This category is subject to the 'habitation effect' where, in the absence of other sources of magnetic material, anomaly strength will decrease away from sources of heated soil and sometimes to the extent of non-detectability.

Former enclosure ditches that contained standing water can promote enhanced volumetric magnetic susceptibility through depositional remanence and remain detectable regardless of the absence of other sources of magnetic enhancement.

Anything that cannot be interpreted as a fill tends to be a structure, or in archaeological terms, a feature. This category is secondary to fills and includes anomalies that by virtue of their character are likely to be of archaeological interest but cannot be adequately described as fills. Examples include strongly magnetic bodies lacking ferrous character that might indicate hearths or kilns. In some cases anomalies of ferrous character may be included.

On some sites the combination of plan form and anomaly character, e.g. rectilinear reduced magnetic field strength anomalies, might indicate the likely presence of masonry, robber trenches or rubble foundations. Other types of structure are only included if the evidence is unequivocal, e.g. small ring ditches with doorways and hearths. In some circumstances a less definite category may be assigned to the individual anomalies instead.

It is sometimes possible to define different areas of activity on the basis of magnetic character, e.g. texture and anomaly strength. These might indicate the presence of middens or foci within larger complexes. This category does not indicate a presence or absence of discrete anomalies of archaeological interest.

3.5 Glossary

Acronym / term	Type	Definition
A	Physical quantity	SI unit Amp of electric current
BGS	Organisation	British Geological Survey
CIfA	Organisation	Chartered Institute for Archaeologists
dB	Physical quantity	Decibel, unit of amplification / attenuation
DRM	Process	Depositional Remanent Magnetisation
EAGE	Organisation	European Association of Geoscientists and Engineers
EGNOS	Technology	European Geostationary Navigation Overlay Service
ERT	Technology	Electrical resistivity tomography
ETRS89	Technology	European Terrestrial Reference System (defined 1989)
ETSI	Organisation	European Telecommunications Standards Institute
EuroGPR	Organisation	European Ground Penetrating Radar Association, the trade body for GPR professionals
G-BASE	Data	British Geological Survey Geochemical Atlas
GeolSoc	Organisation	Geological Society of London, the chartered body for the geological profession
GNSS	Technology	Global Navigation Satellite System
GPR	Technology	Ground penetrating radar
GPS	Technology	Global Positioning System (US)
inversion	process	A combination of forward and backward modelling intended to construct a 2D or 3D model of the physical distribution of a variable from data measured on a 1D or 2D surface. It is fundamental to ERT survey
IP	Physical quantity	Induced polarisation (or chargeability) units mV/V or ms
m	Physical quantity	SI unit metres of distance
mbgl	Physical quantity	Metres below ground level
MHz	Physical quantity	SI unit mega-Hertz of frequency
MS	Physical quantity	Magnetic susceptibility, unitless
mS	Physical quantity	SI unit milli-Siemens of electrical conductivity

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Acronym / term	Type	Definition
nT	Physical quantity	SI unit nano-Tesla of magnetic flux density
OFCOM	Organisation	The Office of Communications, the UK radio spectrum regulator
Ohm	Physical quantity	SI unit Ohm of electrical resistance
OS	Organisation	Ordnance Survey of Great Britain
OSGB36	Data	The OS national grid (Great Britain)
OSTN15	Technology	Current coordinate transformation from ETRS89 to OSGB36 co-ordinates
RDP	Physical quantity	Relative Dielectric Permittivity, unitless
RTK	Technology	Real Time Kinematic (correction of GNSS position from a base station)
s	Physical quantity	SI unit seconds of time
TMI	Physical quantity	Total magnetic intensity (measured flux density minus regional flux density)
TRM	Process	Thermo-Remanent Magnetisation
V	Physical quantity	SI unit Volt of electric potential
WGS84	Data	World Geodetic System (defined 1984)

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3.7 Archiving and dissemination

An archive is maintained for all projects, access to which is permitted for research purposes. Copyright and intellectual property rights are retained by TigerGeo on all material it has produced, the client having full licence to use such material as benefits their project. Where required, digital data and a copy of the report can be archived in a suitable repository, e.g. the Archaeology Data Service, in addition to our own archive.

The archive contains all survey and project data, communications, field notes, reports and other related material including copies of third party data (e.g. CAD mapping, etc.) in digital form. Many are in proprietary formats while report components are available in PDF format.

The client will determine the distribution path for reporting, including to the end client, other contractors,

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local authority etc., and will determine the timetable for upload of the project report to the OASIS Grey Literature library or supply of report or data to other archiving services, taking into account end client confidentiality.

TigerGeo reserves the right to display data rendered anonymous and un-locatable on its website and in other marketing or research publications.

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4 Supporting information

4.1 Standards and quality (archaeology)

TigerGeo is developing an Integrated Management System (IMS) towards ISO certification for ISO9001, ISO14001 and OHSAS18001/ISO45001 and has appointed Alan Ward of Bigfoot Services Limited as our ISO/HSE Technical Advisor. For work within the archaeological sector TigerGeo has been awarded CIfA (Chartered Institute for Archaeologists) Registered Organisation status.

A high standard of client-centred professionalism is maintained in accordance with the requirements of relevant professional bodies including the Geological Society of London (GeolSoc) and the Chartered Institute for Archaeologists (CIfA). Senior members of TigerGeo are professional members of the GeolSoc (FGS), CIfA (MCIfA & ACIfA grades) and other appropriate bodies, including the European Association of Geoscientists and Engineers (EAGE) Near Surface Division (MEAGE) and the Institute of Professional Soil Scientists (MISoilSci).

In addition TigerGeo is a member of EuroGPR and all ground penetrating and other radar work is in accordance with ETSI EG 202 730.

The management team at TigerGeo have over 30 years of combined experience of near surface geophysical project design, survey, interpretation and reporting, based across a wide range of shallow geological contexts. Added to this is the considerable experience of our lead geophysicists in a variety of commercial and academic roles. All geophysical staff have graduate and in many cases also post-graduate relevant qualifications pertaining to environmental geophysics from recognised centres of academic excellence.

During fieldwork there is always a fully qualified (to graduate or post-graduate level) supervisory geophysicist leading a team of other geophysicists and geophysical technicians, all of whom are trained and competent with the equipment they are working with. Data processing and interpretation is carried out by a suitably qualified and experienced geophysicist under the direct supervision and guidance of the Senior Geophysicist. All work is monitored and reviewed throughout by the Senior Geophysicist who will appraise all stages of a project as it progresses.

Data processing and interpretation adheres to the scientific principles of objectiveness and logical consistency. A standard set of approved external sources of information, e.g. from the British Geological Survey, the Ordnance Survey and similar sources of data, in addition to previous TigerGeo projects, guide the interpretive process. Due attention is paid to the technical constraints of method, resolution, contrast and other geophysical factors.

There is a strong culture of internal peer-review within TigerGeo, for example, all reports pass through a process of authorship, technical review and finally proof-reading before release to the client. Technical queries resulting from TigerGeo's work are reviewed by the Senior Geophysicist to ensure uniformity of response prior to implementing any edits, etc.

Work is undertaken in accordance with the high professional standards and technical competence expected by the Geological Society of London and the European Association of Geoscientists and Engineers.

All work for archaeological projects is also conducted in accordance with the following standards and guidance:

- David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008;
- "Standard and guidance for Archaeological Geophysical survey", Chartered Institute for Archaeologists, 2014 (Updated 2016);

and TigerGeo meets with ease the requirements of English Heritage in their 2008 Guidance "Geophysical Survey in Archaeological Field Evaluation" section 2.8 entitled "Competence of survey personnel".

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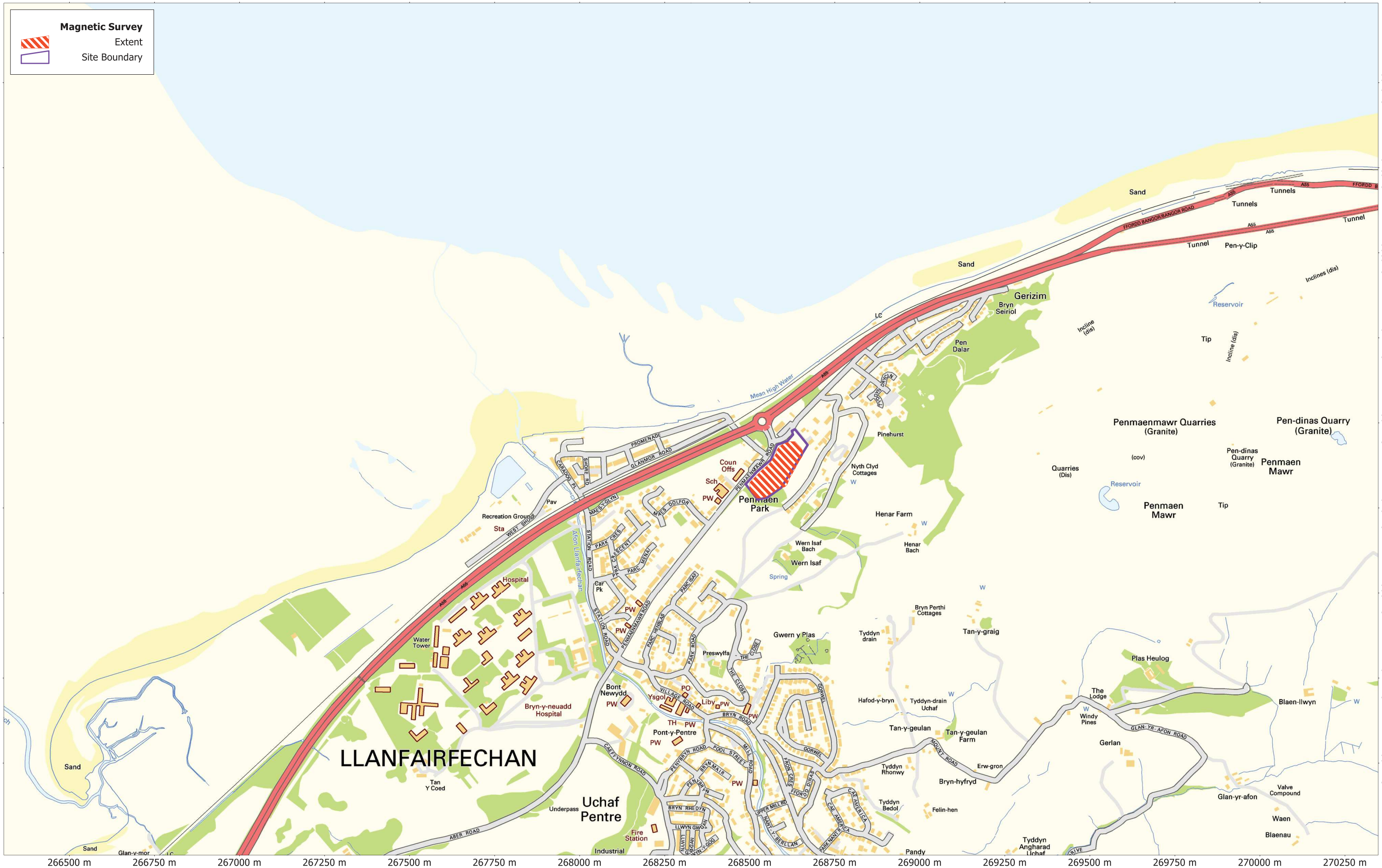
4.2 Key personnel

Martin Roseveare, MSc BSc(Hons) MEAGE FGS MCIfA	**Senior Geophysicist, Director**
Martin specialised (MSc) in geophysical prospection for shallow applications and since 1997 has worked in commercial geophysics. Elected a GeolSoc Fellow in 2009 he is now working towards achieving CSci. A member of the European Association of Geoscientists & Engineers, he has served on the EuroGPR and CIfA GeoSIG committees and on the scientific committees of the 10th and 11th Archaeological Prospection conferences. He has reviewed papers for the EAGE Near Surface conference, was a technical reviewer of the Irish NRA geophysical guidance and is a founding member of the ISSGAP soils group. Professional interests include the application of geophysics to agriculture and the environment, e.g. groundwater and geohazards. He is also a software writer and equipment integrator with significant experience of embedded systems.	
Anne Roseveare, BEng(Hons) DIS MISoilSci	**Operations Manager, Environmental Geophysicist - Data Analyst**
On looking beyond engineering, Anne turned her attention to environmental monitoring and geophysics. She is a Member of the British Society of Soil Science (BSSS) and has specific areas of interest in soil physics & hydrology, agricultural applications and industrial sites. Amongst other contributions to the archaeological geophysics sector over the last 18 years, Anne was the founding Editor of the International Society for Archaeological Prospection (ISAP) and is a founding member of the ISSGAP soils group. Specifications, logistics, safety, data handling & analysis are integral parts of her work, though she is happily distracted by the possibilities of discovering lost cities, hillwalking and good food.	
Jennifer Smith, MSc	**Fieldwork Manager, Environmental Geophysicist**
Jen developed an interest in all aspects of topographical and geophysical survey whilst studying for a MSc in Archaeological Science at the University of Bristol. During her studies she obtained valuable experience in the use of and data analysis for various terrestrial geophysical techniques as well as develop her interest further by adding marine geophysical techniques to her working theoretical knowledge. She has worked as a near-surface geophysicist within archaeology for several years and has developed a good knowledge of UK geology. Outside of work, Jen is currently learning Java code but is easily distracted by keeping fit, exploring the world or some other hobby.	
Daniel Lewis, MA BA(Hons) ACIfA	**Consultant Archaeologist**
Daniel studied archaeology at the University of Nottingham and worked in field archaeology for many years, managing urban and rural fieldwork projects in and around Herefordshire. When the desk became more appealing he jumped into the world of consulting, working on small and large multi-discipline projects throughout England and Wales. At the same time, he returned to University, gaining an MA in Historic Environment Conservation. With over 15 years' experience in the heritage sector, Daniel has a diverse portfolio of skills. Here he ensures that geophysical work within the heritage sector is well grounded in the archaeology. His spare time includes much running up mountains	
Luigi Benente, MSc	**Consultant Environmental Geophysicist**
Luigi is an experienced geologist specialized in geophysics, who gained a blend of practical and technical experience within explorations carried out in Italy, Peru, Colombia, Ecuador, Mexico, Uzbekistan, Thailand and Nigeria. Resourceful and hardworking with a positive attitude in problem solving, he has the ability to lead a team through challenging tasks, organizing people and equipment in order to hit the goal in safety and with time conscious professionalism. He is attracted to discover hidden things within the earth and after celebrating with friends, good wine, good beer and lots of food he is able to repair most broken things...	
Alexandra Gerea, MSc, BSc, PhD Candidate	**Geophysical Processor & Analyst**

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Alexandra has a BSc in Geophysics and an MSc in Applied Geo-biology and started a PhD in the UK after living in Portugal for six months working on her master's degree. Since 2008 she has used most mainstream processing applications across electrical, magnetic and radar methods. She combines a love of nature and science and is currently studying plant roots in agricultural environments using geophysical methods. When not doing that she enjoys travelling, hiking, nature, yoga, books, foreign languages and cats. Two years ago she found a passion for electronics and started building different devices including intelligent gardening systems and coding in Python.

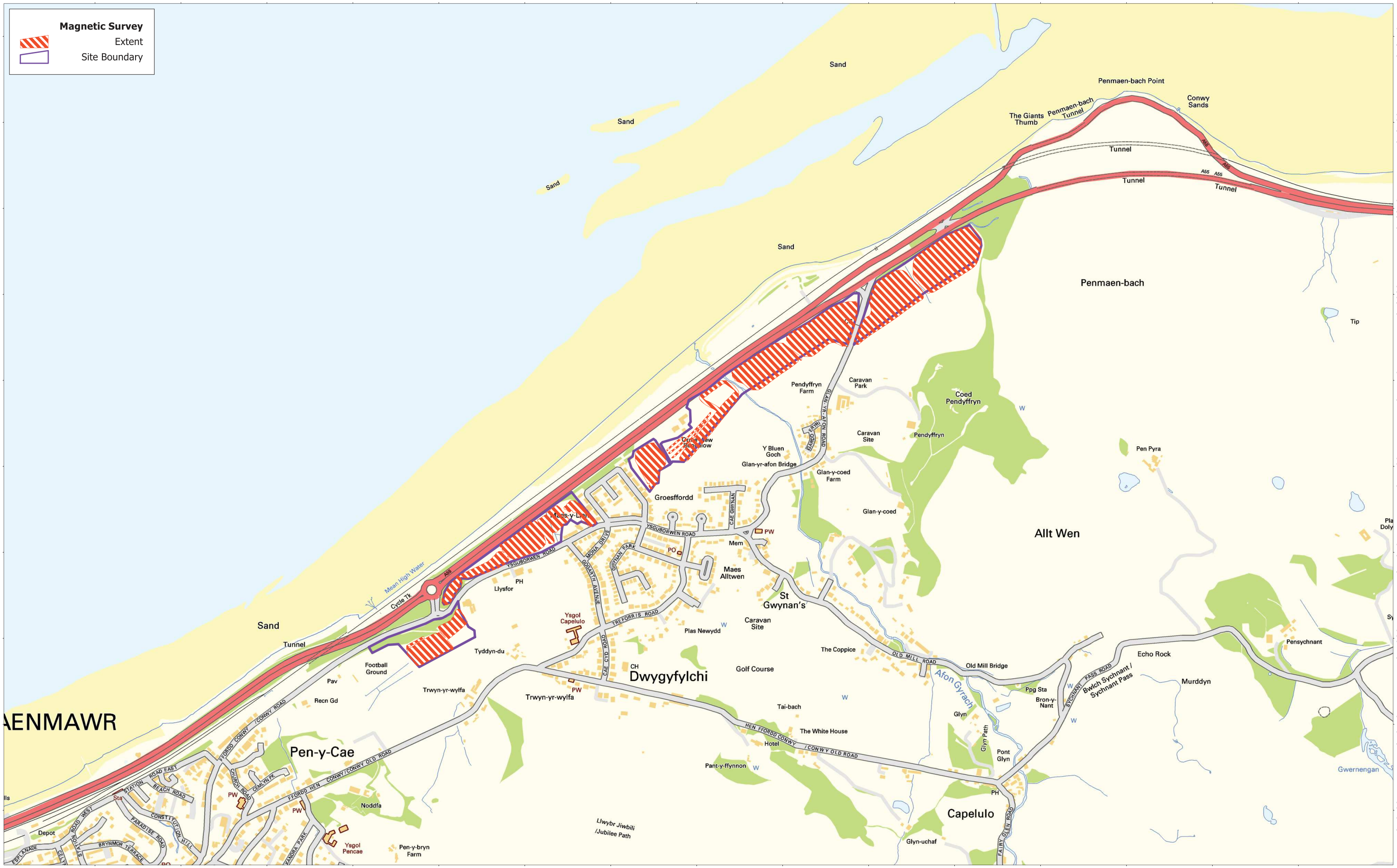
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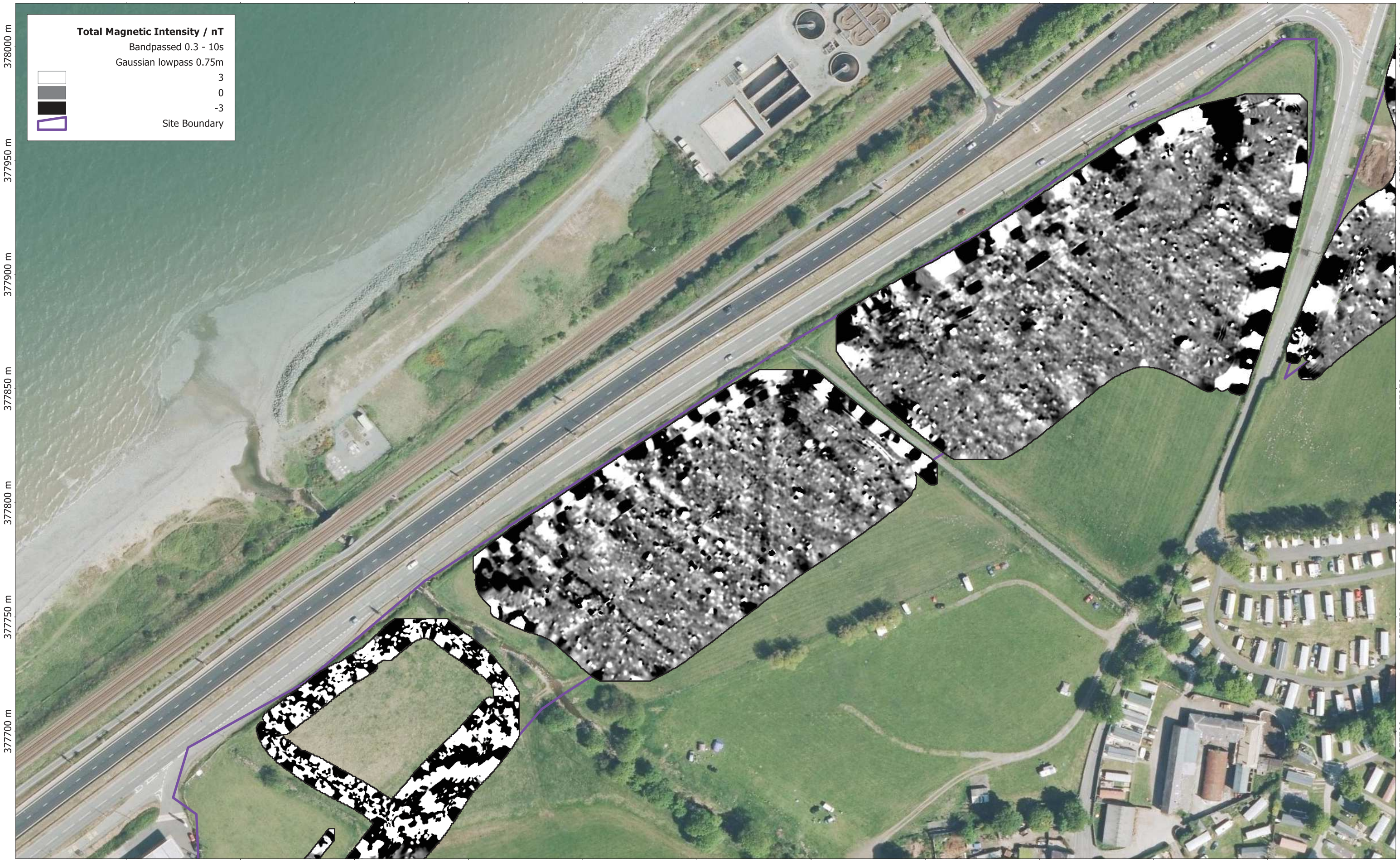
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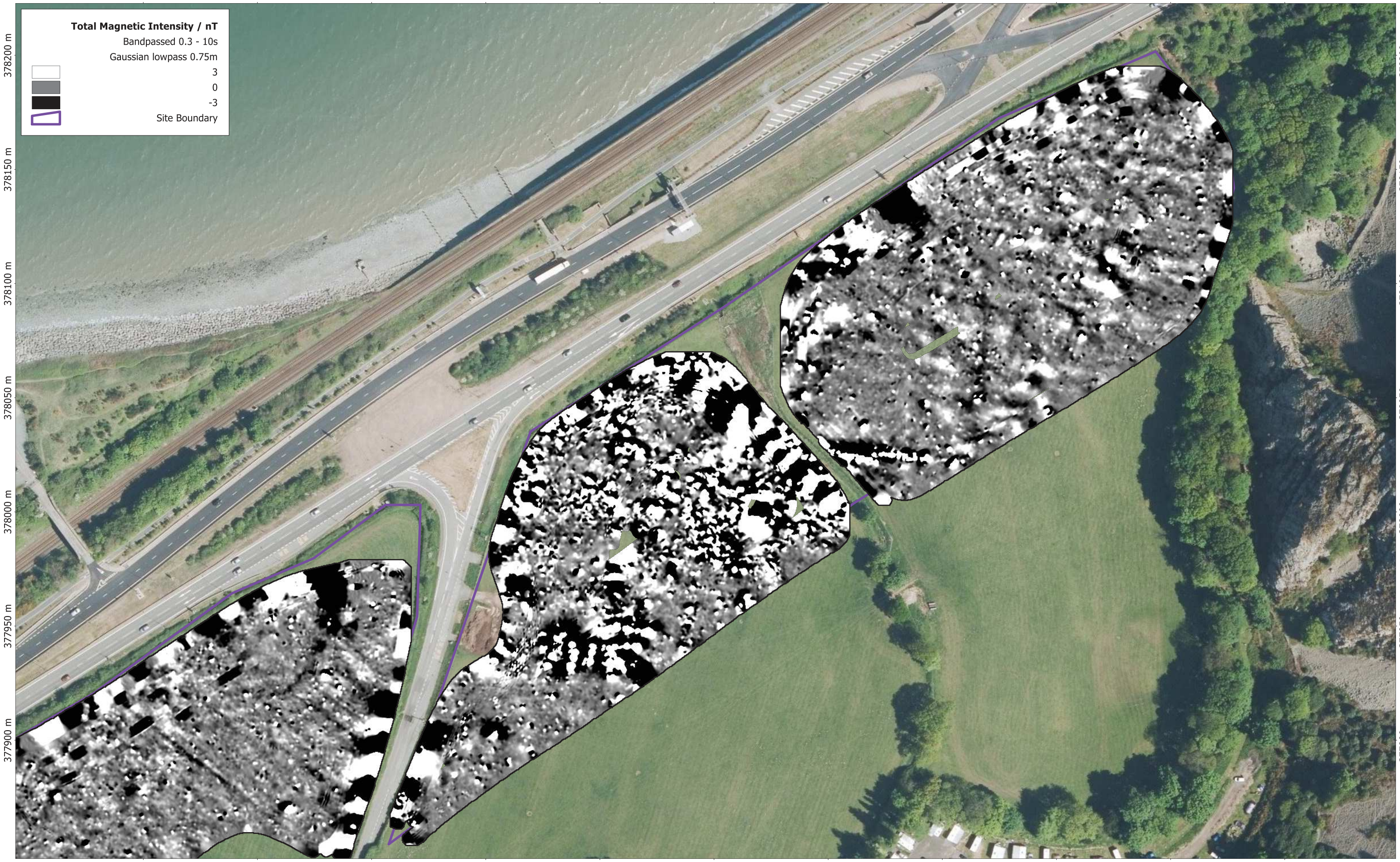
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Total Magnetic Intensity / nT
Bandpassed 0.3 - 10s
Gaussian lowpass 0.75m
3
0
-3
> 50 nT
> 20 nT
> 5 nT
< -5 nT
< -20 nT
< -50 nT

Interpretation
12 Catalogue Labels
Probable ditch fills
Highlighted areas
Highlighted linears
Former cultivation
Probable land drains
Ground change
Services (approximate line)

6
5
10
3
4

272500 m 272525 m 272550 m 272575 m 272600 m 272625 m 272650 m 272675 m 272700 m 272725 m 272750 m 272775 m 272800 m 272825 m 272850 m 272875 m 272900 m 272925 m 272950 m 272975 m 273000 m 273025 m 273050 m 273075 m

377250 m 377225 m 377200 m 377175 m 377150 m 377125 m 377100 m 377075 m 377050 m 377025 m 377000 m 376975 m 376950 m 376925 m

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DWG 03a Interpretation - Fields 02 - 04

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Total Magnetic Intensity / nT
Bandpassed 0.3 - 10s
Gaussian lowpass 0.75m
3
0
-3
> 50 nT
> 20 nT
> 5 nT
< -5 nT
< -20 nT
< -50 nT

Interpretation
12 Catalogue Labels
Probable ditch fills
Highlighted areas
Highlighted linears
Former cultivation
Probable land drains
Ground change
Services (approximate line)

272725 m 272750 m 272775 m 272800 m 272825 m 272850 m 272875 m 272900 m 272925 m 272950 m 272975 m 273000 m 273025 m 273050 m 273075 m 273100 m 273125 m 273150 m 273175 m 273200 m 273225 m 273250 m 273275 m

377425 m 377400 m 377375 m 377350 m 377325 m 377300 m 377275 m 377250 m 377225 m 377200 m 377175 m 377150 m 377125 m 377100 m

6 7 8 9 5 10

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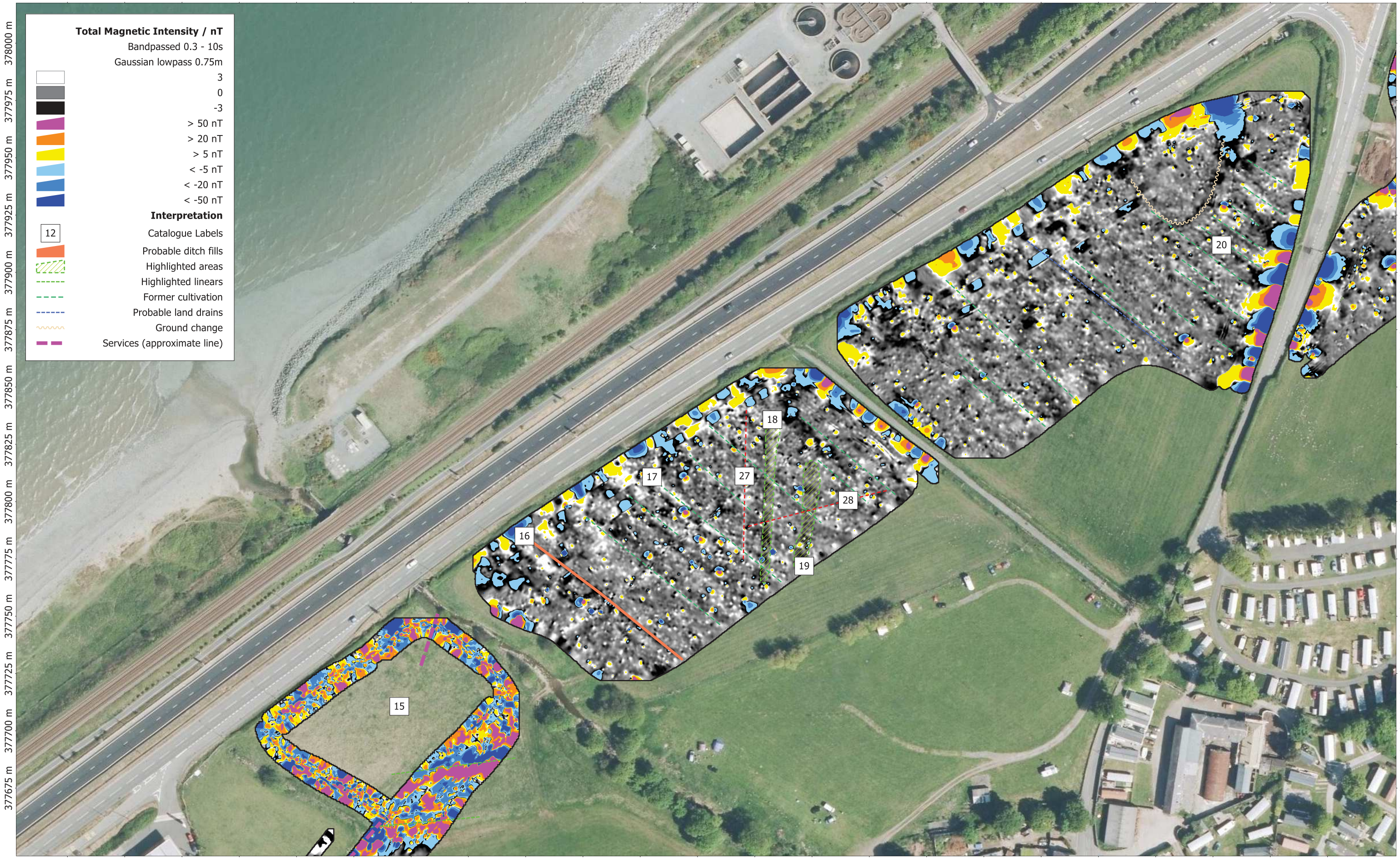


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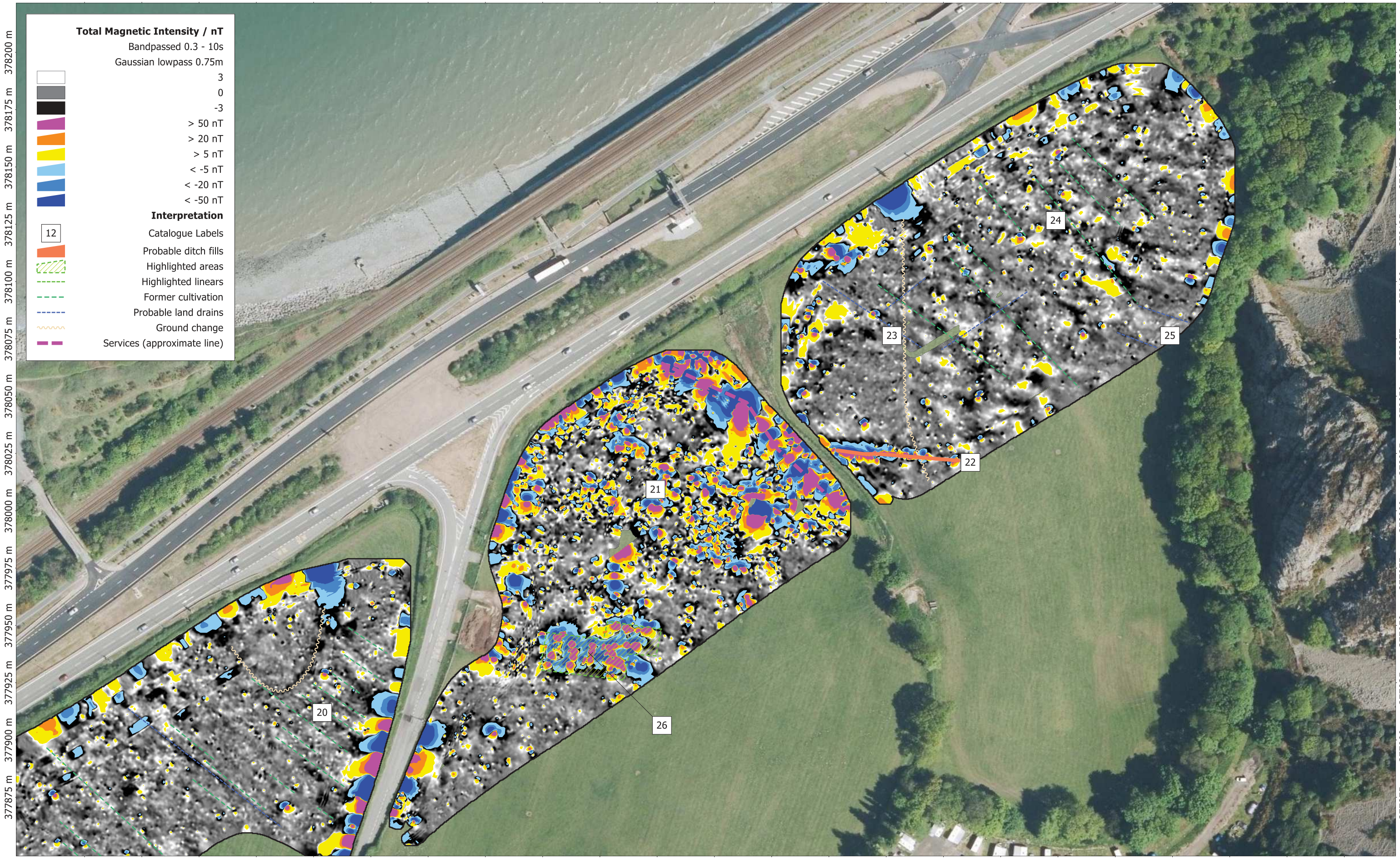
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DWG 03e Interpretation - Fields 15 - 17

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268275 m 268300 m 268325 m 268350 m 268375 m 268400 m 268425 m 268450 m 268475 m 268500 m 268525 m 268550 m 268575 m 268600 m 268625 m 268650 m 268675 m 268700 m 268725 m 268750 m 268775 m 268800 m 268825 m

375550 m 375525 m 375500 m 375475 m 375450 m 375425 m 375400 m 375375 m 375350 m 375325 m 375300 m 375275 m 375250 m 375225 m

Total Magnetic Intensity / nT
Bandpassed 0.3 - 10s
Gaussian lowpass 0.75m
3
0
-3
> 50 nT
> 20 nT
> 5 nT
< -5 nT
< -20 nT
< -50 nT

