Llywodraeth Cymru
Welsh Government

A55 Junctions 14 and 15 Improvements

Environmental Statement

Volume 1 Assessment Chapters

March 2021

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Cronfa Datblygu Rhanbarthol Ewrop
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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 1 INTRODUCTION

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1. CHAPTER INTRODUCTION

1.1 The Scheme

1.1.1 This document is Volume 1 of the Environmental Statement (ES) for the A55 Junction 15 Improvement Scheme (referred to in this document as 'the Scheme'). The ES reports the findings of the Environmental Impact Assessment (EIA) process.

1.1.2 Historically, the schemes at Junction 15 and 16 have been referred to collectively as the 'Junction 15 and 16 Improvements'. Since the Statutory Processes for each junction are being conducted independently of one another and because of the proposed minor improvements to the Junction 14 layout, a decision has been taken to rename the draft Orders, associated Environmental Statements and reporting as follows; the Junction 15 Scheme is now known as the Junction 14 and 15 Improvement Scheme. The Junction 16 Scheme is now known as the Junction 16 and 16A Improvement Scheme.

1.1.3 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. The route is heavily used during the summer months by tourists travelling to holiday destinations such as Snowdonia, Anglesey, the Llyn Peninsula and Holyhead Port for the ferry service connection to Dublin, Ireland.

1.1.4 The A55 is part of Euroroute E22 Trans-European Transport Network (TEN-T) that runs from the Port of Holyhead to Ishim in Russia, one of the longest European routes stretching a distance of 5,320 kilometres[1]. The A55 junctions 15 and 16 are the only two roundabouts on Euroroute E22 and hence are a constraint to the smooth flow of traffic leading to 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.

1.1.5 The scheme proposals are to remove the roundabouts at both Junction 15 and 16 and construct new grade separated junctions to improve safety and access to Llanfairfechan, Penmaenmawr and Dwygyfylchi. The scheme proposals for both junctions require an EIA due to their scale and location. The purpose of the EIA is described below in Paragraph 1.2.1. The location of the Scheme is shown on Figure 1.1. Further details of the Scheme are provided in Chapters 2 and 3 of this ES.

[1] https://en.wikipedia.org/wiki/European_route_E22

Figure 1-: Location of the Scheme

1.2 Purpose of the Environmental Statement (ES)

1.2.1 Environmental Impact Assessment (EIA) is a means of identifying and collating information to inform an assessment of the likely significant environmental effects of a project. The findings of the EIA process are reported in an ES in order to ensure that, when deciding whether to grant consent for a project, the decision-maker has access to information regarding the likely significant effects on the environment. This allows these effects to be considered in the decision-making process. The requirement to prepare an ES is set out in law.

The EIA Directive

1.2.2 The legislative framework for EIA is set by European Directive 2011/92/EU, as amended by Directive 2014/52/EU (collectively referred to as the EIA Directive) and has made significant changes to the EIA regime in Wales. The current Directive requires EIA to be undertaken in support of an application for development consent for certain types of schemes.

The EIA Regulations

1.2.3 Guidance on the procedure for determining whether or not an EIA is required for highways schemes is set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 3 (HD 47/08) (Highways Agency et al., 2008) and Interim Advice Note (IAN) 126/09(W) (Welsh Assembly Government, 2011). This requires that a 'determination' process is followed for certain highways schemes. The determination process (Screening) for this EIA is summarised in Chapter 4, Section 3, while the full Screening Report is provided in Appendix 4.1.

The Requirement for EIA for the Scheme

1.2.4 The proposed Junction 15 Improvements requires an EIA because the scheme is of sufficient size to be a 'relevant project' as defined in Annex II, '*a project for constructing or improving a highway where the area of the completed works together with any area occupied during the period of construction or improvement by requisite apparatus, equipment, machinery, materials, plant, spoil heaps or other such facilities exceeds 1 hectare or where any such area is situated in whole or in part in a sensitive area*.' The area of land required for the Scheme exceeds the minimum threshold and so is treated as a 'relevant project'.

1.3 Scope and Content of the ES

1.3.1 Although there is no statutory provision as to the form of an ES, the Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017[2], states that information must include at least:

a) a description of the site, design, size and any other relevant features of the project,
b) a description of the likely significant effects of the project on the environment,
c) a description of any features of the project or measures envisaged to avoid, prevent or reduce and, if possible, offset any likely significant adverse effects of the project on the environment,
d) a description of the reasonable alternatives studied by the applicant, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the likely effects of the project on the environment,
e) a non-technical summary of the information mentioned in paragraphs (a) to (d), and
f) any additional information specified in Annex IV to the EIA Directive (information for the environmental impact assessment report) relevant to the specific characteristics of the project or type of project and to the environmental features likely to be affected.

1.3.2 This ES provides the information set out above, together with other relevant information listed in the EIA Directive. The information supplied within this ES is considered to provide a clear understanding of the main or likely significant effects of the Scheme on the environment. Further detail regarding the scope of the ES in relation to legislative requirements is provided in Chapter 4 of this ES. The Scoping Report is included in Volume 3 Appendix 4.2.

1.3.3 Welsh Government Schemes for Junction 15 and Junction 16 are both subject to EIA but are reported in separate ESs because the proposed improvements are separated geographically and are not reliant on each other to individually achieve the Scheme Objectives set out in Chapter 2. There is no unifying Line Order linking both proposals and so separate statutory procedures and Orders are required for each junction. As the ES is published in support of the Draft Orders, a separate ES setting out the environmental effects of each Scheme is also required.

1.4 Structure of this ES

1.4.1 The ES has been structured in order to allow relevant environmental information to be easily accessible. The information is set out in the following documents, which make up the full Environmental Statement (ES):

1.4.2 This volume of the ES (Volume 1) includes the main text of the ES.

- **Chapter 2:** Description of the context to the Scheme, transport planning objectives and Scheme proposals.
- **Chapter 3:** Information relating to the main alternatives considered during the evolution of the Scheme and the reasons for the choices made.
- **Chapter 4:** Outlines the approach and methodology adopted during the EIA process.
- **Chapter 5:** Legislative and policy context.

1.4.3 The ES Volume 1 environmental assessment topic chapters that follow Chapter 5 are listed in Table 1.1.

[2] Schedule 1 Paragraph 8, (10) (3)

1.4.4 Volume 2 of the ES includes all the figures and Volume 3 includes Appendices.

1.5 New DMRB Guidance

1.5.1 In August 2019 Highways England began the replacement of the DMRB Volume 11. The new guidance (DMRB 2019) has been published in Sections commencing in August 2019. 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. The decision was made to continue using the DMRB 2008 guidance, rather adopting the 2019 version, because of the advanced state of the EIA. An initial analysis to determine the differences between the scope of the proposed EIA and the scope that would be required under the 2019 guidance was undertaken in December 2019. The main factors in the decision were:

i. The new topics set out in the EU Directive 2014/52/EU included Climate Change, Heat and Radiation, Population and Human Health, Risk of Major Accident and Disaster had already been included in the scope of the EIA and were set out in the Scoping Report. Heat and Radiation was the only topic scoped-out. The new topics were assessed using methodologies already available.

ii. The DMRB Volume 11 (2019) re-ordered the topics (to be known in the future as 'factors) which meant that the ES for the project would have to contribute to a different set of factors, for example topics which would form chapters addressing land use and agriculture, community and private assets, walkers, cyclists and horse-riders and human health would be brought together in the new Population and Human Health chapter.

iii. The assessment methods for those topics that had been published by December 2019 were proving to be broadly similar to the 2008 guidance.

1.5.2 The decision was made to maintain the assessments and chapters as set out in the scoping report, but to consider the new guidance for each topic in turn. Those topics where the new DMRB guidance was adopted are shown with an * asterisk in Table 1.1.

Table 1.1: Structure of this ES

Chapter	Topic Title	DMRB 2008	DMRB 2019	Notes
6	Geology and Soils		*	
7	Drainage and Water		*	LA113 pub. early: August 2019
8	Nature Conservation		*	
9	Landscape	*		Further updates to guidance published in February 2020
10	Cultural Heritage	*		
11	Community Assets	*		
12	Air Quality	*		The new DMRB would require a lower level of assessment for the scheme
13	Noise and Vibration	*		

Chapter	Topic Title	DMRB 2008	DMRB 2019	Notes
14	All Travellers	*		
15	Material Assets and Waste		*	Assessment commenced after LA110 published August 2019
16	Climate Change		*	LA114 available
17	Risk of Major Accident and Disaster			No guidance provided in either version of guidance
18	Population and Health		*	LA112 published in January 2020
19	Assessment of Cumulative Effects			
20	Management of Environmental Effects	*		
21	Conclusion			N/A

1.6 The Assessment Team

1.6.1 The Welsh Government (as the Overseeing Organisation) awarded a Professional Services Contract for the Scheme development and environmental surveys, including publication of the ES and up to any Public Local Inquiry. The contract was awarded to Ramboll, supported by Ymgynghoriaeth Gwynedd Consultancy (YGC) and Richards Moorehead & Laing Ltd (RML).

1.6.2 The EIA process has been managed by RML, considering information and assessments provided by the Welsh Government and the design team. Individual chapters have been prepared by authors from Ramboll and RML.

1.7 Publication of the ES

1.7.1 This ES has been submitted alongside the draft Orders for the Scheme. Statutory Orders are prepared by Welsh Ministers and published in draft. The draft Orders for the Scheme include the following:

- **Draft Trunk Road and Side Roads Order:** to deal with local highway issues (including roads, footpaths, bridleways, byways and cycleways) and private access issues. Side Roads Orders can relate to closure, diversion, improvement, or new provision.

- **Draft Compulsory Purchase Order**: which provides for the acquisition of the land and rights required.

1.7.2 The chapters of this environmental statement were completed in early 2020 in accordance with current methods of assessment. The publication of the ES has been delayed because of the Covid 19 Pandemic.