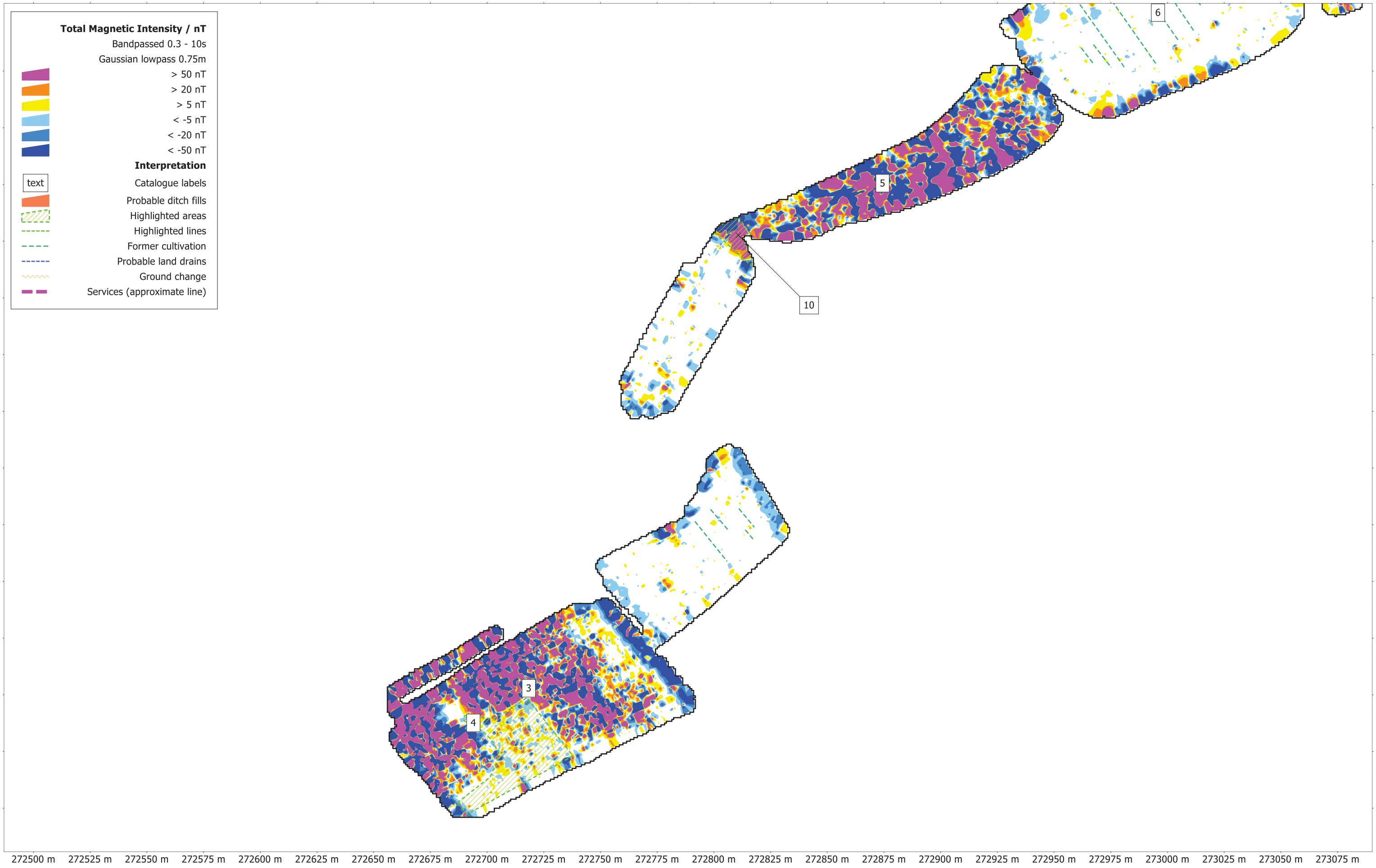
Interpretation
12 Catalogue Labels
Probable ditch fills
Highlighted areas
Highlighted linears
Former cultivation
Probable land drains
Ground change
Services (approximate line)

1
2

APW191 A55 Junctions 15 and 16 Improvements
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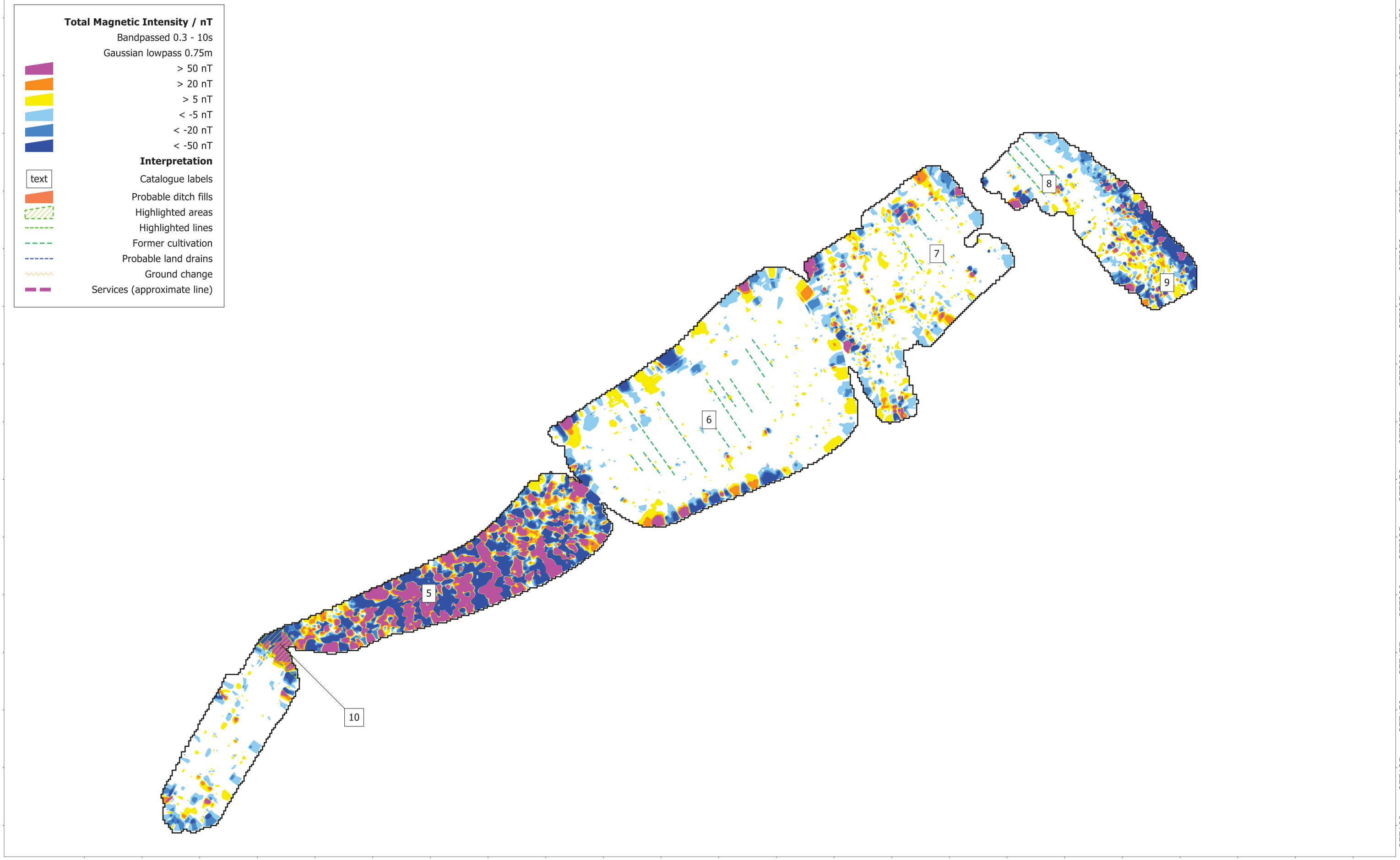
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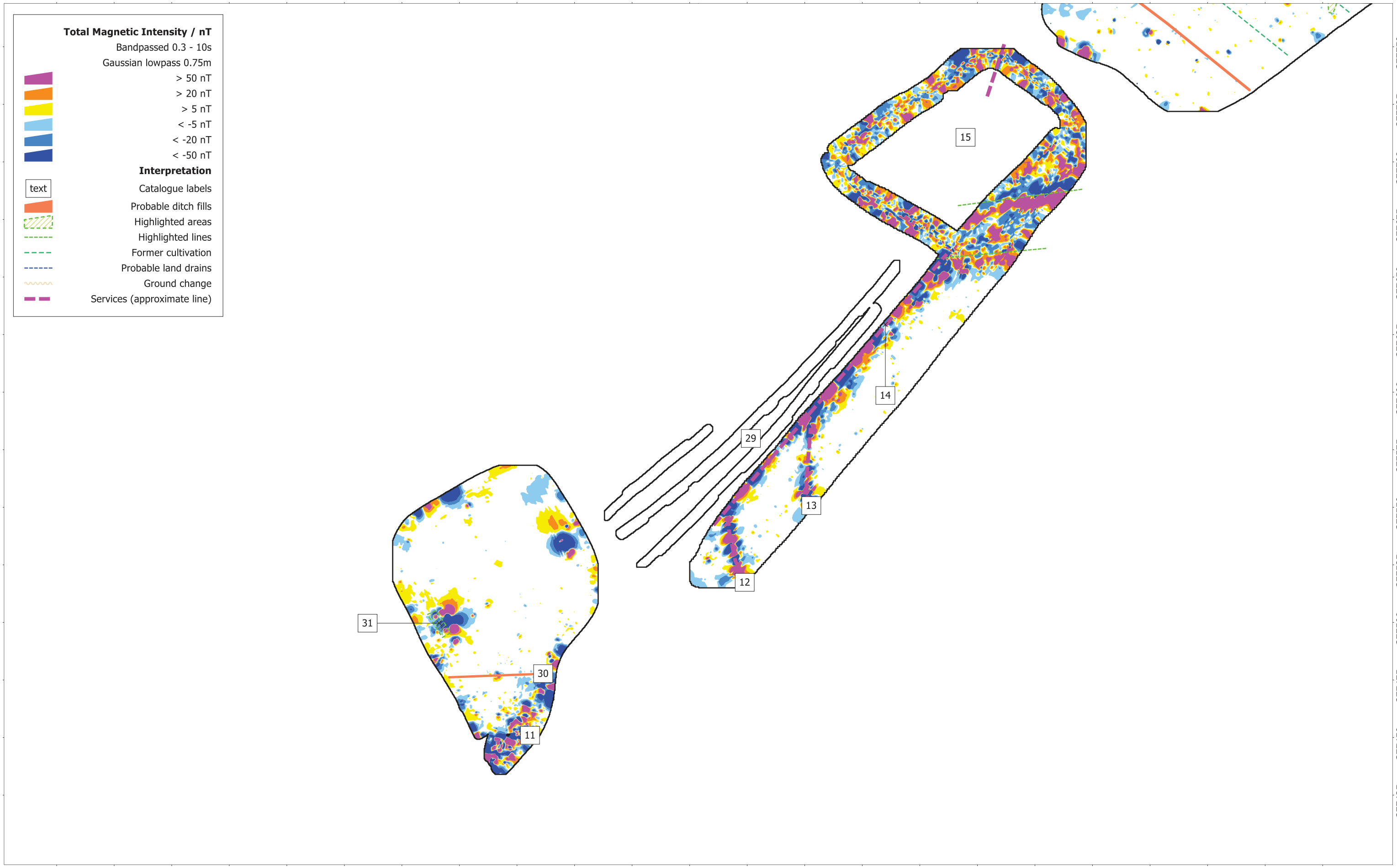


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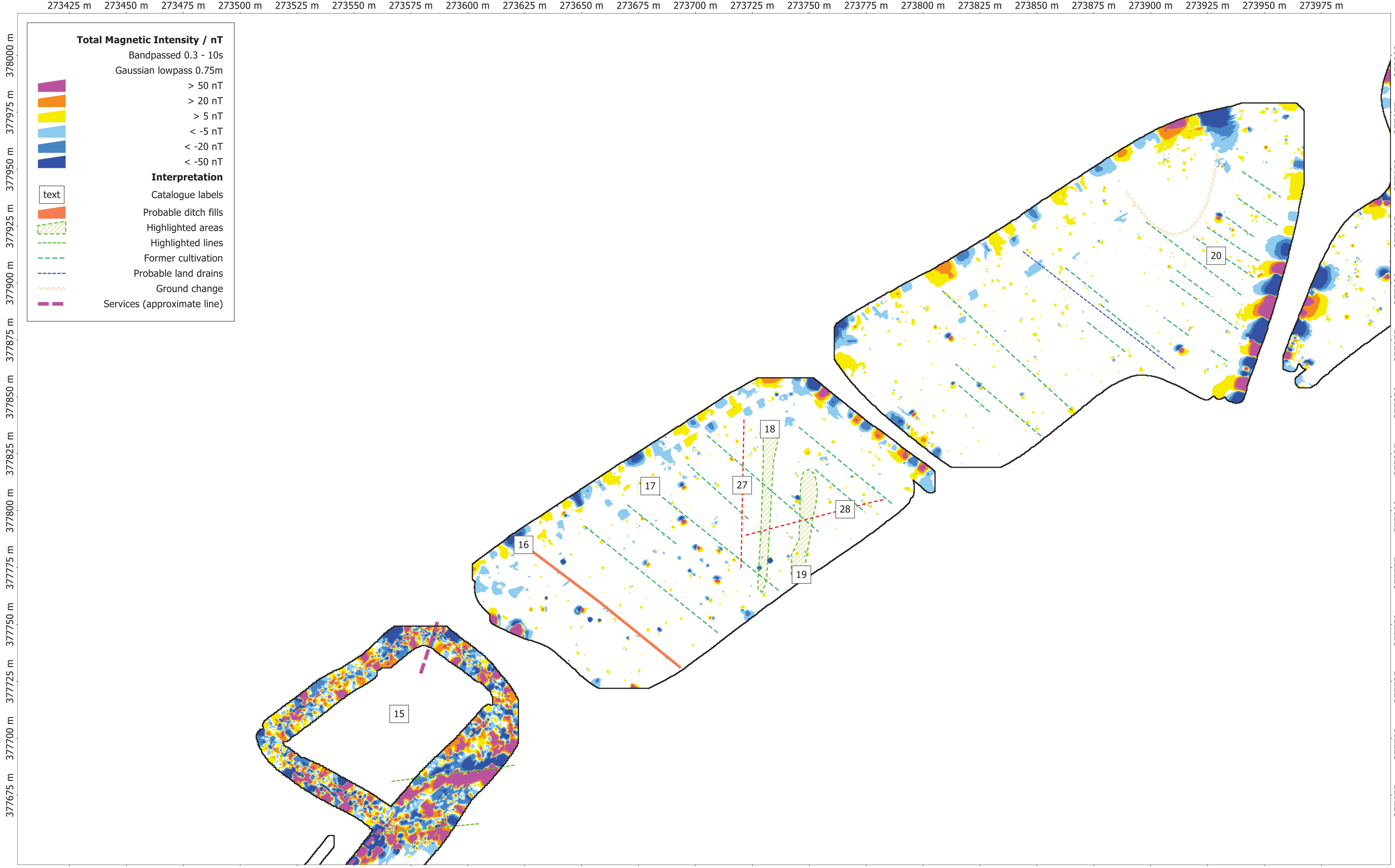
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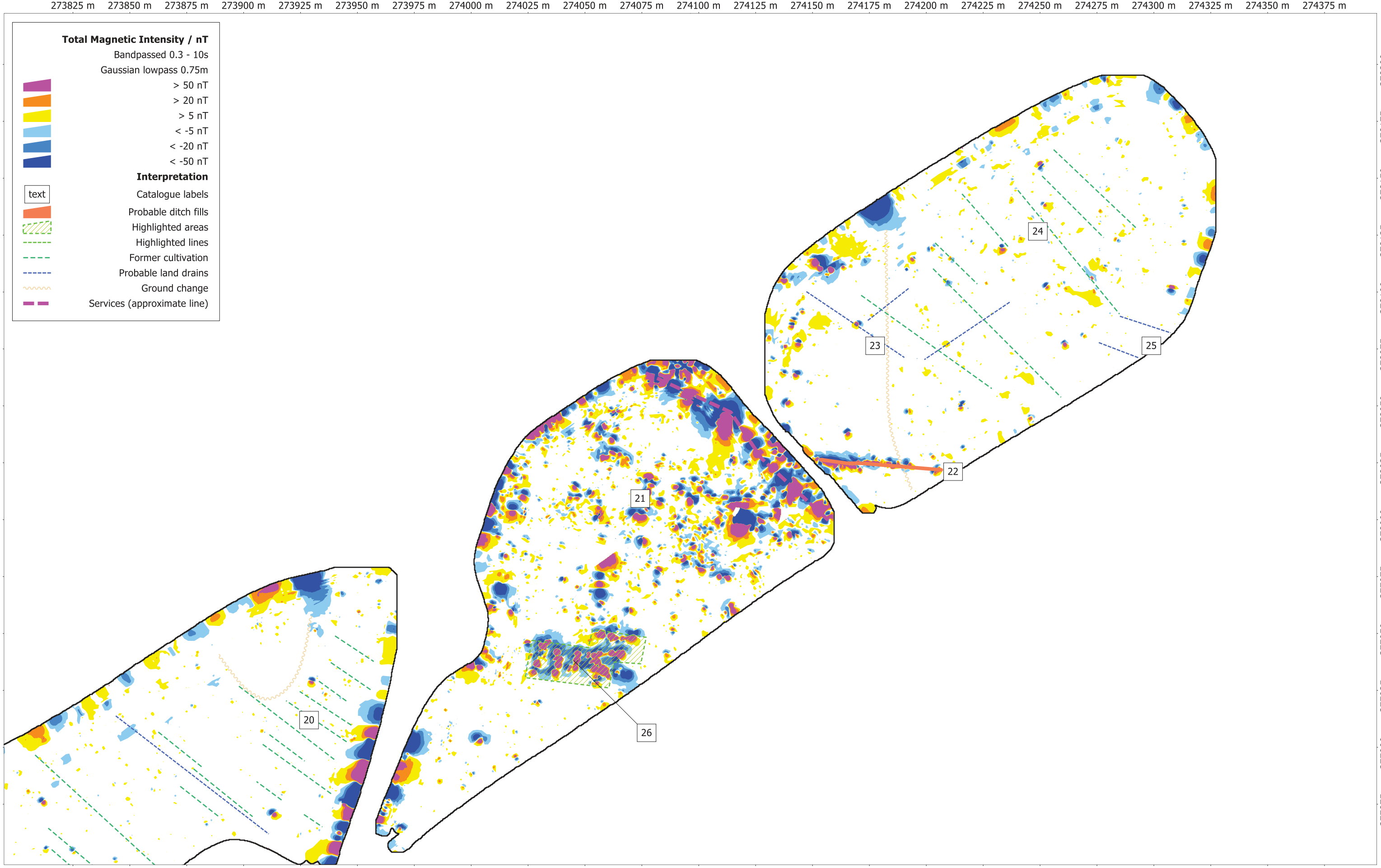
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DWG 04d Interpretation Vector - Fields 13 - 15

Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing
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Total Magnetic Intensity / nT
Bandpassed 0.3 - 10s
Gaussian lowpass 0.75m
> 50 nT
> 20 nT
> 5 nT
< -5 nT
< -20 nT
< -50 nT

Interpretation
text — Catalogue labels
Probable ditch fills
Highlighted areas
Highlighted lines
Former cultivation
Probable land drains
Ground change
Services (approximate line)



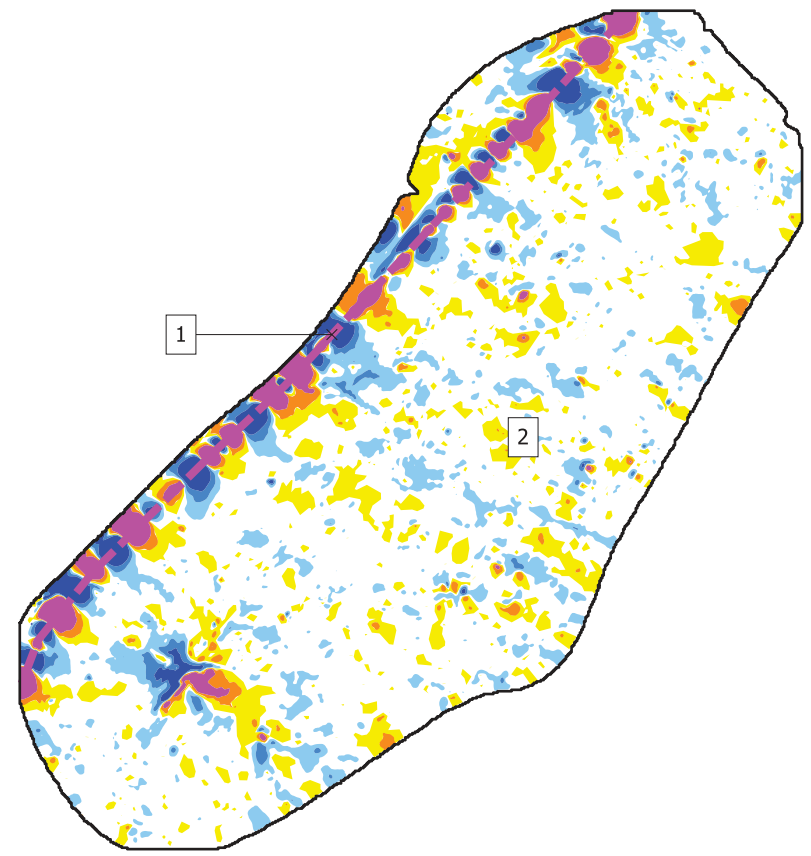
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DWG 04e Interpretation Vector - Fields 15 - 17

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Total Magnetic Intensity / nT
Bandpassed 0.3 - 10s
Gaussian lowpass 0.75m
> 50 nT
> 20 nT
> 5 nT
< -5 nT
< -20 nT
< -50 nT

Interpretation
text Catalogue labels
Probable ditch fills
Highlighted areas
Highlighted lines
Former cultivation
Probable land drains
Ground change
Services (approximate line)



268275 m 268300 m 268325 m 268350 m 268375 m 268400 m 268425 m 268450 m 268475 m 268500 m 268525 m 268550 m 268575 m 268600 m 268625 m 268650 m 268675 m 268700 m 268725 m 268750 m 268775 m 268800 m 268825 m

375550 m 375525 m 375500 m 375475 m 375450 m 375425 m 375400 m 375375 m 375350 m 375325 m 375300 m 375275 m 375250 m 375225 m

APW191 A55 Junctions 15 and 16 Improvements
DWG 04f Interpretation Vector - Field 01

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APPENDIX 10.6
LIST OF ASSETS: VALUE, IMPACT AND SIGNIFICANCE

Junction 15 Chapter 10 Appendix 10.6
Lists of Assets on the HER

No	PRN	Name	SAM	Listed	CA	PG	HL	GR	Source	Value	Impact	Significance	Further assessment
1	255	Gwern y Plas Hut Group	CN072					SH68657484	Cadw	High	Minor	Moderate/ Slight	Noise Reduction
2	11575	Wern Isaf; Rosebriars		II*		Yes		SH6861075110	HER	High	Moderate	Moderate/ Large	Noise Reduction
3	66707	No.1 Bryn Haul		II	Yes			SH6844374662	HER	Medium	Negligible	Neutral/Slight	
4	66706	No.3 Bryn Haul		II	Yes			SH6846474658	HER	Medium	Negligible	Neutral/Slight	
5	66690	No.4 Bryn Haul		II	Yes			SH6847374655	HER	Medium	Negligible	Neutral/Slight	
6	66691	Former Stable Block at Bryn-y-Neuadd Hospital		II		Yes		SH6773274659	HER	Medium	Negligible	Neutral/Slight	
7	66692	GREENHILLS		II	Yes			SH684957488	HER	Medium	Negligible	Neutral/Sli	
8	66693	Post Box		II	Yes			SH6837574696	HER	Medium	Negligible	Neutral/Slight	
9	66694	Grey Gables		II	Yes			SH6850374840	HER	Medium	Negligible	Neutral/Slight	
10	5839	Grey Gables 3549,3522		II	Yes			SH6845274662	HER	Medium	Negligible	Neutral/Slight	
11	66695	Northfield		II	Yes			SH6831674738	HER	Medium	Negligible	Neutral/Slight	
12	66703	Northfield 3526, 3558		II	Yes			SH6829074748	HER	Medium	Negligible	Neutral/Slight	
13	66696	Neuadd Wen		II	Yes			SH6849274913	HER	Medium	Negligible	Neutral/Slight	
14	66698	Paragon Electrical Shop		II	Yes			SH6806474893	HER	Medium	Negligible	Neutral/Slight	
15	66699	Fron Goch		II	Yes			SH6837074542	HER	Medium	Negligible	Neutral/Slight	
16	66700	Garden Fountain in grounds at Bryn-y-Neuadd Hospital		II		Yes		SH6760374564	HER	Medium	Negligible	Neutral/Slight	

Junction 15 Chapter 10 Appendix 10.6
Lists of Assets on the HER

17	66701	Carreg Wen		II	Yes			SH6832974530	HER	Medium	Negligible	Neutral/Slight	
18	3521	Gorsefield		II				SH6769875184	HER	Medium	Negligible	Neutral/Slight	
19	66709	Hilcroft		II	Yes			SH6843374719	HER	Medium	Negligible	Neutral/Slight	
20	66710	Maes Aled		II	Yes			SH6845274712	HER	Medium	Negligible	Neutral/Slight	
21	66718	Rose Lea		II	Yes			SH6839274724	HER	Medium	Negligible	Neutral/Slight	
22	66731	Trewen		II	Yes			SH6840274688	HER	Medium	Negligible	Neutral/Slight	
23	66732	Bryn Ffawydd		II	Yes			SH6846974759	HER	Medium	Negligible	Neutral/Slight	
24	66711	Plas Farmhouse (Henblas Farm		II	Yes			SH6833774804	HER	Medium	Negligible	Neutral/Slight	
25	66717	Plas Farm Outbuildings (Henblas Farm Outbuildings)		II	Yes			SH6833874773	HER	Medium	Negligible	Neutral/Slight	
26	66714	Granary/Cartshed		II	Yes			SH6829574774	HER	Medium	Negligible	Neutral/Slight	
27	66712	Hillcrest		II	Yes			SH6848674826	HER	Medium	Negligible	Neutral/Slight	
28	66713	Parciau		II	Yes			SH6846974702	HER	Medium	Negligible	Neutral/Slight	
29	66725	Araulfan		II	Yes			SH6848174688	HER	Medium	Negligible	Neutral/Slight	
30	66745	Slate Fence To Se Of Araulfan		II	Yes			SH6848274679	HER	Medium	Negligible	Neutral/Slight	
31	66728	Carreg Frau		II	Yes			SH6849674721	HER	Medium	Negligible	Neutral/Slight	
32	66730	Bolnhurst		II	Yes			SH6834074753	HER	Medium	Negligible	Neutral/Slight	
33	66734	Brooklands		II	Yes			SH6832774720	HER	Medium	Negligible	Neutral/Slight	

Junction 15 Chapter 10 Appendix 10.6
Lists of Assets on the HER

34	66737	Beamsmoor		II	Yes			SH6844874941	HER	Medium	Negligible	Neutral/Slight	
35	66739	The Haven		II	Yes			SH6836174693	HER	Medium	Negligible	Neutral/Slight	
36	66740	Dwyfor		II	Yes			SH6850074865	HER	Medium	Negligible	Neutral/Slight	
37	66742	Aey y Gwynt		II	Yes			SH6846774791	HER	Medium	Negligible	Neutral/Slight	
38	66743	Acorn Cottage		II	Yes			SH6852474798	HER	Medium	Negligible	Neutral/Slight	
39	66753	Whilome		II	Yes			SH6837174730	HER	Medium	Negligible	Neutral/Slight	
40	66744	Talfor		II				SH6770575189	HER	Medium	Negligible	Neutral/Slight	
41	66752	Woodcot		II	Yes			SH6835974742	HER	Medium	Negligible	Neutral/Slight	
42	66748	Efrydfa		II	?			SH6843774686	HER	Medium	Negligible	Neutral/Slight	
43	66760	Ty Hwnt Yr Afon		II	Yes			SH6841474725	HER	Medium	Negligible	Neutral/Slight	
44	66756	Coedfa		II	Yes			SH6834374706	HER	Medium	Negligible	Neutral/Slight	
45	66757	Plas Llanfair Cottage		II	Yes			SH6818274798	HER	Medium	Negligible	Neutral/Slight	
46	66755	White Friars		II				SH6766775160	HER	Medium	Negligible	Neutral/Slight	
47	66749	Carreg Llwyd		II	Yes			SH6853574836	HER	Medium	Negligible	Neutral/Slight	
48	3568	Church Men's Club (Church Institute)		II	Yes			SH6830774820	HER	Medium	Negligible	Neutral/Slight	
49	66721	Church Institute		II*	Yes			SH6830874796	HER	High	Negligible	Slight	Noise Reduction
50	66733	Church Cottages		II	Yes			SH6813274731	HER	Medium	Negligible	Neutral/Slight	
51	66715	Llanfair Arms Ph		II	Yes			SH6838174602	HER	Medium	Negligible	Neutral/Slight	
52	66716	B & H Stores		II	Yes			SH6833974646	HER	Medium	Negligible	Neutral/Slight	

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Lists of Assets on the HER

53	66719	Pont-y-Pentre		II	Yes			SH6837374623	HER	Medium	Negligible	Neutral/Slight	
54	66722	Church Cottages		II	Yes			SH6812974724	HER	Medium	Negligible	Neutral/Slight	
55	66723	Christ Church		II				SH681377468	HER	Medium	Negligible	Neutral/Slight	
56	6991	Llanfairfechan Parish Church		II	Yes			SH6829074570	HER	Medium	Negligible	Neutral/Slight	
57	66724	Preswylfa		II	Yes			SH6840374792	HER	Medium	Negligible	Neutral/Slight	
58	66746	Slate Fence To N Of Lodge To Preswylfa		II	Yes			SH6834174859	HER	Medium	Negligible	Neutral/Slight	
59	66726	The Towers		II				SH6791975391	HER	Medium	Negligible	Neutral/Slight	
60	66727	Slate Fence Opposite Ne Corner Of Beamsmoor		II	Yes			SH6847774966	HER	Medium	Negligible	Neutral/Slight	
61	66729	Bryn-Y-Neuadd Farmhouse, Including Attached Dairy		II*	Yes			SH6799174777	HER	High	Moderate	Moderate/ Large	Noise Reduction and screening
62	66759	Dutch Barn At Bryn-Y-Neuadd Farm		II	Yes			SH6804274848	HER	Medium	Negligible	Neutral/Slight	
63	66751	Courtyard Ranges Of Agricultural Buildings At Bryn-Y-Neuadd Farm		II	Yes			SH6798674825	HER	Medium	Negligible	Neutral/Slight	
64	66735	Bronrardd		II	Yes			SH6802174920	HER	Medium	Negligible	Neutral/Slight	
65	66736	Bodafon		II	Yes			SH6842974602	HER	Medium	Negligible	Neutral/Slight	
66	66747	The Original Fish & Chip Shop		II	Yes			SH6836474594	HER	Medium	Negligible	Neutral/Slight	

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67	66750	War Memorial, Llanfairfechan		II	Yes			SH6809774758	HER	Medium	Negligible	Neutral/Slight	
68	66754	Cottage At Pont-Y-Pentre		II	Yes			SH6836274613	HER	Medium	Negligible	Neutral/Slight	
69	66758	Plas Newydd		II	Yes			SH6823174752	HER	Medium	Negligible	Neutral/Slight	
70	69003	Nant,		II				SH6865874319	HER	Medium	Negligible	Neutral/Slight	
71	74906	Gwynfor		II				SH6800875370	HER	Medium	Negligible	Neutral/Slight	
72	4407	Bryn-y-neuadd Hospital Grounds				Yes		SH67707470	HER	High	No Change	Neutral	
73	4475	Wern Isaf; Rosebriars				Yes		SH68007500	HER	High	Minor	Moderate/ Slight	Noise Reduction
74	15814	Llanfairfechan, Landscape in Creuddyn & Arllechwedd					Yes	SH68307510	HER	High	Minor	Moderate/ Slight	Noise Reduction
75	62440	Llanfairfechan Conservation Area			Yes			SH6846674852	HER/Conwy	High	Minor	Moderate/ Slight	Noise Reduction
76	62441	Llanfairfechan Town Centre Conservation Area			Yes			SH6834975202	HER/Conwy	High	Moderate	Moderate/ Large	Noise Reduction and screening
77	24736	Stone Axe						SH69167515	HER	Low	No Change	Neutral	
78	67414	Stone axe findspot						SH6855474268	HER	Low	No Change	Neutral	
79	67330	Stone Axe Working Area, Ffridd Tan y Graig						SH69157518	HER	Medium	Minor	Slight	Noise Reduction
80	67415	Stone axe roughout findspot, Ffridd Tan y Graig						SH69187517	HER	Low	No Change	Neutral	

Junction 15 Chapter 10 Appendix 10.6
Lists of Assets on the HER

81	67641	Stone axe roughout, Tyddyn Drain						SH68877478	HER	Low	No Change	Neutr0al	
82	67642	Stone axe roughout, Ffridd Tan y Graig						SH6912775210	HER	Low	No Change	Neutral	
83	67644	Stone axe roughouts, N of Henar						SH6902875327	HER	Low	No Change	Neutral	
84	67779	Stone axe roughout,						SH684747	HER	Low	No Change	Neutral	
85	67783	Stone axe roughout, Ffridd Tan y Graig						SH69167515	HER	Low	No Change	Neutral	
86	67782	Stone axe-hammer, Park Nant						SH6874074277	HER	Low	No Change	Neutral	
87	4094	Graig Lwyd Roughout						SH68487482	HER	Low	No Change	Neutral	
88	4096	Coin Hoard Roman						SH68907550	HER	Low	No Change	Neutral	
89	31690	Hut Circle, Possible, Tyddyn Drain						SH68907483	HER	Low	Negligible	Neutral/Slight	
90	62315	Rectory,						SH6816474615	HER	Low	No Change	Neutral	
91	62317	Benarth House						SH6808475084	HER	Low	No Change	Neutral	
92	62304	Plas Llanfair (Y Plas						SH6833574945	HER	Low	No Change	Neutral	
93	56317	Crushing Mill						SH6901875574	HER	Low	No Change	Neutral	
94	56318	Footbridge, NE of Tyddyn Drycin						SH6899975643	HER	Low	Negligible	Neutral/Slight	
95	56316	House, Bryn Goleu						SH6879875466	HER	Low	Negligible	Neutral/Slight	

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Lists of Assets on the HER

96	33361	English Wesleyan Methodist Church						SH6814274904	HER	Low	No Change	Neutral	
97	62369	Clergy House of Rest						SH6872275619	HER	Unknown	Unknown	Unknown	Watching Brief/Evaluation Excavation
98	31691	Graffitied Stones, Tyddyn Drain						SH68907486	HER	Low	No Change	Neutral	
99	77131	Milestone, Nant-y-Felin						SH67807435	HER	Low	No Change	Neutral	
100	77190	Training Camp,						SH6786075300	HER	Low	Negligible	Neutral/Slight	
101	62354	Electric Motor, Penmaenmawr Quarry						SH69627528	HER	Low	No Change	Neutral	
102	6389	St. Winifred's School Chapel						SH68307490	HER	Negligible	No Change	Neutral	
103	24157	Figurine Fragment						SH68977567	HER	Low	No Change	Neutral	
104	58782	Line of the Post Road, Conwy to Bangor						SH6803974682	HER	Medium	Minor	Slight	Noise Reduction
105	32070	Ffynnon Fair,						SH68247468	HER	Low	No Change	Neutral	
106	34623	Felin-hen Llanfairfechan						SH6901474365	HER	Low	No Change	Neutral	
107	34625	Nant Upper Mill						SH6855274358	HER	Low	No Change	Neutral	
108	34630	Mill, Ye Olde Mill Stores						SH6841074580	HER	Low	No Change	Neutral	
109	ID 1	Linear-Continuous Probable Service						SH68507538	Geophysics	Unknown	Major	Unknown	Evaluation Excavation
110	ID 2	Area of debris and highly magnetised soils						SH68487530	Geophysics	Unknown	Moderate	Unknown	Evaluation Excavation
111	ID 001	Wern Isaf Track						SH68507510	Field Survey	Low	Minor	Neutral/Slight	

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Lists of Assets on the HER

112	ID 002	Wern Isaf Track 02						SH68607520	Field Survey	Low	Minor	Neutral/Slight	
113	ID 003	Old Boundary near Wern Isaf						SH68497525	Field Survey	Low	Minor	Neutral/Slight	
114	ID 004	Drain 1						SH68597538	Field Survey	Low	Negligible	Neutral/Slight	
115	ID 005	Drain 2						SH68507505	Field Survey	Low	Negligible	Neutral/Slight	
116	ID 006	Mound						SH68687535	Field Survey	Low	Minor	Neutral/Slight	
117	ID 007	Disused Boundary						SH68687535	Field Survey	Low	Minor	Neutral/Slight	
118	ID 008	Slate Boundary Fence near Wern Isaf						SH68707540	Field Survey	Low	Negligible	Neutral/Slight	
119	ID 009	Enclosed Wood						SH68727519	Field Survey	Low	Negligible	Neutral/Slight	

APPENDIX 10.7
HERITAGE IMPACT ASSESSMENT

APPENDIX 10.7 JUNCTION 15

HERITAGE IMPACT ASSESSMENT AND IMPACT ON SETTING JUNCTION 15 A55

1 INTRODUCTION

1.1 Purpose of report

1.1.1 Proposals are being developed to introduce alterations to Junction 15 on the A55, north Wales Expressway.

1.1.2 As part of the archaeological Desk based assessment and Environmental Statement it is required to assess the impact on designated and undesignated archaeology and cultural heritage and their setting. This Heritage Impact assessment, looking at the designated assets in the area of Junction 15 on the A55 is the first step of that process and looks at the setting of these assets following guidance brought out by Welsh Government in 2017, *Setting of Historic Assets in Wales* May 2017.

1.1.3 This report is the document which sets out the findings of that Assessment.

1.2 Location of junction

1.2.1 Junction 15 on the A55 is located close to the settlement of Llanfairfechan. It is currently a roundabout but proposals are being developed to remove the roundabout and achieve the junction through the use of slip roads. The existing highway layout on the A55 to the east of Llanfairfechan is illustrated in the figure (1) below.

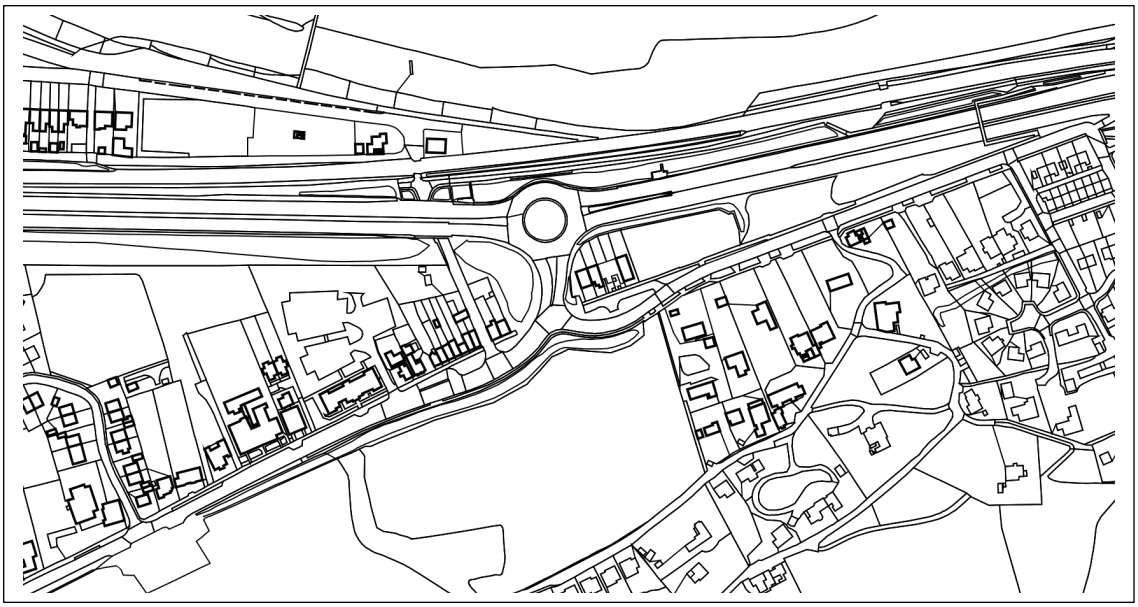


Figure 1 Location of Junction 15

1.2.2 The National Grid reference for the centre of the existing junction is SH

1.3 Proposed junction improvement

1.2.1 It is proposed to alter Junction 15 on the A55 such that the Junction is served by slip roads rather than a roundabout. The outline design for this option is illustrated in attached as Appendix 1.

1.2.2 The Junction 15 improvements would include the replacement of the roundabout at Llanfairfechan with a grade separated junction. This would require an overbridge to be constructed spanning both east and west carriageways. The overbridge would be approximately 8.0-8.5 metres in height above the A55 main carriageway.

1.2.3 New slip roads to the north and south of the overbridge would be constructed to enable east and westbound access on and off the junction to the A55. The A55 dual carriageway would be continuous through the junction. Changes would also affect Penmaenmawr Road and connection to the existing Junction 15. The realignment of Penmaenmawr Road would require additional land take of circa 1.5 hectares to the south-east and a new cutting into the rising ground to the south adjacent to Penmaen Park.

1.2.4 To accommodate the junction and the necessary highway alignments and slip roads, the A55 dual carriageway would be moved south towards residential properties along Penmaenmawr Road resulting in the loss of 10-12 metres of the existing curtilage for the properties closest to the existing roundabout. Penmaenmawr Road, in the area of the former roundabout would be remodelled to provide a safe junction with the A55 slip roads.

1.2.5 Two properties on shore Road East adjacent to the existing roundabout would be demolished as part of the scheme proposals. A new junction off Penmaenmawr Road would be created to maintain access to Shore Road East and maintain access beneath the railway to Shore Road and the Promenade.

1.2.6 A new embankment west of Shore Road East and south of the A55 would be required as a result of the new westbound on slip road. A new retaining wall circa 5.5-6.0 metres in height would be constructed to the north and east of Shore Road East to support the westbound slip road on the approaches to the overbridge.

1.2.7 To the north of the new grade separated junction, the Scheme would be an elevated viaduct supported on a series of piers at varying heights with a maximum at 5.5 metres high immediately south of the railway line in order to support the new overbridge and for the new eastbound off slip and eastbound on slip roads.

2 WORKING METHODS AND DATA SOURCES

2.1 Data from a number of sources has been consulted to inform this Heritage Impact assessment, particularly relating to designated sites which include information regarding Scheduled Ancient Monuments (SAM), Listed (LB) Buildings, Registered Parks and Gardens, Registered Historic Landscapes and Conservation Areas. Tithe maps, First edition Ordnance Survey (OS) maps and LiDAR data has also been consulted.

2.2 One SAM (Gwern y Plas CN 072,) is located within 1km of the Junction. There is one Grade II* Listed Building, Wern Isaf/Rosebriars designed and lived in by the architect Herbert Luck North within 400 metres of Junction15. The gardens of Wern Isaf/Rosebriars are a Registered Historic Park and Garden (Grade II). The Junction is also just outside the North Arllechwedd Historic Landscape and just outside the Llanfairfechan Town Centre Conservation area.

3. Historic Mapping and other data

3.1 Tithe maps of the 1840s and First edition OS maps of the mid 1870s have been consulted. The location of the junction is within Llanfairfechan Parish at the time of the Tithe. The route of the A55 does not exist in the 1840s although land allocated for the railway is shown as is Penmaenmawr Road, few buildings are shown. Around 30 years later the Railway, by now built, is mapped on the OS First Edition 6" maps, buildings are shown to the south of the Railway line as well as development along Penmaenmawr Road.



Figure 2 Location of Junction 15 on Tithe Map

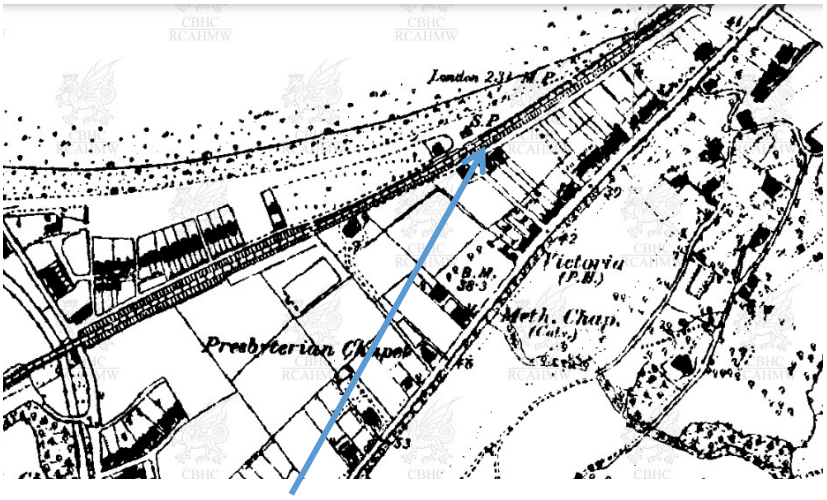


Figure 3 Junction location as shown on First Edition Ordnance Survey 6" maps

3.2 LiDAR data at 1m resolution is available to view on the Welsh Government website www.lle.gov.wales . No features are visible in the vicinity of the Junction or close to the designated sites.

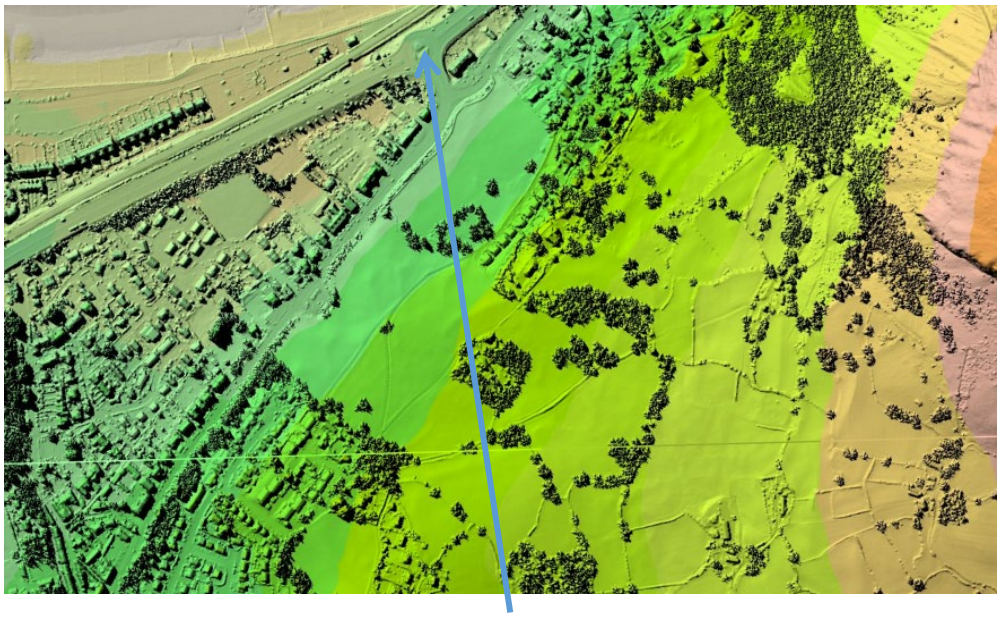


Figure 4 Junction as shown on LiDAR data

4 Designated sites

4.1 Scheduled Ancient Monuments

4.1.1 As noted above there is one SAM within the 1km of the Junction. The site of Gwern y Plas (CN 072) is within 700 metres of the junction 15, located upslope to the south east. Gwern y Plas, CN 072 is described in the Cadw schedule as 'A *settlement of nine or ten round huts with associated stone walls. The site is confined to a small copse, which is surrounded by cultivated fields on three sides and a housing estate on the fourth. The ground slopes to the west, and a small stream runs through the settlement. The enclosure walls are defined by rough lines of boulders, or very low grass covered banks. The hut walls are generally grass covered, but where visible are of two orthostatic faces*

with a rubble core. The monument is of national importance for its potential to enhance our knowledge of prehistoric settlement and defence.' The site is thought to date to the prehistoric period, perhaps the Iron Age. The site is wooded and currently has no authorised public access.

4.2 Listed Buildings

4.2.1 Wern Isaf or Rosebriars as it was known when first designed and built by Herbert Luck North, has a date stone recording 1900 as the construction date. It is a listed building Grade II* (ref 3567). The house, constructed of Buckley brick is described in the listing as '*Two storey, 3 sided gabled and dry-dash rendered front towards terraced garden. Slate roofs without bargeboards, flush eaves; brick stacks towards centre of roof and to cat-slide outer slopes. Sloping dormer head left and (added) small dormer with lattice glazing to right. Paired, narrow upper lights with tall 8-pane timber sashes; triple ground floor windows with paired small pane casements and pointed glazed door to centre with slated steps leading down. Single-storey hipped domestic range towards hillside on S side with oversailing eaves and end stack. "Butterfly Plan" to entrance front with hipped roof over long small-pane landing window; tiled facings. Recessed doorway under timber bressumer with incised date "1900" and monogram "HLN"; studded door with original metal fittings and diagonal bracing (inside).* 'with a '*Remarkably complete interior. Inventive spacious plan unaltered from North's original designs. Polygonal entrance hall with rooms radiating on ground floor; cantilevered landing and staircase with Arts and Crafts timber handrails and newels. Tiled floor and angled chimney surround to hall; cloakroom (family bookroom) to left. Exceptional canted suite of three intercommunicating public rooms within garden front; glazing bars to dividers. Beamed ceilings, wooden shutters with punched decoration and strapwork hinges, low seats to splays, timber sills and valences, dramatic 6-panelled doors. Islamic style design to outward curving overmantel with tiled chimney surround. Similar treatment to bedroom floor with polygonal plan form, small arts and crafts chimney pieces, battened doors. Beams to ceiling groins.'* Wern Isaf is within 400 metres of Junction 15 and is the nearest listed building to the junction. It lies above and looks down towards the junction. Other listed buildings are located within the 1km distance of Junction 15, many of which are the Herbert Luck North designed buildings situated in The Closewhich are predominantly listed at Grade II. From these important listed buildings there is no direct line of sight with Junction 15, thus they will not be considered in any more detail here. They are however assessed within the ES.

4.3 Registered Park and Garden

4.3.1 The Register of Landscapes, Parks and Gardens of Special Historic Interest. Part 1 Parks and Gardens: Gwynedd, was published around 20 years ago. The gardens of Wern Isaf/Rosebriars (ref GD 9), also designed by Herbert Luck North, are included and noted as Grade II. The Register now has statutory status following the enactment of the Historic Environment (Wales) Act 2016. The grounds, noted as Grade II, are included primarily because they represent an '*Arts and Crafts garden laid out by the architect of the house, Herbert Luck North, contemporary with the house. The layout of the terraces is carefully*

integrated with the plan of the house, thus giving a strong sense of unity to the whole'. The extent of the ground surround the house, Wern Isaf, above Junction 15. The gardens are in private ownership (by descendants of Herbert Luck North) and there is no public access although the current owners allow a www.historypoints.org link at the site and the house and gardens are open, by appointment, for a two week period during the summer months. There is however a footpath/right of way which passes Wern Isaf. The Garden Register for Gwynedd depicts the essential setting for Wern Isaf (see image below). This significant view is across Penmaen Park towards the Sea and Puffin Island. More detail on this view are available in the Environmental Statement for Junction 15, Chapter 9, Landscape, Appendix 9.4.

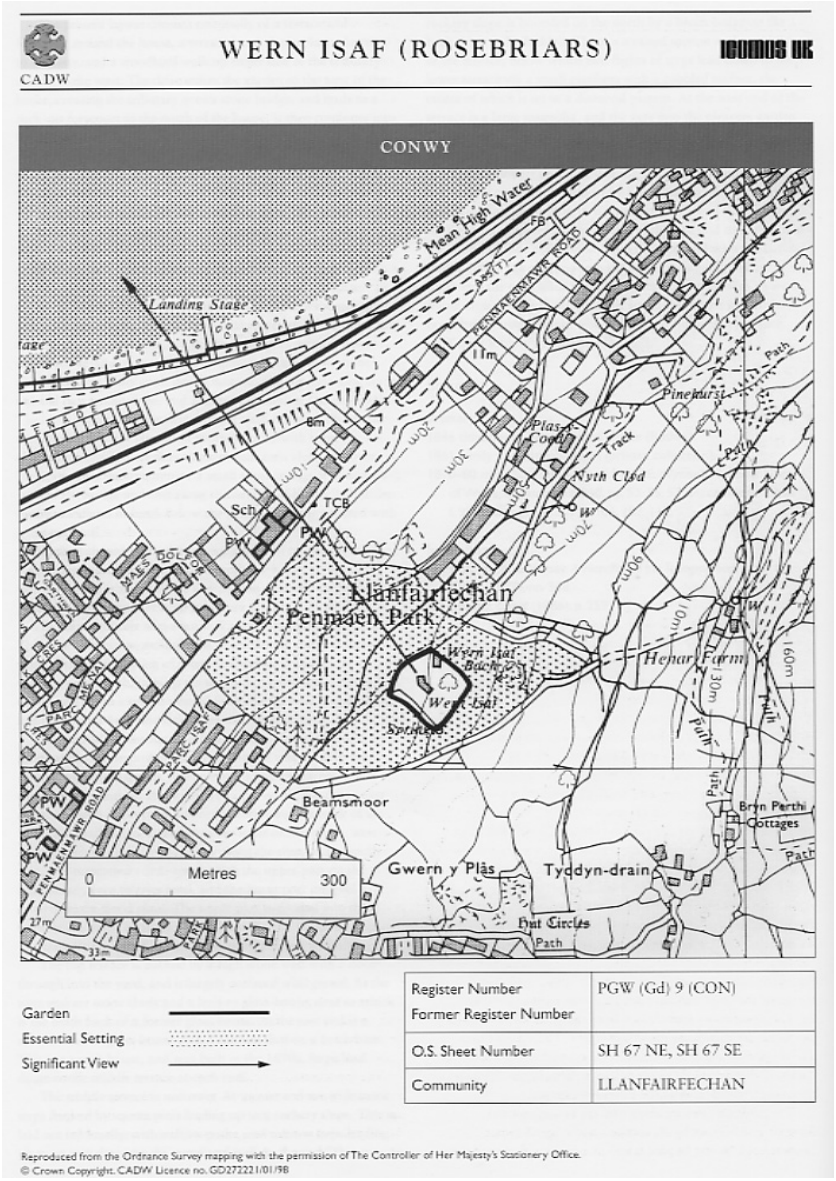


Figure 5 Location of Wern Isaf Registered Garden, showing essential setting (dotted) and significant views.

The essential setting surrounds the garden and extends to Penmaenmawr Road to the north west, with the most significant view towards the sea and the A55.

4.4 Conservation Area

4.4.1 The Llanfairfechan Town Centre Conservation Area stretches eastwards to within almost 50 metres of the roundabout at Junction 15. As yet there is not a separate Conservation Area Management Plan for the Llanfairfechan Town Centre Conservation Area however Conwy County Borough has produced Supplementary Planning Guidance (SPG) which gives generic advice relating to developments affecting Conservation Areas.

4.4.2 The SPG reflects the Conwy Local Development Plan (LDP) states:

POLICY CTH/2 – DEVELOPMENT AFFECTING HERITAGE ASSETS Development proposals which affect a heritage asset listed below (a-f), and/or its setting, shall preserve or, where appropriate, enhance that asset. Development proposals will be considered in line with Policy DP/6, where applicable and Policy DP/3.

a) ***Conservation Areas***

b) Conwy World Heritage Site

c) Historic Landscapes, Parks and Gardens

d) Listed Buildings

e) Scheduled Ancient Monuments

f) Sites of archaeological importance

4.4.3 In relation to Highways the SPG states '*Proposals within Conservation Areas for development/redevelopment that would generate significantly increased levels of traffic, parking, noise, smells or other environmental problems (to a point that is detrimental to the character or appearance of the Conservation Area) will generally be resisted. Movement is essential to the wellbeing of any area, but it can also be destructive….. ….. Achieving the right balance between movement and the quality of a place is never easy. There needs to be an emphasis that the quality of streets and spaces should not be sacrificed to meet the needs of traffic or parking.'*

4.5. Registered Historic Landscape

4.5.1 In the mid-1990s two volumes identifying Historic Landscapes across Wales were produced. The North Arllechwedd (ref HLW (C) 1) is mapped and described as an xxxxx historic landscape. The area stretches from the coastal area near Llanfairfechan southwards to Garnedd Uchaf. Junction 15 lies just outside the designated Historic Landscape as does Wern Isaf/Rosebriars (Listed Building and Registered Park and Garden) and the Llanfairfechan Town Centre Conservation Area but Gwern y Plas SAM is within the Historic Landscape.

5 ASSESSMENT OF IMPACTS

5.1 Junction Proposals

It is proposed to replace the existing roundabout at Junction 15 on the A55 with a junction achieved through the use of slip roads and an overbridge. It is not expected that such a

change would substantially increase traffic but would improve the flow of traffic at the junction. Construction is likely to include the demolition of two buildings to the east of the Junction, just outside the Conservation Area as well as a land-take for the slip roads.

5.2 In order to assess the nature and significance of these potential impacts the value of the assets identified has been assessed alongside the scale of impact on those assets using the tables included in Appendix 2 in order to guide decision making.

Once the Value and Impact of proposals has been assessed it is possible to identify the significance of effect of the proposals using the table below.

Table 1 Significance of Effects Matrix

VALUE	**Very High**	Neutral	Slight	Moderate/ Large	Large or Very Large	Very Large
	High	Neutral	Slight	Moderate/ Slight	Moderate/ Large	Large/ Very Large
	Medium	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Slight/ Moderate
	Negligible	Neutral	Neutral	Neutral/ Slight	Neutral/ Slight	Slight
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
		MAGNITUDE OF IMPACT				

Table 2 Impact and Significance relating to the features identified in this Heritage Impact assessment

Asset	**Ref Number**	**Value**	**Magnitude of Impact**	**Significance of Effect**
Gwern y Plas SAM	CN 072	High	Minor	Moderate/Slight
Wern Isaf LB Grade II*	3567	High	Moderate	Moderate/Large
Wern Isaf Registered Garden Grade II	GD 9	High	Moderate	Moderate/Large
Llanfairfechan Town Centre Conservation Area		Medium	Major	Moderate/Large
North Arllechwedd Historic Landscape	Character Areas 12	High	Minor	Moderate/Slight

From the above table it is possible to see that there is a Moderate/Slight impact on the SAM, Registered Park and Garden and Historic Landscape but a Moderate/Large impact upon the Conservation Area and the Grade II* listed building of Wern Isaf. This compliments the views put forward in The Environmental Statement, Junction 15, Chapter 9, Landscape, where the impact, from a landscape perspective, on these assets is also evaluated as Moderate/Large.

6 IMPACT ON SETTING

6.1 Where there is no direct physical impact on a historic asset the indirect impact or impact on the setting can be analysed. Welsh Government, through their Historic Advisory Service, Cadw, issued in 2017 the document Setting of Historic Assets in Wales. This document sets out a methodology for assessing the impact of change/development within the setting of Historic Assets. Stage 1 is to identify the Historic Asset, Stage 2 to Define and Analyse the Setting and Stage 3 to Evaluate the potential Impact of Change or Development.

6.2 This methodology is followed here to assess the impact of the proposals for alterations and construction of a new Junction 15 on the A55 to the historic assets noted above.

6.3 Stage 1: Identify the Historic Assets

Section 4, above, outlines the nature of the designated assets within 1km of Junction 15 on the A55. The assets comprise the scheduled monument, Gwern y Plas, prehistoric settlement; the Grade II* listed building Wern Isaf and its Grade II associated garden; the Llanfairfechan Town Centre Conservation Area and finally the Regsitered Historic Landscape of North Arllechwedd.

6.4 As noted above in Section 5, Gwern y Plas SAM, Wern Isaf listed building, Wern Isaf Registered Garden and the North Arllechwedd Historic Landscape are of High value while the Llanfairfechan Town Centre Conservation Area if of Medium value.

6.5 Stage 2: Define and analyse the Setting of the Monument

6.6 The SAM, Gwern y Plas (CN 072), is a settlement of 9 or 10 round houses enclosed within a stone wall, probably dating to the late Iron Age or early Roman period. It is now confined to a small copse, upslope and south of Junction 15 and located on the edge of housing within Llanfairfechan, surrounded on three sides by open fields. Similar sites to Gwern y Plas are located south and upslope where other prehistoric sites are located and a very similar site, hut circles near Wern Newydd, CN 250, to the south west of Llanfairfechan. It could be argued that the setting of Gwern y Plas is south of the A55, on the lower slopes of Llanfairfechan rising up to the prehistoric, predominantly ritual and funerary monuments on the uplands of Penmaenmawr Mountain.

6.7 The Grade II* listed building of Wern Isaf, constructed by Herbert Luck North is much closer to Junction 15 on the A55. It is turn is surrounded by its Registered Grade II Garden. The Garden Register published, alongside the description of the garden, a map illustrating the Essential Setting of the Garden and any Significant views. Thus it is possible to more easily identify the setting of the listed building and registered garden. This setting, as shown in the Figure 5 above, demonstrates that the setting of the registered garden extends northwards to Penmaenmawr Road, with the Significant view, similarly north towards the sea and Puffin Island offshore.

6.8 Llanfairfechan Town Centre Conservation Area, at its easternmost extent is within c 50 metres of the existing roundabout at Junction 15 on the A55. No up to date Conservation Area Appraisal exists for the area, however the core of the Conservation Area is the central area of Llanfairfechan, westwards of Junction 15. However part of the setting of the Conservation Area must include the area of Junction 15 and the A55.

6.9 The Register of Outstanding Historic Landscapes includes the area of North Arllechwedd which, although it excludes the settlement of Llanfairfechan, does include the upland area to the south, including the SAM Gwern y Plas. The Historic Landscape area has undergone Historic Landscape Characterisation and this has included the settlement of Llanfairfechan, Area 12 Llanfairfechan (http://www.heneb.co.uk/hlc/creuddyn-arllechwedd/creu12.html). The key historic landscape characteristics are that of a '*Planned resort town, esplanade and shops, Art-and-Crafts style*' The Characterisation recognises that '*It is dominated by its main axes, which run south-west to north east. These are the post-road (the former A55), the modern by-pass to the north and the main line railway. The road which runs from the post-road here to the beach is lined by attractive, though down-at-heel, shop buildings, Arts-and-Crafts influenced, and by substantial nineteenth century dwellings with large gardens, leading to a typical Welsh esplanade development consisting of a row of boarding houses, a cafe on the beach, and a model yacht pond'* Thus the existing Junction 15, to the north east of Llanfairfechan settlement is within the setting of this historic Character area, although the character area itself is not included within the designated Historic Landscape.

6.10 Stage 3: Evaluate the potential impact of a proposed change or development

6.11 As noted above in sections 1.2, it is proposed to alter the existing roundabout at Junction 15 of the A55 to a grade separated junction. It is clear that there is an existing impact on the setting of the designated sites, particularly Wern Isaf listed building and associated Registered Garden, Llanfairfechan Town Centre Conservation Area and Character Area 12 of the North Arllechwedd Historic Landscape. An attempt has been made to assess the potential impact of the proposed new junction which incorporates new slip roads north and south of the A55 carriageway, an overbridge and the construction of both embankments and cuttings.

6.12 It is anticipated that the proposals would have a minimal impact on the setting of Gwern y Plas SAM (CN072) which correlates with the Moderate/Slight significance of effect identified within section 5.3. Any impact is likely to result from changes in noise levels brought about by proposed alterations and 700 metres away. There is no direct line of sight between Junction 15 and Gwern y Plas.

6.13 The proposals have the potential to adversely affect three of the remaining four designated sites of Wern Isaf listed building and Registered Garden and Llanfairfechan Town Centre Conservation Area. In particular Wern Isaf Registered Garden has a Significant View which extends from the house and garden towards the sea and Puffin Island, the proposed new Junction is within this view, as is the existing roundabout. The setting of the listed building Wern Isaf must be deemed to correlate with the setting of its surrounding Registered

garden. The new junction 15 proposals include slip roads and an overbridge, introduced into the landscape, this change would indicate that the impact/effect on the setting of the listed building and Registered Garden would be a significant change. Similarly the impact on the setting of the Llanfairfechan Town Centre Conservation Area would be significant, due both to the proximity of the asset to the proposed changes and to the nature of the proposed changes. This correlates with the assessment in Section 5.3 where the impact is assessed as Moderate/Large.

6.14 The impact on Character Area 12 of the North Arllechwedd Historic Landscape equates with the area of the Llanfairfechan Town Centre Conservation Area however the impact on the North Arllechwedd Historic Landscape itself is assessed as Moderate/Slight which also correlates with the assessment in section 5.3.

7. Mitigating the impact of proposed changes

7.1 The most significant impact of the proposed works is on the Llanfairfechan Town Centre Conservation Area and Wern Isaf Registered Garden, it is a Moderate/Large impact. The junction is within c 50 metres of the Conservation Area. In an attempt to minimise the damage caused by the proposed changes to the setting of the Conservation Area great care should be taken with the treatment of boundaries to the proposed new junction as well as consideration of noise reduction measures. New boundaries should be of a consistent design and provide screening from the new road layout.

7.2 The impact on Wern Isaf Grade II* listed building is also evaluated as Moderate/Large. The initial impact will be exacerbated by the removal of much of the vegetation currently screening the A55 and Junction 15 necessary as part of the construction work. Further screening of the new road layout will require planting but this will only mitigate the impact in time. It is anticipated that for screening to become effective it will take a minimum 15 years from the date of the construction work (See ES. Junction 15. Chapter 9, Landscape)

7.3 The significance of impact on the remaining designated assets has been identified as Moderate/Slight. Any mitigation proposed which will minimise damage to the Conservation Area will also minimise impact on the remaining assets, particularly Gwern y Plas SAM which is not within a direct line of sight of the Junction. The North Arllechwedd Historic Landscape would experience a Moderate/Slight impact on its existing setting but with careful design and screening of the new proposed junction the impact can be mitigated over time. However Wern Isaf (Listed building and Registered Garden), is above, close and to the south of Junction 15 and screening alone at the proposed new junction location will not mitigate impact on views from it. The Register identifies the key significant view from Wern Isaf to be towards the sea and the A55. Wern Isaf currently looks towards the A55 and roundabout at Junction 15 and it could be argued that proposed alterations would not materially alter the experience from Wern Isaf however proposals at the junction include new slip roads and an overbridge which bring new, dominant features into the setting and views from Wern Isaf. However it is important to include noise reduction measures in an attempt to minimise effect on the setting of Wern Isaf from what it is currently. (See ES,

Junction 15, Chapter 13, Noise and Vibration, where a low noise thin surface solution is suggested)

7.3 Proposals for junction changes will not alter existing public access to the Historic features, nor will it increase the public access which is expected to remain stable.

7.4 The OS maps indicate that some buildings were demolished in the past to enable the existing A55 and roundabout at Junction 15 to be constructed. An archaeological watching brief undertaken as part of any mitigation for the overall scheme would have the potential to identify these feature if any remains still exist.

8. Conclusion

8.1 Proposed alterations at Junction 15 on the A55 have the potential to adversely impact the designated assets described above, particularly the Llanfairfechan Town Centre Conservation Area which is within 50 metres of the existing junction and Wern Isaf Grade II* listed building and Registered Garden. A Moderate/Large impact has been identified on the Conservation Area and listed building while a Moderate/Slight impact has been identified on the SAM of Gwern y Plas and the Historic Landscape Character area within the North Arllechwedd Historic Landscape.

8.2 The proposed design of a new junction layout at Junction 15 on the A55 is a major adjustment to the carriageway to bring about a junction which improves flow along the carriageway. Proposals include slip roads, in a cutting to the south of the A55, with an overbridge to allow access either side of the A55. The use of cuttings and embankments would lessen impact on the designated assets and along with a traffic surface designed to reduce traffic noise should mitigate adverse impact on the setting of the designated heritage assets. (See ES, Junction 15, Chapter 9, Landscape, and Chapter 13, Noise and Vibration.)

8.3 With sensitive treatment of the new boundaries created, roadside planting to mimic that currently in place, the use of cuttings and embankments and noise reduction road surfacing should reduce in time impact on the aesthetics and setting of the designated assets. However any mitigation measures achieved through planting will take time to take effect.

ES Chapter 12 Appendices	
12.1	Dust Risk Assessment Methodology
12.2	2018 Meteorological data
12.3	Scheme Traffic Data
12.4	No_x Concentration Verification Method
12.5	Details of Bias Adjustment and Annualisation

APPENDIX 12.1
DUST RISK ASSESSMENT METHODOLOGY

Determining Dust Emission Magnitude

Large	Medium	Small
Demolition		
• total building volume >50,000 m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20 m above ground level	• total building volume 20,000m^3 – 50,000m^3 • potentially dusty construction • demolition activities 10-20m above ground level	• total building volume <20,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10m above ground • during wetter months
Earthworks		
• total site area >10,000m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8m in height • total material moved >100,000 tonnes	• total site area 2,500m^2 - 10,000m^2 • moderately dusty soil type (e.g. silt) • 5-10 heavy earth moving vehicles active at any one time • formation of bunds 4m - 8m in height • total material moved 20,000 - 100,000 tonnes	• total site area <2,500m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4m in height • total material moved <20,000 tonnes • earthworks during wetter months
Construction		
• total building volume >100,000m^3 • piling • on-site concrete batching • sandblasting	• total building volume 25,000m^3 - 100,000m^3 • potentially dusty construction material (e.g. concrete) • piling • on-site concrete batching	• total building volume<25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout		
• >50 HDV (>3.5t) movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100m	• 10-50 HDV (>3.5t) movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50m – 100m	• <10 HDV (>3.5t) movements in any one day • surface material with low potential for dust release • unpaved road length <50m

Determining Receptor Sensitivity

High	Medium	Low
Sensitivities of People to Dust Soiling Effects		
• users can reasonably expect a enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be • diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland (Unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Sensitivities of People to the Health Effects of PM_{10}		
• locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties, Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations where the people exposed are workers, and • exposure is over a time period relevant to the air quality • objective for PM10 (in the case of the 24-hour objectives, • a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM10, as protection is covered by Health and Safety at Work legislation.	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects		
• locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	• Locations with a local designation where the features may be affected by dust deposition. • Indicative example is a local Nature Reserve with dust sensitive features.

Determining Sensitivity of the Area

Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Human Health Impacts

	Annual Mean PM_{10} concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium		>1	High	Medium	Low	Low	Low
Low		>1	Medium	Low	Low	Low	Low

Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Determining Risk of Dust Impacts

Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX 12.2
2018 METEOROLOGICAL DATA

J15 Scheme Traffic Data

Road name	Direction	2018		DM 2022		DS 2022		DM-DS
		AADT	%HGV	AADT	% HGV	AADT	% HGV	% AADT Change
A55 between J14-J15	W	15710	8.1	16616	7.9	16758	7.8	0.9%
	E	15834	10.9	16729	10.6	16753	10.6	0.1%
A55 between J15-J16A	W (After High Street)	17945	8.6	19045	7.7	19045	7.6	0.0%
	E(Before Off Slip to Bangor Road)	18011	10.5	19040	10.1	19040	10.1	0.0%
J15 off slip link to Bangor Road	E	1090	27.3	1158	26.3	1280	11.9	10.5%
Conway Old Road	W	195	24.0	211	12.1	87	12.3	-58.6%
	E	273	32.6	286	32.0	179	1.0	-37.5%
Conway Road	W	1974	3.1	2075	3.0	2194	3.1	5.7%
	E	2101	5.2	2245	4.9	2475	5.3	10.2%
Bangor Road	W	1981	5.8	2057	5.1	2052	5.0	-0.2%
	E	1911	11.5	2028	11.0	2150	4.7	6.0%
Pant-Yr-Afon	W	607	4.3	651	1.9	645	1.5	-0.9%
	E	408	40.7	450	37.9	459	11.9	2.2%
High Street	W	1442	10.6	1486	9.7	1481	9.5	-0.3%
	E	136	1.8	143	1.7	143	1.7	0.0%
Penmaenmawr Road (towards Pendular)	W	204	24.5	280	19.2	280	19.2	0.0%
	E	403	9.0	473	7.9	473	10.0	0.0%
Penmaenmawr Road (towards village)	W	1877	2.8	2107	1.9	2131	1.9	1.2%
	E	2046	7.5	2213	6.3	2355	5.0	6.4%
Shore Road East	S	574	5.0	609	4.8	609	4.8	0.0%
	N	603	1.8	639	1.6	639	2.8	0.1%
Station Road	S	627	2.7	661	2.7	661	2.7	0.1%
	N	592	4.8	622	4.6	622	4.6	0.0%
Caradog Place	S	627	2.7	661	2.7	661	2.7	0.1%
	N	591	4.3	622	4.2	622	4.2	0.0%
Promenade	W	627	3.0	661	2.9	661	3.0	0.1%
	E	591	4.3	622	4.2	622	4.2	0.0%
Aber Road	W	2045	3.9	2170	3.7	2029	4.0	-6.5%
	E	1518	5.4	1551	5.4	1527	5.5	-1.6%

W: Westbound; E: eastbound; N: Northbound; S: Southbound.



J15 Scheme Baseline and 'Do Minimum' Modelled Road Network Sources



J15 Scheme 'Do Something' Modelled Road Network Sources

APPENDIX 12.3
SCHEME TRAFFIC DATA

J15 Scheme Traffic Data

Road name	Direction	2018		DM 2022		DS 2022		DM-DS
		AADT	%HGV	AADT	% HGV	AADT	% HGV	% AADT Change
A55 between J14-J15	W	15710	8.1	16616	7.9	16758	7.8	0.9%
	E	15834	10.9	16729	10.6	16753	10.6	0.1%
A55 between J15-J16A	W (After High Street)	17945	8.6	19045	7.7	19045	7.6	0.0%
	E(Before Off Slip to Bangor Road)	18011	10.5	19040	10.1	19040	10.1	0.0%
J15 off slip link to Bangor Road	E	1090	27.3	1158	26.3	1280	11.9	10.5%
Conway Old Road	W	195	24.0	211	12.1	87	12.3	-58.6%
	E	273	32.6	286	32.0	179	1.0	-37.5%
Conway Road	W	1974	3.1	2075	3.0	2194	3.1	5.7%
	E	2101	5.2	2245	4.9	2475	5.3	10.2%
Bangor Road	W	1981	5.8	2057	5.1	2052	5.0	-0.2%
	E	1911	11.5	2028	11.0	2150	4.7	6.0%
Pant-Yr-Afon	W	607	4.3	651	1.9	645	1.5	-0.9%
	E	408	40.7	450	37.9	459	11.9	2.2%
High Street	W	1442	10.6	1486	9.7	1481	9.5	-0.3%
	E	136	1.8	143	1.7	143	1.7	0.0%
Penmaenmawr Road (towards Pendular)	W	204	24.5	280	19.2	280	19.2	0.0%
	E	403	9.0	473	7.9	473	10.0	0.0%
Penmaenmawr Road (towards village)	W	1877	2.8	2107	1.9	2131	1.9	1.2%
	E	2046	7.5	2213	6.3	2355	5.0	6.4%
Shore Road East	S	574	5.0	609	4.8	609	4.8	0.0%
	N	603	1.8	639	1.6	639	2.8	0.1%
Station Road	S	627	2.7	661	2.7	661	2.7	0.1%
	N	592	4.8	622	4.6	622	4.6	0.0%
Caradog Place	S	627	2.7	661	2.7	661	2.7	0.1%
	N	591	4.3	622	4.2	622	4.2	0.0%
Promenade	W	627	3.0	661	2.9	661	3.0	0.1%
	E	591	4.3	622	4.2	622	4.2	0.0%
Aber Road	W	2045	3.9	2170	3.7	2029	4.0	-6.5%
	E	1518	5.4	1551	5.4	1527	5.5	-1.6%

W: Westbound; E: eastbound; N: Northbound; S: Southbound.



J15 Scheme Baseline and 'Do Minimum' Modelled Road Network Sources



J15 Scheme 'Do Something' Modelled Road Network Sources

APPENDIX 12.4
NO_X CONCENTRATION VERIFICATION METHOD

Nitrogen Dioxide

The model has been run to predict the 2018 annual mean road-NOx contribution at three monitoring locations (identified in Table 12. 8). Concentrations have been modelled at a height described in Appendix E Annualisation.

The model output of road-NOx has been compared with the 'measured' road-NOx, which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NOx from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution. This factor was then applied to the modelled road-NOx concentration for each monitoring site to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (Figure D.1).

Monitor	Monitored NO_2 µg/m^3	Measured Road NOx µg/m^3	Modelled Roadside NO_x µg/m^3	Ratio Measured NOx/ Modelled road NOx	Total NO_2 after adjustment µg/m^3	% Difference in NO_2 after adjustment
Ramboll 4	14.5	11.9	13.1	0.91	14.7	1.7
Ramboll 5	9.7	2.9	7.5	0.39	9.6	-0.7
Ramboll 6	13.2	9.4	9.6	0.98	12.9	-1.7

The results imply the model was over-predicting the road-NOx contribution at the monitoring sites resulting in a primary factor of 0.8396, which is not a common experience with most models. For a worst case scenario a primary factor of 1 as therefore been applied.

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary Adjustment Factor	**1**
Secondary adjustment factor	0.9752

Model uncertainty has been estimated by calculating the root mean square error (RMSE). The calculated RMSE was 0.2 µg/m^3 (0.5%) after adjustment which is within the suggested value (10% of the objective being assessed) in LAQM.TG(16). The model has therefore performed sufficiently well for use within this assessment.