1.7.3 In 2019, after the EIA Screening and Scoping of the ES had been agreed, the Design Manual for Roads and Bridges, including Volume 11, was withdrawn but was not immediately replaced. In the

absence of a replacement, the old guidance was still applicable (see Section 1.5 above). The new guidance was published on a topic-by-topic basis over the months that followed. For this project, a review of the new guidance was completed by each topic specialist as it was published. In discussion with Welsh Government a decision was made to apply the new guidance in the following manner:

- **First consideration:** if the new guidance were published before an ES chapter was completed, and the work of assessment had not advanced beyond the evaluation of baseline data, the old guidance would be applied; *but*

- **Second consideration:** if the new guidance were considered to produce substantially different assessment outcomes, or where the old guidance might under report the significance of impacts, or the need for mitigation, the new guidance would apply.

1.7.4 Data about the site and the setting, on which the ES assessments are based, has been gathered since 2017 with some of the ecological surveys continuing into 2021. The assessments have been reviewed periodically to determine the impact of new data arising from the surveys. No changes have emerged that would change the assessments or the conclusions of any chapter.

1.8 Appropriate Assessment

1.8.1 In accordance with Regulation 63 of The Conservation of Habitats and Species Regulations 2017, an Assessment of Implication of European Sites (AIES) has also been carried out to consider the possible effects of the Scheme on European sites. The findings of the AIES are reported within a Statement to Inform an Appropriate Assessment (SIAA). This is a separate document to the ES.

1.9 Britain's Departure from the European Union

1.9.1 The UK left the EU on 31 January 2020 and entered a transition period until the 31 December 2020. The transition period has now ceased, and new Regulations have come into force. The Conservation of Habitats and Species Regulations 2017 (as amended) will remain in place with only relatively minor changes (the changes are being effected by the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019 which came into force on 31 December 2020).The Habitat and Species Regulations 2017 (as amended) (referred to as the 2017 Regulations) are one of the pieces of domestic law that transposed the land and marine aspects of the Habitats Directive (Council Directive 92/43/EEC) and certain elements of the Wild Birds Directive (Directive 2009/147/EC) (known as the Nature Directives).

1.9.2 The 2017 Regulations (Regulation 9(1)), as amended by the 2019 Regulations, require the Secretary of State and Welsh Ministers to secure compliance with the requirements of the Nature Directives. Any new powers in the 2019 Regulations must be exercised in line with the Directives and retained EU case law up to 1 January 2021.

1.9.3 The European Commission's role in the Habitat Regulations Assessment (HRA) derogation test process will be replaced by the Secretary of State for the Environment, Food and Rural Affairs. The HRA regime set out in the Conservation of Habitats and Species Regulations 2017 (as amended) will continue to apply in largely the same way. Parliament will however be at liberty to introduce future changes to the Conservation of Habitats and Species Regulations 2017 (as amended) since, after 31 December 2020, the UK is no longer bound by the EU Habitats and Wild Birds Directives.

1.9.4 Changes include arrangements replacing the European Commission's functions with regard to the imperative reasons of overriding public interest (IROPI) test where a plan or project affects a priority habitat or species. The appropriate authority must consult with the devolved administrations, JNCC and any other person the appropriate authority considers appropriate in developing its opinion. The appropriate authority will also take account of the broader national interest in developing their IROPI opinion. The appropriate authority will publish the IROPI opinion they give to the competent authority.

1.9.5 SACs and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network. The 2019 Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes existing SACs and SPAs, new SACs and SPAs designated under these Regulations. Any references to Natura 2000 in the 2017 Regulations and in guidance now refers to the new national site network.

1.9.6 This assessment was undertaken prior to the transition period and adoption of the amended Regulations. It is acknowledged that while the process may have changed slightly, the conclusions reached in the assessment are the same.

1.10 How to View or Obtain Copies of the Documents

Viewing the Documents

1.10.1 Copies of the draft Orders, the ES and supporting information are available to view free of charge during the objection period either online (via the document library or Welsh Government project websites for Junction 14/15 and Junctions 16/16A) or by visiting one of the following premises:

- **Conwy Culture Centre,** Town Ditch Road, Conwy, LL32 8NU
- **Penmaenmawr Library**, Bangor Road, LL34 6DA
- **Llanfairfechan Library**, Village Road, LL33 0AA

1.10.2 Due to Covid-19 social distancing restrictions, viewing will be by prior appointment only. To arrange to view the documents, please contact the venues directly. In the event of changed COVID-19 restrictions or for further information, please contact the Scheme Public Liaison Officer or the project team. Their contact details can be found on the Help and Support page.

Obtaining Copies

1.10.3 Further copies of the Non-Technical Summary can be obtained free of charge from the Welsh Government in Cardiff at the following address: Orders Branch Transport Department of Economy, Science and Transport Welsh Government Cathays Park, Cardiff CF10 3NQ.

1.10.4 The full Environmental Statement is available to view and download from the Welsh Government website: http://www.wales.gov.uk/transport

1.10.5 Electronic copies of the Environmental Statement (on USB) can be purchased from the above Welsh Government address.

1.10.6 Paper copies of the Environmental Statement are also available from the above address, although an administrative charge will be made to cover the cost of producing (price on application).

1.11 Next Steps

1.11.1 Following publication of the draft Orders, there will be an opportunity to support, comment or object to the draft Orders, put forward alternative proposals, or comment on the Environmental Statement by writing to the Welsh Government at the address given above for obtaining copies of the ES. All such correspondence should be sent to arrive at the Welsh Government no later than 6 weeks after the publication date.

1.11.2 Welsh Government will consider all of the responses to the draft Orders and then decide whether to hold a Public Local Inquiry. Such Inquiries are held before an independent Inspector who would hear and consider the evidence both for and against the published Scheme and subsequently report the findings and recommendations to the responsible Welsh Ministers. The Welsh Ministers would consider all issues before deciding whether to proceed with the Scheme and, if so, make the Orders with or without modification.

1.11.3 Subject to the above process, the key dates for progressing the scheme are set out in Figure 1.2.

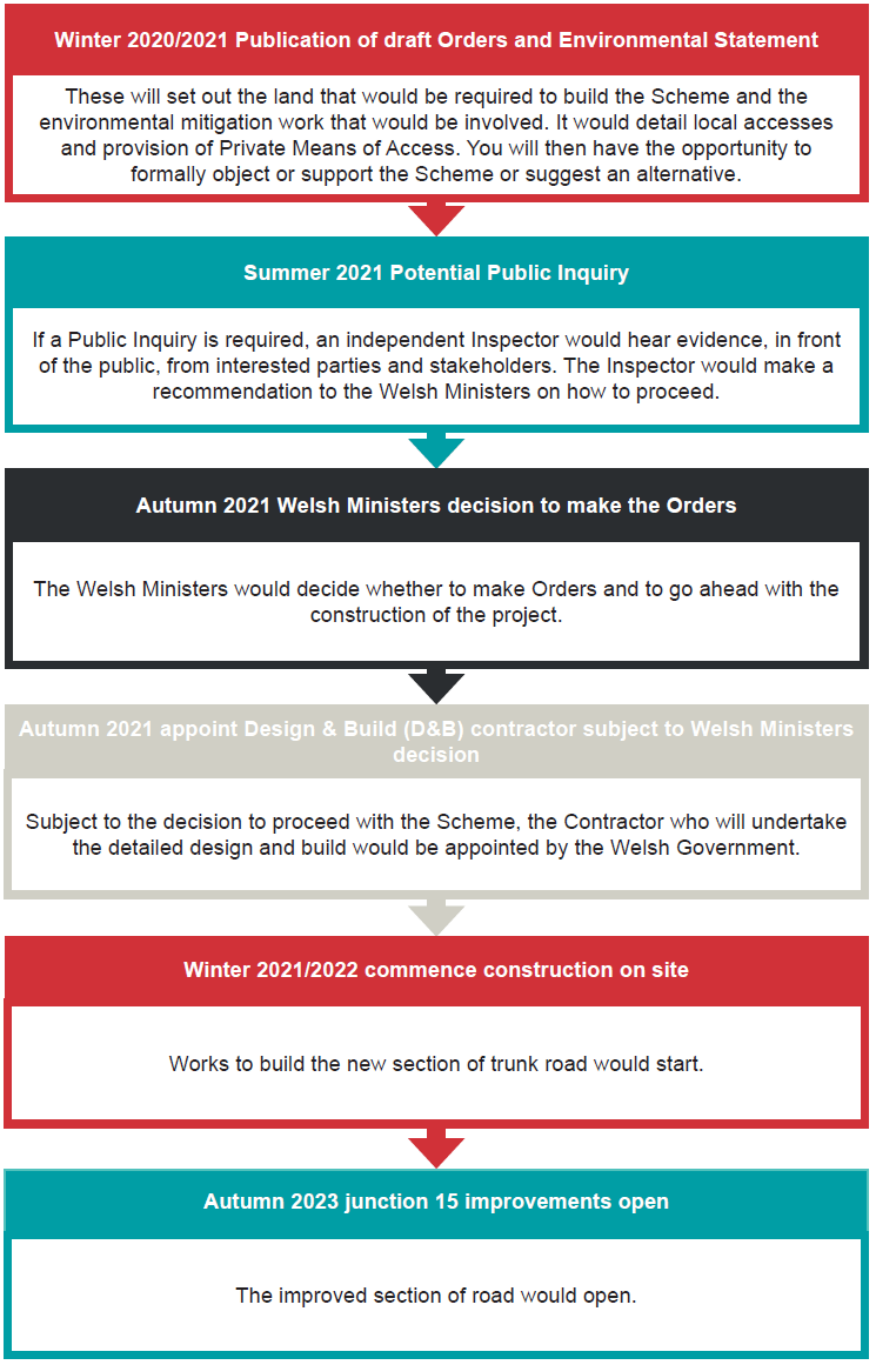

Figure 1.2: Project Timeline

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 2 DESCRIPTION OF THE SCHEME

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2. DESCRIPTION OF THE SCHEME

2.1 Chapter introduction

2.1.1 This chapter provides the description of the Scheme together with the process of construction, which forms the basis for the environmental assessment provided in this Environmental Statement (ES).