Figure D.2 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line.

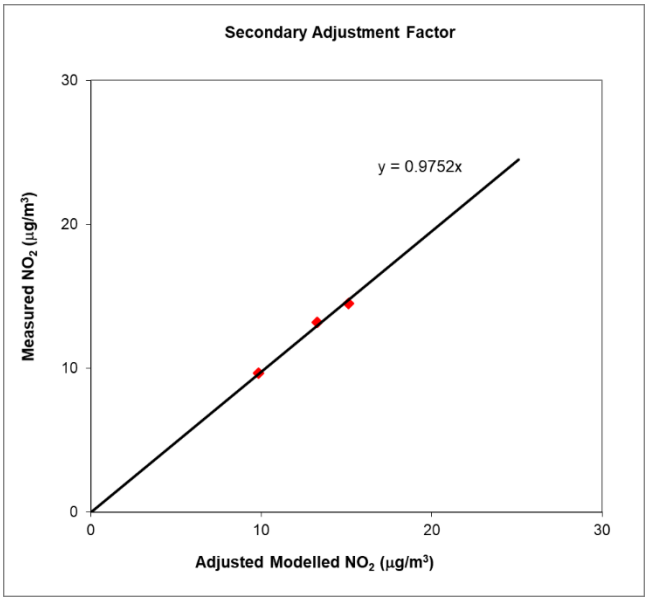


Figure D.1: Comparison of Measured NO2 with Primary Adjusted Modelled NO2 Concentrations

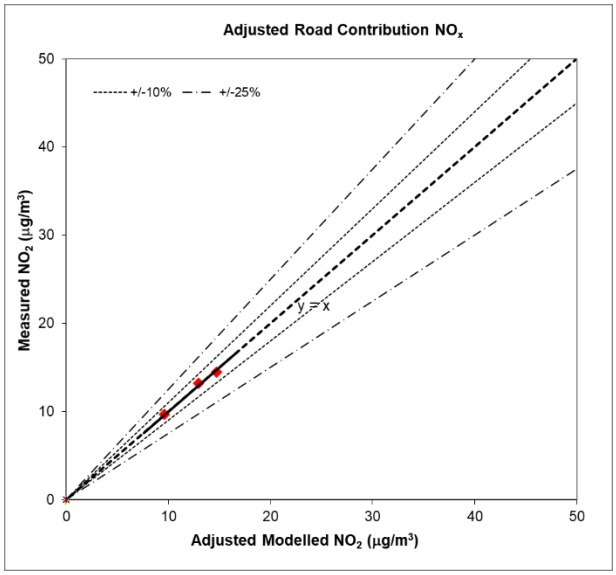


Figure D.2: Comparison of Measured NO2 with Fully Adjusted Modelled NO2 Concentrations

Particulates (PM10 and PM2.5)

There is no PM10 monitoring in close proximity to the proposed development site. Therefore, the primary adjustment factor calculated for NO2 concentrations has been applied to the modelled road-particulates concentrations.

APPENDIX 12.5
DETAILS OF BIAS ADJUSTMENT AND ANNUALISATION

Bias Adjustment

Diffusion tubes exhibit bias when compared to results from automatic analysers, and diffusion tube results are routinely adjusted to account for this. The 2018 national bias adjustment for Gradko 50% TEA in acetone tubes (spreadsheet v09/19) has been applied to the 2018 diffusion tube data. The bias factor of 0.89 has been based in 18 studies.

Annualisation

Monitoring commenced on the 4th July 2018 until the 2nd February 2019. Consequently, only 7 months of data were available, and the monitoring data do not meet the data capture requirements to represent a full calendar year. Therefore, in accordance with the guidance set out in Box 7.9 of LAQM.TG(16), the data have been adjusted to an annual mean, based on the ratio of concentrations during the short-term monitoring period to those over the February 2018 to February 2019 calendar year. This has utilised data from four background sites operated as part of the Automatic Urban and Rural Network (AURN) where long-term data are available (with data capture >85%).

The annual mean nitrogen dioxide concentrations and the period means for each of the monitoring sites from which adjustment factors have been calculated are presented in the table below.

Table E1: Annualisation factors

Automatic Station	**Approximate Distance to Site (km)**	**Type**	**Annual Mean (06/02/2018-06/02/2019)**	**Period Mean**		
				DT6 (04/07/18 - 09/01/19)	DT4 (4/7/18-01/08/18; 5/9/18-6/2/19)	DT5 (04/7/18-01/8/18; 5/9/18-5/12/18; 9/1/19 - 6/2/19)
Wirral Tranmere	65 km	Urban Background	17.9	16.8	19.0	18.0
Aston Hill	105 km	Rural Background	3.1	2.8	3.0	3.1
Blackpool	85 km	Urban Background	12.8	11.2	13.9	13.6
Stoke-on-Trent Centre	123 km	Urban Background	24.1	24.7	27.2	26.1
Average Ratio Am/Pm				**1.07**	**0.94**	**0.97**

Table E2: Diffusion tubes location and height

Duplicate Tubes - NO_2		x	y	Heigh (m)	Distance to kerb (m)
4	Penmaenmawr Road (Lamp post on Penmaenmawr road, near what may be a substation)	268723	375607	2.2	2
5	Penmaenmawr Road (Lamp post on Penmaenmawr Road. Nearest postcode LL33 0PL)	268630	375491	2.3	1
6	Penmaenmawr Road (Sign post with information for part time signals)	268556	375424	2.6	1

Table E3: Monitoring data annual mean

DT	Period	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	Period Mean	Annual Mean	Bias Adj (0.89)
	On	04/07 /2018	01/08 /2018	05/09 /2018	04/10 /2018	31/10 /2018	05/12 /2018	09/01 /2019			
	Off	01/08 /2018	05/09 /2018	04/10 /2018	31/10 /2018	05/12 /2018	09/01 /2019	06/02 /2019			
4	Measured	25.9	M	14.9	17.9	17.5	13.9	15.7	17.2	16.3	14.5
		26.8	M	11.4	19.1	18.0	8.4	17.3			
	Average	26.3	-	13.1	18.5	17.8	11.2	16.5			
5	Measured	15.3	M	8.2	10.8	10.7	M	11.0	11.2	10.9	9.7
		M	M	9.1	11.1	10.2	M	10.7			
	Average	15.3	-	8.7	11.0	10.5	-	10.8			
6	Measured	18.6	15.3	10.9	13.6	13.2	12.0	M	13.8	14.8	13.2
		18.2	15.1	10.5	14.0	11.6	12.7	M			
	Average	**18.4**	**15.2**	**10.7**	**13.8**	**12.4**	**12.3**	**-**			

M: missing

ES Chapter 13 Appendices	
13.1	Construction Noise Assumptions

APPENDIX 13.1
CONSTRUCTION NOISE ASSUMPTIONS

Plant items

Plant	BS5228 Ref.	Source Type	%on-time/frequency*	Sound power (dBA)
Phase 1 Traffic management				
HGV	BS 5228 Table D.7 averaged numbers 121-122	Moving point source	2/hr	106
Cutters, drills and small tools	BS 5228 Table D.6 ref 54	Moving point source	2/hr	109
Tipper Lorry	BS 5228 Table C.8 ref 20	Moving point source	1/hr	107
Phase 2 Site clearance				
HGV	BS 5228 Table D.7 avg no.'s 121-122	Moving point source	2/hr	106
Dozer	BS 5228 Table C.2 ref 10	Moving point source	2/hr	108
Dumper	BS 5228 Table C.2 ref 31	Moving point source	2/hr	115
Pulveriser mounted on excavator	BS 5228 Table C.1 ref 4	Moving point source	2/hr	108
Mobile crane	BS 5228 Table C.4 ref 39	Point sources	50%	105
Phase 2 Excavation				
Excavator	BS 5228 Table D.3ref 35	Moving point source	2/hr	106
Loader (tracked)	BS 5228 Table D.3 ref 13	Moving point source	2/hr	113
Dozer	BS 5228 Table C.2 ref 10	Moving point source	2/hr	108
HGV	BS 5228 Table D.7 avg no.'s 121-122	Moving point source	2/hr	106
Crusher	BS 5228 Table C.1 ref 14	Moving point source	2/hr	110
Phase 2 Substructure				
Cutters, drills and small tools	BS 5228 Table D.6 ref 54	Point source	33%	109
HGV	BS 5228 Table D.7 avg no.'s 121-122	Moving point source	2/hr	106
Ready-mix concrete lorry	BS 5228 Table C.4 ref 18	Moving point source	2/hr	103
Concrete pump	BS 5228 Table C.3 ref 26	Moving point source	2/hr	103
Sheet steel piling rig	BS 5228 Table C.3 ref 9	Moving point source	2/hr	91
Mobile crane	BS 5228 Table C.4 ref 39	Point sources	50%	105
Phase 2 Superstructure				
Cutters, drills and small tools	BS 5228 Table D.6 ref 54	Point source	33%	109
Ready-mix concrete lorry	BS 5228 Table C.4 ref 18	Moving point source	2/hr	103
Concrete pump	BS 5228 Table C.3 ref 26	Point source	50%	103
Scaffolding and mobile hydraulic access	Table 5228 Table C.4 ref 57	Point source	50%	95

Mobile crane	BS 5228 Table C.4 ref 39	Point sources	50%	105
Phase 2 Finishing works				
Road Planer	BS 5228 Table C.5 ref 7	Moving point source	2/hr	110
Vibratory compactor	BS 5228 Table C.5 ref 29	Moving point source	2/hr	110
Road Roller	BS 5228 Table C.5 ref 19	Moving point source	2/hr	108
Phase 3 Road works				
HGV	BS 5228 Table D.7 ave no.'s 121-122	Moving point source	2/hr	106
Cutters, drills and small tools	BS 5228 Table D.6 ref 54	Moving point source	1/2hr	109
Road Planer	BS 5228 Table C.5 ref 7	Moving point source	2/hr	110
Petrol hand-held circular saw	BS 5228 Table C.4 ref 70	Moving point source	1/2hr	119
Phase 4 Finishing works				
Road Planer	BS 5228 Table C.5 ref 7	Moving point source	2/hr	110
Vibratory compactor	BS 5228 Table C.5 ref 29	Moving point source	2/hr	110
Road Roller	BS 5228 Table C.5 ref 19	Moving point source	2/hr	108
**%on-time applied to point sources and frequency applied to moving line sources*				

Construction noise modelling

Construction plant noise has been modelled in Cadna-A® with reference to construction works locations as shown in the following drawings:

Ramboll Drawing: Junction 15 Temporary Traffic Layout Construction Phase 1 (*drawing number A55J15J16-RAM-XX-15-DR-T-1171, dated March 2019)*

Ramboll Drawing: Junction 15 Temporary Traffic Layout Construction Phase 2 (*drawing number A55J15J16-RAM-XX-15-DR-T-1172, dated March 2019)*

Ramboll Drawing: Junction 15 Temporary Traffic Layout Construction Phase 3 (*drawing number A55J15J16-RAM-XX-15-DR-T-1173, dated March 2019)*

Ramboll Drawing: Junction 15 Temporary Traffic Layout Construction Phase 4 (*drawing number A55J15J16-RAM-XX-15-DR-T-1174, dated March 2019)*

ES Chapter 14 Appendices	
14.1	Walking, Riding, Cycling and Horse-Riding Assessment

APPENDIX 14.1
WALKING, RIDING, CYCLING AND HORSE-RIDING ASSESSMENT

Intended for
Welsh Government

Document type
Assessment

Date
October 2018

A55 JUNCTIONS 15 AND 16 IMPROVEMENTS

WALKING, CYCLING & HORSE-RIDING ASSESSMENT

RAMBOLL

A55 JUNCTIONS 15 AND 16 IMPROVEMENTS
WALKING, CYCLING & HORSE-RIDING ASSESSMENT

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Description	**Walking, Cycling & Horse-Riding Assessment**

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1. SCHEME DESCRIPTION AND BACKGROUND

1.1 Background

The A55 Junction 15 and Junction 16 Improvement Scheme includes the replacement of 2 existing roundabouts with 2 grade separated junctions. There are currently 9 options under consultation, with a preferred option to be identified in Autumn 2018. In accordance with HD 42/17, the scale of the scheme has been assessed (by the Lead Assessor) and is considered to qualify as a 'large' scheme for the purposes of this assessment. Therefore, the scheme will be subject to a Walking, Cycling & Horse Riding Assessment (WCAHR) during the options stage of the proposed highway scheme; this will then be followed by Walking, Cycling & Horse Riding Reviews at the preliminary and detailed design stages.

The purpose of the WCAHR Assessment is to facilitate the inclusion of all walking, cycling & horse-riding modes in the A55 Junctions 15 and 16 improvement scheme design process from the earliest stage, enabling the design team to identify opportunities for improved facilities and integration with the local and national network throughout the design process.

Aims of the WCAHR Assessment are to:

- Gain an appropriate understanding of all the existing facilities for pedestrians, cyclists and equestrians in the study area;
- Provide background information that can be referred to throughout the design process; and
- Identify opportunities for improvement for users.

The WCAHR Assessment contains the following elements:

- Definition of the study area;
- A review of walking, cycling & horse-riding policies and strategies;
- Collision data;
- Public transport service and interchange information;
- Key trip generators and local amenities;
- Existing walking, cycling & horse-riding network facilities within the local area;
- Existing walking, cycling & horse-riding network facilities at a strategic level; and
- Walking, cycling & horse-riding survey data.

1.2 Proposed Highway Scheme

The A55 junctions 15 and 16 are the only 2 roundabouts on the Euroroute E22 Trans-European Transport Network (TEN-T). This causes problems to the traffic using the A55 travelling along the route.

The purpose of the project is to remove the 2 roundabouts at A55 junctions 15 and 16 and replace them with upgraded junctions. The new junctions will mean that traffic will not need to slow down at the roundabouts thus reducing delays. The removal of the roundabouts will also make the junctions safer, both to traffic travelling along the A55 and for people wishing to enter and leave the A55 in these locations. The project will also address a number of substandard features of the trunk road in the vicinity of the junctions.

Table 1.1 presents the nine junction improvement options for junctions 15 and 16 providing the scheme reference for each option, which junction the option is designed for and a brief description

of the improvement scheme. The 9 junction options, including Public Rights of Way and Cycleway routes are presented in Appendix 1.

Table 1.1: A55 Junctions 15 & 16 Improvement Scheme

A55 Improvement Options			
No.	**Ref.**	**Junction**	**Improvement Scheme Description**
1	J15 OPTA	15	2-way movement. WB off/on only. No EB on/off.
2	J15 OPTB	15	4-way movement with bridge across A55.
3	J15 OPTC	15	2-way movement. WB off but no WB on. New under bridge under A55 for EB on but no EB off.
4	J15 OPTD	15	4-way movement. New r/bt to allow EB on/off. Overbridge over A55 and T junction to allow WB on/off.
5	J15 OPTE	15	4-way movement. Same as Option 4 only with the r/bt to west of overbridge at the site of the Heath building.
6	J16 OPTA	16	4-way movement with bridge across A55. New Link road linking to Glan-Yr-Afon Rd and Ysguborwen Rd.
7	J16 OPTB	16	4-way movement. EB off/on via slip at existing r/bt. W/B off/on facilitated by an overbridge located to north-east of existing r/bt.
8	J16 OPTC	16	3-way movement, no EB off. EB on via a new underpass under A55. WB off/on at existing junction.
9	J16 OPTD	16	3-way movement, no EB off. EB on via an overbridge across A55. WB off/on at existing junction.

The key objective for the scheme is to improve access to regional, national and international markets and employment opportunities, in addition to improving resilience and safety and reducing delays both to local traffic as well as for people travelling along the A55.

1.2.1 Scheme Objectives

OBJ1 Improve access to regional, national and international markets and improve access to employment opportunities

OBJ2 Improve road safety on the A55 from Junction 14 to Junction 16A

OBJ3 Improve resilience on the A55 for strategic and local traffic

OBJ5 Improve journey times, journey time reliability and safety for access onto the A55

OBJ6 Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists

OBJ7 To take reasonable steps to build healthier communities and better environments

OBJ8 Opportunities to provide integrated transport are increased

The scheme objectives include improving conditions for walking, cycling and horse-riding as the current route has limited facilities and connections for users. The project team are consulting with local groups, eg Cycling UK and Sustrans and CCBC and the WG, to identify opportunities to improve Active Travel in connection with the project. Where there is a direct impact on existing

walking and cycling routes as a result of the scheme, we will ensure all existing movements will be accommodated. We will also seek to make improvements to walking and cycling routes where feasible, with a particular focus on improving NMU access to the coastline for local residents.

1.3 Study Area

The approximate study area for this Assessment Report can be found in Appendix 2. The assessment area includes the section of A55 and the local highway network between Penmaenmawr, Llanfairfechan and Dwygyfylchi.

2. WALKING, CYCLING & HORSE-RIDING ASSESSMENT

This chapter summarises the findings of the assessment. The findings under each topic area are summarised below and any potential opportunities for improvements are noted and summarised in Chapter 3.

2.1 Review of Walking, Cycling and Horse-Riding Policies and Strategies

This section provides an overview of relevant walking, cycling and horse-riding local and national policies and the information contained in the documents below will help to inform the identification of opportunities and incorporate them into the scheme through the WCAHR process. The documents reviewed are:

- Planning Policy Wales, 2018;
- Planning Policy Wales, Technical Note, 18 Transport;
- Active Travel (Wales) Act 2013;
- Design Guidance Active Travel (Wales) Act 2013;
- Well-Being of Future Generations (Wales) Act 2015;
- Strategy for the Horse Industry in England and Wales; and,
- The Conwy Local Development Plan 2007-2022.

2.1.1 Planning Policy Wales, 2018

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government, while it is supplemented by a series of Technical Advice Notes. The primary objective of the PWW is "*to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic and environmental and cultural well-being of Wales….*".

Transport Assessments are identified in the policy as "*an important mechanism for setting out the scale of anticipated impacts a proposed development, or redevelopment, is likely to have. They assist in helping anticipate the impacts of development so that they can be understood and catered for appropriately*".

It is also stated that "*Transport Assessments can be required for any proposed development if the planning authority considers that there is a justification or specific need. Transport Assessments provide the basis for negotiation on scheme details, including the level of parking, and measures to improve walking, cycling and public transport access….*"

2.1.2 Planning Policy Wales, Technical Advice Note, 18 Transport

This Technical Advice Note (TAN) supplements the Planning Policy Wales and should be taken into account by local planning authorities when they are preparing transport related development plans. This TAN outlines how to integrate land use and transport planning, while it explains how transport impacts should be assessed and mitigated.

Integration of land use planning and development of transport infrastructure is of crucial importance in addressing the environmental aspects of sustainable development and can help the Welsh Government to achieve their objectives for transport through:

- Improving accessibility by walking, cycling and public transport;

- Ensuring that transport is accessible to all, taking into account the needs of disabled and other less mobile people;
- Promoting walking and cycling;
- Supporting traffic management measures;
- Promoting sustainable transport options for freight and commerce;
- Supporting sustainable transport options in rural areas;
- Supporting necessary infrastructure improvements; and
- Ensuring that, as far as possible, transport infrastructure does not contribute to land take, urban sprawl or neighbourhood severance.

According to the same document, when preparing development plans and in determining planning applications, authorities should:

- Ensure that pedestrian routes provide a safe and fully inclusive pedestrian environment, particularly for routes to primary schools;
- Ensure the adoption of suitable measures, such as wide pavements, adequate lighting, pedestrian friendly desire lines and road crossings, and traffic calming;
- Promote the reallocation of road space to pedestrians;
- Support the use of public rights of way for local journeys;
- Identify and protect existing and proposed routes suitable for the use of cyclists and walkers; and
- Ensure that new development encourages cycling by giving careful consideration to location, design, access arrangements, travel 'desire lines' through a development, and integration with existing and potential off-site links.

2.1.3 Active Travel (Wales) Act 2013

Key objectives of the Welsh Government are to enable more people to walk, cycle and generally travel by more sustainable modes of transport.

One of the major steps in achieving these goals was the Active Travel (Wales) Act 2013 which gained Royal Assent on 4 November 2013. The Active Travel Act requires local authorities to consult on their existing route maps and integrated network maps and makes the consultation one of the factors that the Welsh Ministers consider in deciding whether to approve the maps.

Further, it gave the Welsh Ministers the power to issue guidance on the location, nature and condition of active travel routes and facilities to ensure they are suitable for use.

2.1.4 Design Guidance Active Travel (Wales) Act 2013

According to the Active Travel Act, safety concerns related to the existing infrastructure, such as road junctions, are the biggest barriers to walking and cycling.

It is also stated that "*Where infrastructure already exists, breaks in the network and varying standards can affect people's ability to make use of it and that the purpose of this document is to provide a consistent standard to work to when planning, designing, constructing and maintaining networks and routes for walking and cycling.*"

This document provides advice on the planning, design, construction and maintenance of active travel networks and infrastructure, and is to be used at all stages of the process. There are also

details on the design of active travel routes – links, junctions and crossings which meet the needs of pedestrians and cyclists in urban and rural areas.

The Design Guidance Active Travel (Wales) Act 2013 also provides advice on how active travel should be integrated with other modes of transport (cycle, walking, park and cycle). Well-connected interchanges to the cycle network and walking routes should be considered a very high priority in the planning of the pedestrian or walking network.

2.1.5 Well-Being of Future Generations (Wales) Act 2015

The Well-Being of Future (Wales) Act is about to improve the social, economic, environmental and cultural well-being of Wales.

It sets out the long-term goals, while it looks how to prevent problems and take a more joined-up approach. The 7 well-being goals as stated in the document are:

- A prosperous Wales;
- A resilient Wales;
- A healthier Wales;
- A more equal Wales;
- A Wales of cohesive communities;
- A Wales of vibrant culture and thriving Welsh language; and,
- A globally responsible Wales.

2.1.6 Strategy for the Horse Industry in England And Wales

The Strategy has been developed by the British Horse Industry Confederation (BHIC) in partnership with the Government and sets out a vision of where the industry aspires to be within 10 years.

Its purpose is to foster a robust and sustainable horse industry, increase its economic value, enhance the welfare of the horse and develop the industry's contribution to the cultural, social, educational, health and sporting life of the nation.

Key aims of the Strategy are:

- To bring the Horse Industry together and develop its national, regional and local impact;
- To increase participation in equestrianism and the social contribution of the Horse Industry;
- To boost the economic performance of equine businesses;
- To raise equestrian skills, training and standards;
- To increase access to off-road riding and carriage driving; and,
- To consider the environmental impact of the horse.

2.1.7 The Conwy Local Development Plan 2007-2022

The Conwy Local Development Plan (LDP) replaces existing Structure Plans and Local Plans which previously provided the policy framework for the Conwy Plan Area. It sets out the key challenges facing Conwy, identifies the vision, objectives and the Spatial Strategy for development in the area over the period 2007-2022, while providing the basis by which planning applications will be determined.

According to the LDP, convenient access via footways, cycle infrastructure and public transport should exist or be provided where appropriate, thereby encouraging the use of these modes of travel for local journeys and reducing the need to travel by private car and improving the accessibility of services to those with poor availability of transport.

Furthermore, leisure and recreation routes are also an important resource, particularly to improve access to the surrounding countryside as part of a healthy lifestyle.

2.2 Collision Data

Records of accidents and casualties for the study area (Llanfairfechan, Penmaenmawr and Dwygyfylchi) for a 5-year period from 2012-2016 has been obtained from the STATS19 database (www.data.gov.uk) and the data has been analysed to identify any trends and areas of particular concern. Locations and detailed descriptions of the accidents in the study area can be found in Appendix 3, while a summary of them is presented in Table 2.1.

Table 2.1: Accident Data by Year and Severity

Year	Severity			Vulnerable Road Users			Total Casualties	Total Accidents
	Slight	Serious	Fatal	Pedestrians	Cyclists	Motorcycle		
2012	3	6	0	1	1	2	13	9
2013	11	1	0	2	1	1	16	12
2014	6	2	0	0	0	4	10	8
2015	6	1	0	2	0	1	11	7
2016	2	2	1	1	0	0	7	5
Total	**28**	**12**	**1**	**6**	**2**	**8**	**57**	**41**

Analysis of the data has revealed during this time there have been 41 accidents involving either cyclists, equestrians or pedestrians. Of these accidents one was recorded as fatal, 12 serious and 28 slight.

In Llanfairfechan, Penmaenmawr and Dwygyfylchi, during the 5 year period, 6 pedestrians and 2 cyclists were involved in those accidents recorded.

2.3 Public Transport Services and Interchange Information

2.3.1 Bus

Four bus services 5, 75, A55 and X5 serve Llanfairfechan, Penmaenmawr and Dwygyfylchi and are summarised in Table 2.2.

Table 2.2: Bus Services in the Study Area

Service	Bus Route	Frequency		
		MON-FRI	SAT	SUN
5	Llandudno-Conwy-Bangor-Caernarfon	30mins (from 6.30am to 19:50), 60mins (from 19:50 to 23:50)		60mins (from 09:08 to 22.20)
X5	Llandudno-Conwy-Bangor-Caernarfon	30mins (from 07:15 to 18:25)		60mins (from 10:38 to 19:38), last service at 23:30
A55	Llandudno-Conwy-Bangor-Caernarfon	Only one service leaving at 08:38 from the Bont Newydd bus stop		n/a
75	Llanfairfechan-Llandudno	Two services (09:58, 13:46)		n/a

Source: http://www.conwy.gov.uk/en/Resident/Parking-Roads-and-Travel/Public-Transport/Assets-Bus-pass/documents/Bus-Information/Conwy- Public-Transport-Guide-2018.PDF

Service 75 is a smaller vehicle providing limited services for Pendalar.

The route maps of the 4 services can be found in Appendix 4.

Bus services 5 and X5 access Dwygyfylchi at junction 16A, passing through Penmaenmawr. The services continue onto the A55 via junction 15A and access Llanfairfechan from junction 15 before re-entering the A55 via junction 14.

The eastbound route of bus services 5 and X5 exits Llanfairfechan at junction 14, continues onto the A5, and accesses Penmaenmawr via junction 15A. The services then exit Dwygyfylchi via junction 14A and then travel west along A55 using the junction 16 roundabout to turn around to head east.

The westbound and eastbound routes of the A55 bus service are the same for both directions. Buses access/exit Llanfairfechan at junction 14, continuing onto the A55. The service accesses/exits Penmaenmawr at junction 15A and finally accesses/exits the A55 via junction 16.

With regards to the bus service 75, it accesses/exits Llanfairfechan at junction 14, continues onto the A55, accesses/exits Penmaenmawr via junction 15 and finally enters/exits Dwygyfylchi from junction 16A.

2.3.2 Rail

Railway stations are located in Llanfairfechan and Penmaenmawr and are served by Arriva Trains Wales with services to Chester via Colwyn Bay, Rhyl, Prestatyn and Flint from 05:55am to 23:59pm. Passenger services run between Holyhead and Crewe approximately every two hours during the week and on Saturdays. There are around 4 services on a Sunday. There are no bus services connecting to either train station. Rail services in the study area can be found in Appendix 5.

2.4 Trip Generators

2.4.1 Key Trip Generators and Local Amenities

There are a wide variety of trip generators in the vicinity of the proposed improvements that could be attractive to pedestrians, cyclists and equestrians including:

- Hotels and Restaurants in Llanfairfechan, Penmaenmawr and Dwygyfylchi;
- Penmaenmawr Golf Club;
- Conwy (Caernarvonshire) Golf Club;
- Snowdonia National Park;
- Retail Units in Penmaenmawr and Llanfairfechan;
- Glyn Uchaf Stables; and
- Schools in Llanfairfechan, Penmaenmawr and Dwygyfylchi.

There are 4 schools (Table 2.3) located in the study area, while all the trip generators can be found in Appendix 6.

Table 2.3: Schools in Study Area

Llanfairfechan	
Primary Schools	**Address**
Ysgol Pant y Rhedyn	Penmaenmawr Road, LL33 0PA
Ysgol Babanod Llanfairfechan	Pentref Road, LL33 0PA
Penmaenmawr	
Primary Schools	**Address**
Ysgol Pencae	Graiglwyd Road, LL34 6YG
Dwygyfylchi - Capelulo	
Primary Schools	**Address**
Ysgol Capelulo	Treforis Road, LL34 6RA

Source: http://www.conwy.gov.uk/en/Resident/Education-and-Families/Schools/Schools-Units-Colleges/Schools-Units-Colleges-and-Centres.aspx

Ysgol Pant y Rhedyn school is accessible off Penmaenmawr Road, where footways are provided on the north-west part of the road, with a bus stop (services 5, 75, A55, X5) located approximately 60m north-east of the school.

The main access road to Ysgol Babanod Llanfairfechan school is Village Road, footways are provided on both sides, with a bus stop located 50m north of the school's main entrance.

Ysgol Pencae school is located to the east of Penmaenmawr and is accessible off Graiglwyd Road. There are no footways present in the vicinity of the school, while a bus stop (service 75) is located close to the main entrance.

Ysgol Capelulo school is located to the west of Dwygyfylchi and is accessible off Treforis Road, where footway provision is only present to the east of the school on the north side of the road. The nearest bus stop is located at approximately 200m from the school.

2.4.2 Future Trip Generators

A review of committed development within Conway and its 3 neighbouring councils; Denbighshire, Gwynedd and Anglesey, has been undertaken. The 4 following residential developments have been identified as potential future trip generators, with all developments likely to be completed by 2022.

1) Residential development for 17 units (8 apartments and 9 dwellings with associated access) located on Penmaenmawr Road to the north of Llanfairfechan. The main access for pedestrians and cyclists to the development would be expected to be from Penmaenmawr Road, providing good connectivity to the existing NCN 5 route.

2) A residential development located on Conway Road in Penmaenmawr. The development has planning permission for 23 units across two blocks (1 block of 16 apartments and 1 block of 7 apartments) and the main access for pedestrians and cyclists to the development would be expected to be from Conway Road, while the railway station is accessible off Station Road East; cyclists and pedestrians have access to the NCN 5 via the subway located on Station Road East.

3) A residential development located on Penmaenmawr Road in Llanfairfechan and has planning permission for 28 units. The main access to the development would be expected to be from Penmaenmawr Road which forms part of the NCN 5, while footways are presented on both sides of the road.

4) A residential development located on Ysguborwen Road in Dwygyfylchi. The development has planning permission for 46 units and is accessible for pedestrians off Ysguborwen Road where footways are provided on both sides of the road. Cyclists have access to the NCN Route 5 at approximately 250m from the development site through the bridge to the north east of the development.

2.5 Site Visit

The site visit was undertaken by Nicola Evans (Lead Assessor) and Ioannis Spyropoulos (Assessor) on Thursday, 6 September 2018, between 11:00 and 16:00 during daylight hours. An additional site visit may be undertaken later in the year during the early evening to review darkness hours. The site visit took the form of walking along a variety of pedestrian and cycling facilities, both within the extents of the scheme and beyond the scheme footprint. The level of use and condition/suitability of each route during the site visit were recorded and potential improvements, repairs were noted (see Appendix 7). The weather during the morning period of the site visit was overcast with rain and during the afternoon it was dry and sunny.

The primary findings of the site visit were:

- No queues or delays were observed at any surveyed location during the site visit;
- Very few cyclists were observed using the section of NCN 5 located along the beach on Penmaenmawr;
- Relatively high volume of cyclists was observed on Penmaenmawr Road;
- No cycle access (ramps) is provided at the surveyed overbridge (Location 10), which links Dwygyfylchi with NCN5;
- No separate cycleway provision is provided on Penmaenmawr Road which forms part of the NCN5;

- No cycle storage is provided at any of the two railway stations; and
- No pedestrian crossing facilities are provided on any of the roads located in front of the surveyed schools.

A summary of observations from site visits to the local schools in the study area are presented in Table 2.4.

Table 2.4: Summary of School Site Visits

School	Comment / Observations
Ysgol Pant y Rhedyn	A number of parents and younger pupils were observed walking from Ysgol Babanot Llanfairfechan to Ysgol Rhedyn. Parents typically park in The Heath car park on the south eastern side of the school and pupils cut through via a footpath after school. Some parking bays are also available and used by parents at the school entrance. It was noted that a few pupils from Aber School were dropped off by Alpine Travel Bus at the bus stop located approximately 60m opposite the school. A school crossing patrol officer assisted pupils crossing Penmaenmawr Road.
Ysgol Babanod Llanfairfechan	A parking area is provided to the south-west of the school. PRoW are located to the south of the school, connecting to Aber Road, Cae Ffynnon Road and Village Road. There is a pedestrian crossing facility located on Penmaenmawr Road to the west of the school, with footways located on both sides of Village Road to the east of the school.
Ysgol Pencae	There are a lack of pedestrian or cycling facilities within the vicinity of the school. There is a school crossing patrol on Conway Old Road.
Ysgol Capelulo	There is a footway on Trefforis Road to the east of the school. There are no designated cycleways however, cycle bays were noted within the school grounds.

A number of observations were also noted on an additional site visit which took place on 30 July 2018. The weather during the site visit was dry but overcast. The primary findings of this site visit were:

- Little evidence of horse riders – although we have received anecdotal evidence that horse riders use the beach;
- A number of cyclists were observed travelling along various sections of the NCN 5. These were noted to be keen cyclists, as opposed to family or leisure cyclists;
- Two pedestrians walking dogs were observed along the Network Rail access adjacent to junction 15;
- Approximately 15 pedestrians, including families, were observed picnicking and walking along the promenade;
- One passenger was observed waiting for bus services at Penmaenmawr Road. The Arriva bus was observed using the bus gate exiting the A55 onto Penmaenmawr Road; and
- Approximately 5 people were observed walking along the seafront towards the Beach Café.

2.6 Consultation with Key Stakeholders

A Public Information Exhibition (PIE) was held at Penmaenmawr Museum, Penmaenmawr on Wednesday, 13 December 2017, The Church Institute, Llanfairfechan on Thursday, 14 December 2017 and St Gwynin's Parish Hall, Dwygyfylchi on Friday, 15 December 2017. Consultation leaflets were sent via email to key stakeholders and parties who were involved in the previous consultation undertaken by Atkins on 2008, including those identified in Table 2.5.

Table 2.5: Engagement with Statutory Stakeholder Organisations during PIE, December 2017

Statutory Consultees	Non-Statutory Consultees
Natural Resources Wales (NRW)	Local residents and commuters
CADW Office, Welsh Government	Local businesses
Councils (Councillors & Officers)	Local Action Groups
Conwy County Borough Council	Town Clerks
Gwynedd Council	Bus and train companies
Denbighshire County Council	Cycling groups
Ynys Mon/Anglesey Council	Ramblers Association
North and Mid-Wales Trunk Road Agent (NMTRA – previously known as NWTRA)	Gwynedd Archaeological Trust
Emergency service providers, including the North Wales Police, North Wales Fire and Rescue Service and Welsh Ambulance Services NHS Trust (North Region)	Local Wildlife Trust
Public Utilities	Holyhead Port Authority
Network Rail	Freight Transport Association
	Road Haulage Association
	Federation of small businesses

Further public consultation exhibitions were held at St. Gwynin's Parish Hall, Dwygyfylchi on Tuesday, 12 June 2018, Penmaenmawr Community Centre, Penmaenmawr on Wednesday, 13 June 2018 and Llanfairfechan Community Centre, Llanfairfechan on Thursday, 14 June 2018. A preview session was held on Monday evening, 11 June 2018 for Conwy County Borough Council councillors at Conwy Business Centre, Llandudno Junction.

Key stakeholder organisations contacted included, but not limited to, are presented in Table 2.6. Additional meetings were held with the parties highlighted in bold, either during the formal consultation period or in the run up to or after the end of the period.

Table 2.6: Engagement with Statutory Stakeholder Organisations during PIE, June 2018

Statutory Stakeholder Organisations	
Cable & Wireless UK	**North Wales Fire & Rescue Service**
CADW	**North Wales Police**
Conwy County Borough Council (CBC)	NTL: Telewest
Conwy Town Council	Openreach
Denbighshire County Council	Penmaenmawr Town Council
Dwr Cymru Welsh Water	Powergen
Fibrespeed, JSM Group Ltd	SP Energy / Manweb

Statutory Stakeholder Organisations	
Gwynedd Council	Virgin Media
Llanfairfechan Town Council	Wales & West Utilities
Magnox Electric PLC	Welsh Ambulance Service NHS Trust
National Grid	**Welsh Government (WG)**
National Power Plc	Western Power Distribution
Natural Resources Wales	Ynys Mon / Isle of Anglesey Council
NMWTRA	Zayo Fibrespeed

During the consultation event on Tuesday, 12 June 2018, a meeting was held between the Project Team and Paul Smith, Active Travel, CCBC, Carole Willgoose, Active Travel, WG and James Healey Project Manager, WG.

Details of each of the options were presented and existing pedestrian, cyclist and equestrian facilities within the vicinity of the proposed scheme were discussed and recorded. In addition, the meeting was used to explore planned and aspirational routes, connections and other facilities for the benefit of pedestrians, cyclists and equestrians.

Primary comments from the meeting included:

- Overall, CCBC would like to see improved NMU access for local residents to the NCN5 and to the beach;
- Some evidence of equestrian use on the beach – accessed via Pen slip-road beach club;
- Access to the seafront for NMU restricted due to steps. Walls need to be retained as they are part of the sea defence. Issues with access to the Promenade for cyclists around bird sanctuary and through the existing kissing gate near Pant Pavilion;
- Need to ensure there are sufficient crossing points and that pedestrian/cycle links are provided where scheme impacts on pedestrian/cycle routes. Consider locations of crossing points – need to be realistic/compliant. Need to consider desire lines. Check LDP for details of further developments – consider connectivity;
- Footbridge across the A55 is not just used to access bus stop, it is currently used to provide access to the beach – would be met with resistance if this is removed. Ideally be good to provide cycle access on the bridge;
- Shore Road East is currently in poor condition – would be good to improve pedestrian/cycle facilities – make car feel like a guest in a pedestrian environment. Keep design in keeping with the local area – not a city scheme; and
- Need to consider interaction between pedestrian/cyclists and A55, to reduce interruption of NMU flow.

2.7 Existing Pedestrian, Cyclist and Equestrian Facilities Within the Local Area

The following pedestrian, cyclist and equestrian facilities within the local area have been identified:

2.7.1 Pedestrian Facilities

Public Rights of Way can be found in Appendix 8 and have been extracted from Conwy's Council website.

The Wales Coast Path and NCN 5 shares the same route which currently runs along the North Wales coastline connecting Dwygyfylchi, Penmaenmawr and Llanfairfechan locally. Long distance the route connects Reading and Holyhead via Oxford, Stratford-upon-Avon, Birmingham, Chester, Colwyn Bay and Bangor. Locally there are issues with accessing the NCN 5 in main due to the A55.

Llanfairfechan

Footways are present along the entire length of Penmaenmawr Road, Promenade and Station Road.

Pedestrian crossing facilities are provided on the Penmaenmawr Road/Station Road junction.

Pedestrian access to the beach can be obtained via an underpass close to Penmaenmawr Station, connecting to the Beach Café and NCN5.

Penmaenmawr

Footways are present along Bangor Road, Conway Road and Paradise Road, which leads to Penmaenmawr railway station.

Pedestrian crossing facilities are provided on the Bangor Road/Paradise Road junction, while a zebra crossing is provided on Bangor Road between Station Road West and Celyn Street.

Dwygyfylchi

Footways are present along Ysguborwen Road, while no pedestrian crossing facilities are provided.

There is a public right of way providing access to the beach from Ysguborwen Road, via a footbridge over the A55.

2.7.2 Cyclist Facilities

Llanfairfechan

National Cycle Route 5 runs through Llanfairfechan along Aber Road, onto Penmaenmawr Road, up through Pendalar and onto the overbridge of the A55 towards Penmaenmawr.

There are no cycle storage facilities at Llanfairfechan Rail Station.

Penmaenmawr

A shared use foot/cycle path (NCN 5) is provided along the coast line.

No cycle storage is provided at Penmaenmawr Rail Station.

Dwygyfylchi

No dedicated cycling facilities are provided in Dwygyfylchi.

2.7.3 Equestrian Facilities

No specific equestrian facilities have been identified within the scheme area.

2.8 Existing Pedestrian, Cyclist and Equestrian Facilities Beyond Scheme Extents and Links to County / Strategic Networks

The following pedestrian, cyclist and equestrian facilities outside the immediate scheme extents, but within the study area, have been identified.

2.8.1 Pedestrian and Cyclist Facilities

NCN Route 5.

Various footways are identified in Appendix 9.

2.8.2 Equestrian Facilities

No equestrian facilities have been identified.

CCBC Integrated Network Maps (INM), as approved by the WG in February 2018, are provided in Appendix 9. The IMN proposals are a requirement of the Active Travel (Wales) Act 2013 and identify the future development of strategic walking, cycling and/or equestrian routes in CCBC.

2.9 Pedestrian, Cyclist and Equestrian Survey Data

Surveys of the numbers of pedestrians, cyclists and equestrians within the study area were undertaken on bank holiday Monday, 28 May 2018. The survey was undertaken by TRL 360 between 08:00 and 20:00. Data from the surveys are presented in Table 2.7, while survey data and locations are identified in Appendix 10. The count surveys have been undertaken at the following locations:

- **Survey 1** – The A55 overbridge - the survey included the pedestrian/cycle overbridge and pedestrian/cycle route to A55 bus stop, cycle route/footway along Penmaenmawr Road, and NCN 5 cycleway;
- **Survey 2** – Shore Road East/Penmaenmawr Road;
- **Survey 3** – Penmaenmawr Road;
- **Survey 4** – Station Road/Aber Road/Village Road – signalised crossing;
- **Survey 5** – Aber Road;
- **Survey 6** – High Street;
- **Survey 7** – Beach café – monitor NCN 5 cycle route usage and subway under A55 into Penmaenmawr (and return);
- **Survey 8** – Fernbrook Road/Bangor Road/Brymor Terrace/Pant-y-Afon;
- **Survey 9** – Conway Road/Ysguborwen Road; and,
- **Survey 10** – A55 Overbridge (near Shell garage) – monitor who is using overbridge and cycle route.

Table 2.7: Pedestrian and Cyclist Flows on Survey Locations

Survey Ref	Location	Bicycle	Pedestrian	Equestrian	Total
1	Footway	6	17	0	23
1	Overbridge	2	36	0	38
1	A55 Bus Stop (North)	0	0	0	0
1	A55 Bus Stop (South)	0	0	0	0
1	Penmaenmawr Road	169	110	0	279
2	Shore Road East/Penmaenmawr Road	190	342	0	532
3	Penmaenmawr Road	135	193	0	328
4	Village Road/Aber Road	171	1268	0	1,439
5	Aber Road	74	67	0	141
6	High Street/NCN 5	190	56	0	246
7	NCN 5	328	1,736	0	2,064
7	Subway Under A55	154	1,881	0	2,035
8	Brynmor Terrace/Bangor Road	105	1,724	0	1,829
9	Conway Road/Ysgurborwen	35	101	0	136
10	Overbridge	40	514	0	554
10	NCN5	257	34	0	291

The following is a summary of the main points from the data:

- No equestrian use was recorded at any of the survey sites;
- Survey data suggests all routes surveyed are actively used by both pedestrians and cyclists; and
- There are no cycle facilities at overbridges no. 1 and no. 10; however, a number of cyclists were surveyed using these links suggesting a demand for these facilities.

2.10 Consultation with Local User Groups and Wider Public

Further to the above PIE and Public Consultation events, an Active Travel liaison meeting was held at The Heath, Penmaenmawr on Friday, 27 July 2018, between the Project Team and Carole Willgoose, WG, Paul Smith, CCBC, Victor Turner (CCBC), Richard Evans-Snarr (CCBC), John Mather (Cycling UK) and Glyn Evans (Sustrans).

The objective of the meeting was to identify potential opportunities to improve walking, cycling and equestrian facilities both within the footprint of the scheme, but also to identify opportunities through Active Travel beyond the scheme footprint. Minutes from the meeting are provided in Appendix 11.

A meeting was also held on Monday, 30 July 2018, at Conwy Business Centre, Llandudno Junction with local Bus Operators. The meeting was attended by James Healey (WG), David Hall (WG),

Bob Saxby (Bus Users UK), Chris Owens (Alpine Travel), Dafydd Williams (Arriva) and the Project Team.

Each of the options were presented and the potential impact on bus services identified, in summary for Junction 15 the preferred option was B, and the least preferred was option A. For junction 16, the most preferred was option A, with the remaining options viewed as no worse than the existing scenario. Minutes from the meeting are provided in Appendix 11.

Further consultation in respect to walking, cycling and equestrian facilities will be ongoing throughout the project.

3. USER OPPORTUNITIES

The opportunities highlighted below are considered to be relevant to the scheme and should be considered by the wider design team throughout the progression of the scheme design in addition to any further opportunities that may arise through the ongoing development of the design phase, and the ongoing Active Travel consultation. Although the scheme options vary, it should be noted that where the scheme directly impacts on any NMU routes, as a minimum all existing movements will be retained within the proposed scheme design. Table 3.1 identifies a number of scheme specific opportunities to improve walking and cycling routes.

3.1 Scheme Specific Opportunities

Table 3.1 Scheme Specific Opportunities

Description
Improvements to overbridges to accommodate cyclists, specifically A55 overbridge at Shell garage and existing overbridge at Pendalar
Cyclists on Penmaenmawr Road, which forms a section of the NCN Route 5, are exposed to traffic and thus dedicated/shared cycleway are recommended to be provided
Ensure continuity of NCN 5 through Penmaenmawr Road/Junction 15
Provision of pedestrian crossing on Penmaenmawr Road (to the north of Junction 15)
Provision of pedestrian crossing on Penmaenmawr Road (to the south of Junction 15)
Repositioning of bus stops on Glan Yr Afon Road
Improvements to footway surfacing/dropped kerb provision along NCN 5 (in proximity to scheme design)
Seek to incorporate footway/cycleway provision on any new highway/infrastructure (where permitted) to improve access to coastline

3.2 Opportunities Identified Through Site Visit

A number of opportunities for walking and cycling routes were identified during the site visit, as presented in Appendix 7. These are presented in Table 3.2.

Table 3.2 Opportunities Identified Through Site Visit

Location	Proposed Improvement
The A55 pedestrian overbridge. Eastbound pedestrian footway to A55 bus stop. Westbound footway to stairs leading down towards beach. NCN 5 along Penmaenmawr Road.	• Upgrade bridge to provide cycle access. NCN 5 runs along Penmaenmawr Road and this would provide access for cyclists onto the beach, and Shore Road East. Survey data suggests cyclists already use the overbridge. • Improve current unlit stepped access to 'track' which provides access to the beach and Shore Road East. • Improvements to 'track' – surfacing/lighting etc. • Provision of dropped kerbs and resurfacing of footways along Penmaenmawr Road.
Shore Road East/Penmaenmawr Road	• Provision of dropped kerbs and resurfacing of footways along Penmaenmawr Road. • Provision of pedestrian crossing facility on Penmaenmawr Road. • Provision of cycle lanes along Penmaenmawr Road.
Station Road/Aber Road/Village Road – signalised crossing.	• Provision of advanced stop line to help cyclists pull away in front of traffic
Aber Road	• Provision of cycle lanes along Aber Road.
High Street/NCN 5	• Improvements to drainage to reduce flooding on steps. • Improvements to lighting underneath the A55 bridge.
Beach Café	• Improvements to lighting along the NCN 5.
Fernbrook Road/Bangor Road/Brymor Terrace/Pant-y-Afon.	• Dropped kerbs on Bangor Road. • Provision of advanced stop line on Conway Road to help cyclists pull away in front of traffic.
Conway Road/Ysguborwen Road. (next to J16)	• Relocation of bus stop. • Realignment of cycleway/footway through junction. • Designed waiting area for cyclists at junction.
A55 Overbridge (near Shell garage).	• Upgrade bridge to provide cycle access. • Improve current unlit stepped access to 'track' which provides access to the beach and Dwygyfylchi. • Improvements to 'track' – surfacing/lighting etc.

3.3 Active Travel Opportunities

Active Travel journeys are those made to or from a workplace or educational establishment, or in order to access health, leisure or other services or facilities. As such, many of the improvements identified to walking, cycling and horse-riding routes could potentially be classed as Active Travel improvements and are described in Table 3.3.

Detailed description of each Active Travel opportunity can be found in Appendix 12.

Table 3.3 Active Travel Opportunities

Llanfairfechan
Improvement to the unpaved sections of the Coastal Path to the West of the Llanfairfechan promenade.
Improved links to Llanfairfechan station from the Coastal Path, including the provision of signage and cycle storage.
Improvement to access from Shore Road East and the Promenade to the Beach Front Path, which is currently unsuitable for cyclists and disabled users due to the kerb and steps through the sea wall.
Improvements through the footprint of the scheme, to improve links onto the sea front from the Sustrans Route 5, including signing, markings and landscaping.
An improved Cycling and walking link from the Promenade to the railway underpass (adjacent to the Pendalar footbridge), consisting of coastal protection works and a short 150m footway link.
A replacement footbridge, to link Pendalar to the coast.
Penmaenmawr and Dwygyfylchi
Penmaenmawr Station improvements, including the provision of cycle storage.
Improved signage, road and footpath markings to create a Beach Front to Station to Town Link.
Provision of a cycleway ramp down to Sustrans Route 5 from the existing Puffin Footbridge.
A circular walking link via Darbyshire's Bridge, via the beach and dunes and Puffin Footbridge, by providing a new footbridge crossing the A55.
Advanced Stop Lines on Penmaenmawr Road/Station Road junction to allow cyclists to be positioned ahead of the traffic.

4. WALKING, CYCLING AND HORSE-RIDING ASSESSMENT TEAM STATEMENT

As Lead Assessor, I confirm that this Walking, Cycling and Horse-Riding Assessment Report has been compiled in accordance with DMRB HD42/17 and contains the appropriate information for the wider design team. The Walking, Cycling and Horse-Riding Assessment was undertaken by the following Assessment and Review Team:

Walking, Cycling and Horse-Riding Lead Assessor

Nicola Evans	**Signed:**	
Principal Transport Planner Ramboll	**Date:**	12.10.18

Walking, Cycling and Horse-Riding Assessor

Ioannis Spyropoulos	**Signed:**	
Transport Planner Ramboll	**Date:**	12.10.18

As design team leader, I confirm that the assessment has been undertaken at the appropriate stage of the scheme development and that the wider team has been involved in the process.

I confirm that, in my professional opinion, the appointed Lead Assessor has the appropriate experience for the role making reference to the expected competencies contained in HD 42/17.

Design Team Leader

Rob Griffiths	**Signed:**	
BSc (Hons) CENG MICE Ramboll UK ltd	**Date:**	12.10.18

APPENDIX 1
A55 JUNCTIONS 15 AND 16 IMPROVEMENT OPTIONS



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KEY

PUBLIC RIGHT OF WAY

NATIONAL CYCLE NETWORK

WALES COAST PATH

Rev	Description	Date	By Chk	App
P01	DESCRIPTION	DD/MM YYYY	DRN CHK	APP

FOR INFORMATION

A55 JUNCTION 15 & 16 IMPROVEMENTS

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A55 JUNCTION 15 IMPROVEMENT OPTION A PROW & CYCLEWAYS

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:2000	JW	MAY 18

Drawing No: RAM-03-XX-SK-J-1000

Rev: P01

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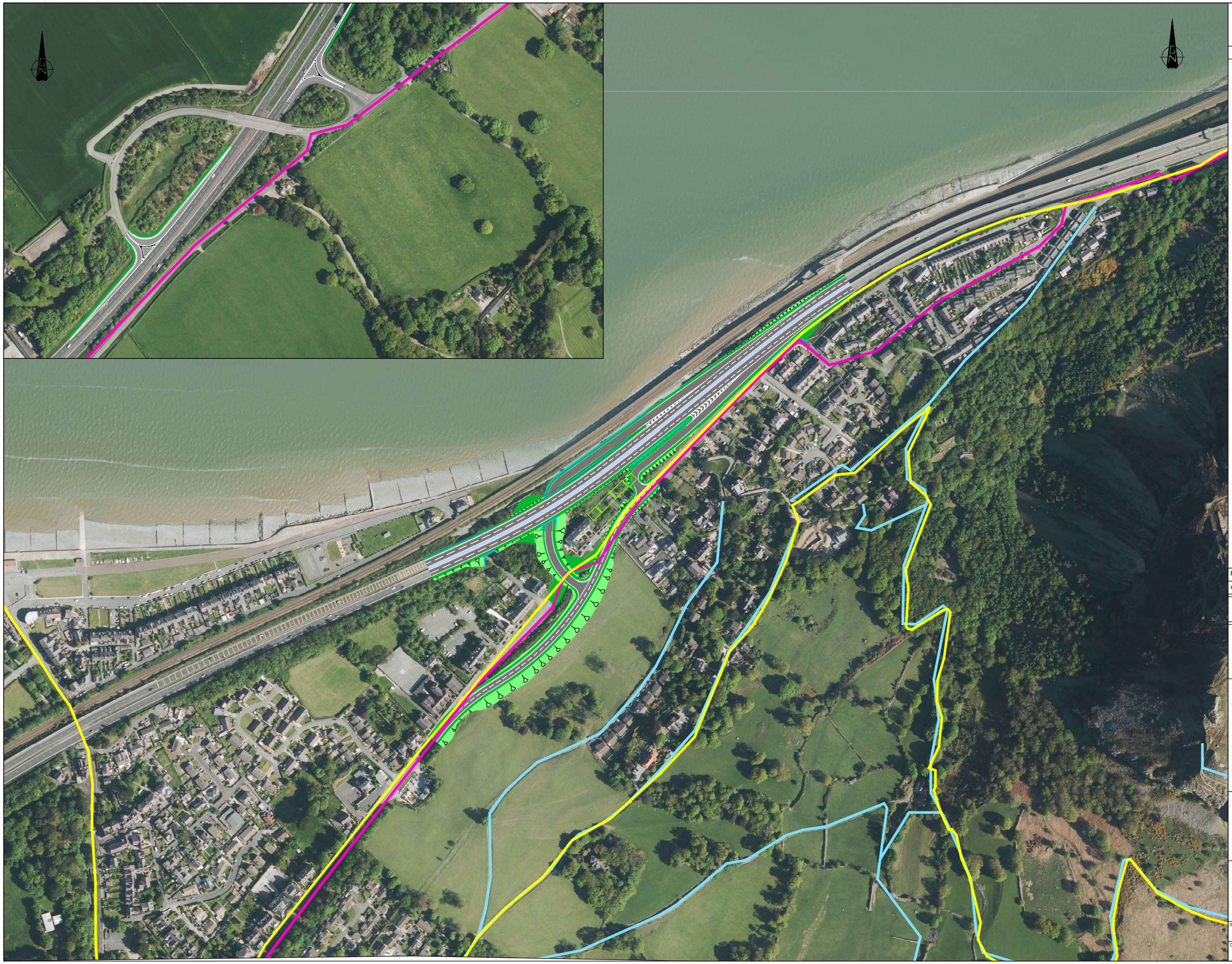
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A55 JUNCTION 15 IMPROVEMENT OPTION B PROW & CYCLEWAYS

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:2000	JW	MAY 18

Drawing No:	Rev:
RAM-03-XX-SK-J-1001	P01

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NATIONAL CYCLE NETWORK

WALES COAST PATH

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P01	DESCRIPTION	DD/MM YYYY	DRN CHK	APP

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WALES COAST PATH

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A55 JUNCTION 15 IMPROVEMENT OPTION D PROW & CYCLEWAYS

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:2000	JW	MAY 18

Drawing No:	Rev:
RAM-03-XX-SK-J-1003	P01

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KEY

PUBLIC RIGHT OF WAY

NATIONAL CYCLE NETWORK

WALES COAST PATH

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P01	DESCRIPTION	DD/MM YYYY	DRN CHK	APP

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A55 JUNCTION 15 IMPROVEMENT OPTION E PROW & CYCLEWAYS

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PUBLIC RIGHT OF WAY

NATIONAL CYCLE NETWORK

WALES COAST PATH

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WALES COAST PATH

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A55 JUNCTION 16 IMPROVEMENT OPTION B PROW & CYCLEWAYS

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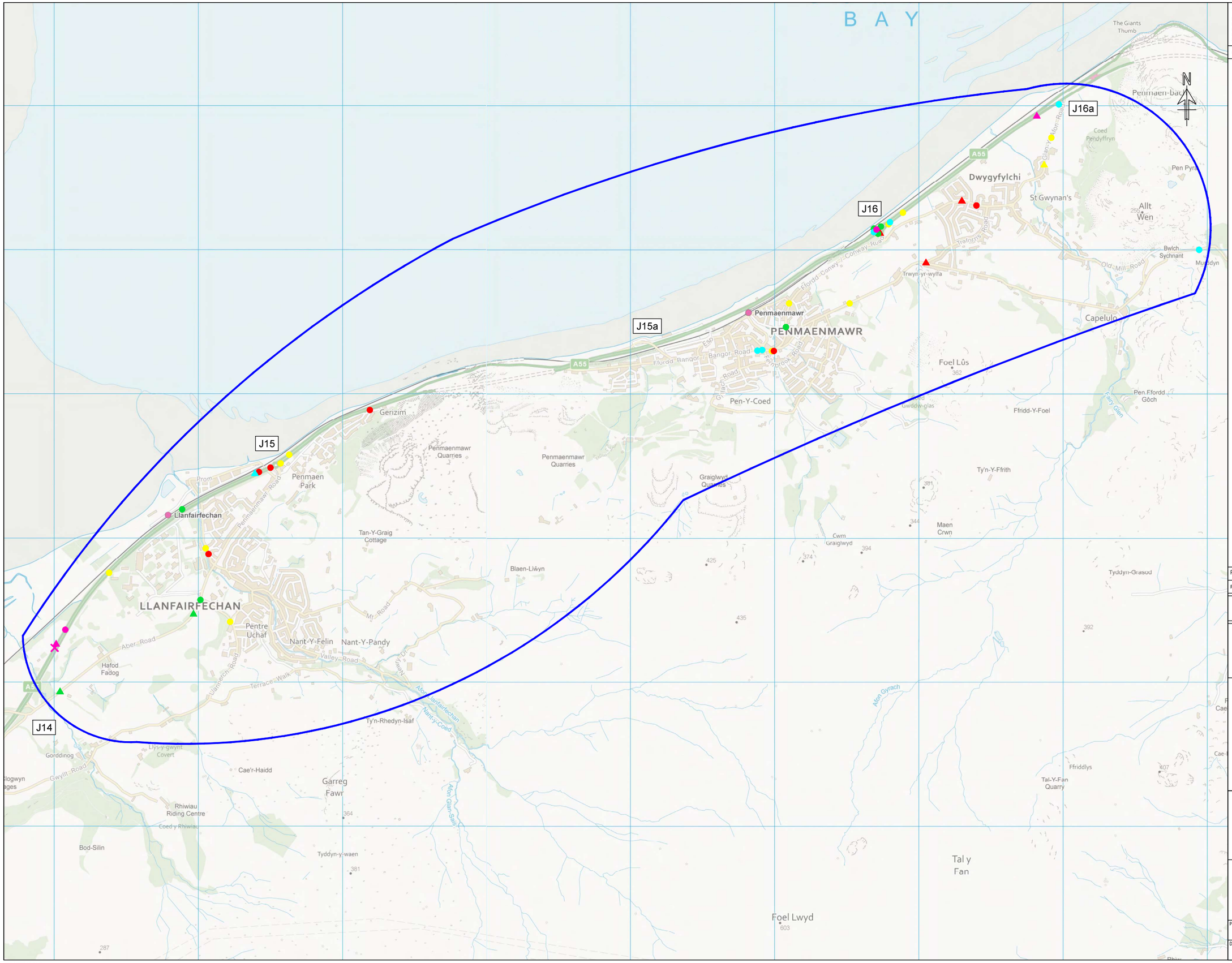
Drawing No:	Rev:
RAM-03-XX-SK-J-1008	P01

01/06/2018 09:24:57

APPENDIX 2
STUDY AREA


N
J16a
J16
J15a
J15
J14
A55
Penmaenmawr
PENMAENMAWR
Llanfairfechan
LLANFAIRFECHAN
Dwygyfylchi
St Gwynan's
Capelulo
Foel Lûs
Pen-Y-Coed
Gerizim
Penmaenmawr Quarries
Graiglwyd Quarries
Penmaen Park
Tan-Y-Graig Cottage
Blaen-Llwyn
Pentre Uchaf
Nant-Y-Felin
Nant-Y-Pandy
Hafod Fadog
Ty'n-Rhedyn-Isaf
Gorddinog
Tan-Y-Clogwyn Cottages
Cae'r-Haidd
Garreg Fawr
Rhiwiau Riding Centre
Bod-Silin
Tyddyn-y-waen
Trwyn-yr-wylfa
Ffridd-Y-Foel
Ty'n-Y-Ffrith
Maen Crwn
Cwm Graiglwyd
Tyddyn-Grasod
Ffriddlys
Tal-Y-Fan Quarry
Tal y Fan
Foel Lwyd
Allt Wen
Pen.Ffordd Gôch
Penmaen-b
The Giants Thumb
Coed Pendyffryn
Coed Gwddw-glas
Aber Road
Conway Road
Bangor Road
Terrace Walk
Valley Road
Mill Road
Old Mill Road
Trefonis Road
Glan-yr-Afon Road
Ffordd Bangor
Ffordd Conwy
Llanfairfechan
Aber Brook
Aber Falls
Aber Valley
Aber Falls Visitor Centre
Lôn y gwynt Covert
Coed y Rhiwiau
Aber Gyrach
Aber Llanfairfechan
Nant-y-Coed
Aber Glan-Saeg
Fairy Glen
Prom
Gwyllt Road
Llanfairfechan Road
Ysgol Dyffryn Nant
Ysgol Dyffryn Nant Playing Field
Ysgol Dyffryn Nant Playing Fields
Ysgol Dyffryn Nant Sports Ground
Ysgol Dyffryn Nant Sports Pitch
Ysgol Dyffryn Nant Sports Pitches
Ysgol Dyffryn Nant Sports Pitches
Ysgol Dyffryn Nant Sports Pitches

APPENDIX 3
COLLISION DATA



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KEY

- STUDY AREA
- 'SLIGHT' ACCIDENT
- 'SERIOUS' ACCIDENT
- 'FATAL' ACCIDENT
- ACCIDENT DATA 2012
- ACCIDENT DATA 2013
- ACCIDENT DATA 2014
- ACCIDENT DATA 2015
- ACCIDENT DATA 2016

Rev	Description	Date	By	Chk	App
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TRAFFIC ACCIDENT LOCATIONS (2012-2016)

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1620000620	1:12000	JW	DEC 18

Drawing No: RAM-ZZ-ZZ-SK-J-3005

Rev: P01

13/12/2018 14:24:54

Collision data 2012

Year	DateOfAccident	neOfAccide	calAuthori	Easting	Northing	Zone	RoadType	loadNumbe	Pedestrians	Cars	Motorcyclists	Pedal cyclists	Ridden horse	otalVehicle	Fatal	Serious	Slight	TotalCasualties
2012	25/06/2012 00:00	1506	W0600000	268500	375490	12	Dual carriageway	A55	0	3	0	0	0	3	0	0	2	2
2012	18/09/2012 00:00	1109	W0600000	268420	375460	12	Dual carriageway	A55	0	3	0	0	0	3	0	0	1	1
2012	20/12/2012 00:00	812	W0600000	269190	375890	13	Dual carriageway	A55	0	3	0	0	0	3	0	0	1	1
2012	24/09/2012 00:00	409	W0600000	272720	377110	24	Dual carriageway	A55	0	1	0	0	0	1	0	2	0	2
2012	15/03/2012 00:00	1803	W0600000	273050	376910	26	Single carriageway	U	1	0	0	1	0	1	0	2	0	2
2012	15/08/2012 00:00	1308	W0600000	268070	374890	10	Single carriageway	U	0	1	1	0	0	2	0	0	1	1
2012	17/06/2012 00:00	1706	W0600000	273300	377340	25	Single carriageway	U	0	1	1	0	0	2	0	1	1	2
2012	17/06/2012 00:00	1906	W0600000	273400	377310	26	Single carriageway	U	0	4	0	0	0	4	0	0	1	1

Collision data 2013

Year	DateOfAccident	neOfAccide	calAuthori	Easting	Northing	Zone	RoadType	loadNumbe	Pedestrians	Cars	Motorcyclists	Pedal cyclists	Ridden horse	otalVehicle	Fatal	Serious	Slight	TotalCasualties
2013	20/06/2013 00:00	906	W0600000	267380	374760	10	Dual carriageway	A55	0	1	0	0	0	1	0	0	1	1
2013	15/03/2013 00:00	703	W0600000	268630	375580	13	Dual carriageway	A55	0	2	0	0	0	2	0	0	1	1
2013	04/08/2013 00:00	708	W0600000	268570	375520	13	Dual carriageway	A55	0	2	0	0	0	2	0	0	3	3
2013	19/03/2013 00:00	1703	W0600000	272890	377260	24	Dual carriageway	A55	0	1	0	0	0	2	0	0	1	1
2013	25/05/2013 00:00	1605	W0600000	272790	377180	24	Dual carriageway	A55	0	2	0	0	0	2	0	0	1	1
2013	16/07/2013 00:00	2007	W0600000	272520	376630	23	Single carriageway	U	0	2	0	0	0	2	0	0	1	1
2013	20/11/2013 00:00	1511	W0600000	272100	376630	23	Single carriageway	U	1	1	0	0	0	1	0	0	1	1
2013	26/05/2013 00:00	5	W0600000	273870	377590	27	Single carriageway	U	0	0	1	0	0	1	0	1	0	1
2013	08/08/2013 00:00	2108	W0600000	273920	377780	27	Single carriageway	U	0	1	0	1	0	2	0	0	1	1
2013	15/08/2013 00:00	1008	W0600000	268220	374420	1	Single carriageway	U	0	2	0	0	0	2	0	0	3	3
2013	08/11/2013 00:00	1211	W0600000	271980	376300	21	Single carriageway	U	0	3	0	0	0	3	0	0	1	1
2013	23/12/2013 00:00	1012	W0600000	268050	374930	10	Single carriageway	U	1	1	0	0	0	1	0	0	1	1

Collision data 2014

Year	DateOfAccident	neOfAccide	calAuthori	Easting	Northing	Zone	RoadType	loadNumbe	Pedestrians	Cars	Motorcyclists	Pedal cyclists	Ridden horse	otalVehicle	Fatal	Serious	Slight	TotalCasualties
2014	27/12/2014 00:00	1030	W0600000	267887	375201	13	Dual carriageway	A55	0	1	0	0	0	1	0	0	2	2
2014	17/10/2014 00:00	747	W0600000	272701	377142	24	Dual carriageway	A55	0	3	0	0	0	3	0	0	2	2
2014	19/04/2014 00:00	1130	W0600000	272737	377164	24	Roundabout	A55	0	1	1	0	0	2	0	0	1	1
2014	10/03/2014 00:00	1335	W0600000	272717	377114	24	Roundabout	A55	0	0	1	0	0	1	0	0	1	1
2014	27/05/2014 00:00	1700	W0600000	268014	374572	1	Single carriageway	U	0	2	0	0	0	2	0	0	1	1
2014	19/06/2014 00:00	1700	W0600000	267966	374472	1	Single carriageway	U	0	3	0	0	0	3	0	1	0	1
2014	04/02/2014 00:00	1223	W0600000	267039	373933	10	Single carriageway	U	0	1	1	0	0	2	0	1	0	1
2014	25/01/2014 00:00	1100	W0600000	272078	376466	23	Single carriageway	U	0	1	1	0	0	2	0	0	1	1

Collision data 2015

Year	DateOfAccident	neOfAccide	calAuthori	Easting	Northing	Zone	RoadType	loadNumbe	Pedestrians	Cars	Motorcyclists	Pedal cyclists	Ridden horse	otalVehicle	Fatal	Serious	Slight	TotalCasualties
2015	24/07/2015 00:00	1517	W0600000	268392	375448	12	Dual carriageway	A55	0	0	1	0	0	1	0	1	0	1
2015	07/01/2015 00:00	1415	W0600000	272695	377131	24	Dual carriageway	A55	0	2	0	0	0	2	0	0	1	1
2015	20/10/2015 00:00	1600	W0600000	272800	377194	24	Dual carriageway	A55	0	3	0	0	0	4	0	0	3	3
2015	05/05/2015 00:00	2236	W0600000	273972	378012	27	Dual carriageway	A55	0	1	0	0	0	1	0	0	3	3
2015	06/03/2015 00:00	1610	W0600000	271880	376302	20	Single carriageway	U	1	1	0	0	0	1	0	0	1	1
2015	02/08/2015 00:00	715	W0600000	271913	376307	20	Single carriageway	U	0	2	0	0	0	2	0	0	1	1
2015	22/08/2015 00:00	215	W0600000	274946	377002	29	Single carriageway	U	1	1	0	0	0	1	0	0	1	1

Collision data 2016

Year	DateOfAccident	neOfAccide	calAuthori	Easting	Northing	Zone	RoadType	loadNumbe	Pedestrians	Cars	Motorcyclists	Pedal cyclists	Ridden horse	otalVehicle	Fatal	Serious	Slight	TotalCasualties
2016	25/01/2016 00:00	2000	W0600000	267007	374251	10	Dual carriageway	A55	0	2	0	0	0	4	0	1	0	1
2016	08/02/2016 00:00	1030	W0600000	267076	374365	10	Dual carriageway	A55	0	2	0	0	0	2	0	0	2	2
2016	17/08/2016 00:00	1915	W0600000	267002	374239	10	Dual carriageway	A55	0	1	0	0	0	2	1	0	0	1
2016	27/10/2016 00:00	747	W0600000	272706	377143	24	Dual carriageway	A55	1	1	0	0	0	2	0	0	1	1
2016	10/02/2016 00:00	1640	W0600000	273819	377930	27	Dual carriageway	A55	0	1	0	0	0	2	0	1	1	2

APPENDIX 4
ROUTE MAPS OF BUS SERVICES



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KEY

BUS ROUTE

BUS STOPS

Rev	Description	Date	By	Chk	App
P01	DESCRIPTION	DD/MM YYYY	DRN	CHK	APP

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BUS ROUTE X5 WESTBOUND

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:12000	JW	DEC 18

Drawing No: RAM-ZZ-ZZ-SK-J-3010

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BUS ROUTE

BUS STOPS

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BUS ROUTE X5 EASTBOUND

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BUS ROUTE

BUS STOPS

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BUS ROUTE A55 EASTBOUND

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KEY

BUS ROUTE

BUS STOPS

Rev	Description	Date	By Chk App
P01	DESCRIPTION	DD/MM YYYY	DRN CHK APP

FOR INFORMATION

A55 JUNCTION 15 & 16 IMPROVEMENTS

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BUS ROUTE A55 WESTBOUND

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:12000	JW	DEC 18

Drawing No: RAM-ZZ-ZZ-SK-J-3012

Rev: P01

13/12/2018 11:04:35



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KEY

BUS ROUTE

BUS STOPS

Rev	Description	Date	By	Chk	App
P01	DESCRIPTION	DD/MM/YYYY	DRN	CHK	APP

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BUS ROUTE 75

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:12000	JW	DEC 18

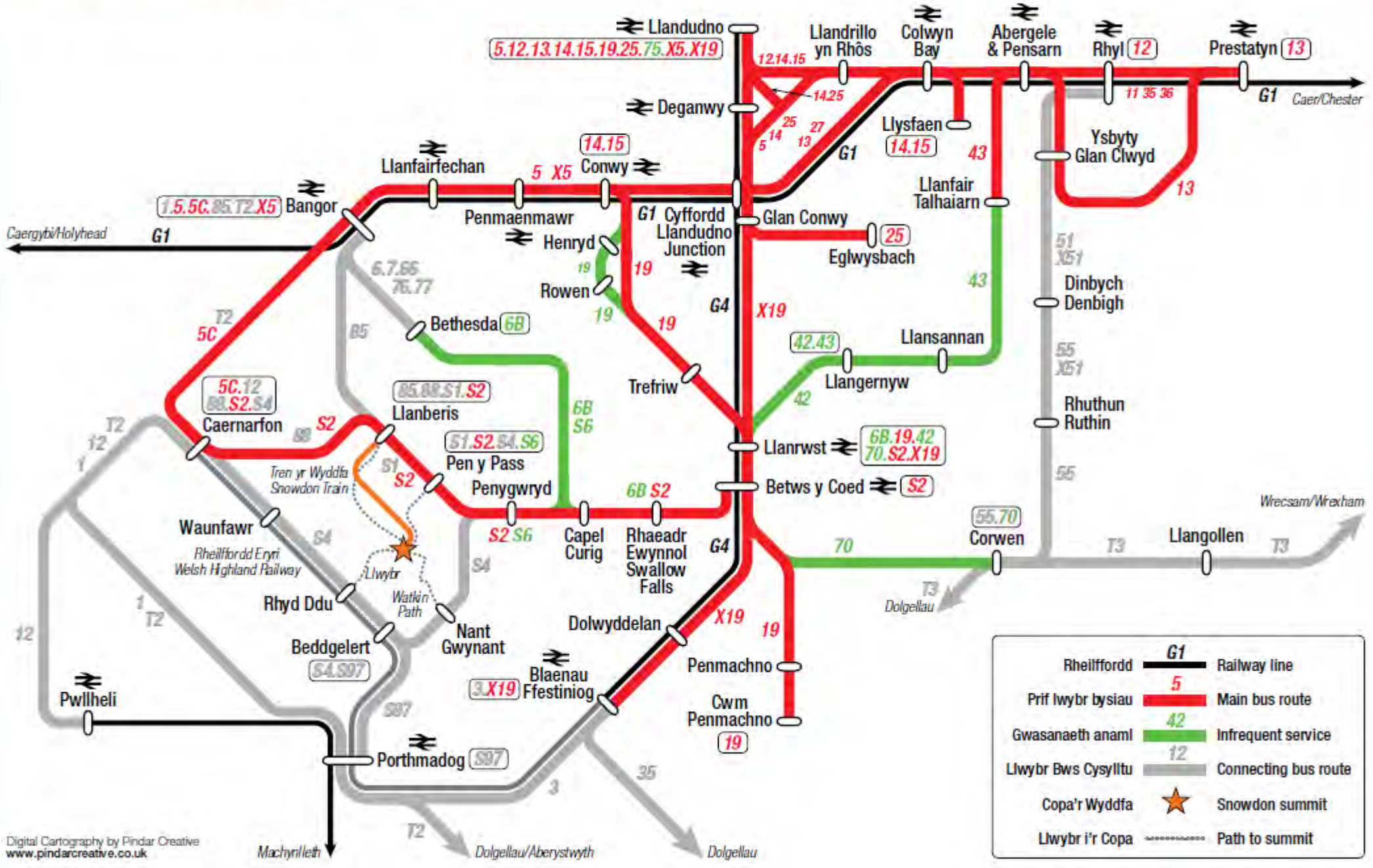
Drawing No: RAM-ZZ-ZZ-SK-J-3014

Rev: P01

18/12/2018 12:11:12

APPENDIX 5
RAIL MAP

Map Bysiau a Threnau / Bus and Train Map



APPENDIX 6
TRIP GENERATORS

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KEY

PUBLIC FOOTPATHS

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LOCATION OF PUBLIC FOOPATHS

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:12000	JW	DEC 18

Drawing No: RAM-ZZ-ZZ-SK-J-3002

Rev: P01

11/12/2018 15:09:59

APPENDIX 7
SITE VISIT ASSESSMENT TABLE

Site/Survey Location	Daily Usage (based on May bank holiday survey data) (Cyclists/Pedestrians)	Route Condition	Potential Improvements
Location 1: The A55 pedestrian overbridge. Eastbound pedestrian footway to A55 bus stop. Westbound footway to stairs leading down towards beach. NCN 5 along Penmaenmawr Road.	177/163	The pedestrian overbridge is unlit, and in good condition providing access from Penmaenmawr to the disused eastbound bus stop on the A55 and footway connecting to 'track' (via steps) providing access to the beach and Shore Road East. Lit footway along eastbound side of A55 is in good condition – existing bus stop is no longer used. Overall, the footways either side of Penmaenmawr Road are considered to be in good condition. There is some lighting provision, which is considered to be adequate. Inconsistent provision of dropped kerbs along the footway. NCN5 runs along Penmaenmawr Road – no separate cycleway provision.	• Upgrade bridge to provide cycle access. NCN 5 runs along Penmaenmawr Road and this would provide access for cyclists onto the beach, and Shore Road East. Survey data suggests cyclists already use the overbridge. • Improve current unlit stepped access to 'track' which provides access to the beach and Shore Road East. • Improvements to 'track' – surfacing/lighting etc. • Provision of dropped kerbs and resurfacing of footways along Penmaenmawr Road.
Location 2: Shore Road East/Penmaenmawr Road	190/342	Footways and lighting are provided on both sides of Penmaenmawr Road. No provision of pedestrian crossing facilities on Penmaenmawr Road or along the footway at its intersection with Shore Road. NCN5 runs along Penmaenmawr Road – no separate cycleway provision.	• Provision of dropped kerbs and resurfacing of footways along Penmaenmawr Road. • Provision of pedestrian crossing facility on Penmaenmawr Road. • Provision of cycle lanes along Penmaenmawr Road.