2.1.2 As described in Section 2.2 the Scheme is located at Junction 15 of the A55, which is the primary junction for Llanfairfechan, Conwy. The Scheme's objectives detailed in Section 2.4 have been developed in response to problems and opportunities identified (in Section 2.3) through consultation with key stakeholders and the public, in relation to the existing junction arrangement.

2.1.3 The Scheme layout is shown in the General Arrangement Drawings included in Appendix 2.5, while the proposed Scheme with environmental Mitigation is shown in Appendix 2.6. Visualisations of the completed Scheme are included in Appendix 2.7.

2.1.4 The Scheme involves a number of measures intended to improve the corridor associated with the A55 around Junction 15:

a) The removal of Junction 15 roundabout and replacement with a new grade separated junction providing on and off slip roads in both directions;
b) A range of Active Travel measures to enhance the provision made for walkers and cyclists that would promote active travel journeys. These measures would improve connections such as with Pendalar and the Promenade to the local network within Llanfairfechan town enabling improved access to local facilities, as well as to established long-distance routes including the National Cycle Network Route 5;
c) Enhancement of public green space with more generous verges and new tree and shrub planting and a gateway design for Llanfairfechan;
d) Street improvements to Penmaenmawr Road and Shore Road East; and
e) Minor junction improvement works at Junction 14, prior to the commencement of construction works at Junction 15.

2.1.5 Further information with respect to the Scheme description, the design approach and the construction strategy, can be found in Sections 2.5 onwards.

2.1.6 The likely significant effects of the Scheme have been described throughout the ES based on what is likely (i.e. the likely eventuality) considering the requirements of the EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU. Several measures have been incorporated into the design of the Scheme to avoid or reduce potential adverse environmental effects. In some cases, these measures may result in enhancement of environmental conditions. Details of measures forming part of the design of the Scheme are listed later in this chapter. These measures have been considered in assessing the effects of the Scheme.

2.1.7 Chapters 2 and 3 of this ES, together with the subsequent topic chapters, provide the data and information required to identify and assess the likely significant effects of the Scheme in accordance with Annex IV of the EIA Directive.

2.1.8 'Chainage' (ch) is the term used to refer to a distance in metres from the western end of the Scheme. For example, chainage (ch) 750 is located 750 metres east from the western end of the Scheme.

2.2 Context

2.2.1 The A55 Junction 15 Scheme lies within the administrative area of Conwy County Borough Council (CCBC). Figure 2.1 shows the Scheme in relation to the administrative areas of Gwynedd, Snowdonia National Park and Conwy.

2.2.2 The A55 is important to the economy of North Wales. It forms part of the Trans-European Transport Network (TEN-T), connecting coastal communities, transporting people and goods to homes, industry and employment, provides access to ports and serves the Welsh tourism industry. The topographical setting of the A55 is shown on Figure 2.2.

2.2.3 Between Llanfairfechan and Conwy the A55 and the North Wales Chester to Holyhead railway follows a tightly constrained corridor to pass the northern extreme of the Snowdonia massif where mountainous terrain abuts the coast and splits the coastal plain. The A55, which runs parallel with, and in proximity to the railway is punctuated by three tunnels. The first, lies to the east of Junction 15 and carries the A55 through a headland known as Pen y Clip. The second tunnel is through the headland at Penmaenbach, which lies to the east of Junction 16. The third is the River Conwy Tunnel.

2.2.4 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 14 at Madryn approximately 2.8km 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, meaning that there are no alternative routes in and out of the town other than via the A55.

2.2.5 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. The proposed Scheme would replace the at-grade roundabout with a grade-separated junction which would 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 would be moved south towards residential properties along Penmaenmawr Road. Further details of the highway design improvements can be found in 2.6.

2.2.6 The settlement at Llanfairfechan traces its origins back to the Middle Ages, beginning huddled along a narrow winding lane that climbed the hill beside the Afon Llanfairfechan. Settlement growth in the 19th century occurred along the Penmaenmawr Road, Station Road and by the sea. Llanfairfechan grew rapidly with the arrival of the railway in 1845, with the new main streets laid out and built up by the 1870s. By the 1920s the town had developed a wide promenade and supported a thriving tourism trade. Economic decline commenced in the 1970s and continued through to the end of the century, with many shops closing and services disappearing from the town. Possibly because of economic decline the population of Llanfairfechan has been falling.

2.2.7 In 1989 the A55 Llanfairfechan Bypass was constructed next to the railway, introducing large structures, retaining walls, a wide dual carriageway and fast-moving traffic. A wide swathe of the shoreline landscape was lost, including a group of terraced houses or apartments that stood beside where the A55 Junction 15 roundabout now stands.

2.2.8 Llanfairfechan sits astride the Afon Llanfairfechan which initially flows northwest for about 5km in an elevated and steep-sided upland valley. For the last 2.5km the valley widens out to form the undulating agricultural landscape of the coastal plain. The land is substantially pasture, with some woodland. Along the edge of the hills are scattered farms and rural residential properties linked by minor lanes.

2.2.9 Whilst the centre of the town Llanfairfechan occupies land beside the river, some of the highest residential areas extend to the foot of the hills. To the east of the river urban and suburban residential areas extend to the coast and eastwards into a tapering strip of land below Pen y Clip. To the west of the river lies the large park associated with Bryn y Neuadd Hospital. To the north of the A55 and the railway, the river discharges into Conwy Bay with the residential area of the promenade tapering away to the east and an area of sports, leisure and allotment land to the west. At the west end of Llanfairfechan lies Junction 14 on the A55, known as Madryn. This junction lies approximately 600 metres into the administrative area of Gwynedd. Here the coastal plain gradually widens to the west with the settlements of Abergwyngregyn and Talybont lying 7 and 18km away respectively.

2.2.10 While the river flows roughly south east to north west, the A55 and railway form a south west to north east transport corridor which divides the coastal plain and most of the town from the coast and restricts lateral movement of people and vehicles.

2.2.11 There are a wide range of community facilities in the town of Llanfairfechan including schools, care homes, health centre, public halls, public parks and recreation areas, shops, banks, post offices, public houses, places of worship and a seaside promenade. The Wales Coastal Path and National Cycle Network Route 5 follow the A55 and the coast. Among these are some sensitive receptors.

2.2.12 The National Cycle Network (NCN) Route 5 follows the A55 along the route corridor from the headland of Penmaen Mawr in the east, to where it crosses the expressway to continue along Penmaenmawr Road and Aber Road in the west. The North Wales Coast Path follows the same route as the NCN Route 5, but from Station Road continues along the coast to Aber Ogwen.

2.2.13 There are several statutory designated nature conservation sites in the setting of Junction 15, including a Special Protection Area (SPA) and a Special Area of Conservation (SAC). Details of these are provided in Chapter 8 Nature Conservation and shown on Figures 8.1 and 8.2. Snowdonia National Park (SNP) lies close to the Scheme (shown in Figure 2.1). Further details of these areas are provided in Chapter 7 Road Drainage and the Water Environment and Chapter 9 Landscape and Visual Effects.

2.2.14 Heritage designations in the area include several Listed Buildings (LB), two Registered Historic Parks and Gardens, a Scheduled Ancient Monument (SAM) and a Conservation Area. The Conservation Area covers much of the urban fabric. Details of these are provided in Chapter 10 Cultural Heritage.

2.2.15 Photographs illustrating the existing situation are provided in Figure 2.3 (Sheets 1 to 4).

2.3 Problems and opportunities associated with the existing situation

2.3.1 This section set out how the problems and opportunities are seen and have been considered together and provide a basis for the overall design strategy for all aspects of the Scheme. Aspects of the strategy that can be implemented using the powers given under the umbrella of Highways Act 1980 would be possible as part of the Junction 15 Improvements Scheme, but others may have to be carried out by others in the future.

2.3.2 Fundamental to the identification of problems and opportunities has been the involvement of the local communities through ongoing key stakeholder meetings and a programme of public engagement events, which have been held since the first Public Information Exhibition in December 2017 (see Chapter 4). The community of Llanfairfechan have raised many of the concerns addressed in the Scheme, both during these events and directly via the Public Liaison Officer. Some of the principal environmental concerns have related to traffic noise, retaining views of the sea and access to the shore across the road.

2.3.3 A summary of the existing problems that have been identified as being associated with the existing situation are listed in Table 2.1. These problems have been confirmed through consultation with key stakeholders, including Conwy County Borough Council (CCBC), North and Mid Wales Trunk Road Agency (NMWTRA) and the Welsh Government.

Table 2.1: Existing Problems associated with the existing situation

Issue	Existing Problems
Environmental and social issues	Existing environmental issues include noise and the visual impact associated with the A55. The Welsh Government has identified the section along the A55 near Llanfairfechan and Penmaenmawr as being a priority area for intervention in North-West Wales. This includes Noise Action Priority Areas (NAPPA) at Junction 15 and 16. This is addressed in Chapter 13 Noise and Vibration. Social issues include those associated with the communities' reliance on the A55 plus the impact of the A55 severing the communities from themselves and the coast.
Transport - Safety	The junctions and A55 mainline between Junctions 14 and 16A do not comply with current design standards. Based on feedback from public consultation, there is a perception that the roundabouts are dangerous, with members of the public raising concerns about near misses and their fears of using the junctions. Transport Safety is addressed in the WelTAG Stage 2 Report.
Transport - Delays	The A55 corridor experiences seasonal traffic and delays, especially during summer weekends and where peak flows correspond with the Holyhead/Dublin ferry.
Poor Network Resilience	The primary issues identified relate to the lack of local and strategic diversion routes, during incidents or planned works, and the operational requirements for tunnel maintenance.
Sustainable Travel	Public consultation has identified that there is a perception that there is a lack of competitive sustainable travel options, poor coastal access for non-motorised users and concerns with respect to the safety of cyclists.

2.3.4 Many of these problems primarily relate to environmental and social issues associated with the relative location of the settlement and hinterland to the existing A55 corridor, in addition to transport problems. The proposed Scheme provides the opportunity to address some of the

issues and potentially provide improvements to the existing situation as discussed below.

Environmental and Social Issues

2.3.5 Ever since the A55 Expressway was opened through Llanfairfechan in the 1980s, residents have expressed concern about the poor relationship of the road with the urban setting. In particular, the criticisms are concerned with the intrusive character of the road, its traffic noise, its effects on the town and on views to the sea. However, the A55 is also vitally important as the only road in and out of Llanfairfechan and residents are dependent on it to travel to work, to trade and to access services in other places.

2.3.6 Although established links under or over the railway to the sea were retained, connections between the town and the shore are perceived to be more constrained by the A55 Expressway and to be less attractive to residents and visitors. Two low and narrow railway bridges restrict vehicular and pedestrian access from the town to the Promenade. The promenade, as well as the whole town, has declined as a seaside destination. Several terraces of houses remain on the seaward side of the expressway and whilst railway bridges restrict access for large vehicles, there is the benefit that the Promenade remains undisturbed by through traffic and large vehicles. The promenade retains much of its form and open space, but local residents, consulted regarding the junction improvements, indicated that traffic noise from the Expressway and the physical barriers to movement across the A55 are negative influences.

2.3.7 The Local Development Plan (LDP) acknowledges that Llanfairfechan has a shortage of public open space and much of this is on the Promenade. To the south and east of Llanfairfechan there is an extensive network of public rights of way and unclassified roads that provide access into the mountains and to extensive areas of designated Open Access land. The proposed Scheme provides opportunities for improved access for non-motorised users, linking communities to the coast and local amenities such as Ysgol Pant Y Rhedyn, through the provision of additional safer shared footpaths and cycleways. These routes are described further in Section 2.5 and Chapter 14 All Travellers.

2.3.8 South west of the town lies the extensive hospital and Registered Park and Garden of Bryn-y-Neuadd. Large areas of the town are within Conservation Areas. Land allocated for housing lie on the south side of the A55 Expressway, including a large area adjacent to A55 Junction 15. To the south and east the land is in agricultural use, some of it steep. To the north east are the scree-covered slopes of Penmaen Mawr and the tiny former quarrying community of Gerazim.

2.3.9 There are limits on the future expansion of the town due to topography and other established land uses. In particular, the sea, the railway and the A55 Expressway limit settlement growth on flatter land in the north west.

2.3.10 The Fernbank development, which consists of two-bedroom apartments and three-bedroom homes, was completed in 2018 and lies close to the westbound carriageway of the A55 near Junction 15. Unless circumstances change, further development of the town is likely to be in small increments to meet modest demands. These incremental expansions of the settlement could gradually increase demand for local services and make remaining services more viable. The potential for either combining the existing junior schools or the provision of a new purpose-built school has been mooted, with a number of locations being suitable[1]. Whilst an expanding settlement means a growing population and potentially enhanced viability for commercial and public services, there would be a related increase in traffic using the junctions on the A55 and

[1] https://www.conwy.gov.uk/sep/snap/llanfairfechan/en/ [accessed December 2019]

this will have been considered in predicted traffic growth.

Traffic and highways

2.3.11 Junctions 15 and 16 are the only at-grade roundabout interchanges on this major North Wales trunk road. This has led to increased journey times and poor journey time reliability. The roundabouts contribute to the incidence of stationary traffic backing up into Pen-y-Clip and Penmaenbach Tunnels, which in turn can be an increased safety hazard. The proposed replacement junction arrangement at Junction 15 would be designed and constructed in accordance with modern standards. Thus, providing opportunities to optimise traffic management along the section of the A55 corridor, both during normal operation and planned maintenance, as well as during incidents.

2.3.12 The existing dual carriageway (A55) was built in the 1980s along the narrow shoreline to avoid demolition of properties, where possible. In order to fit the road into the narrow corridor, the designers had to use horizontal and vertical alignments which based on modern (DMRB 2008) design guidance are considered subject to departures from standard.

2.3.13 By removing the roundabout at Junction 15 and replacing it with a safer junction and associated infrastructure, the proposed Scheme supports the aspiration to bring this section of the A55 up to Expressway standards including the provision of concrete central barriers instead of steel barriers (thus reducing the frequency of routine maintenance work and the need for replacement of assets following incidents). Moreover the provision of a new junction at Junction 15 would remove a number of existing features, which would be considered non-compliant with modern design standards and have associated safety and maintenance liabilities (such as those associated with existing manhole covers that are located within the carriageway, resulting in problems with potholes in the surrounding road surfacing). It would also reduce the need for routine maintenance tasks including grass and hedge cutting to be carried out at the roundabout, reducing the need for temporary closures of the carriageway to allow the work to be carried out safely.

2.3.14 The dual-carriageway is perceived by residents to be visually intrusive into attractive seaward views. Since it was constructed residents have found that their access to facilities and area across the road is restricted, for example the beach and promenade. Traffic noise is also considered to be intrusive, particularly at peak periods of use or when sirens are used by emergency services vehicles. The installation of speed-reducing ‘rumble strips’ at approaches to the roundabouts causes additional vehicle noise. These would be removed as part of the Scheme.

2.4 Scheme Objectives

2.4.1 The transport and technical Scheme objectives have been developed during previous development work and engagement, aiming to address one or more of the identified problems. During the early stages of Key Stage 3 the problems and objectives were refreshed during a focused workshop event with key stakeholders, considering the WelTAG 2017 guidance and Wellbeing of Future Generations (Wales) Act wellbeing goals.

2.4.2 The Scheme objectives are:

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 journey times and journey time reliability on the A55 from Junction 14 to Junction 16A
OBJ4	Improve resilience on the A55 for strategic and local traffic
OBJ5	Improve journey times, journey time reliability and safety for access onto the A55 from Llanfairfechan and Penmaenmawr
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

Technical objectives

TECJ OBJ9	Minimising technical departures from standards
TECH OBJ10	Minimising need to reduce speed limits
TECH OBJ11	Minimising disruption during construction

Scheme Environmental Objectives

2.4.3 Working with the Statutory Environmental Bodies the following Scheme Environmental Objectives were agreed:

We want to achieve:

A Avoidance or mitigation of impacts to provide:

a) Connectivity to and from the coast, and either side of the A55 so that communities continue to enjoy public services and open spaces;
b) Protection of community assets and local businesses from adverse impacts during construction;
c) Protection of the quality of urban spaces, listed buildings, and registered Parks and Gardens that are adversely affected through the careful alignment of roads, surfacing of footways, earthworks and tree and shrub planting;
d) Minimise adverse impacts on buried archaeological sites;
e) Landscape integration the junctions into their coastal settings by avoidance of further 'industrialisation' of the road corridor;
f) Consider the design of the Scheme to achieve an overall reduction in traffic noise nuisance, problems associated with airborne pollution and visual impact of traffic;
g) Protect valued seaward views in the long term through careful design and aftercare
h) Minimise light spill from highway lighting to avoid or reduce the impact on 'Dark Skies' within the Snowdonia National Park;
i) Protection of the marine SPA, associated species and habitats;

j) Improved road drainage to reduce the adverse impacts of A55 traffic pollutant spills on water quality in watercourses and on the sea;
k) Protect habitats and biodiversity and provide habitats designed to suit the coastal context;
l) Consider whole-life cost, health and safety risks and onerous management commitments when designing the soft estate.

B Enhancements to support the purposes of the Well-Being of Future Generations Act:

a) Support community life and economic viability through enhanced cohesion and connectivity, support for education, learning and community involvement;
b) Enhanced quality and quantity of public spaces associated with the road corridor;
c) Improve access and enjoyment of the coastal setting, the townscape and the seafront, while enhancing opportunities for walking cycling and healthy lifestyles;
d) Enhance biodiversity through habitat creation, habitat connectivity and improvements within the road corridor in a manner that reflects and supports the coastal setting.

2.5 Description of the highways design proposals for the Junction 15 Improvements

2.5.1 The Economy and Transport Minister Ken Skates announced the preferred option for Junction 15 on 5th April 2019. Having taken full account of the technical, social, economic and environmental aspects of the Scheme and listened carefully to the consultation responses, Option D has been selected as the preferred route to replace the roundabout at Junction 15 Llanfairfechan. Further information with respect to the alternatives considered can be found in Chapter 3.

A55 Trunk Road

2.5.2 With the purpose of removing the roundabout, the Scheme 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. The eastbound slip roads would rise on embankment and viaduct to meet with a signal controlled T-junction to the north of the overbridge. The westbound traffic off the A55 would meet with a priority junction with the link road, at the south side of the overbridge. The General Arrangement drawings are shown in Appendix 2.5.