Location 3: Penmaenmawr Road.	135/193	Overall, the footways either side of Penmaenmawr Road are considered to be in good condition. Lighting provision is considered adequate. NCN5 runs along Penmaenmawr Road – no separate cycleway provision.	• No potential improvements
Location 4: Station Road/Aber Road/Village Road – signalised crossing.	171/1,268	The junction is in good condition with adequate lighting and road marking. NCN5 runs along Penmaenmawr Road – no separate cycleway provision.	• Provision of advanced stop line to help cyclists pull away in front of traffic
Location 5: Aber Road.	74/67	The footways either side of Aber Road are considered to be in good condition, while lighting provision is considered to be adequate NCN5 runs along Aber Road – no separate cycleway provision.	• Provision of cycle lanes along Aber Road.
Location 6: High Street/NCN 5.	190/56	The footways either sides of High Street are in good condition, while adequate traffic signs are provided for cyclists and pedestrians. Links to the NCN 5 to the south and north of High Street are unlit, while pedestrians can access the NCN 5 along the beach via steep steps.	• Improvements to drainage to reduce flooding on steps. • Improvements to lighting underneath the A55 bridge.
Location 7: Beach Café.	484/3,617	Very good condition of the railway underpass connecting Penmaenmawr beach to Station Road East with adequate lighting. Access to beach/NCN 5 clearly signed. No adequate lighting along NCN 5. Cycle racks are provided out of the path near the Beach Café.	• Improvements to lighting along the NCN 5.

Location 8: Fernbrook Road/Bangor Road/Brymor Terrace/Pant-y-Afon.	105/1,724	Adequate lighting and in overall good condition. Provision of guard-railing. Survey data suggest cyclists pass through the junction.	• Dropped kerbs on Bangor Road. • Provision of advanced stop line on Conway Road to help cyclists pull away in front of traffic.
Location 9: Conway Road/Ysguborwen Road.	35/101	No good visibility for traffic on Conway Road approaching the roundabout. Good lighting provision. The roundabout provides access to A55.	• Relocation of bus stop. • Realignment of cycleway/footway through junction. • Designed waiting area for cyclists at junction.
Location 10: A55 Overbridge (near Shell garage).	297/548	The pedestrian overbridge is accessible via Maes Y Llan. It is unlit and in good condition providing access to the beach, NCN 5 and Dwygyfylchi. A bus stop is located at the south side of overbridge at approximately 80m and is accessible via a footpath. NCN 5 runs at the north side of overbridge in the form of separated cycle lane.	• Upgrade bridge to provide cycle access. • Improve current unlit stepped access to 'track' which provides access to the beach and Dwygyfylchi. • Improvements to 'track' – surfacing/lighting etc.

APPENDIX 8
PUBLIC RIGHTS OF WAY

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KEY

PUBLIC FOOTPATHS

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A55 JUNCTION 15 & 16 IMPROVEMENTS

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LOCATION OF PUBLIC FOOPATHS

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:12000	JW	DEC 18

Drawing No:	Rev:
RAM-ZZ-ZZ-SK-J-3002	P01

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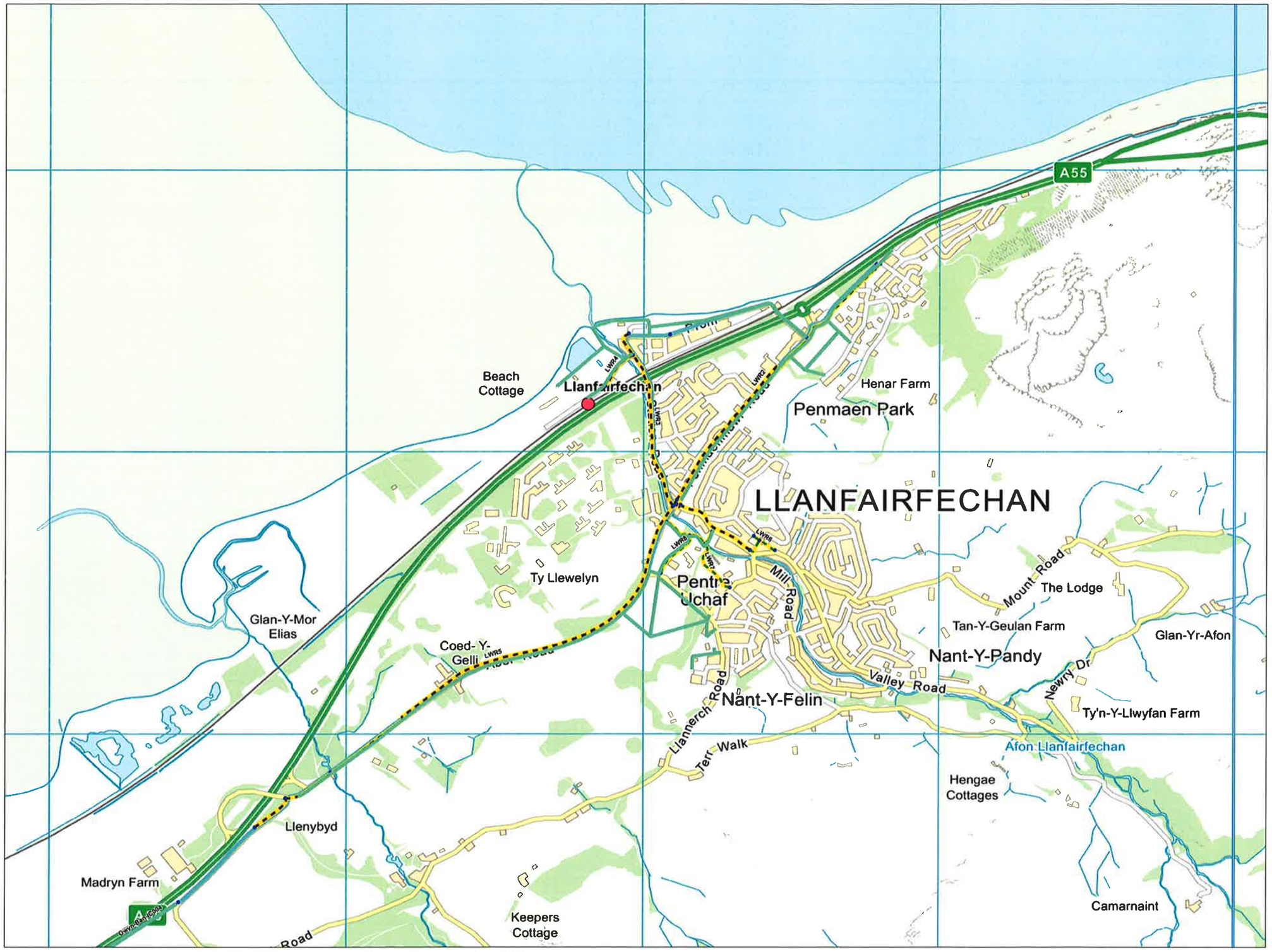
APPENDIX 9
CCBC INTEGRATED NETWORK MAPS

Teithio Llesol Llanfairfechan

Produced by the Active Travel web site. Gynhyrchwyd gan y wefan Teithio Llesol.

Yr Amgylchedd
Ffyrdd a Chyfleusterau / Environment
Roads & Facilities

CONWY
CYNGOR BWRDEISTREF SIROL
COUNTY BOROUGH COUNCIL



Legend / Eglurhad

Active Travel Route / Llwybr Teithio Llesol

- Undefined path design / Dyluniad llwybr heb ei ddiffinio
- Footpath (away from road) / Llwybr troed (i ffwrdd o'r ffordd)
- Footway (alongside road) / Troedffordd (ochr yn ochr â ffordd)
- Cycle track (away from road) / Trac beicio (i ffwrdd o'r ffordd)
- Cycle track (alongside road) / Trac beicio (ochr yn ochr â ffordd)
- Shared use foot/cycle path (away from road) / Llwybr cerdded/beicio a rennir (i ffwrdd o'r ffordd)
- Shared use foot/cycle path (alongside road) / Llwybr cerdded/beicio a rennir (ochr yn ochr â ffordd)
- Segregated foot/cycle path (away from road) / Llwybr cerdded/beicio wedi'i wahanu (i ffwrdd o'r ffordd)
- Segregated foot/cycle path (alongside road) / Llwybr cerdded/beicio wedi'i wahanu (ochr yn ochr â ffordd)
- Cycle route (on road, not segregated) / Lôn feicio (ar y ffordd, heb ei gwahanu)
- Cycle lane (on road, segregated) / Lôn feicio (ar y ffordd, wedi'i gwahanu)
- Pedestrian zone / Ardal cerdded
- Pedestrian and cycle zone / Ardal cerdded a beicio
- Road without footway / Ffordd heb droedffordd

- Line end points / Pwyntiau diwedd llinell
- Integrated Network / Rhwydwaith Integredig

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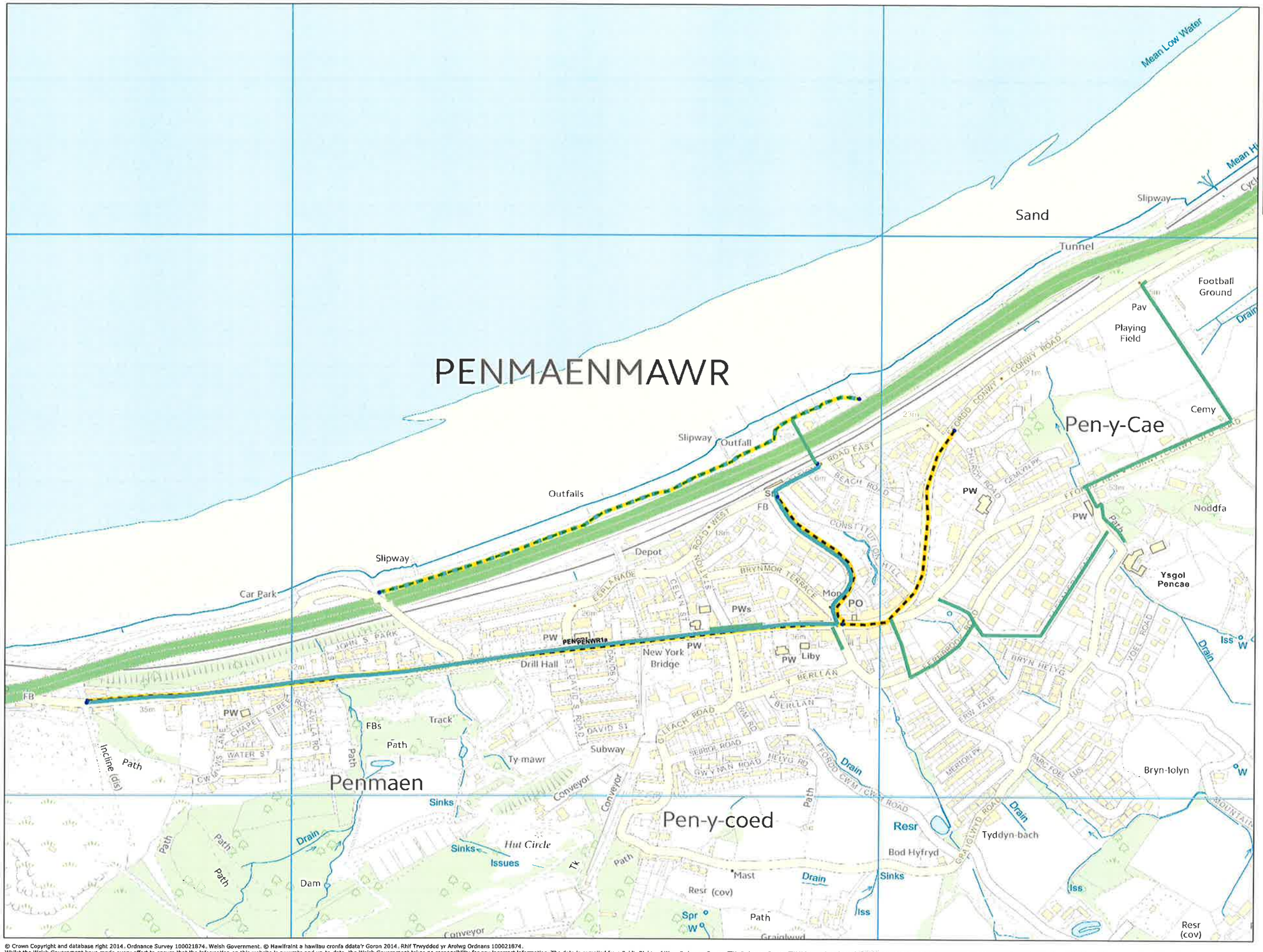
30 Oct 2017 17:38 PM

Teithio Llesol Penmaenmawr

Produced by the Active Travel web site. Gynhyrchwyd gan y wefan Teithio Llesol.

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CONWY
CYNGOR BWRDEISTREF SIROL
COUNTY BOROUGH COUNCIL



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APPENDIX 10
LOCATIONS AND RESULTS OF THE SURVEY DATA

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KEY

PEDESTRIANS/CYCLISTS

1
41/26
48/3
43/10
69/60
2
73/18
68/73
100/62
3
93/73
25/5
17/47
111/11
23/1
281/7
87/5
4
135/5
274/12
128/10
86/6
10/55
91/7
32/45
5
35/29

1
Bus Stops
0/0
0/0
0/0
0/0
0/2
1/0
Footpath
0/2
16/2
17/2
19/0
Bridge
52/84
58/85

P01	DESCRIPTION	DD/MM YYYY	DRN CHK	APP
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PEDESTRIANS & CYCLISTS SURVEY LOCATIONS 1-5

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:3000	JW	DEC 18

Drawing No:	Rev:
RAM-ZZ-ZZ-SK-J-3003	P01

11/12/2018 16:38:49



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KEY

PEDESTRIANS/CYCLISTS

Rev	Description	Date	By Chk	App
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PEDESTRIANS & CYCLISTS SURVEY LOCATIONS 6-10

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:5000	JW	DEC 18

Drawing No:	Rev:
RAM-ZZ-ZZ-SK-J-3004	P01

11/12/2018 16:39:27

APPENDIX 11
MINUTES FROM THE MEETING

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TRANSPORT

MINUTES OF MEETING

Project name	**A55 J15 and J16 Improvements**
Project no.	**1620000620**
Subject	**Active Travel/Cycling Consultation**
Meeting date	**27/07/18**
Location	**The Heath, Llanfairfechan**
Meeting no.	**01**
Taken by	**Nicola Evans**
Participants	**Rob Griffiths (Ramboll), Paul Smith (CCBC), Victor Turner (CCBC), Richard Evans-Snarr (CCBC) John Mather (Cycling UK), Glyn Evans (Sustrans), Gareth Barker (Corderoy), Carol Willgoose (WG)**
Copy to	**As above, James Healey, Jenny Bringloe**
Next meeting	**Tbc**

Agenda

1 Introductions
2 Objective of the meeting
3 Brief review of scheme and options
4 Identify opportunities to improve NMU facilities
5 AOB

Date 27/07/2018

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1 Introductions

Introductions were made.

2 Objective of the meeting

RG outlined the purpose of the meeting; to seek feedback on potential opportunities to improve NMU and Active Travel Provision between A55 Junctions 14 and 16A.

At this early stage in scheme development it is an opportunity to identify potential options to improve walking/cycling/horse riding to be explored further.

Any existing NMU facilities, within the footprint of the scheme, will be retained or improved as part of the scope of the scheme. The details will depend on which option is selected, however the general philosophy will be to provide safe, well-marked, signed and landscaped routes in accordance with Active Travel guidelines.

In addition to this there is the opportunity to explore the feasibility of NMU improvements beyond the scheme footprint. In particular, there is scope to provide Active Travel improvements in the wider area. It should be noted however that there is no commitment at this stage to provide Active Travel improvements outside of the

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scheme footprint. Alternative funding streams will however be investigated and if approved these improvements will be incorporated within the scope of the scheme.

GE questioned who had been consulted ie Living Streets etc. It was explained that an extensive list of consultees/stakeholders had been identified based upon those previously involved with the Stage One Consultation and updated accordingly. Emails/letters were issued advising of the consultation period and requesting comments/feedback. It was agreed where we have received direct feedback ie Sustrans and Cycling UK we will hold face to face meetings. Relevant stakeholders ie Living Streets will remain updated as details of design options progress. This approach was considered to be reasonable by those present in the meeting. [POST MEETING NOTE – Living Streets were not included in the initial consultation list, they will now be contacted].

JM appreciated the opportunity to identify opportunities and build relationships with the project team. It is recognised there is a gap between aspirations and what can be provided. It is important to avoid damaging existing facilities.

3 Brief Review of the scheme and options

There are still nine options being considered, as above, we will seek to incorporate NMU movements within the design of the preferred option. Where the scheme directly impacts the NMU routes we will maintain or improve all existing facilities, in addition we will seek to include improved signage/linage etc.

Consultation on the detailed design will be undertaken as appropriate.

4 Identify opportunities to improve NMU / Active Travel facilities

Local Councillors are keen to see connections to the NCN 5 from the local area ie Penmaenmawr, Llanfairfechan and Dwygyfylchi.

Funding for Active Travel is dependent upon the information presented in the INM - integrated network map. However, it is recognised that the current INM will not reflect the opportunities that this scheme may present.

JM stated there is a real issue in Pendalar. The recommended maximum incline for active travel routes is 5%, Pendalar significantly exceeds this at 21%. It is important for people to be able to move from Pendalar onto Shore Road East, and to tie in to the cycle route linked to the Abergwyngregyn and Tai'r Meibion scheme. Providing access to the promenade and to the beach is important.

GE advised that Sustrans provided comments to Stage One – don't feel that these comments have been considered.

RES recommended a proper masterplan is required between J14 and J16a – to ensure scheme won't hinder future opportunities. Any proposed active travel scheme will need to be audited in accordance with Active Travel Design Guidance, and the active travel audit tool kit. Schemes should score above 70. (it is noted that a revised edition of the design guidance is currently being progressed). Sustrans could assist with this audit (for a fee).

RG presented a number of options considered to date [Drawing Nos A55J15J16-RAM-XX-XX-DR-T-0001 and 0002]. General comments to these concepts:

Any NMU provision on road with speed limit over 40mph has to be off road. Important to recognise the difference between NCN and Active Travel Routes. Active Travel routes are different and need to provide a continuous link eg from a residential area to local facility etc. Active travel links should not end at the scheme footprint boundary.

Potential issues with rail crossings – Network Rail are not typically supportive of increasing usage at crossing points.

Must consider who would benefit from these improvements. In line with active travel should focus on providing benefits to local residents, not visitors.

Improvements proposed to signage, cycle parking at station etc. provide better signage and connectivity.

Removal of footbridge to be considered further – initial view was this provided access to the bus stop only. View that this can provide access on to the beach etc. Option to improve access from the bridge? Utilise underpass under railway line.

Issue with bus access – eastbound movements are restricted due to a lack of opportunity to turn buses. Bus gate will also need to be removed, currently speeds are naturally reduced due to vehicles slowing down for the roundabout, if this is removed speeds will be increased.

Pendalar route. Local residents unhappy with cyclists passing so close to front of properties. Dave Peel was considering design for cycle route on Mona Terrace (private road) – CW to contact for update.

Potential to provide a link along coastline extension of NCN route, in connection with coastal protection scheme. Engineered structure along Network Rail wall. Would provide active travel connectivity.

Need to be aware of other schemes/developments in the area. Ie car park space has been identified as potential for cycle parking however there is a possibility that the car park may be sold and therefore usage may not be an option.

[PS/RES] The above are good ideas however need to consider whether these are Active Travel. Should also focus on connecting local people to local facilities, does not include leisure trips. Would want to see improvements to help NMU access to local facilities as well as improved linkages to the NCN. ie Dropped kerbs, crossing points, link train station to promenade – important that the pedestrian does not feel second class to the car. Need to focus on what is existing and what is presented in INM. Suggested Ramboll drawings are updated to include routes identified on INM.

Some options may need consultation with Sian Williams and Owen Conroy (CCBC), who is progressing with coastal protection works.

CW questioned whether any of the active travel options had been progressed since the last consultation meeting. Advised that each option should be assessed against the project

objectives, which includes active travel. Therefore may need to consider progressing the design of some of the active travel elements.

Ramboll drawings and Technical Note to be circulated with these meeting minutes. It was suggested that these can form a starting point to capture additional ideas that CCBC/Sustrans/Cycling UK might have for NMU and Active Travel improvements. Ramboll will update the documents to include feedback received from the various organisations.

5 AOB

Access to schools – RES can provide a tool used to identify issues on specific individual routes to school. Conwy currently looking into an existing route along a narrow hill in Penmaenmawr under active travel as there is no footway provision and this road is used as a route to school.

Any comments required prior to the end of the consultation stage ends 28th August.

Minutes to be circulated – any additional comments will be incorporated to ensure consistency.

Actions:

Action	Responsibility
Circulate Drawing Nos A55J15J16-RAM-XX-XX-DR-T-0001 and 0002 presented at meeting and accompanying technical note [A55-RAM-XX-XX-TN-T-0001] for comment.	RG
Identify any additional potential improvements	CCBC/Sustrans/Cycling UK
Request update from David Peel on status of cycle route design on Mona Terrace.	CW
Update Drawing Nos A55J15J16-RAM-XX-XX-DR-T-0001 and 0002 with routes identified on INM.	RAMBOLL

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TRANSPORT

MINUTES OF MEETING

Project name	**A55 J15 and J16 Improvements**
Project no.	**1620000620**
Subject	**Bus Operator Review of Options**
Meeting date	**30.07.18**
Location	**Conwy Business Centre, Conwy**
Meeting no.	**01**
Taken by	**Nicola Evans**
Participants	**David Hall (WG), James Healey (WG), Gareth Barker (Corderoy), Rob Griffiths (Ramboll), Bob Saxby (Bus Users UK), Chris Owens (Alpine Travel), Dafydd Williams (Arriva)**
Absent	**Steve Jones (Jones Coaches),**
Copy to	**As above plus Jenny Bringloe**
Next meeting	**tbc**

Agenda

1 **Introductions**
2 **Scheme Overview**
3 **Bus Services (Public and School) and Bus Stop Usage**
4 **Long term Plans for Bus Lay-bys and Gates**
5 **Mitigation Measures**
6 **Impact of J15 Options on Bus Operations**
7 **Impact of J16 Options on Bus Operations**
8 **Aspirations to Enhance Bus Provision**
9 **AOB**

Date 31/07/2018

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1 Introductions

Introductions were given.

2 Scheme Overview

Outline of the scheme and the options for Junctions 15 and Junctions 16 presented.

JH stated we were keen to receive views frim bus operators on the options presented.

RG explained background to project, the PIE presented options and received opinions from the public etc, Public consultation recently presented 9 options. Under some of the options, some existing movements will no longer be permitted and will impact on bus services.

3 Bus Services (Public and School) and Bus Stop Usage

It is understood that the bus stops on the A55 are currently closed. Alpine and Arriva do not operate any services from the bus stops located on the A55. It's a possibility that a college bus collects students from this bus stop.

There is no demand to retain these bus stops on the A55.

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Service 75 (mini bus) currently operates in Pendalar – am and pm service only.

4 Long term Plans for Bus Lay-bys and Gates

Speeds along the A55 are due to increase due to removal of roundabouts which currently reduce speeds on the approach to the bus gate.

Bus gate could be replaced with ANPR. However, this doesn't address safety issues and issue regarding reducing speeds. It was agreed that the bus gate off the A55 isn't ideal, and that alternative solutions should be identified.

5 Mitigation Measures

RG presented an option for a turning head – in location of existing bus stop where caravans are parked. Will need significant turning head and area of land. Arriva may be able to provide details of bus size, and details of similar facility.

May still result in 3 minute increase in running time.

BS advised we need to consider majority of people (100+) who are using the service - who will experience additional 3 minute journey against the potential few people who may use the service from Pendalar.

BS queried whether it would be an option to include addition bus lane from existing bus gate? However, there is an issue with space due to local constraints etc.

Issues with changing service routes ie if services are every 15minutes but only one an hour accesses Pendalar. Likely that they won't know which services is actually arriving due to delays etc.

Rather than a turning head would focus on making sure that access to the next stop down, layout between the existing two stops is level etc.

Arriva would rather avoid turning head, as additional time taken serving Pendalar would make service unviable.

Agreed not to proceed with turning head proposal.

It is noted bus operators concerns that the westbound exit from Dwygyfylchi, re-entering the A55 remains a concern.

Eastbound services operate every 15 minutes, access via J16A requires left turn, and uses roundabout to turn around adding approx. 3 minutes to journey times.

6 Impact of J15 Options on Bus Operations

Option A

Movements limited to westbound off and westbound on at Llanfairfechan. Eastbound on/off movements will be located at J14. It is proposed to improve J14 to full design standard.

Potentially may lose the bus stop currently accessed via the bus gate. The stop further south would be retained, however this would not be ideal for the public in Pendalar. Bus operators not overly concerned with the removal of this stop.

This option would likely add additional 10 minutes to the services, increasing costs. May need additional bus service to maintain frequency, which would have expensive implications @£100k for the bus operator.

BS considered this as an awful option and a complete disaster in terms of buses.

Proposals currently recommend removal of footbridge – however this is being reconsidered to provide access to the beach.

BS questioned whether bus stops on the slip road is an option? Advised this is unlikely due to design standards and lack of available width (RG).

Alpine consider the removal of the roundabouts as a huge benefit for bus operators. Local vehicle speed usually very high makes it very difficult for buses to pull out.

Option B
Full movement junction including link onto promenade. Would require removal of existing new houses and bus gate.

CO considered the overpass would be better in terms of bus operators. Would consider access to promenade would be of benefit to local residents and could enable access for tourist buses to the promenade.

It was noted that feedback during the consultation on improved access to the Promenade was mixed.

This option would be good for School bus movements – no impact on existing services no additional resources required.

Option C
Limited movements with Option A. Bus gate closed.

Potential impact for coaches with the Underpass. Issues regarding 10% gradient and bend, advised to make the turn as shallow as possible so coaches can travel at 30mph. Slip on needs to be long enough to enable buses to enter A55 – may struggle with gradient.

Option D
Full movement eastbound on/off elevated slip roads traffic lights at top link road in Llanfairfechan. Westbound movements permitted on/off here. No link to promenade.

May require demolition of new residential buildings.

This would be better to enable buses to get enough speed onto A55.

Disadvantage that you are moving bus movements away from Pendalar, but moving closer to the school.

Option E
Similar to Option D with eastbound on/off slip located to the east of the westbound slips.

Full movement eastbound on/off elevated slip roads traffic lights at top link road in Llanfairfechan. Westbound on/off movements permitted here. No link to promenade.

Would require removal of The Heath.

This would be better to enable buses to get enough speed onto A55.

Disadvantage that you are moving bus movements away from Pendalar, but moving closer to the school.

Junction 15 Summary
Option B – preferred
Option A - least preferred

7 Impact of J16 Options on Bus Operations

Option A
Utilises current J16A and sewage works access.

Westbound movements same as present, and same issues. Ie access off J15A west of Penmaenmawr westbound slip provides dangerous access onto A55.

Mitigation measures on A55 should be considered. Alpine have had instances where buses have collided with cars. Consider putting a turning circle here to avoid this movement? However, this leads to an increase in journey times and operating costs, and could lead to reduction in services etc.

Alpine suggested at Atkins consultation a westbound bridge/viaduct (££).

Would it be an option to remove new link road and spend budget on improving junction 15A.

Option A considered best option as provides improved access to Dwygyfylchi.

Option B
Option utilises current rbt for westbound on/off movements. Moving A55 across into hillside, providing a new link over near Gladstone Hotel to elevated eastbound slip roads.

Option enables all movements. Benefit slightly less as eastbound buses will need to use 16A and then travel west to J16 as at present before turning again to go east.

Bus operators previously used a turning circle at St Gwinin's church - locals used to park which prevented this movement. Didn't save much time and didn't work.

Option C - underbridge
No eastbound off movement permitted. This is no change to the existing bus movement although it is recognised that restricted movements are not ideal.

Previous comments on gradients etc should be noted.

Option D - overbridge
No eastbound off movement permitted. This is no change to the existing bus movement although it is recognised that restricted movements are not ideal.

Previous comments on gradients etc should be noted

Summary Junction 16

Option A – preference.
Consider inclusion of bus bridge at J16A on Option B, C and D.

8 Aspirations to Enhance Bus Provision

No bus links to Penmaenmawr or Llanfairfechan rail stations – this is due to a lack of demand.

Consider inclusion of a bus bridge at J16A to provide safer access for buses onto the A55.

9 AOB

BS recommended that the scheme should include for the cost of paying for a shuttle service during the construction phase. This has been done previously when the roundabouts or junctions at one end were closed. It seems likely that closures are inevitable at various stages during the works therefore the cost of a bus shuttle needs to be included from the outset rather than being an unexpected extra later on.

Comments were made on the Abergwyngregyn and Tai'r Meibion scheme [BS]. Would like to see the existing single track road for buses only so they can use in both directions – so they wouldn't have to do dog leg and enter A55 to enter/exit Abergwyngregyn. It was noted that this is a separate scheme being progressed and this section is being upgraded for cycles only. RG commented this was outside the bounds of our scope.

APPENDIX 12
DESCRIPTION OF ACTIVE TRAVEL OPPORTUNITIES

Detailed Description of Active Travel Opportunities

Improvement to Coastal Path

The existing coastal path is paved from Shore Road East, along the sea front all the way to a point half way along the woodland, in line with the western extremity of the hospital site to the south of the A55. It provides a safe, quiet, attractive alternative to the current NCN 5 route through Llanfairfechan.
However, west of the above point, the route is unpaved all the way to the level crossing.
Paving of this length (approximately 900m), together with the improvements outlined above (1, 2) would provide a high-quality alternative to the current NCN 5 route through the town, for walkers and cyclists.
Conwy/NRW are currently examining ways of accommodating sea level rise due to climate change, and such an improvement would need to work with these plans.

Improved Links to Llanfairfechan Station from Coastal Path

Improved signage from the sea front path, together with covered lockable cycle storage at the station, would increase the attractiveness of using this integrated transport (cycle/rail) option for many journeys.

Improvement to Access from Shore Road East and the Promenade to the Beach Front Path

The access from the eastern end of the Promenade at Shore Road East onto the Beach Front Path is currently unsuitable for cyclists and disabled users, due to the kerb and then the steps through the sea wall.
Provision of a wider opening, together with ramp rather than steps/kerb, and improved signage and markings would provide improved access to the sea front for cyclists and disabled users.

Improvements Through the Footprint of the Scheme

The scheme provides the opportunity to improve links onto the sea front from the NCN 5 Cycleway (currently along Penmaenmawr Road) to the east.
A new improved corridor would be formed by means of improved signing, markings and landscaping. The provision would differ with each Scheme Option, though most would link via Shore Road East.

Improved Cycling and Walking Link from Promenade to Railway Underpass

Apart from at low tide (where people use the beach), there is currently no beach front walking link between the community east of the current J15 roundabout and the promenade. People currently use the footbridge over the A55 to access bus stops but there is no link to the sea front.
Sea front access for this community would be improved substantially if the footbridge link over the A55 were to be retained and extended to link in to the track currently used as access by Network Rail. There is then an underpass which takes the track under the railway to a path extending east along the sea front.
There is however no link west to the promenade and facilities. People currently making the journey to the sea front would walk on roads and access via Shore Road East. Providing a short (150m) footway link at promenade level would provide direct access for the community to the sea front.
This would require coastal protection works (rock armouring) over this length also, but it would provide a significant community benefit.

Replacement Footbridge

The existing footbridge, which presently serves a bus stop for schoolchildren on the A55 Eastbound carriageway, is due to be scrapped and not replaced in the new scheme. An alternative would need to be found for the schoolchildren.
Most scheme options contain new slip roads which would require modification or demolition of the existing footbridge.
A replacement footbridge in the current position but linking instead down to the underpass below the railway (see 8) would provide a sea front link for the community east of J15 as well as linking to an improved bus stop on Penmaenmawr Road (see 10).

Improved Bus Stop Provision at Eastern End of Penmaenmawr Road

The current bus stop at the eastern end of Penmaenmawr Road serves only buses exiting the A55 Westbound carriageway at the bus gate. Eastbound travellers have to walk an extra 500m close to The Heath to pick up an eastbound bus. For older and disabled people in the community east of J15, this represents a significant challenge given the topography of the area.
The feasibility of providing a bus turning area has been examined briefly and a site identified fotr a potential roundabout to allow buses to turn, just west of the junction of Penmaenmawr Road and Tyddyn Drycin.
This is adjacent to the existing footbridge ramp and would be located in private land currently used as an area for the parking of caravans and other vehicles.
The roundabout/turning area would potentially affect accesses to three properties.

Improvement to Sustrans Route 5 adjacent to Mona Terrace

The existing designated cycle route follows an existing narrow road (Pendalar) with many parked cars on a tortuous vertical alignment. Representations have previously been made to the Welsh Government, according to the PROW Officer at Conwy, to improve this by taking the cycleway past Mona Terrace running parallel to the A55 Westbound carriageway.
It is understood that the previous scheme looked at the feasibility of re-routing the cycleway along the designated parking area and (potentially private) road in front of the properties and that this was dropped due to land issues.
A potential alternative would be to locate the cycleway in Welsh Government land on the A55 side of the boundary fence. This would require vegetation clearance, a small retaining wall and a guardrail to the A55 side. The affected length is of the order of 100m. The cycleway could then be re-directed back onto the public section of Penmaenmawr Road at either end.

Link around Pen-y-Clip Headland

Provision of a dedicated foot-cycle link between Llanfairfechan and Penmaenmawr just above high tide level around the headland to link the existing coastal path east of Llanfairfechan to the existing coastal path west of Penmaenmawr.
Currently the NCN 5 route utilises the old coach road which is narrow and very hilly, making it a challenge for many leisure users, and discouraging it's use as an active travel route.
At low tide people can walk on the beach between the two towns, however at high tide there is no alternative low level link.
A 1.5km long new path could be built at low level. This would abut the existing Network retaining wall along most of its' length and abut the headland for the remaining length. It would need to be integrated into a rock armouring/coastal protection solution.
Such an improved relatively flat path would increase the usage of the coastal path and attract more active travel usage.

Penmaenmawr Station Improvement

There is no dedicated covered cycle parking at Penmaenmawr Station. However, there is

ample clear (hardened) unused space in the Station Car Park in which a shelter could be located. This would help to improve integrated transport usage (cycle/rail).
Beach Front to Station to Town Link The current link from the beach front to the town centre is poorly signed. Provision of additional flag signs and better road and footpath markings, from the beach front, along Station Road and Paradise Road to the town centre, would increase usage for the benefit of both the town and for cyclists (NCN 5) and station users.
Improvements Through the Footprint of the Scheme The scheme provides the opportunity to improve pedestrian and cycle routes through the scheme, linking onto the Sustrans Cycleway. The link would differ depending on option chosen.
Cycleway ramp down to NCN 5 Route from existing Puffin Footbridge The current access down from the footbridge to the cycleroute is via steps, requiring cyclists to dismount and being unsuitable for disabled use. The footbridge could be improved by replacement or addition of a dedicated ramp and better lighting. By linking the NCN 5 Route to the housing in Dwygyfylchi, active travel provision would be enhanced.
Improved Walking Link to Beach If a new footbridge were provided at Junction 16 (see 17), then an improved walking route via Darbyshire's Bridge could be provided to give improved access to the beach, providing a potential circular walking route via the beach and dunes and Puffin Footbridge.
Advanced Stop Lines on Penmaenmawr Road/Station Road junction Considering that Penmaenmawr Road forms part of the NCN Route 5, advanced stop lines could be provided on Penmaenmawr Road/Station Road junction that could give cyclists a safe place to stop and allow them to be positioned ahead of other traffic so they have more time to pull off as the lights change.

ES Chapter 16 Appendices	
16.1	Greenhouse Gas Assessment Summary

APPENDIX 16.1
GREENHOUSE GAS ASSESSMENT SUMMARY

A55 Junction 15 Construction Greenhouse Gas Assessment

Item	Quantity	Unit	Carbon Factor (tCO_2e per unit)	Carbon (tCO_2e)	Carbon Factor Source	Assumptions and Limitations
Materials (Embodied Carbon)						
Pre-cast concrete	2,647	tonne	0.122	322.93	ICE v3.0: Precast concrete, UK general mix (ref1)	Includes kerbs, man holes, gullies, headwalls, culverts, structures (east and west bound slip and Shore Road).
Ready-mix concrete	40,706	tonne	0.103	4,192.72	ICE v3.0: In-situ, general concrete (ref1)	Includes kerb backing, man holes, ducting, small sign foundations, ADS foundations, CSB foundation, structures (overbridge, footbridge, east and west bound slip and Shore Road).
Steel (rebar)	2,949	tonne	1.99	5,868.51	ICE v3.0: Steel, rebar (ref1)	Includes structures (overbridge, footbridge, east and west bound slip and Shore Road).
Steel (galvanised)	131.52	tonne	2.76	363.00	ICE v3.0: Steel, hot dipped galvanized steel (ref1)	Includes lighting columns and weight for double sided (for 1/3) and single sided safety barriers (for 2/3) and steel component of noise barrier
Aggregates	25032	tonne	0.00747	186.99	ICE v3.0: General aggregates (ref1) -	Includes filter drains and pavenment foundation (assumes 600mm).
Asphalt	15,011.00	tonne	0.0532	798.59	ICE v3.0: Asphalt 4.5% binder content (ref1)	Includes Inlay/ overlay (100mm average) full depth trunk (300mm) and full depth country 200mm).
Plastic	34.32	tonne	2.52	86.49	ICE v3.0: HDPE Pipe (ref1)	Includes HDPE pipework (300mm) and plastic ducting (150mm).
Brick	80.50	tonnes	0.21	16.91	ICE v3.0: General brick (ref1)	Density material factor for brick is 2.13kg per brick (ref1) Includes walls and man hole cover risers
Timber	88.51	tonne	0.263	23.28	ICE v3.0: Timber softwood - no carbon storage (ref1)	Includes post and 4 rail fence, fencing to properties (1.8m height) and wooden component of noise barrier (2m height).
			Subtotal	**11,859.40**		
On site emissions						
Heavy Plant (Diesel)	1,197,735.00	Litre	0.003211	3,846.17	UK Government GHG Conversion Factors 2019: Average diesel blend including well to tank emissions (ref2)	Assumes 11 items of heavy plant (e.g. 3 x piling rigs, 4 x large excavators, 4 X 35tonne dump trucks) utilised for 50% of the 24 month construction period. Fuel consumption of 30 litres / hour estimated based on average of values for heavy construction plant (ref3)
Medium Plant (Diesel)	1,306,620.00	Litre	0.003211	4,195.82	UK Government GHG Conversion Factors 2019: Average diesel blend including well to tank emissions (ref2)	Assumes 16 items of medium plant (e.g. 4 x crane, 4 x diesel generators, 1 x bulldozer, 2 x telehandler, 4 x JCB, 1 x concrete batching plant) utilised for 75% of the 24 month construction period. Fuel consumption of 15 litres / hour estimated based on average of values for medium construction plant (ref3)
Light Plant (Diesel)	130,662.00	Litre	0.003211	419.58	UK Government GHG Conversion Factors 2019: Average diesel blend including well to tank emissions (ref2)	Assumes 8 items of light plant (e.g. 4 x air compressor, 2 x compactor, 2 x water bowsers) utilised for 75% of the 24 month construction period. Fuel consumption of 3 litres / hour estimated based on average of values for light construction plant (ref3)
			Subtotal	**8,461.57**		
Transport						
Road transport (Heavy Duty Vehicles)				318.80	UK Government DEFRA Emissions Factors Toolkit version 9.0 (ref4)	Total km of HGV construction vehicles travelled for 24 months assuming a maximum travel distance of 30 km, 80Kph speed limit and 9.3% of HGVs, 90.7% LGVs. Refer to Chapter 12, Air Quality for assumptions.
			Subtotal	**318.80**		
Waste Disposal						
Demolition materials	20.00	tonnes	0.00126	0.03	UK Government GHG Conversion Factors 2019. Mix of construction wastes, landfill (ref2)	Demolition material from no. 8 and 9 adjacent to Shore Road East. Assumes 95% of material can be recycled.

Construction waste	150.00	tonnes	0.00126	0.19	UK Government GHG Conversion Factors 2019. Mix of construction wastes, landfill (ref 2).	Refer to Chapter 15, Material Assets and Waste, for assumptions. 70% of off cuts, surplus materials and site operations during construction can be recycled.
			Subtotal	**0.21**		
			Total	**20,639.98**	**over the 24 month construction period**	

Project Phase	**Total Emissions ($MtCO^2e$)**	**Relevant National Carbon Budget (2018-2022) ($MtCO^2e$)**	**Welsh Annual Carbon Budget 2016-2020 ($MtCO^2e$)**	**% of National Budget**	**% of Welsh Budget**
Demolition and Construction	0.0206	2,544	225.6	0.000811%	0.009149%

$MtCO_2e$ = 1,000,000 (One million metric tonnes of carbon dioxide equivalent)

References

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ES Chapter 18 Appendices	
18.1	Health Impact Assessment

APPENDIX 18.1
HEALTH IMPACT ASSESSMENT

Intended for
Welsh Government

Document type
Report

Date
24 January 2020

A55 JUNCTION 15 IMPROVEMENTS HEALTH IMPACT ASSESSMENT (HIA)

CORDEROY WSP TACP RAMBOLL RICHARD PLANNING | LANDSCAPE | ENVIRONMENT YGC

A55 JUNCTION 15 IMPROVEMENTS

Project name	**A55 Junctions 15 & 16 Improvements**
Recipient	**Welsh Government**
Document type	**Report**
Version	**01**
Date	**24/01/2020**
Prepared by	**Debra A. Kaden, PhD, ATS**
Approved by	**Rob Griffiths**
Description	**Health Impact Assessment for the Preferred Options for Junction 15**

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1. INTRODUCTION

1.1 The A55, also known as the North Wales Expressway, is a strategic route along the North Wales Coast connecting many towns, villages and local communities. Part of the Euroroute E22 Trans-European Transport Network, the A55 contains two roundabouts at Junctions 15 and 16 that are the only roundabouts in the Euroroute E22. This causes problems to the traffic using the A55 travelling along the route, limiting the smooth flow of traffic and resulting in increased journey times and poor journey time reliability. They also contribute to the incidence of stationary traffic backing up into the A55 Pen-y-Clip and Penmaenbach Tunnels, which in turn can be an increased safety hazard.

1.2 The purpose of the project is to remove the two roundabouts at Junctions 15 and 16, and construct new grade separated junctions to improve safety and access to Llanfairfechan, Penmaenmawr and Dwygyfylchi.

1.3 This Appendix discusses potential impacts on human health which may potentially result from the construction and operation of the Proposed Scheme for Junction 15, as compared to the "do-minimum" current scheme. It uses this information and the context of the Proposed Scheme to define the scope of assessment that will be taken forward in the development of the Environmental Impact Assessment (EIA).

1.4 While human health examines potential health effects in individuals within the population, population health is a broad term that includes the health outcomes of a group of individuals, including the distribution of such outcomes within the group. In this assessment, these groups are the geographic populations near Junction 15 near the town of Llanfairfechan. The health outcomes of such groups are of relevance to policy makers in both the public and private sectors.

1.5 Note that human health is not just the overall health of a population but also includes the distribution of health within sub-populations of the population. Overall health could be quite high if most of the population is relatively healthy—even though a minority of the population is much less healthy. The impact of the Proposed Scheme on such susceptible subpopulations is also important.

1.6 The Proposed Scheme has the potential to impact the health of the community as a whole as well as the health of individual community members. In addition to influencing more traditional pollution metrics which factor into traditional human health risk assessments, the Proposed Scheme has the potential to alter journey times, road safety, reliability and resilience, noise disturbance, and affect local the communities where people reside, thus influencing the health and well-being of community members through environmental, social and economic pathways.

1.7 The World Health Organisation defines health as a state of complete physical, mental and social well-being, factors which span environmental, social and economic aspects. In Wales, there is also a statutory duty to consider well-being as part of the Well-Being of Future Generations Act. Therefore, the assessment will need to be sufficiently broad to cover the potential determinants to health and not just focus on environmental hazards.

1.8 This Report therefore considers how the Proposed Scheme may affect health and well-being, including for example the risks to human health due to water contamination, air pollution, and accidents or disasters. This type of assessment is referred to as a Health Impact Assessment (HIA).

2. REGULATORY/POLICY FRAMEWORK

2.1 The following legislative and policy guidance has been considered in assessing impacts on population and health:

2.2 2014 EIA Directive

2.3 A Population and Human Health chapter is required by EU Directive 2014/52/EU (itself amending Directive 2011/92/EU) to evaluate impacts on human health.

2.4 The Environmental Impact Assessment (Miscellaneous) Amendments Relating to Harbours, Highways and Transport) Regulations 2017

2.4.1 Schedule 2 of The Environmental Impact Assessment (Miscellaneous) Amendments Relating to Harbours, Highways and Transport) Regulations 2017 amended 'Part VA Environmental Impacts' of the Highways Act 1980. The scoping amendments include a wider list of potential issues to be considered, though not necessarily a list of topics to include in an EIA, including the addition of "Population and Human Health." Each of these parameters needs to be considered in the light of the nature of the proposed development, the nature of the site and any interactions with other systems, processes, or sites. Scoping should be used to remove issues that are not likely to result in significant environmental effects and focus the assessment on the issues that may result in significant effects.

2.5 Public Health (Wales) Act 2017

2.5.1 The Public Health (Wales) Act 2017 includes a prospective provision within Part 6 for Regulations to be made, requiring HIAs to be carried out by public bodies. Although the Act was enacted in July 2017, Part 6 had yet to be implemented at the time of writing. Part 6 pf the regulations notes that an authority must specify:

a) The circumstances in which a public body must carry out an HIA;

b) The way in which a HIA is to be carried out.

2.6 The Well-Being of Future Generations (Wales) Act 2015

2.6.1 The Well-Being of Future Generations (Wales) Act 2015 puts in place the legislation needed to make public bodies listed in the Act think more about the long-term, work better with people and communities and each other, and look to prevent problems by taking a more proactive, sustainable and joined-up approach. It puts in place seven well-being goals, as presented below.



Figure A1: Well-being goals from the Well-Being of Future Generations (Wales) Act 2015

2.7 Equality Act 2010

2.7.1 The public-sector equality duty created by the Equality Act 2010 came into force in April 2011. It requires public sectors to have due regard to the need to eliminate discrimination, advance equality of opportunity, and foster good relations, when making decisions and setting policies. To do this, it is necessary for them to understand the potential effects of its activities on different people. Where these are not immediately apparent, it may be necessary to carry out some form of assessment or analysis, in order to understand them.

2.8 The Equality Act 2010 (Statutory Duties) (Wales) Regulations 2011

2.8.1 The Welsh government have brought in specific equality duties in order for public bodies to better perform their public-sector equality duties, in the form of the Equality Act 2010 (Statutory Duties) (Wales) Regulations 2011. These Regulations place duties on the devolved public sector, including Welsh Government, including those that cover equality impact assessments.

2.9 The Children's Act 1989

2.9.1 The Children Act 1989 allocates duties to ensure children are safeguarded and their welfare is promoted.

2.10 Other Guidance

2.10.1 HIA is not currently a statutory requirement in Wales (or anywhere in the UK) but the Welsh Government increasingly regards it as best practice to consider health and well-being specifically in non-health domains. As such, HIAs are referred to in guidance from the Welsh government, including:

a) Draft Ministerial Interim Planning Policy Statement (DMIPPS) 02/063 which supports a consideration of health and well-being at a local level and is supplementary guidance to

Planning Policy Wales for large planning applications and Local Development Plans (LDPs).

b) The Welsh Transport Appraisal Guidance (WelTAG) that has been developed by the Welsh Government to ensure that public funds are invested in a way that ensures they maximise contribution to the well-being of Wales.

2.10.2 However, the amended EIA Directive requires that population and health factors should be considered as part of the EIA process, although the Directive itself (as well as the transposed UK legislation) does not define how it should be addressed.

2.10.3 National strategies, such as the Clean Air Strategy 2019, that are relevant to Population and Human Health are referenced in the appropriate Chapters.

2.10.4 At a local level, the Proposed Scheme has links to a number of policies contained in Conwy Local Development Plan 2007-2022, which was adopted in 2013. These include (not exclusively):

a) Spatial Objective S013: To protect and improve accessibility to essential services and facilities, including open space, allotments, health, education and leisure.

b) Policy CFS/11: Development and open space, which recognises "the benefits to health and well-being that parks and open spaces bring to communities," as described in the Conwy Health Strategy.

c) Strategic Policy STR/1: Sustainable transport, development and accessibility to support healthy lifestyles.

d) Strategic Policy STR/4: Non-motorised Travel, which highlights that "Leisure and recreation routes are also an important resource, particularly to improve access to the surrounding countryside as part of a healthy lifestyle."

2.10.5 The recently published DMRB Standard LA112 discusses how population and health should be addressed in an EIA for a highways project. However, it does not include any specific guidance on how any associated health impact assessment should be undertaken. Notwithstanding this, the Chapter must include information which, considering current knowledge and methods of assessment, is reasonably required by the project authority to reach a reasoned conclusion about the significant effects. As the Population and Human Health Chapter overlaps with many of the EIA topics (for example air quality and noise) described in the Design Manual for Roads and Bridges (DMRB) Volume 11, to avoid duplication, reference will be made to the relevant DMRB standards and guidance as appropriate.

2.10.6 The following guidance has been taken into account when completing the assessment of potential impacts to population and human health:

a) Material provided by the Wales Health Impact Assessment Support Unit (WHIASU). WHIASU is an all-Wales service responsible to Public Health Wales and funded by Welsh Government as a part of a wider strategy to improve health, reduce inequalities, and assist organisations in planning a health future.

b) IEMA Health in Environmental Impact Assessment, A Primer for a Proportionate Approach, 2017.

c) Guidance provided by the World Health Organization (WHO).
d) Guidance provided by the World Bank International Finance Corporation (IFC) Introduction to Health Impact Assessment.
e) Guidance provided by the Society of Practitioners of Health Impact Assessment (SOPHIA).

3. STUDY AREA

3.1 A description of the Proposed Scheme can be found in Chapter 2 (Scheme Description) of the Environmental Impact Assessment (EIA) report. The broader study area includes the A55 corridor between Junction 14 and Junction 16A, which runs parallel to the railway in close proximity to the centres of Llanfairfechan, Penmaenmawr and Dwygyfylchi (see figure A2, below). The overall study area therefore includes the residential areas between Junction 14 and Junction 16A, including the towns of Llanfairfechan, Penmaenmawr and the village of Dwygyfylchi. Although the geographical scope of the assessment will vary between different health factors being assessed, the data will generally be assessed at a ward level. Depending on the health factors being considered, the buffer(s) will be defined in accordance with the relevant topic's study area and will be applied proportionately.

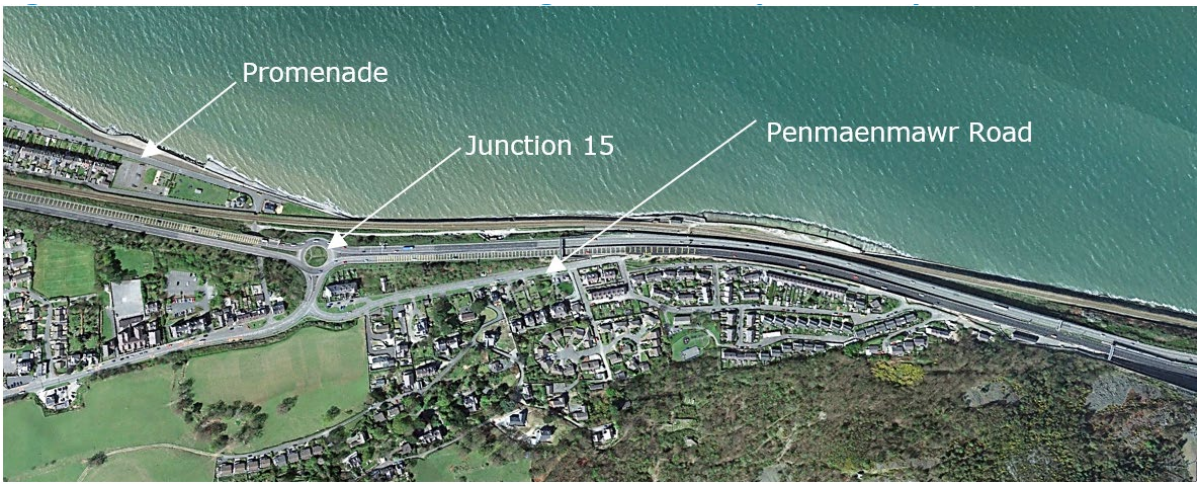


Figure A2 Junction 15. Location and setting of Junction 15 (not to scale)

3.2 Junction 15 is an existing at-grade roundabout located on the A55 North Wales Coast road at Llanfairfechan between Bangor to the west and Conwy to the east. Junction 15 and Junction 14a at Madryn approximately 2.8 km to the west, are the only vehicular access points to the town of Llanfairfechan and surrounding area. Access is limited due primarily to the mountainous terrain of Snowdonia that rises steeply to the south of the A55 and the town and limiting access from the A55 only.

3.3 Junction 15 lies slightly to the east of the town centre of Llanfairfechan with an almost separate community lying to the west, under the steep scree-covered slopes of Penmaen Mawr. The main settlement of Llanfairfechan lies on both banks of a small watercourse, the Afon Llanfairfechan, that discharges into the sea at the west end of the Promenade. Residential areas and individual properties lie close to the existing A55, although properties on the Promenade are separated from the A55 corridor by the North Wales main line railway. Junction 15 is located to the south of the railway, while on the north side is the foreshore and Llanfairfechan Coastal Promenade.

3.4 The Proposed Scheme will replace the at-grade roundabout with a grade-separated junction which will provide 4-way access onto and off the A55. To accommodate the junction and the necessary highway alignments and slip roads, the A55 dual-carriageway will be moved south towards residential properties along Penmaenmawr Road. Penmaenmawr Road, in the area of

the former roundabout will be remodelled to provide a safe junction with the A55 slip roads.

3.5 There are a wide range of community facilities in the town of Llanfairfechan including a school, public halls, public parks and recreation areas, shops, banks, post offices, public houses, a place of worship and a seaside promenade. The Wales Coastal Path and National Cycle Route follow the A55 and the coast. Among these are some sensitive receptors.

3.6 With the purpose of removing the roundabout, the Proposed Scheme for Junction 15 would result in a dual carriageway with free-flowing traffic in both directions. A new grade-separated junction would provide movement on and off the A55 to both east and westbound carriageways, utilising an overbridge with a T-junction to the north of the A55 and a priority junction to the south of the existing roundabout. The slip roads on the north would rise on embankment to meet an overbridge across the A55. Access via Shore Road East would be retained. Changes would also affect Penmaenmawr Road and the link road to the existing Junction 15. Further details are contained in Chapter 2 (Scheme).

3.7 Populations: Construction workers and Local communities

3.7.1 Some of the most significant effects would occur during construction of the Proposed Scheme. Construction experts have advised on suitable construction methods and a construction programme has been developed so that these significant effects can be predicted. Measures have been developed to protect the environment and thus the nearby communities.

3.7.2 Working hours would be subject to agreement with the Local Authority Environmental Health Officer and may vary by location and activity. Typically, contractors work Monday to Friday 7 AM (summer) or 7.30 AM (winter) to 7 PM (summer) or 4:30 PM (winter), with earlier end times (4.30 PM) on Saturday and no Saturday work in the winter. There would normally be no working on Sundays or Bank Holidays.

3.7.3 Site specific risk assessments and method statements would be produced by the contractor, prior to any work activities commencing to ensure that health and safety responsibilities are met in relation to site personnel and the public. A 'Permit to Work' procedure is required for any construction activities where the contractor has identified that there is a high residual risk of harm.

3.7.4 In addition to the construction workers, this assessment will also consider the health and well-being status of all people within the local community, and in particular any specific vulnerable and/or disadvantaged groups that may be particularly affected (such as young children, young people, older people and people with disabilities). As part of this effort, we have analysed the population make-up of Llanfairfechan taking into account the impact of the preferred option on equality (for example in relation to protected characteristics, such as disability, religion or belief under the Equality Act 2010), diversity and human rights.

3.8 Community Population Density & Local Amenities

3.8.1 The Proposed Scheme is located in a rural area with low population density. The nearest homes are along Penmaenmawr Road, and in particular, the residential properties that comprise 'Sunnybank' terrace, the new Fernbank development and Penmaen View. The locations of key local amenities used by the local community are shown in Figure A3.

3.8.2 The nearest town is Llanfairfechan, in Conwy County Borough, a seaside resort community a resident population (30 June 2017) estimated to be 3,781 people and a population density of approximately 3,218 persons per square kilometre.[1]

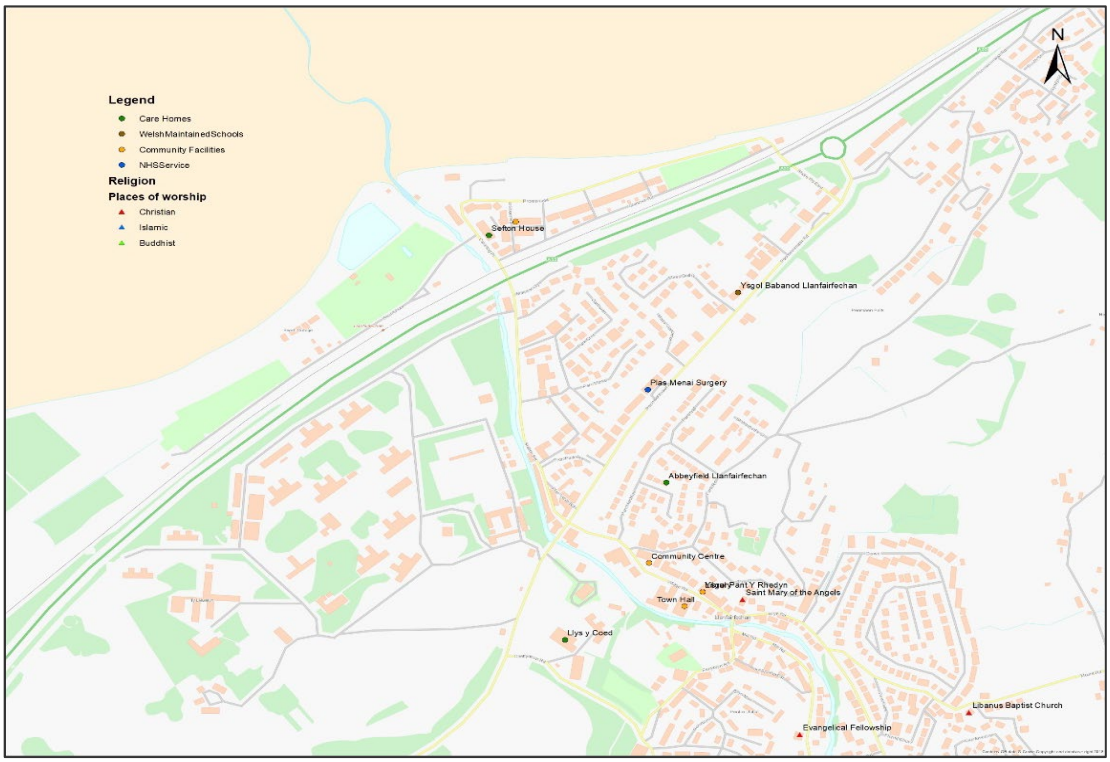


Figure A3: Locations of the local amenities in Llanfairfechan

3.9 Population structure

3.9.1 The age profile of Llanfairfechan is contrasted to the age profile for the Wales in Table A1 (for mid-2017). Approximately 22% of the population is age 65 years or older, similar to Wales where this percentage is 21%. The older age profile in the study area is an important consideration for the health and equalities assessments, as the elderly population can be considered a susceptible population. Furthermore, the elderly are likely to have an increased requirement for healthcare services and changes to well-being and mobility.

Table A1: Age Profile for Llanfairfechan

	Llanfairfechan	Wales
Total	3,800 (100%)	3,125,165 (100%)
Age 0-15 years	600 (16%)	559,260 (18%)
Age 16-29 years	550 (14%)	557,536 (18%)
Age 30-44 years	600 (15%)	538,085 (17%)
Age 45-64 years	1,150 (30%)	827,015 (26%)
Age 65 years and older	850 (22%)	643,269 (21%)

[1] https://citypopulation.de/en/uk/wales/

3.9.2 The gender split in Wales is fairly even with 51% of the population female and 49% male. The gender distribution in Llanfairfechan is similar: 51% female and 49% male.

3.10 Ethnicity

3.10.1 Data from the 2011 census shows Llanfairfechan is comprised of a fairly homogeneous ethnic population with over 96% of the population being White British as compared to 93% in this category across Wales. Although the 'other white' category is comparable (2.25% versus 2.38%), the mixed ethnic groups and other ethnic groups are much lower, less ethnic diversity in Llanfairfechan than in Wales as a whole.

Table A2: Ethnicity by broad ethnic group (Source: Census 2011)

	Llanfairfechan	Wales
Total	3,637 (100%)	3,063,456 (100%)
White British	3,502 (96.29%)	2,855,450 (93.21%)
Other white	82 (2.25%)	72,803 (2.38%)
Mixed ethnic group	29 (0.80%)	31,521 (1.03%)
Other ethnic group	24 (0.66%)	103,682 (3.38%)

3.11 Religion

3.11.1 The 2011 census shows that Llanfairfechan is a fairly homogeneous population with respect to religion. While the religion of majority (65%) is Christianity, less than 1% belong to other religions, with 34% having no religious affiliation. In contrast, over 10% of the general population of Wales identify with other religions, including Muslim (1.5%), Hindu (0.3%), Sikh (0.1%), and Jewish (0.1%). A large proportion of the Welsh population (7.6%) identified as 'other religions' without specification.

Table A3. Religion compared to greater Wales

	Llanfairfechan	Wales
Christian	2,168 (64.91%)	57.6%
Other religion	23 (0.69%)	10.3%
No religion	1,149 (34.4%)	32.1%

3.12 Socioeconomic

Per capita income

3.12.1 The median per capita household income in Llanfairfechan was £30,300 with those in the lowest quartile earning £17,900 or less (CACI PayCheck, 2018)2. In contrast, the median gross weekly household earnings for full-time adults working in Wales were £509 in April 2018 (£26,468 annualized)3. Although not directly comparable (the latter is only among working adults, as opposed to taking into account pensioners), it appears that the average household income in Llanfairfechan is higher than the average across Wales.

[2] https://www.caci.co.uk/products/product/paycheck

[3] https://gweddill.gov.wales/statistics-and-research/annual-survey-hours-earnings/?lang=en

4. BASELINE CONDITIONS: THE DO-MINIMUM CURRENT SCHEME

4.1 Baseline conditions were established through a preliminary scoping review based on expert judgement, considering publicly available baseline data (such as the statistical population profiles for wards published by Conwy CBC and the Welsh Index of Multiple Deprivation [WIMD] 2014 data)[4] and findings from the Welsh Transport Appraisal Guidance (WelTAG) and the associated distributional impact assessment.

4.2 In the subsections below, we review baseline data as discussed in the relevant Environmental Impact report Chapters:

a) Chapter 6. Geology and Soils

b) Chapter 9. Landscape

c) Chapter 11. Community Assets

d) Chapter 12. Air Quality

e) Chapter 13. Noise and Vibration

f) Chapter 14. All Travellers

g) Chapter 17. Risks of Accidents or Disasters

4.3 Geology and Soils

4.3.1 As described in Chapter 6, several historical ground investigations were performed in the Study Area. These investigations help define the baseline conditions.

4.3.2 Several areas showed evidence of 'organic' odours, all of which were associated with natural strata:

a) 'Organic odour' noted 2.0 – 4.0 meters below ground level, associated with peat.
b) 'Slight putrid odour' noted 2.0 - 2.9 meters below ground level associated with peat.
c) 'Slight organic odour' noted 5.5 - 7.1 meters below ground level associated with slightly gravelly, slightly silty sand.
d) 'Organic odour' noted 2.7 – 4.0 meters below ground level associated with peat.

4.3.3 Water samples in historical investigations indicate traces of petrol or diesel oil.

4.3.4 Soil samples in historical investigations indicate localised contamination of soil with polycyclic aromatic hydrocarbons (including naphthalene, dibenz(ah)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene), as well as metals (zinc, arsenic), and road surface material (tarmacadam). No asbestos was identified. Radon potential for properties in the Study Area range from <1% up to a maximum radon potential of 10-30%.

[4] https://www.conwy.gov.uk/en/Resident/Resident.aspx; https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Welsh-Index-of-Multiple-Deprivation

4.4 Landscape

4.4.1 As described in Chapter 9, Llanfairfechan is a Victorian seaside town with a promenade and beach frontage that extends inland up the wooded valley of Afon Llanfairfechan to the foothills of the Carneddau mountain range in Snowdonia National Park.

4.4.2 Llanfairfechan promenade is a popular destination with tourists and people local to the town. The promenade provides access to the beach and parade of three-story Victorian terrace properties. The area contains several cafes, adjacent areas of parkland, boating pool, play area and skateboard park. There area is also popular for various recreational activities such as sailing and as a starting point for circular coastal walks. Connections to the promenade are via Station Road that passes beneath the railway line and Shore Road East that connects to Penmaenmawr Road close to the existing Junction 15 roundabout.

4.4.3 The historic core of the town centre includes two Conservation Areas: one extends along Penmaenmawr Road and crossroads with Station Road; the other lies to the east of the town centre and is referred to as the Close, a residential area containing several listed buildings in the Arts and Craft style built by Herbert Luck North (1871 – 1941).

4.4.4 West of the town centre lies the historic park and garden of Bryn y Neuadd Hospital that abuts the A55 along the northern boundary. The grounds of the hospital are extensive and includes mature trees and woodland with well-established roadside plantations adjacent to and south of the A55 road corridor.

4.4.5 Penmaen Park is located to the east of Penmaen Road close to the existing Junction 15 roundabout. It is an area of parkland that separates the main settlement of Llanfairfechan from another smaller residential community to the east of the roundabout and overlooking the A55 known as Pendalar and Llanfairfechan Drycin.

4.4.6 The scenic quality of the study area is generally high and there are scenic views out over the coast towards Anglesey, Puffin Island and the Great Orme. In elevated positions, particularly in the upland areas of the Snowdonia National Park, the scenic quality is outstanding with open views overlooking the Conwy Bay and Menai Straits and extending to the coasts of Anglesey, Puffin Island, and headlands of Penyclip and the Great Orme. The A55 road and rail corridor, however, is generally a detractor, being highly visible with moving traffic, and containing other detractors such as lighting, signage, overhead gantries and bridges, concrete and metal barriers, parapets and close boarded fencing.

4.4.7 The A55 and railway also have a significant effect on the audible tranquillity in the area impacting on the coastal tranquillity for users of Llanfairfechan promenade and nearby residents in the town of Llanfairfechan. The noise of the A55 is also audible from the uplands to the south and this varies in amplitude depending on wind direction and other climatic factors. Visual effects on tranquillity are also experienced at greater distances on elevated ground as a result of constant movement of traffic, including high sided vehicles. These effects are apparent both day and night with vehicle headlights and lighting at Junctions.

4.5 Community Assets

4.5.1 As outlined in Chapter 11, the study area includes one primary school, Ysgol Pant y Rhedyn, on Penmaenmawr Road. In addition, two parks, play areas, other public open space and sports centres were identified. There is open space on the approach to the Prominade, and open

space to the rear of Ysgol Pant y Rhedyn. The study area also includes a single house of worship, Garisim, Capel Yr Annibynwyr, which is located adjacent to the Primary School. There is a mental health clinic in Llanfairfechan, Bryn Y Neuadd Hospital, located on Aber Road near the A55. No doctor surgeries or pharmacies, hospitals, or aged people homes were identified. No libraries were identified.

4.6 Air Quality

4.6.1 As outlined in Chapter 12, baseline concentrations of selected pollutants were determined from a combination of Defra-modelled background concentrations and measurements at area monitors.

4.6.2 Background concentrations of oxides of nitrogen (NOx), as modelled by Defra, were estimated at concentrations of 10.6 µg/m^3 in 2018, and projected to be 8.8 µg/m^3 in 2022.

4.6.3 Nitrogen dioxide (NO_2) background is modelled at concentrations of 8.1 µg/m^3 in 2018, and projected to be 6.8 µg/m^3 in 2022. The annual mean concentration of NO_2 as measured by the CCC monitoring network at A55 roadside locations near Llanfairfechan was 16.2 µg/m^3 in 2017, the most recent year, twice the concentration modelled background in 2018. This is likely due to roadway contribution to NO_2, as monitors were placed in close proximity to the A55. The annualization concentration of NO_2 from a separate monitoring program conducted on behalf of the Welch Government between April 7, 2019 and June 2, 2019, was 14.5 µg/m^3, 9.7 µg/m^3, and 13.2 µg/m^3 along Penmaenmawr Road.

4.6.4 Background particulate matter with an aerodynamic diameter of 10µm or less (PM_{10}), as modelled by Defra, were estimated at concentrations of 7.5 µg/m^3 for 2018, and projected to be 7.2 µg/m^3 in 2022. There is no PM_{10} monitoring available in close proximity to J15.

4.7 Noise and Vibration

4.7.1 As described in Chapter 13, the baseline noise levels were assessed by survey undertaken during the daytime on 12 July, 2019. The measurements were carried out at eight locations representative of the nearest Noise Sensitive Receptors (NSRs). All measurements were 15 minutes in duration, and multiple measurements were averaged to obtain a typical daytime noise level.

4.7.2 Noise was reported as ambient noise level (L_{Aeq}) with its value equivalent in time to a steady sound level. Values at the seven monitoring locations ranged from 54 dB to 72 dB. Road traffic noise was estimated using the L_{A10} indicator used in the Calculation of Road Traffic Noise (CRTN) prediction method. Values at the seven monitoring locations ranged from 55 dB to 74 dB. The highest noise levels for both L_{Aeq} and L_{A10} were located at same monitoring station, at 72 dB (L_{Aeq}) and 74 dN (L_{A10}).

4.8 All Travellers

4.8.1 Chapter 14 lays out the impacts on all travellers: pedestrians, cyclists, equestrians and vehicular travellers. The area contains several public rights of way and cycling areas, including:

a) The National Cycle Network (NCN) Route 5, which extends along the North Wales coast from Chester to Holyhead along the coastline passing Llanfairfechan.

b) The Wales Coast Path from Chester, which extends along the coast through Penmaenmawr and Llanfairfechan with an optional inland route at Penmaenmawr.

c) A public footpath which crosses the A55 using the railway bridge on Station Road, in the centre of Llanfairfechan.

d) A footbridge which crosses the A55 between Junction 15 and Gerizim. This route connects Penmaenmawr Road and the NCN Route 5 along the coastline.

4.8.2 In addition, there are a number of informal pathways within the area, including the Network Rail access track which provides access along the coastline between Shore Road East and Pendalar via the footbridge crossing the A55 discussed above.

4.8.3 Count surveys and a site visit were used to assess how frequently each right-of-way and cycling area was used, and the general conditions. The count surveys were undertaken on a bank holiday, to reflect maximum use. Up to 73 cyclists and 281 pedestrians were counted on the survey day at any given location.

4.8.4 Future traffic flow data along A55 in the vicinity of J14-J16A, the offslip of J15, and local roads were modelled for the do minimum situation for 2022. Annual average daily traffic (AADT) of 33,345 was projected for the stretch of A55 between J14-J15; 38,084 was projected for the stretch of A55 between J15-J16A. AADT of 1,158 was projected for the J15 off slip link to Bangor Road. AADT of local roads was projected as 4,320 along Penmaenmawr Road in the direction towards the village; 3,722 along Aber Road; 1,248-1,283 along Shore Road East, Station Road, Caradog Place, and Promenade; and 753 along Penmaenmawr Road in the direction towards Pendalar.

4.9 Risks of Accidents or Disasters

4.9.1 As described in Chapter 17, North Wales' has low vulnerability to natural disasters such as major earthquakes, volcanic activity and tsunamis which pose risk to projects in other parts of the globe. In recent decades there has been an increase in the number of severe weather events, however, particularly those that lead to flooding.

4.9.2 The A55 dual carriageway route follows the north Wales coast and there is some extreme topography along the route, including rocky coastline and cliffs, low-lying river flood plains, and coastal foreshore. The steep rocky headlands of Penmaenmawr and Penmaenbach extend into the sea, while between them is a gently-sloping landscape occupied by settlements. To pass through this landform the road uses tunnels, follows cliff-side terraces and then uses embankments to cross low-lying land on the shoreline. The main Chester to Holyhead Railway shares the narrow transport corridor. For much of the route from Chester to Holyhead, the A55 and the railway are located on former intertidal land and the foreshore. These are now behind the 19th century sea defences provided mainly for the railway. This is the case at Junction 15.

4.9.3 Llanfairfechan is dependent on the A55 trunk road for connectivity to the rest of Wales and so the resilience of this route is fundamental to their viability, economy and quality of life.

4.9.4 Possible accidents and disasters include:

a) Extreme tides and resulting flooding, particularly during extreme weather conditions. At

Llanfairfechan, there are coastal areas of the town that are at risk of flooding from the sea. Much of the Promenade and low land to the south of the railway and linked to the Promenade by Shore Road East is classified as Flood Zone 2 (1% to 0.1% probability). Areas to the south of the railway linked to the Promenade by Station Road have a lower probability of flooding (Flood Zone 3; 0.5% to 0.1% probability). Flooding would only occur when existing flood defence structures were overwhelmed.

b) Flooding from rivers and surface water. The local catchments are small but mountainous with short, steep routes down to the coastal plain and sea. Periods of precipitation can result in a rapid increase in the volume and velocity of water descending the steeper upland channel, followed by restrictions as the river channel gradient eases on the coastal plain. The resulting slower-moving water may back up in the river channel and can flood adjacent low-lying areas of the coastal plain. This can be exacerbated by the condition of the tide to cause flooding near the coast. There are recognised flooding problems from watercourses that have been culverted through the town of Llanfairfechan, and from surface water flooding because of heavy precipitation.

c) Rock slides from steep mountain slopes. Rock faces and extensive areas of scree slope are present on Penmaenmawr headland and to the east of Llanfairfechan. This headland has been extensively quarried and the slopes have historically been affected by quarry inclines, buildings and access tracks. Considerable work has been done to stabilise some steeper slopes above the A55. Whilst not within a zone known for serious earthquakes, some minor tremors have been felt in north Wales.

d) Industrial hazards from quarrying activities. Quarrying in the Penmaenmawr headland is the largest industry in the proximity of the Proposed Scheme with the potential to influence LLanfairfechan and the A55 and railway corridor.

e) Closure of road tunnels. Traffic accidents or other events could close tunnel roads through the headlands with the consequence that travellers and goods would be unable to travel east or west on this international route.

f) Traffic and rail accidents could occur within or adjacent to the Proposed Scheme with fatalities, serious injuries and potential for spillage of loads. These risks already exist for the existing A55 Junction, but the changes brought about could change driving conditions and the consequent risks of major accidents occurring. As described in the Economic Assessment Report, a review of the five-year (2014-2018) accident data for the A55TM study area revealed 29 motor vehicle accidents. One accident was fatal, 7 were recorded as serious, and 21 were recorded as slight.