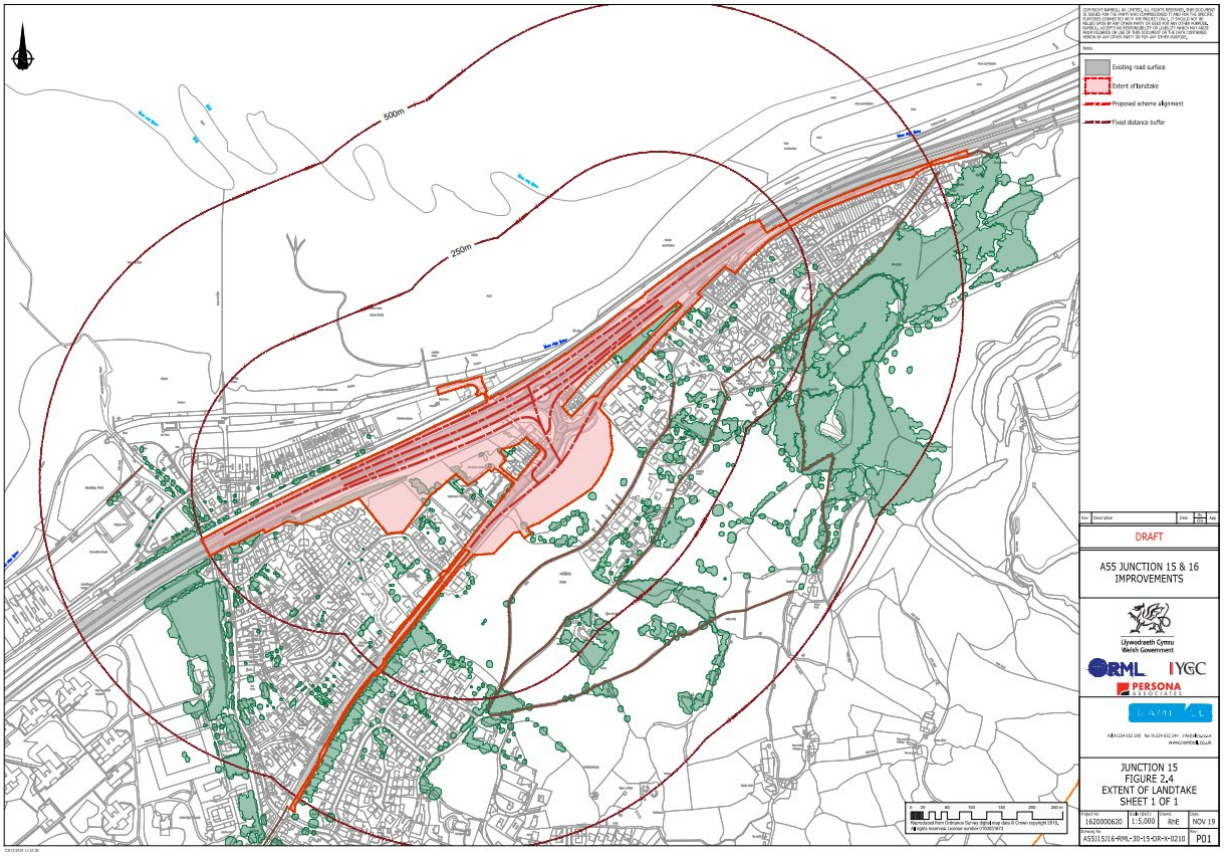
2.5.3 Proposed eastbound slip roads, on the north side of the junction, would rise on embankment and viaduct up to a maximum of 7.5 metres above existing ground level, to cross the dual carriageway on the proposed overbridge. To accommodate the junction and the necessary highway alignments and slip roads, the A55 dual-carriageway would be moved, up to 6 metres south, towards residential properties along Penmaenmawr Road. As a consequence, the arrangement would affect Penmaenmawr Road and the link road to the existing Junction 15. The change in alignment means that for the property St Brendas, the new westbound slip road would be approximately the same distance away from the property as the existing carriageway but significantly higher (circa 4 metres)with a retaining wall approximately 3 metres from the property and steep embankment rising above the wall.

2.5.4 The realigned A55 mainline and lengthened slip roads would extend approximately 337 metres south west from the existing roundabout for a distance of 610 metres, to a point approximately 222 metres north east from the existing roundabout, where the road tapers back to meet the existing dual carriageway.

2.5.5 To the south of the bridge over the dual carriageway slip road, the link road would descend towards Penmaenmawr Road and a signal-controlled junction. The west bound slip roads on the south side of the dual carriageway would rise on embankments to meet the link road. To accommodate the junction, which must meet current highway design standards, Penmaenmawr Road would be moved further south, cutting into the hillside.

2.5.6 The total length of the new trunk road would be approximately 2337 metres (including slip roads, overbridge and link road) with approximately 400 metres of side roads affected. The extent of permanent land-take for the Scheme is shown in Figure 2.1.

Figure 2:1: Extent of Land Take at Junction 15



Local Side Roads

2.5.7 The existing highway network would be modified at a number of locations, where the proposed improvements would join or cross existing routes. Details are provided in Table 2.2.

Table 2.2: Local side roads

Side road	Proposed works
Penmaenmawr Road (east of Junction 15)	Realigned south at the approach to the junction for a length in the order of 118 metres. Although some of the existing paving would be located under the new alignment, much of it would be within the landscaped area adjacent to the east of the new link road to the overbridge; where it is proposed that a surface water attenuation basin would be located.

Side road	Proposed works
Penmaenmawr Road (west of Junction 15)	Realigned south at the approach to the junction for a length in the order of 205 metres. Much of the existing paving would be under the new road alignment.
Shore Road East (south of A55)	Alignment modified to accommodate the realigned Penmaenmawr Road, over a length in the order of 77 metres.
Shore Road East (north of A55)	The improvements to Shore Road East to the north of the A55 consist primarily of kerb realignment works.

Design speed

2.5.8 The Design Speed of the proposed Trunk Road is 120kph and would be subject to the national speed limit. Side Roads would be in keeping with the existing local road network.

Traffic flows

2.5.9 Details of traffic flows are provided in Appendix 2.1 Traffic Forecasting Report, but a summary of the information is provided in Tables 2.3 and 2.4.

2.5.10 Table 2.2 provides a summary of the total (all vehicles) for the Existing and Predicted traffic flows on the new trunk road in the Base Year (2016), the Opening Year (2023)[2] and the Design Year (2037).

2.5.11 Table 2.3 provides a summary of the Existing and Predicted flows of heavy goods vehicles (HGVs) on the new trunk road in the Base Year (2016), the Opening Year (2023)[2] and the Design Year (2037).

[2] Due to an extension by 6 months in the proposed construction programme the Opening Year has changed from late 2022 to early/mid 2023. It should be noted that the traffic modelling has not been updated to reflect this change in opening year due to the anticipated 1% growth in traffic between 2022 and 2023. It is considered that this change in traffic flow would have a negligible impact on the operational performance of the highway network, as the network is not operating near capacity. The following assessment is therefore based upon traffic data from 2022, whilst assuming an opening year of 2023.

Table 2.3: EXISTING AND PREDICTED AADT TRAFFIC FLOWS (ALL VEHICLES) - Summary of the Total Two Way Traffic Flows for the new trunk road in the Base Year (2016), Opening Year (2022) and Design Year (2037)

Location	Base Year 2016	Opening Year 2023			Design Year 2037		
	Do Nothing	Do Minimum	Do Something	Difference from Do Minimum	Do Minimum	Do Something	Difference from Do Minimum
A55 south of J14	34,251	37,066	37,066	**0%**	42,933	42,933	**0%**
A55 northbound J14 off/on slip	1,481	1,551	1,527	**-2%**	1,668	1,639	**-2%**
A55 southbound J14 off/on slip	1,995	2,170	2,029	**-7%**	2,440	2,339	**-4%**
A55 between J14 and J15	30,775	33,345	33,511	**0%**	38,825	38,954	**0%**
Promenade, Llanfairfechan	1,148	1,248	1,248	**0%**	1,444	1,445	**0%**
Shore Road East, Llanfairfechan	1,148	1,248	1,248	**0%**	1,444	1,445	**0%**
Aber Road, Llanfairfechan	3,476	3,722	3,556	**-4%**	4,108	3,979	**-3%**
Penmaenmawr Road (by Station Road / Village Road Junction), Llanfairfechan	3,764	4,167	4,049	**-3%**	4,865	4,792	**-2%**
Penmaenmawr Road, Llanfairfechan	3,828	4,320	4,487	**4%**	5,170	5,300	**3%**
Penmaenmawr Road (just off slip), Llanfairfechan	5,306	5,985	6,151	**3%**	7,101	7,230	**2%**
A55 north of J15	35,079	38,084	38,084	**0%**	44,107	44,107	**0%**
A55 between J15 and J15A	35,079	38,084	38,084	**0%**	44,107	44,107	**0%**
Station Road, Llanfairfechan	1,181	1,271	1,270	**0%**	1,465	1,465	**0%**

Table 2.4: HEAVY GOODS VEHICLES (HGVs)- Summary of the Total Two Way Traffic Flows for the new trunk road in the Base Year (2016), Opening Year (2022), Design Year (2037) and Horizon Year (2051)

Location	Base Year 2016	Opening Year 2023			Design Year 2037		
	Do Nothing	Do Minimum	Do Something	Difference from Do Minimum	Do Minimum	Do Something	Difference from Do Minimum
A55 south of J14	3,087	3,235	3,235	**0%**	3,619	3,619	**0%**
A55 northbound J14 off/on slip	80	84	84	**0%**	93	93	**0%**
A55 southbound J14 off/on slip	77	81	81	**0%**	90	90	**0%**
A55 between J14 and J15	2,930	3,071	3,071	**0%**	3,436	3,436	**0%**
Promenade, Llanfairfechan	44	46	47	**1%**	52	52	**1%**
Shore Road East, Llanfairfechan	44	46	47	**1%**	52	52	**1%**
Aber Road, Llanfairfechan	157	164	164	**0%**	184	184	**0%**
Penmaenmawr Road (by Station Road / Village Road Junction), Llanfairfechan	157	165	164	**0%**	184	184	**0%**
Penmaenmawr Road, Llanfairfechan	163	171	172	**0%**	191	192	**0%**
Penmaenmawr Road (just off slip), Llanfairfechan	288	302	302	**0%**	338	338	**0%**
A55 north of J15	3,160	3,312	3,312	**0%**	3,705	3,705	**0%**
A55 between J15 and J15A	3,160	3,312	3,312	**0%**	3,705	3,705	**0%**
Station Road, Llanfairfechan	35	37	37	**-2%**	41	41	**-2%**

Active Travel Measures

2.5.12 As part of the Scheme a number of proposed improvements to walking and cycling routes are presented below. It is anticipated that these would improve the quality and connectivity of the existing walking and cycling routes. Figure 14.5 (in Volume 2)) identifies the location of the proposed 'mini Schemes' in the vicinity of J15.

NMU Mini Scheme 4: Mona Terrace

2.5.13 Mona Terrace is a private no-through road for vehicles. Although it is feasible for cyclists and pedestrians to use the road, this is discouraged by residents. The official National Cycle Network Route 5 (NCN 5) follows Pendalar, with a gradient of 21%. This is an on-road route, through a residential area with on street parking.

2.5.14 The proposed mini-Scheme consists of a 240m segregated cycle/footway on trunk road land adjacent to Mona Terrace. The mini-Scheme would be set at a lower level than Mona Terrace to minimise the impact on residents' views. This would reduce the gradient of the route to approximately 6% providing improved accessibility and connectivity to amenities in Penmaenmawr (or further afield in Conwy) or in Llanfairfechan. A retaining wall is required to one or both sides over a significant length.

NMU Mini Scheme 5: Penmaenmawr Road - East of Junction Improvements

2.5.15 Consists of a 240m segregated cycleway on the verge adjacent to the existing footway. The off road cycleway would provide a link from Llanfairfechan to the replacement footbridge and Mona Terrace. In addition the link would also provide on off road cycleway from Pendalar to Ysgol Pant Y Rhedyn.

NMU Mini Scheme 6: Penmaenmawr Road - West of Junction Improvements

2.5.16 The Scheme consists of a 550m segregated cycleway/footway to south side of Penmaenmawr Road, providing a direct route into the village centre and associated local facilities. The cycleway also provides a segregated route between Llanfairfechan village and Ysgol Pant Y Rhedyn. The existing route on the north side is maintained as footway only.

NMU Mini Scheme 7: Replacement footbridge at Pendalar

2.5.17 Consists of a replacement footbridge with Disability Discrimination Act (DDA) compliant ramps and enhanced access, to replace a footbridge that would no longer fit due to the increased span. This would provide improved access to the coast.

NMU Mini Scheme 8: Improvements from Pendalar to Shore Road East, to the north of the A55

2.5.18 During construction, access would be required along the existing maintenance access track to the north of the A55. Following construction, the access track would be resurfaced. This track ties in with the new ramps for the replacement footbridge, providing improved links to the shore from Pendalar. The works would also tie into the shared open space improvements which extend along Shore Road East. This mini-scheme received little support from stakeholders and has been removed from the Scheme.

NMU Mini Scheme 9: Llanfairfechan Promenade Access

2.5.19 Improvements would include the reconfiguration of the existing walls to improve cycle access, whilst maintaining level of protection for tidal flooding. The works would tie into the shared open space improvements which extend along Shore Road East and the improvements along the existing Network Rail maintenance access track.

Road drainage and disposal of water

2.5.20 The Scheme would use conventional piped drainage to remove water from the carriageway. This drainage, along with attenuation storage, would be designed to store surface water and then discharge it to the existing network, under the North Wales coastal railway line and then into the sea via existing outfalls. The drainage measures are set out in Chapter 7. The locations of the proposed road drainage outfalls are detailed in Table 2.5 below.

Table 2.2: Locations of Proposed Road Drainage Outfalls

Outfall	Approximate Chainage	Description
A	Chainage 200m north side	Existing Sea outfall
B	Chainage 275m north side	Existing Sea outfall
C	Chainage 475m north side	Existing Sea outfall

Fencing

2.5.21 Fencing of the road boundary would be provided to delineate the road corridor, areas of soft estate and the Welsh Government landownership. Special fencing, designed to exclude wild mammals from the road, otters or badgers for example, would be provided where necessary. Barriers would be required to discourage access to hazardous locations, such as the tops of structures such as the viaduct, retaining walls and steep slopes. In other locations, where noise or visual and landscape assessments indicate they are required, the boundary would be formed by walls, or, for example, by acoustic barriers.

2.5.22 A summary of the locations where proposed environmental fencing and barriers have been proposed is provided in Table 2-6 below. Indicative alignments are shown in the Environmental Masterplan included in Appendix 2.6.

Table 2.3: Locations of Proposed Environmental Mitigation Fencing/Barriers

Type	Status	Location
Noise barrier (solid fence up to 3m in height)	Existing fence retained	South side of the A55 from Station Road bridge to the east end of Maes-y-Glyn
	New noise barrier	South side of the A55 across Station Road bridge to Pant y Rhedyn playing fields.
	New noise transparent barrier	South side adjacent to St Brendan's, Sunny Bank, Glan Meurig, Glan Seirol, Fern Bank, and eastwards to chainage 500.
	Existing noise barrier	North side of the A55 from west of Station Road bridge to the commencement of the new fence (see below) to be defined on site during construction.
	New noise barrier	North side of the A55 from the end of the existing barrier along the north side of the proposed northern slip roads to

Type	Status	Location
		approximately 700m east of the proposed junction 15 overbridge.
	New noise barrier	Along north side of A55 carriageway for the full length of the slip roads on viaduct from chainage 150 to 450.
Mammal fence (based on standard badger fence to a height of 1.5 metres	New boundary fence	South side of Penmaenmawr Road from the site of the former Economy Car Centre to Chainage 0.00 by Earlfield. Access gates to the land to the south would be suitable for use in mammal fencing to exclude badger and otter.

Signs and communications

2.5.23 The improvements would incorporate signage, for example, in relation to junctions and destinations. Although there would be no proposed Intelligent Transport Systems (ITS) provided as part of the Scheme, it includes for the provision of ducting which would enable ITS to be installed after completion of the Scheme by others. The approximate locations of signs are indicated on the General Arrangement drawings in Appendix 2.5. A symbol is used to show the location but does not indicate actual sizes of signs. Design of signs to accord with standards would be the responsibility of the future design and build contractor.

Lighting

2.5.24 Highway lighting is already provided along this length of the A55 and on adjacent county roads and within the town of Llanfairfechan. New lighting would be installed along the A55 and at Junction 15 to meet current standards. Luminaires would be designed to emit no light above the horizontal level. LED Luminaires are proposed because these can be more directional and so reduce light spill beyond the road.

Utilities

2.5.25 The Scheme affects several utilities and all owners and operators of the various utilities have been consulted to establish how their equipment would be affected by the proposed Scheme. The design has taken these into account and seeks to minimise the impact.

Existing features affected by the Scheme

2.5.26 The requirement to provide a safe road with good visibility for drivers, pedestrians and cyclists means that sometimes features in the setting are adversely affected by the proximity of the new road and associated structures and earthworks. The route has been aligned to minimise the impact of the Scheme on adjacent properties, but demolition of two properties to the east of Shore Road East would be required. These consist of semi-detached residential properties. The realignment of the A55 dual carriageway and Penmaenmawr Road to the south of the existing routes and the introduction of longer slip roads would result in the loss of some well-established roadside planting.

Public rights of way

2.5.27 No existing public rights of way would require modification as part of the Scheme. Further details of existing public rights of way are provided in Chapter 14 (All Travellers) and are shown on Figure 14.1.

2.6 Design strategy for the Scheme

2.6.1 In June 2019 the project team, led by Welsh Government, met with the Design Commission for Wales (DCfW) to discuss the Scheme. The DCfW promotes the importance of good design for the built environment across all sectors, including infrastructure. The Design Commission reviewed the Scheme and responded by letter on the 28th June[3], welcoming the project team's analysis and insight regarding travel, traffic, future opportunities and the area's overall enhancement. The report is provided in a report which is included in Appendix 2.4.

2.6.2 The DCfW report acknowledged that the proposals had been through a WelTAG appraisal in accordance with Welsh Government procedures. It continued by stating that, 'there is a clear design ambition behind the Scheme focusing on the highway and the delivery of future enhanced links and spaces for the area, however, the aspects of connections, road safety, active travel, visual impact and public realm are topics that should be considered within a holistic design impact rational and this is not evident [in the material used to present the Scheme to the DCfW]. It is imperative that the access narrative is translated into all levels in the design process.

2.6.3 This section aims to set out how the Scheme has been considered holistically and to explain the design strategy. Fundamentally the design process has involved key stakeholder and public engagement events. A programme of these has been held since December 2017. The community of Llanfairfechan have raised many of the concerns we are aiming to address with the Scheme. Some of the principle environmental concerns have related to traffic noise, retaining views of the sea and access to the shore across the road. Specific social concerns raised by the community included that the Scheme design should minimise any loss of social housing.

Responding to the Scheme objectives

2.6.4 The vision that has emerged from the Scheme objectives, taking into consideration the problems and challenges that have been noted and the comments and advice from stakeholders is that Llanfairfechan should have a thriving coastal corridor of beaches, foreshore, strategic transport routes, countryside, public open space and residential areas that provide a clean environment, allows effective access to employment, viable public services and appropriate space for recreation. These should exist within a framework of green infrastructure, enhanced biodiversity, attractive urban and rural spaces and routes between valued local destinations.

Recent legislation that would assist in achieving the vision

2.6.5 The key policies and legislation behind achieving the vision, or to assist in achieving it are the *Well Being of Future Generations (Wales) Act 2015*, The *Active Travel (Wales) Act 2013* and the *Environment (Wales) Act 2016*. These are reflected in Planning Policy Wales Edition 10 (PPG10) and the newly draft National Development Framework (NDF).

2.6.6 **Well Being of Future Generations (Wales) Act:** the vision would be implemented initially through the construction and aftercare of the A55 Junction 15 Improvements Scheme, but also through longer term projects, implemented by others to achieve 'sustainable development', which is the '*process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals'.* The Well-being goals are set out in the Act.

[3] Design Review Report DCfW Ref 201: provided in Appendix 2.4

2.6.7 **Active Travel Act:** further duties of public bodies are set out in the Active Travel (Wales) Act 2013. The intention is to '*increase levels of walking and cycling in Wales to realise the many benefits that travelling actively brings - for individuals and for society'. It paves the way for a lasting transformation of how we plan and build walking and cycling infrastructure as well as encourage behaviour change in Wales. But the Act is only a part of the picture. It needs to be accompanied by a range of wider reaching actions and changes by government and others in order to achieve the change we wish to see.'* [4].

2.6.8 **Environment (Wales) Act**: put in place the necessary legislation to enable the planning and management of the natural resources (Natural Capital) of Wales in a more sustainable, pro-active and joined-up way than was previously possible. The sections of the Act that are most relevant are Sections 6 and 7:

2.6.9 Section 6, Biodiversity and resilience of ecosystems duty: The Section 6 'duty requires that public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems'.

2.6.10 Section 7, Biodiversity lists and duty to take steps to maintain and enhance biodiversity: 'this section replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will 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 Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section and encourage others to take such steps.'