5. ASSESSMENT METHODOLOGY: HEALTH IMPACT ASSESSMENT

5.1 HIA is a tool designed to help communities, decision makers, and practitioners make choices that improve public health through making recommendations to optimize health gains from the project or Scheme and reduce potential negative health impacts or inequalities. It attempts to broadly assess the potential health outcomes (both adverse and beneficial) of a proposed project, plan or programme, or policy and to deliver evidence-based recommendations that optimise health gains and reduce or remove potential negative impacts or inequalities. It considers not only the more traditional determinants of health (anticipated changes in air pollution, water pollution) but also more social and economic impacts.

5.2 HIA is a process that helps evaluate the potential health effects of a plan, project or programme, or policy before it is built or implemented using quantitative, qualitative, and participatory techniques. HIAs bring potential positive and negative public health impacts and considerations to the decision-making process for plans, projects or programmes, and policies that fall outside traditional public health arenas, such as transportation and land use. An HIA may help decision-makers make choices among alternatives and improvements to prevent disease or injury, and actively promote well-being. It also provides practical recommendations to increase positive health effects and minimize negative health effects.

5.3 The major steps in conducting an HIA include:

a) Screening (identifying plan, project, or policy decisions for which an HIA would be useful).
b) Scoping (planning the HIA and identifying what health risks and benefits to consider).
c) Assessment (identifying affected populations and quantifying health impacts of the decision).
d) Recommendations (suggesting practical actions to promote positive health effects and minimize negative health effects).
e) Reporting (presenting results to decision makers, affected communities, and other stakeholders).
f) Monitoring and evaluation (determining the HIA's impact on the decision and health status).

5.4 Screening

5.4.1 Consultation was carried out during the Public Information Exhibition held in December 2017 and the 12-week WelTAG Stage Two Public Consultation held during the summer of 2018, including Environmental Liaison Group meetings with statutory consultees such as representatives from Conwy CBC Environmental Health team. The primary purpose of this consultation was to collate information regarding stakeholders' views on the possible options and general environmental information. This consultation did not specifically include health concerns.

5.4.2 A number of stakeholder groups were contacted asking for input into the HIA. Written consultation was carried with key bodies whilst preparing the population and human health assessment. It was anticipated that this would be focussed on Public Health Wales, including

the Conwy CBC 'Social Care and Wellbeing' team, the Local Public Health Director, together with the Conwy CBC Environmental Health team. A detailed consultation exercise beyond these organisations was not proposed although other parties that might wish to comment were identified, as follows, and were consulted by email on 6 September, 2019:

a) University Health Board (Betsi Cadwaladr).
b) Conwy and Denbighshire Public Services Board.
c) Dewis Cymru (general email address for Care Inspectorate Wales).
d) Conwy People's Partnership.
e) Community and Voluntary Support Conwy (North Wales Citizens' Panel).

5.4.3 No responses were received from this outreach.

5.5 Scoping

Determinants of health and well-being

5.5.1 As defined by the World Health Organisation:

> *Determinants of health are factors which influence health status and determine health differentials or health inequalities. They are many and varied and include, for example, natural, biological factors, such as age, gender and ethnicity; behaviour and lifestyles, such as smoking, alcohol consumption, diet and physical exercise; the physical and social environment, including housing quality, the workplace and the wider urban and rural environment; and access to health care (Lalonde, 1974; Labonté 1993).* All of these are closely interlinked and differentials in their distribution lead to health inequalities.

5.5.2 The health determinants identified during the preliminary Scoping Review (with reference to the WIAHU Health and Well-Being Determinants Checklist) as being relevant to the Proposed Scheme are shown in the table below.

Table A4: Health and well-being determinants identified during the preliminary scoping review

Health and Well-Being Determinants	Preliminary assessment of relevant factors (not exclusively)	Relevant to Construction	Relevant to Operation
Lifestyles	Physical activity	✓	✓
Social and community influences on health	Family organisation and neighbourliness, social support networks (such as midwifes, health visitors, social services), community identity, other social exclusion, including severance (where barriers to pedestrian movement are introduced or removed). These impacts are linked to those associated with access to services (e.g. safe routes to schools or child care centres).	✓	✓
Living / environmental conditions affecting health	Built environment, noise, air and water quality, attractiveness of area, green space and play areas, community safety (including road hazards).	✓	✓
Economic conditions affecting health	Access to employment and affordability of transport (including public transport or fuel costs). How the preferred option impacts an individual may depend on where people live relative to services.	✓	✓
Access and quality of services	Access to amenities, including health care (e.g. GP surgery or hospitals), training / education and shops. This is linked to any increase in journey length / cost of travel compared to the do minimum scenario.	✓	✓
Macro-economic, environmental and sustainability factors	Climate	✓	✓

5.5.3 Based on the Scoping Report submitted in January 2019, the following effects were scoped out of the HIA:

a) Individual and lifestyle effects such as smoking, diet, use of alcohol, cigarettes, non-prescription drugs, and sexual activity should not differ between do-minimum and the preferred option.
b) Social factors such as neighbourliness, sense of belonging, local pride, community identity, cultural and spiritual ethos, and racism should not differ between do-minimum and preferred option.
c) Workplace conditions should not differ between do-minimum and preferred options.

d) Macro-economic, environmental and sustainability factors including Government policies, biological diversity, gross domestic product, and climate should not differ between do-minimum and preferred options.

e) Living conditions such as smell, odour and waste management are unlikely to differ between do-minimum and preferred options from the perspective of health. Localised odours from soil disruption are considered in other Chapters (such as Chapter 6: Soils and Geology), and were judged to have minimal impact as organic odours are not considered to be offensive or unpleasant[5].

5.5.4 Based on the Scoping Report submitted in January 2019, the following effects were scoped in. Some of these topics will be included in the Populations and Health Chapter (Chapter 19). To avoid duplication, reference will be made to the relevant chapters as appropriate.

a) Impacts on individuals, including lifestyle factors such as physical activity, risk-taking activities, and impact on access to health care services (Chapter 14: All Travellers).

b) Impacts on social effects and health. For example, the preferred option may impact on the availability of housing, access to cost-effective public transportation or the potential to encourage families to use cycle tracks (Chapter 14: All Travellers).

c) Impacts on accessibility and active travel, including the encouragement of walking/cycling, and traffic management and calming measures (Based on Chapter 14: All Travellers).

d) Impacts on access to skills and knowledge, including access to training and education (Chapter 19: Population and Health).

e) Impacts on the community, including social support mechanisms, social networks and neighbourliness (Chapter 19: Population and Health).

f) Impacts on Community divisions and degree of isolation. This criterion can apply to either groups or individuals. The Project has the most potential to impact community severance and degree of isolation for those options where properties are located within slip road 'islands' or along-side roads that form part of the Proposed Scheme (Chapter 19: Population and Health).

g) Impacts on the historical identity of a community, as well as cultural and spiritual ethos. This could include the impact on designated Conservation Areas, townscape and landscape and isolation from areas important to the community such as the coast or the mountains. Where severance is reduced, this would potentially provide a positive effect (Chapter 19: Population and Health).

h) Impacts on the local community, related to issues associated with the built environment, housing, noise and air quality, physical view and outlook (e.g. those associated with changes to the landscape/townscape). The Proposed Scheme has the potential to impact

[5] http://www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf

during both its construction and operational phases (Chapter 5: Geology and soils; Chapter 9: Landscape; Chapter 12: Air Quality; Chapter 13: Noise and Vibration).

i) Impacts on employment, occupation, and income (Chapter 19: Population and Health).

j) Impacts on socio-economic, cultural and environmental and sustainability factors, including biological diversity, efficient use of resources, pollution, diversity / local distinctiveness and climate. It should be noted that it was not envisaged it would be considered proportionate to carry out a socio-economic study as part of this work (Chapter 19: Population and Health).

5.5.5 Based on the overall project considerations identified during the scoping stage and the findings of the assessment carried out under the Welsh Transport Appraisal Guidance (WelTAG), it was determined that a prospective desktop/rapid HIA, compared no-change option with the preferred option, was the most appropriate approach.

5.5.6 Typically, a prospective desktop/rapid HIA would involve a suitable investigation of health impacts, including a short desk-top review of evidence and the gathering of further information from key stakeholders. Although an attempt at consultation was carried out with statutory consultees, no additional consultation took place with members of the public.

5.6 Assessment

5.6.1 This assessment incorporates a review of available data, including initial feedback from the WelTAG Stage Two Public Consultation process, and a critical review of possible health impacts by the project team with a focus on establishing where significant effects could arise. It considers other relevant activities described elsewhere in this Environmental Impact Assessment document, including the air quality and noise review and consideration of effects on all travellers.

5.6.2 There are two relevant time periods to consider impacts on human health: during the Construction Phase and after completion during the Operational Phase (including use and any maintenance activities).

5.6.3 During the Construction Phase, impacts can potentially affect both construction workers and the nearby community. During this Phase the focus will be on the immediate construction zone, as well as nearby receptors.

5.6.4 After the Construction Phase and during the Operation Phase, the impacts can potentially affect nearby communities, either through direct or indirect impact of the new highway configuration. The impact of the Operational Phase was assessed up to 15 years after opening.

5.6.5 When considering the impacts on health, both during the Construction Phase and the Operational Phase, the buffer applied will depend on the impact being considered. For example, as described Chapter 12, the health impacts associated with construction dust were considered within 350 m of the associated works, whereas the air quality during the Operational Phase was considered in the immediate vicinity of the Proposed Scheme and adjoining road (up to a distance of 200 m). Reference is made to the relevant chapters for the appropriate buffers that were applied.

5.6.6 In the subsections below, we assess impacts as discussed in the relevant Environmental Impact report Sections:

a) Chapter 6. Geology and Soils

b) Chapter 9. Landscape

c) Chapter 11. Community Assets

d) Chapter 12. Air Quality

e) Chapter 13. Noise and Vibration

f) Chapter 14. All Travellers

g) Chapter 17. Risks of Accidents or Disasters

5.7 Geology and Soils

5.7.1 As described in Chapter 6, the only potentially significant effect identified for the Proposed Scheme with regards to Geology and Soils relates to workers in confined spaces (if introduced). This would require mitigation in order to reduce the potential effects. Following implementation of the mitigation by the Contractor these would no longer be considered potentially significant effects.

5.7.2 There would be no long-term significant effect on the groundwater beneath the site from the Proposed Scheme and risks associated with the ground conditions can be adequately managed during construction and operation phases.

5.7.3 A number of standard best practice measures will therefore be adopted during construction and operation of the site in order to ensure that the contamination identified at the site does not result in any significant environmental effects. These best practice measures are described in Chapter 6.

5.8 Landscape

5.8.1 As described in Chapter 9, nine Landscape Character Areas (LCA's) were identified as being potentially significant landscape receptors. These LCA's are:

a) LCA 01 – Traeth Lafan and Dutchman Bank.

b) LCA 02 – Penmaenmawr Beach.

c) LCA 08 – Trunk Road and Railway (Llanfairfechan to Pen-y-clip).

d) LCA 11 – Llanfairfechan Promenade.

e) LCA 12 – Llanfairfechan Town Centre.

f) LCA 13 – Llanfairfechan Drycin.

g) LCA 19 – Penmaen Park.

h) LCA 21 – Penmaenmawr Quarries (disused).

i) LCA 25 – Nant-y-Pandy Pasture.

5.8.2 Potential landscape impacts were initially assessed assuming no mitigation. Several mitigation approaches are then proposed, as discussed in Chapter 9.

5.8.3 Potential adverse impacts on LCA 01, Traeth Lafan and Dutchman Bank, were judged to be minor, with no direct impact. Some visual impact of the proposed new wall (refer to Chapter 2: Scheme Description) is anticipated when viewed from the seaward side. Disturbance to general amenity during construction works and on Day 1 of opening are also anticipated. Overall, this was judged as having a moderately adverse impact.

5.8.4 Potential adverse impacts on LCA 02, Penmaenmawr Beach, were judged to be minor, with no direct impact. Some limited and minor visual impact of the proposed new wall (refer to Chapter 2: Scheme Description) is anticipated when viewed from the seaward side. Some minor disturbance to general amenity is anticipated during construction; however, this was judged not likely to be significant. Overall, this was judged as having a neutral impact.

5.8.5 Potential adverse impacts on LCA 08, Trunk Road and Railway (Llanfairfechan to Pen-y-clip), were judged to be major, with the loss of existing roadside plantations during site clearance operations. Significant changes in landscape character would remain until Year 1 of opening. Overall, this was judged as having a moderately adverse impact.

5.8.6 Potential adverse impacts on LCA 11, the Llanfairfechan Promenade, were judged to be minor, with the loss of existing roadside plantations during site clearance operations having a minor adverse effect on landscape character. This is a popular area valued by the local community and tourists. Only the eastern section of the area is likely to be affected during the construction period through noise disturbance caused by construction (piling) operations and restricted access in the vicinity of Shore Road East. Overall a slight adverse effect would remain until Year 1 of opening.

5.8.7 Potential adverse impacts on LCA 12, Llanfairfechan Town Centre, were judged to be major, with a localised impact in the vicinity of Shore Road East. Two properties on Shore Road East (8 and 9 Penmaen View) would be demolished and the soft estate, a key landscape element to the rear of nearby properties would be lost. The setting of the Conservation Area would also be indirectly affected. Overall, a large adverse effect would remain until Year 1 of opening.

5.8.8 Potential adverse impacts on LCA 13, Llanfairfechan Drycin, were judged to be minor, with a direct but localized impact on landscape. The existing footbridge would be replaced with a new footbridge providing better access. There would be some disruption during the construction period. Overall, this was judged as having a neutral impact.

5.8.9 Potential adverse impacts on LCA 19, Penmaen Park, were judged to be moderate. Areas of well-established roadside plantation would be lost resulting in an urbanising effect on the eastern section of the area close to the new junction, and there would be encroachment of Proposed Scheme footprint into former parkland area. Overall, this was judged as having a moderate adverse impact on Year 1 Opening.

5.8.10 Potential adverse impacts on LCA 21, Penmaenmawr Quarries (disused), were judged to have no changes and thus are expected to have a neutral impact.

5.8.11 Potential adverse /beneficial impacts on LCA 25, Nant-y-Pandy Pasture, were judged to be negligible. During construction, some indirect effects and noise disturbance caused by construction and operational activities might impact the tranquil setting of the area. However,

there also may also be some benefits to the perceptual qualities of the area during the operational period if some degree of noise reduction is achieved.

5.8.12 The most significant potential impact on the landscape character of the area is largely confined to the area immediately surrounding and adjacent to the new junction. As a result of the Proposed Scheme, the landscape character of the area here would become more urbanised with the new junction and overbridge and associated slip roads and retaining walls. There would be significant loss of the existing roadside plantation, including mature deciduous trees and shrubs that are currently well-established. Their removal, together with elements of the new junction described above, would result in a highly urban and exposed environment.

5.9 Community Assets

5.9.1 As described in Chapter 11, the Proposed Scheme will result in temporary use of a small area of open space land on the land on the promenade during construction, but this will be replaced and possibly improved upon during completion. This impact is considered as beneficial.

5.9.2 The Proposed Scheme also includes a temporary and a permanent loss of the open space playing pitches at Pant Y Rhedyn. The playing pitch would be excavated to provide surface water compensation measures and returned to open space use and part landscaped with the Proposed Scheme. The temporary removal of the existing open space area at Pant y Rhedyn would be a 'moderate adverse' impact, potentially achieving 'beneficial' on completion of the Proposed Scheme. The permanent removal of part of the open space at Pant y Rhedyn would be a 'large/moderate adverse' impact. The temporary use of a small are of open space land on the land on the promenade would be considered as a 'beneficial' impact.

5.9.3 With respect to private assets, the Proposed Scheme will also result in demolition of two residential properties, Numbers 8 and 9 Penmaen View. This is considered a large adverse impact.

5.9.4 The Proposed Scheme also results in demolition of residential garden areas of residential properties on Penmaenmawr Road and the current land allocation site, land to the West of Penmaen Park, as well as reduction in the residential garden areas for St Brendas; Sunny Bank; Glan Meurig; Glan Seirio; Fernbank; the communal garden for properties 1-4, the separate garden for property 5, and the new development adjacent to Fernbank. Partial removal of existing garden areas was a 'moderate adverse' impact.

5.9.5 However, the Proposed Scheme minimises the number of residential properties that would need to be demolished and ensures that is does not adversely affect Ysgol Pant Y Rhedyn, reducing the potential impact on the school community.

5.9.6 The Proposed Scheme will provide additional cycleways and enhanced connectivity, which is a beneficial impact for both the immediate area and the community assets located at the Prominade, further north.

5.10 Air Quality

5.10.1 As described in Chapter 12, the Proposed Scheme has the potential to impact air quality in both the Construction Phase and the Operational Phase.

5.10.2 During the construction phase, dust impacts may be caused by earthworks and site

preparation, demolition of existing structures, construction of structures such as foundations, material handling, construction of on- and off-site highway improvements, and various landscaping activities. Dust impacts would be anticipated to be greatest in dry weather, especially following periods without rain.

5.10.3 The closest sensitive receptors to construction activity will be residential properties along A55 and Penmaenmawr Road.

5.10.4 Much of the dust generated during the construction phase is likely to be coarse particle sizes, with only a fraction likely to be in the PM10 size range. As described in Chapter 12, the risk of dust soiling impacts is likely to be highest for earthworks and construction activities. However, this is anticipated to be low without mitigation and negligible with mitigation, and the risk of human health effects from this activity is likewise anticipated to be negligible.

5.10.5 To assess the impacts during the operational phase, Chapter 12 presents the changes in NO_2 and PM_{10} concentrations by comparing the 'do minimum' scenario with the 'do something' scenario.

5.10.6 NO_2 impacts from the Proposed Scheme are projected to be negligible, with concentrations at all receptors modelled decreasing slightly, remaining the same, or increasing by no more than 1%.

5.10.7 PM_{10} impacts are also projected to be negligible, with concentrations at all receptors modelled decreasing slightly or remaining the same.

5.10.8 Based on these two pollutants, the health implications of air quality changes from the Proposed Scheme are judged to be minimal, and no significant health effects are anticipated from these minimal air quality changes resulting from the Proposed Scheme.

5.11 Noise and vibration

5.11.1 As described in Chapter 13, noise was assessed during both construction phase and operations phase.

Construction Phase

5.11.2 All demolition and construction effects are expected to be direct and temporary, with a construction environmental management plan (CEMP) defining all mitigation measures and a defined best practices measure (BPM) to minimise the noise and vibration effects at receptors in the vicinity of the construction.

5.11.3 Construction-related activities were predicted for 11 noise-sensitive receptors. Only two receptors, P6 and P7 (Sunnybank Terrace and New Fernbank), were expected to have noise levels above 65 dBA.

5.11.4 Moderate Adverse effects are predicted for noise at receptor P6 during the Phase 2 superstructure construction activity. Major Adverse effects are predicted for noise at receptor P6 during the Phase 2 site clearance activity and at receptor P7 during the Phase 2 site clearance, Phase 2 substructure and Phase 2 superstructure construction activities. The noise sources that have been predicted to result in the highest noise levels at receptors P6 and P7 are mobile cranes and cutters, drill and small tools.

5.11.5 Noise levels from cutters, drills and small tools may be reduced by utilising an acoustic enclosure with a roof whilst carrying out these works in the vicinity of P6 and P7.

5.11.6 Even with mitigation, moderate noise effects are predicted at receptor P7 during the Phase 2 substructure and superstructure works. The effects are considered significant.

5.11.7 Predicted noise effects from construction have been found to result in significant noise effects. Mitigation measures in the form of portable noise barriers are proposed to reduce the significant noise. Significant construction noise effects may remain at some assessment locations.

5.11.8 Significant vibration levels may occur during the finishing works activity of Phase 2 at assessment locations S1, P3, P6, P7.

Operations Phase

5.11.9 Without any mitigation, the Proposed Scheme is predicted to result in a noise level increase at majority of the identified receptors. This is attributed to an increase in traffic speed around the existing junction, realignment of the roads with introduction of additional carriageways closer to the receptors, and due to removal of existing roadside barriers. No receptors are predicted to experience a significant decrease in effect.

5.11.10 Planned mitigation of operational noise includes roadside barriers achieving up to 10 dB reduction in noise level emissions. The introduction of thin surface systems instead of hot rolled asphalt has the potential to reduce noise with full effectivity at traffic speeds above 75 km/hour.

5.11.11 The Proposed Scheme has been assessed to result in significant effects during its operation, due to changes in road traffic noise level in the short-term. However, with the incorporation of low noise thin surface system and the introduction of roadside noise barriers, the Proposed Scheme is assessed to result in no significant noise effects during the operations phase.

5.12 All Travellers

5.12.1 As described in Chapter 14, there may be impacts to travellers during the construction and use phases.

Construction phase

5.12.2 During construction, which is anticipated to last 18 months, there will be two lanes of traffic in each direction with reduced speed.

5.12.3 The bus gate between the A55 and Penmaenmawr Road will be closed permanently during the construction phase. There may be some disruption to existing bus routes and journey times, however all services will continue to operate.

5.12.4 National Cycle Network (NCN) 5 (Penmaenmawr Road East of Junction Improvements) will be severed during construction at the junction of Penmaenmawr Road. This impact on community severance is assessed as a major adverse impact.

5.12.5 NCN 5 (Penmaenmawr Road West of Junction Improvements) may be potentially impacted temporarily during construction of the segregated cycleway along Penmaenmawr Road and

through construction of shared open space improvements at Penmaenmawr Road/Shore Road East. This impact on community severance is assessed as a major adverse impact.

5.12.6 Shore Road East may be potentially impacted temporarily during construction of shared open space improvements at Penmaenmawr Road/Shore Road East. This impact on community severance is assessed as a major- to moderate adverse impact.

5.12.7 The footbridge over A55 at Pendalar may be potentially impacted temporarily during construction of the replacement bridge. This impact on community severance is assessed as a major- to moderate adverse impact.

5.12.8 There may be a temporary impact on access to the Llanfairfechan Promenade during minor improvement works. This impact on community severance is assessed as negligible.

5.12.9 Works to Mona Terrace will be offline and thus have negligible impact on community severance.

5.12.10 The narrow lanes and reduced speed along the A55 during construction is likely to result in an increase in drivers stress and frustration. Furthermore, fear of potential accidents could increase due to the presence of roadworks and narrow lanes. Uncertainty may result from temporary road closures and changes to access or egress arrangements to and from the A55 to local road. These effects are considered adverse.

5.12.11 Non-motorised user journeys adjacent to construction works are likely to be subject to a temporary increase in noise levels due to construction machinery and works. The assessment of visual and noise impacts of the Proposed Scheme is detailed in Chapters 9 and 14 respectively in this ES.

5.12.12 Without mitigation, the construction phase will therefore cause considerable disruption to drivers and non-motorised users.

Operational phase

5.12.13 Overall the Proposed Scheme seeks to improve the quality of non-motorised user routes through a series of mini-Schemes as identified in Chapter 2. These mini-Schemes will be designed to current standards and will seek to improve connectivity to the local area for pedestrians and cyclists through the provision of dedicated facilities.

5.12.14 As described in Section 4, only minimal changes are anticipated to the average automobile daily trips, with no change greater than 10% from the do minimum situation in 2022.

5.12.15 NCN5 (Penmaenmawr Road East of Junction Improvements) will also have improved connectivity between Pendalar and Ysgol Pant Y Rhedyn along NCN5. There will be an improved online and offline dedicated cycle facility through J15 approach/ Penmaenmawr Road. This impact on community severance is assessed as a major beneficial impact.

5.12.16 NCN 5 (Penmaenmawr Road West of Junction Improvements) will also have improved non-motorised user facilities with segregated cycleway/footway along Penmaenmawr Road and shared open space improvements at Penmaenmawr Road/Shore Road East. This impact on community severance is assessed as a major-to-moderate beneficial impact.

5.12.17 Shore Road East will have improved accessibility due to open space improvements at Penmaenmawr Road/Shore Road East. This impact on community severance is assessed as a major- to moderate beneficial impact.

5.12.18 The footbridge over A55 at Pendalar will have improved accessibility for pedestrians, cyclists and disabled users. This impact on community severance is assessed as a major- to moderate beneficial impact.

5.12.19 There may be a temporary impact on access to the Llanfairfechan Promenade during minor improvement works, with improved accessibility for cyclists. This impact on community severance is assessed as a major to moderate beneficial impact.

5.12.20 Mona Terrace will have improved routing of NCN5, with a lower gradient and more direct, segregated route. This impact on community severance is assessed as a major beneficial impact.

5.12.21 Removal of the J15 roundabout seeks to address existing issues with resilience, delays, and safety, therefore reducing driver stress and frustration. Furthermore, fear of potential accidents could decrease, and uncertainty should be minimised. These effects are all considered beneficial.

Overall (both phases)

5.12.22 Proposed mitigation during the construction phase should reduce the impact of the Proposed Scheme during this phase.

5.12.23 While there are several major-to-minor adverse impacts anticipated during construction, the benefits during the operational phase are anticipated to outweigh these anticipated impacts, with a net result of a beneficial impact.

5.13 Risks of Accidents and Disasters

5.13.1 As described in Chapter 17, several accidents and disasters were considered in the Environmental Impact Assessment. With the exception of traffic accidents, most of those considered fall under the general heading of 'natural disasters.'

5.13.2 The A55 lies on the coast, elevated a few metres above the high tide line but protected by coastal flood defences and the railway. Risk of flooding were therefore analysed.

5.13.3 Flooding from the sea can occur over areas of the Promenade and inland of the A55 around Shore Road East and Station Road in Llanfairfechan. As stated in Chapter 17, consequences of coastal flooding risk from the sea would not be affected by changes resulting from the Proposed Scheme and so would not result in significant adverse effects on the environment as a result of the Proposed Scheme.

5.13.4 Similarly, fluvial (river or river-bank) flooding could occur over areas of Llanfairfechan associated with the Afon Ddu along Station Road and associated low-lying land south of the A55. The risk would not be changed by the Proposed Scheme would not result in significant adverse effects on the environment as a result of the Proposed Scheme. Fluvial flooding could affect construction activity associated with Shore Road East.

5.13.5 During construction, however, flooding from the sea, fluvial flooding, or surface water flooding could have a significant effect on construction activity associated with Shore Road East (all) and the Promenade (flooding from the sea).

5.13.6 High temperatures in this maritime context are a low risk hazard for the Proposed Scheme, but these events have become more frequent in recent decades with temperatures reaching record highs in the Summer of 2019. Thermal expansion and contraction of materials can affect the performance of surfaces and structures, while the softening of road surfacing can occur in high temperatures. Bridge design for the new junction assumes a normal range of thermal expansion, but extreme conditions could result in damage to bridge abutments and joint bearings. In extreme circumstances the effects could result in temporary bridge closure. Bridge design would take account of predicted temperature ranges. Effects of extremely high temperatures could result in traffic being diverted to other routes for a short duration which would not be a significant impact.

5.13.7 Fog and the resulting poor visibility can increase the risk of fast-moving vehicles on the A55 being involved in collisions. The likelihood of fog occurring would be similar for both the existing A55 and the Proposed Scheme. Improving the junction will not result in increased risk of fog occurring.

5.13.8 Rapid slowing of high-speed traffic approaching the roundabout in conditions of poor visibility could result in collisions. Providing a free-flowing grade separated junction will reduce the risk of these accidents, but the higher speeds of vehicles on the Proposed Scheme could worsen the consequences of collisions if they do occur. Traffic Wales monitor traffic flows on the A55 and can mitigate or avoid the effects of fog by using electronic information signs to inform drivers of road conditions ahead, or by deploying Traffic Officers to manage traffic and reduce the risk and severity of collisions.

5.13.9 Road traffic accidents occur daily on Britain’s roads. Major or severe accidents involving numerous fatalities or serious injuries are less frequent. Design of the Proposed Scheme to modern standards would avoid or mitigate some accidents by comparison with the existing road. This assessment is concerned with the major accidents that could occur despite these avoidance and mitigation measures.

5.13.10 Major accidents resulting in large numbers of casualties could occur in extreme circumstances. Such an event could block the A55 and cause damage to road surfaces and structures. Closure of the road for an extended period could adversely affect the communities by closing the only major road in and out.

5.13.11 While accidents could result in major spillages of pollutants such as fuels or bulk loads and the use of fire-fighting chemicals, there would be containment measures incorporated into the road drainage system to contain the spread of pollution and reduce the risk of harm to residents, road users, designated marine wildlife sites and other receptors.

5.13.12 Traffic Wales monitor traffic on the A55, and can use electronic information signs and / or deploy traffic officers to manage the speed and behaviour of traffic. The emergency services are trained and equipped to deal with the consequences of traffic accidents. While these events can result in temporary road closures, they are considered unlikely to cause significant adverse effects on the environment as a result of the Proposed Scheme.

5.13.13 During construction of the Proposed Scheme the contractor will be responsible for managing

traffic through the works. They will also be responsible for liaison with the emergency services to ensure that they have free access into and through the works.

5.13.14 As assessed in Chapter 17, there are potential risks to the Proposed Scheme itself and to the environment as a result of the development. Most of these events arise from natural sources and would occur whether or not the junction improvements are carried out. The consequences of these events are associated with road traffic accidents. Wherever possible this risk is being addressed by a range of measures that include traffic management and design to current design to minimise the risk to people, property and the environment.

5.13.15 Some events will cause damage to elements of the Proposed Scheme which would require repair. Temporary, full or partial, closures of the road would be implemented, with consequential impacts on road users and adjacent communities.

5.13.16 As described in the Economic Assessment Report, the predicted number of motor vehicle accidents in the 60-year period for the study area under the Proposed Scheme is a net prevention of 34.2 total accidents. Of these, 0.7 fatal accidents would be prevented, 4.3 serious accidents would be prevented, and 42.5 slight accidents would be prevented.

6. SIGNIFICANT EFFECTS

6.1 There is no specific guidance on the assessment of significance in EIA in relation to HIAs. The evaluation of the HIA therefore broadly follows the approaches described above and takes the following into account:

a) What is the nature of the impact? Explain how the Proposed Scheme might affect health and whether the impact will be positive or negative.

b) What is the likelihood of the impact? -Because this is a desktop assessment, all impacts are speculative.

c) What is the scale and significance of the impact? Occupational and community populations were considered. The severity or benefits of impacts were assessed in broad terms.

d) How does timing and duration affect the impact? Assessment takes into account Construction and Operational Phases, and considers whether short-term impacts on health may be worth the long-term benefits.

e) What is the distribution of impacts? Assessment takes into account occupational and community populations. Because the community is relatively homogeneous, subpopulations within the community were not considered.

6.2 The assessment will report only the potential significant effects from the Proposed Scheme and will be based on professional judgement, as described in the IEMA Primer on Health Impact Assessment. The assessment has been undertaken on a qualitative basis.

7. INDICATION OF ANY LIMITATIONS ENCOUNTERED

7.1 Since this HIA is a desktop review, it is limited by data already collected by the Project Team, supplemented by data readily available in the public domain.

7.2 One area posed limitations due to lack of readily available data: Air Quality.

7.3 Air Quality

7.3.1 Based on the guidance that has been followed, the Environmental Impact Assessment only examined NOx and PM_{10}, with data on the latter quite limited. There is no PM_{10} monitoring undertaken in close proximity to the J15 Scheme. However, PM_{10} monitoring is carried out at 1 of the 6 local authorities that encompass the North Wales Combined Authority[6]. The annual mean PM_{10} concentrations recorded at all stations were well below the annual mean objective of 40 µg/m^3, with the highest measured concentration recorded being 13.3 µg/m^3 in 2017.

7.3.2 No $PM_{2.5}$ data was presented in the assessment, even though from a health perspective this is the more relevant size of particulate matter.

7.3.3 Although $PM_{2.5}$ monitoring is not undertaken in close proximity to the Proposed Scheme, it has been carried out at 2 of the 6 local authorities that encompass the North Wales Combined Authority. The annual mean $PM_{2.5}$ concentrations recorded at all stations were well below the annual mean objective of 25 µg/m^3, with the highest measured concentration recorded being 8.6 µg/m3 in 2017. Therefore, as outlined in Chapter 12, $PM_{2.5}$ was not included in the assessment[7].

7.3.4 Furthermore, no data related to hazardous air pollutants (such as benzene) were compiled, since several hazardous air pollutants are anticipated from mobile sources, analysing these air pollutants would have been useful from a public health perspective.

[6] North Wales Combined Authority. 2018 Air Quality Progress Report. September 2018.
[7] Highways England. LA105 Air Quality. November 2019. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20105%20Air%20quality-web.pdf

8. SUMMARY

8.1.1 Based on this Health Impact Assessment, the following general conclusions are drawn:

8.1.2 Soils and Geology: During the construction phase, there may be adverse impacts for workers if they are in confined spaces. A combination of best practice measures and mitigation (if confined spaces are needed) should reduce these impacts, leading to neutral impacts. No long-term significant effects are anticipated on the groundwater beneath the site from the Proposed Scheme and risks associated with the ground conditions can be adequately managed during Construction and Operation Phases. Overall, the impact from soils and geology is expected to be neutral.

8.1.3 Landscape: Potential adverse impacts on Landscape Character Areas (LCA's) were evaluated and judged as having neutral impacts or, at worse, moderately adverse for a limited duration of time (for example, during the Construction Phase or early in the Operational Phase while new plants are maturing). The most significant potential impact on the landscape character of the area is largely confined to the area immediately surrounding and adjacent to the new junction. As a result of the Proposed Scheme, the landscape character of the area here would become more urbanised with the new junction and overbridge and associated slip roads and retaining walls. There would be significant loss of the existing roadside plantation, including mature deciduous trees and shrubs that are currently well-established. Their removal, together with elements of the new junction described above, would result in a highly urban and exposed environment. Overall, the impact from landscape changes are expected to be neutral.

8.1.4 Community Assets: Although the Proposed Scheme will result in temporary loss of a small area of open space land on the land on the Promenade during construction, this will be replaced and possibly improved upon during completion. The Proposed Scheme will provide additional cycleways and enhanced connectivity, which is a beneficial impact for both the immediate area and the community assets located at the Prominade, further north. Although steps have been taken to minimise the impact, two residential properties will need to be demolished due to the Proposed Scheme. This loss would lead to a large adverse impact. In addition, the Proposed Scheme will result in the loss of a considerable amount of residential garden space. However, the Proposed Scheme specifically ensures that residential property demolition does not adversely affect Ysgol Pant Y Rhedyn, reducing the potential impact on the school community. Overall, the Proposed Scheme's impact on Community Assets is neutral-to-positive.

8.1.5 Air Quality: Based on the guidance followed air quality measures that were evaluated were limited to PM10 and NO2. During the Construction Phase, there may be dust impacts on workers and nearby residents. However, much of this dust is in the coarse range and thus while a potential nuisance, the health effects are anticipated to be low. Furthermore, the introduction of mitigation measures should control this. During the Operational Phase, both NO2 and PM_{10} changes are expected to be negligible and the health impacts are thus also considered to be negligible based on these two air pollutants. Overall, the impact from air quality is expected to be neutral.

8.1.6 Noise and vibration: Noise and vibration from the Proposed Scheme are anticipated to be temporary, and greatest during the Construction Phase. Of the 11 noise-sensitive receptors evaluated, only 2 were expected to have noise levels above 65 dBA. Even with mitigation measures, there is anticipated to be noise impacts at 1 of these receptors (New Fernbank) during the Construction Phase. Furthermore, significant vibrations may occur at several receptor locations during some construction activities (for example, finishing works). During the Operational Phase, noise is anticipated to increase without mitigation. However, planned mitigation measures should reduce these impacts with the incorporation of a low noise thin surface system and the introduction of roadside noise barriers. Overall, the Proposed Scheme's impact in terms of noise and vibration are expected to be neutral, with only mild impacts on limited areas during the Construction Phase and no significant impacts during the Operational Phase.

8.1.7 All Travellers: Without mitigation, the Construction Phase of the Proposed Scheme would cause considerable disruption to drivers and non-motorised users. However, proposed mitigation measures during the Construction Phase should reduce these impacts. During the Operational Phase, there will be numerous changes that improve connectivity. This beneficial impact is greatest for foot traffic and cyclists. For motorised users, the Proposed Scheme will address existing issues with resilience, delays, and safety. The net effect will be a reduction of driver stress and frustration. Overall, while there are several major-to-minor adverse impacts anticipated during construction, the total benefits during the Operational Phase are anticipated to outweigh these anticipated impacts, with a net result of a strong beneficial impact.

8.1.8 Risks of Accidents and Disasters: Several potential natural disasters were evaluated for the Proposed Scheme. Coasting flooding, river flooding, and surface water flooding risk would remain the same, but should they occur they might impact the Construction Phase, particularly along the Promenade and Shore Road East. The Proposed Scheme would not impact high temperatures, but extreme temperature conditions (which are anticipated to be rare in the Proposed Schemes maritime location) might soften road surfaces or damage bridges. Such effects of extremely high temperatures could result in traffic being diverted to other routes for a short duration which would not be a significant impact. Likelihood of fog conditions, with poor visibility increasing the risks of motor vehicle accidents, would remain the same under the Proposed Scheme. Providing a free-flowing grade separated junction will reduce the risk of these accidents, but the higher speeds of vehicles on the Proposed Scheme could worsen the consequences of collisions if they do occur. Mitigation measures include electronic information signs run by Traffic Wales. Importantly, modelling demonstrates that the number of motor vehicle accidents would decrease under the Proposed Scheme, providing a strong beneficial impact.

8.1.9 Based on the above assessment, it is therefore concluded that the Proposed Scheme has minimal potential to result in significant effects on human health, and includes several important health benefits.