2.6.11 **Road to Zero**: The United Kingdom Government's policy is for at least half of new cars to be ultra-low emission by 2030 and the sale of new conventional petrol and diesel cars and vans to end by 2040. Electric vehicles are currently considered a suitable low-emission alternative to the use of vehicles with internal combustion engines. The change to electric vehicles has the potential to benefit the town and the residents of Llanfairfechan by reducing exhaust emissions and reducing some aspects of traffic noise.

2.6.12 **Planning Policy Wales Edition 10**: published in December 2018, sets out to 'promote actions at all levels of the planning process which is conducive to maximising its contribution to the well-being of Wales and its communities. It encourages a wider, sustainable and problem-solving outlook which focuses on integrating and addressing multiple issues'[5]. PPW10 encourages the 'preparation of development plans and strategies and individual proposals' to 'stimulate and support innovative and creative ideas as well as high standards of evidence and assessment' so that sustainable improvements can be achieved.

Environmental Design Principles (Mitigation and Enhancement)

2.6.13 The design for the Scheme has been developed iteratively by the design team to ensure that the most appropriate solutions have been identified and developed. Numerous minor adjustments were made to improve the design or to avoid or minimise impacts. The proposed Scheme is complex because it must satisfy wide ranging Scheme objectives as well as complying with legislation and the requirements of safety and of highways design standards.

[4] An Active Travel Action Plan for Wales, Welsh Government, 2016
[5] Planning Policy Wales Edition 10, Introduction

2.6.14 Environmental constraints of the site must also be considered during route selection and design. To identify constraints the design team have gathered environmental data about the area through field surveys, consultations with statutory consultees, as well as comments and advice from stakeholders in the community. Environmental constraints include:

a) Designated nature conservation site: Marine Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI);
b) Designated heritage assets: Scheduled Ancient Monuments (SAM), sites on the Historic Environment Record (HER), Listed Buildings, Historic Landscapes and Registered Parks and Gardens;
c) Llanfairfechan Conservation Areas (which would be affected by the realignment of Penmaenmawr Road);
d) Snowdonia National Park (the Scheme lies entirely outside the National Park boundary);
e) Landform: topography, geology and soils;
f) Watercourses, ground water, sea level, flooding;
g) Landownership including agriculture, land use, planning allocations, existing and proposed residential areas;
h) Vegetation cover;
i) Habitat and European Protected Species (EPS).

2.6.15 The design process has continued to develop with refinements to the road alignments and structures to minimise or avoid environmental impacts. The residual environmental impacts of the Scheme, which remain once the route is fixed, are then considered and measures to compensate or mitigate any adverse impacts are designed. Measures to enhance the Scheme, beyond the limits of mitigation were also developed in the interests of future generations.

2.6.16 The Scheme would bring traffic closer to some residential properties on Penmaenmawr Road and would require the demolition of two houses on the east side of Shore Road East and just outside the Conservation Area. The grade separated slip roads and overbridge would be raised above the A55 dual-carriageway so that substantial support structures would be required rising higher than the existing A55. Proposed mitigation for the likely changes to traffic noise and visual impact would include acoustic barriers and the planting of trees and shrubs to screen views of traffic and mitigate for traffic noise. The new junction, in combination with open land for visibility splays, sustainable drainage measures, landscape planting and Active Travel routes would create a corridor of urban public space along Penmaenmawr Road. The Junction Improvements Scheme is shown in visualisations included in Appendix 2.7.

2.6.17 The proposed mitigation within this corridor would:

A. Protect the quality of views where this is physically achievable and minimise or mitigate any adverse impacts:
   i. Provide reasonable visual screening of the A55 and traffic without compromising views to the sea for more elevated properties and open spaces to the south. Some houses along Penmaenmawr Road would still lose views to the sea;
   ii. New structures: consideration to the design and integration into the sensitive landscape with careful selection of materials, planting treatments and associated earthworks. Mitigate for the obtrusive new structures, retaining walls, parapets, noise barriers, embankment slopes, gantries, signs and lighting columns which would be visible from a close range for residents living on the north side of Penmaenmawr Road and cause increased visual impact on visual receptors further south.
   iii. Use coloured or textured finishes for the retaining walls to break up the façade that would be visible from north and south;

iv. Protect landscape/scenic quality for residents and visitors to Llanfairfechan and for viewers at elevated locations within Snowdonia National Park;

v. Use appropriately located hedges, walls, noise barriers and replacement specimen trees, plantations, shrubs and grassland, using species suited to the setting, to create attractive urban spaces;

B. Protect cultural heritage features and their settings on the mountains and within settlements: and mitigate adverse impacts where opportunities fall within the boundary of the Scheme;

C. Protect the character and qualities of the Llanfairfechan Conservation Area where it is adversely affected by the changes to Penmaenmawr Road. This would include enhancements of the public areas, including:

i. Green space around the junctions to integrate the Scheme and minimise and mitigate for adverse impacts of the Scheme on the townscape and the Penmaenmawr Conservation Area;

ii. Streetscape improvements to create a wide shared use urban promenade along the former line of Penmaenmawr Road within the Conservation Area with wide paved frontages to residential properties, street trees and dedicated residents parking bays. The shared use route would continue down Shore Road East and under the railway to the Promenade.

D. Replacement planting along the south side of Penmaenmawr Road to replace the plantations that would be cleared. These would provide a landscape barrier for residential properties in Penmaen Parc, restore the original roadside strip of trees which is currently used by commuting and foraging bats, and would prepare for future development by providing a planted landscape barrier between the LDP Reserve Allocation for housing at Penmaen Park and the proposed Junction Improvements. This proposal would make allowance for pedestrian and cycle access to the proposed development from the Active Travel Routes along Penmaenmawr Road.

E. Use noise reduction measures to mitigate the adverse effects of traffic noise on residential properties and public areas associated with the junction improvements.

F. Accommodate east to west cycleways and footpaths along Penmaenmawr Road from Gerazim in the east with the town centre in the west and connecting with existing and proposed new crossings over the A55 to the shoreline and existing footpaths and roads. These would collectively form a network of routes for Active Travel and for leisure.

G. Using suitable planting and other landscape details to form a settlement gateway around Junction 15, in accordance with the NMWTRA strategy for implementing the Green Corridors Initiative. The proposal would allow space for the town council to incorporate a future gateway feature.

H. Avoid or minimise light pollution, where possible, using products that minimise light spillage outside the area to be illuminated.

2.7 Construction

2.7.1 Some of the most significant effects on the environment would occur during construction of the Scheme. Construction experts have advised on suitable construction methods and a construction programme has been developed so that these significant effects can be predicted, and measures developed to protect the environment. This section describes the likely sequence

of construction.

Sequence of Construction

2.7.2 Following the issue of the 'Notice to Proceed to Construction', there would be a period when the detailed design would be developed. Prior to work starting on site, property precondition surveys and vegetation surveys would be carried out.

2.7.3 The construction site would be made secure as early as possible by the erection of permanent fencing. Where this is not possible temporary fencing would be installed. Site clearance work would commence with vegetation clearance at a time and method to avoid harm to wildlife.

2.7.4 Early construction activities would include:

a) Construction of the main site compound;
b) Construction of main site access points;
c) Temporary and permanent fencing;
d) Construction of temporary diversions to existing footpath and cycleways.
e) Ongoing programme of seasonal ecological surveys;
f) Development of site haul roads;
g) Statutory Undertakers service diversions;
h) Topsoil stripping and stockpiling with archaeological monitoring;
i) Site clearance of trees, hedges, fencing, walls and small structures;
j) Construction of structures would commence as soon as possible;
k) Earthworks operations to form embankments and cuttings;
l) Drainage operations including pre-earthworks drainage ditches and existing water course culvert installation;
m) Haulage of materials to and from the site on the existing road network;
n) Construction of the carriageways
o) Side road works;
p) Accommodation works.

Construction Working Hours

2.7.5 Working hours would be subject to agreement with the CCBC Environmental Health Officer and may vary by location and activity. Typically, contractors work Monday to Friday with reduced activity on a Saturday. There would normally be no working on Sundays or Bank Holidays. Typical working hours are shown in Table 2.7.

Table 2.4: Typical Site working hours

Period	Day	Start time	Finish time
Summer	Monday to Friday	7am	7pm
	Saturday	7am	4. 30pm
Winter	Monday to Friday	7. 30am	5. 30pm

Construction timing, durations and programme

2.7.6 This section outlines the proposed construction sequence and the key construction activities. Construction would be anticipated to commence in 2022, with work programmed to take place over period of approximately 18 to 24 months. The construction would be completed and the

Scheme opened in 2023, followed by a 3 year period of environmental maintenance and aftercare extending until 2026.

Construction Strategy.

2.7.7 The Junction 15 Improvement Scheme and the associated Junction 16 Improvement Scheme have been developed and designed together but have been published as separate draft Orders and will be taken through the statutory process as separate schemes. If Welsh Ministers decide that both junctions should be improved, then they are most likely to form a single construction contract. However, Welsh Ministers could decide that only one junction is to proceed to construction. If that becomes the case, the single junction improvements would be the full extent of the construction contract.

2.7.8 The overriding consideration throughout the construction stage is to maintain two lanes of traffic in each direction on the A55 throughout daytime working hours. The existing central reserve and roundabout island would be excavated and replaced with full depth road construction. This would give the Contractor the facility to relocate lanes to the north and south of their existing alignment within the A55 corridor as needed, thereby enabling sufficient working space for construction activities whilst maintaining dual carriageway traffic flows on the A55. Consideration must be given to the high proportion of heavy goods vehicle traffic using this route and consequently a minimum lane width of 3.25m for Lane 1 and 3.0m for Lane 2 together with a 50mph speed limit would be imposed.

Construction Phasing

Erection of site offices & compound

2.7.9 It is anticipated that the principal site offices and compound for the Junction 15 improvement is to be located on land beside the junction between the Heath and the A55 and would be made ready in advance of the commencement of construction.

Phase 1 (indicative 4 weeks duration)

2.7.10 This phase requires the existing A55 to be reduced to single line working in both directions with the outside lane used for construction operations and would therefore be a night-time operation. The work entails site clearance and excavation within the existing central reserve and roundabout island and full depth road reconstruction. Excavated arisings would be hauled to a stockpile for later reuse within the Works.

Phase 2 (indicative 45 weeks duration)

2.7.11 This site is extremely constricted. Both carriageways of the A55 would be relocated to the extreme north of the corridor, enabling construction work to progress on the southern side. Turning movements at Junction 15 would be banned, all traffic being required to use Junctions 14. There would be the opportunity to commence sub-structure work offline to the north of the A55 between the existing retaining walls and the railway.

2.7.12 he westbound off and on slip roads would be supported by retaining walls and additionally, the westbound on slip road requires a bridge over the existing Shore Road East. This narrow road would need to be available at all times for emergency access for Network Rail as well as providing access to the north of the A55 for ongoing work in that location. Inevitably, such access requirements in an already constrained site would reduce output. Bridge construction,

followed by completion of slip road earthworks and roadworks are critical for this Phase of the construction. Two houses would be demolished before the westbound off slip road retaining wall could be completed.

2.7.13 The early relocation of Penmaenmawr Road would require excavation of 14,500m^3 of material which may be reused within westbound sliproad embankments. There remains, however, a fill deficit of around 28,000m^3 for this Phase. Following completion of the cut, existing services within Penmaenmawr Road and the road itself would be diverted to the extreme south of the site away from further construction work.

2.7.14 Construction of the south abutment for the Junction 15 overbridge would be carried out early during this phase in advance of A55 carriageway works.

2.7.15 North of the existing A55, work would commence on the construction of the piled bases and stems of the two abutments and eight piers of the eastbound slip roads. Both the site and the access are extremely constricted because they lie in a narrow corridor between the existing A55 retaining walls to the south and the railway to the north. This route is a Network Rail emergency access and so all activities must be planned to keep access open.

2.7.16 Construction of the new westbound carriageway would continue throughout Phase 2 with tie-in work at either end being undertaken at night with single lane working on the westbound A55.

Phase 3 (indicative 45 weeks duration)

2.7.17 The A55 traffic would be rerouted to the south of the corridor partially on the realigned westbound carriageway enabling access for the construction of the eastbound slip roads viaduct from the old A55 eastbound carriageway. Turning movements for eastbound traffic would remain prohibited as in Phase 2, but the junction would now be open for westbound traffic.

2.7.18 The eight pier crossheads would be constructed early in order to permit precast concrete beam placing and subsequent deck construction and finishing works.

2.7.19 Concurrently, the piled retaining wingwalls leading from both east and west abutments adjacent to the railway, would be constructed. In excess of 4,000m^3 of fill would be imported to form the approaches to the viaduct. Slip road carriageway construction would follow. Very high containment road restraint barrier, with its associated ground beam would be needed on the north side of the slip roads due to the proximity of the railway.

2.7.20 The steel beams, permanent falsework and traffic protection measures for the overbridge would be placed during a weekend, when the A55 would be closed. The beams would be supported at the north end of the deck on falsework in readiness for connection into the structure of the viaduct deck. Deck construction would continue without interruption to the flow of traffic on the A55 beneath. Further A55 night closure(s) would be needed to remove the parapet falsework and safety measures spanning the live carriageway.

2.7.21 Construction of the new eastbound carriageway would continue throughout Phase 3 with tie-in work at either end being undertaken at night with single lane working on the eastbound A55. It is known that poor ground exists to the west of Shore Road East and appropriate subgrade strengthening measures may be needed once the site investigation has been completed.

Phase 4 (indicative 4 weeks duration)

2.7.22 The A55 traffic would be rerouted onto the final alignment. Finishing works to both realigned carriageways, including final tie-in work, road restraint barriers to the central reserve and road markings would be completed. Night working and contraflows should not be necessary. One lane in each direction would use the main A55, while the 2nd lane in each direction would be re-routed over the (now opened) slip roads.

2.8 Construction Activities

Site clearance, topsoil strip and archaeological watching brief

2.8.1 All site clearance would be carried out under ecological supervision considering ecological seasonal constraints as identified in Chapter 10 Cultural Heritage and Chapter 8 Ecology and Nature Conservation.

2.8.2 During and after site clearance the Archaeologist would carry out any recording of above ground features. The details of any recording of above ground features are set out in Chapter 10. Topsoil would generally be stripped from areas within the construction footprint and where necessary would be subject to archaeological supervision. Topsoil would be stored in temporary stockpiles and re-used within the works. Wherever there is enough space over and above that required for construction movements, topsoil would be stored close to the source so that it would be replaced as near as possible to its origin. Storage areas have been allowed for within the Scheme boundary for this purpose.

Demolition

2.8.3 The Scheme would require the demolition of two semi-detached properties which are located to the south of the existing roundabout. Where viable, existing highway structures such as retaining walls would be retained in-situ. However, lengths may need to be demolished to facilitate the construction of the new structures, including:

- The retaining wall adjacent to the eastbound carriageway between Shore Road East and Station Road;
- The retaining wall behind the 'Sunnybank' terrace; and
- The retaining wall by the access track, to the east of the roundabout at Junction 15.

2.8.4 The existing footbridge at Pendalar would need to be dismantled as its existing span across the A55 would not be sufficient once the proposed works have been completed. Additionally, the existing CCTV at the roundabout and the steel gantry to the east of the roundabout would be removed and reinstated. Opportunities for reuse / recycling have been considered as part of the design development of the Scheme. Further information can be found in Chapter 15 Materials.

2.8.5 The existing bus gate between the A55 westbound carriageway and Penmaenmawr Road at Pendalar would be stopped up and associated infrastructure removed.

2.8.6 A detailed method statement would be produced for each structure prior to demolition. In addition to identifying all the safety and environmental protection measures required this would include investigation for the presence of any hazardous materials which may require special procedures for disposal. As described in Chapter 15, where viable, demolition materials would be recycled.

Service Diversions

2.8.7 Diversions to Statutory Undertakers plant would need to be carried out throughout the construction period. These works would be planned and coordinated to meet the construction programme.

2.8.8 Utility diversions are necessary where existing roads would be stopped-up or realigned. The diversions would generally be routed along existing service corridors, roads or footpaths. Where the service could be retained in its present location but would be affected by the proposed Scheme, appropriate protection measures would be agreed with the relevant authority.

2.8.9 Through ongoing liaison appropriate protection measures and/or diversions are being determined which would be implemented as part of the construction of the Scheme. These measures would comply with the relevant standards and codes of practice agreed nationally with utilities companies.

Earthworks

2.8.10 A major element of constructing the Scheme would be excavation of earthworks and construction of new embankments. Wherever possible, designers try to balance the volume of excavated materials (cut) with volume required to raise ground levels (fill). The cut fill balance associated with the earthworks has been assessed for the Scheme. It is anticipated that the Scheme would require the movement of approximately 27,423 tonnes of cut earthworks materials and 84,416 tonnes of imported earthworks materials. Further information can be found in Chapter 15.

2.8.11 During detailed design construction experts would assist the designers in optimising the balance of cut and fill and to plan out how the future contractor would need to move excavated material around the Scheme. That information would form the basis for planning the optimum movement of excavation and haulage plant around the site. It is envisaged that bulk earthworks would mainly be carried out in the summer, but the contractor would take advantage of any periods of dry weather in the other seasons.

2.8.12 Wherever possible all excavated material would be reused in the design to minimise the volume that would leave site. It is currently anticipated that overall, there would be some importation of bulk fill because a balance cannot be achieved. If the Junction improvements for Junctions 15 and 16 are carried out concurrently there would be some opportunities to use materials excavated in Junction 15 in the Junction 16 Scheme and vice versa. If material does have to leave the site there would always be careful consideration about where it should go and how it can be used productively, rather ending up in a landfill.

2.8.13 The large volumes of excavated material often need to be stored on a temporary basis and to enable this, some temporary working areas located outside the permanent land take for the Scheme would be required. So that the Scheme can be built efficiently and safely, whilst minimising the environmental impacts, temporary areas have been identified and incorporated within the draft Compulsory Purchase Order. The land would be properly restored to the original use on completion.

2.8.14 Earthwork excavation would generally be carried out using hydraulic excavators loading articulated dump trucks that would transport material along haul routes to identified filling locations. Filling operations would involve using bulldozers and vibrating rollers. Where no

practicable site alternative is available road lorries would be used to transport material on the public highway. Operations on public roads would be carefully controlled and monitored to minimise disruption to the travelling public.

2.8.15 An assessment of the geotechnical information available indicates that glacial material (including cobbles and boulders), alluvial soil (including compressible bands of organic peat and loose soil) and localised clay is present on site. The compressible bands are primarily located in the vicinity of Shore Road East and towards the west. The assessments of the ease of excavation undertaken indicates that generally excavation can be carried out with mechanical excavators. For grading work, a large bulldozer might be used. However, where large boulders are encountered, they might need to be broken out by means of a hydraulic breaker.

2.8.16 The earthworks activities would be coordinated with the construction programme for structures to minimise the interface between public highway and construction plant. The number of plant crossings and the length of time they are required would be minimised.

2.8.17 Earthworks activities are vulnerable to wet weather. North Wales presents challenging weather conditions with a high annual rainfall. The earthworks season normally lasts from April to October, but with the opportunity taken to extend the season as weather conditions permit. Clay materials are susceptible to degradation when they get wet. To ensure that they remain suitable for reuse it would be important to protect them from rainfall and surface and groundwater flows. Control and management of all water sources would be given particular consideration in the method statements for all earthworks activities.

2.8.18 In addition to safety and quality problems associated with carrying out earthworks operations in the wet there are also environmental implications. These can include increased risk of silt entering watercourses, mud spreading onto local roads and subsequent dust as the mud dries. These environmental risks are managed by careful construction methods and temporary measures to contain mud, dust and silt. These measures would be set out in the contractors Construction Environmental Management Plan (CEMP).

Potential contaminated land

2.8.19 There are several locations in the area of the Scheme where previous industrial activity has occurred, these include a gas works, railway sidings and vehicle maintenance and service stations. A ground investigation has been completed and the results have been considered in the Chapter 6 (Geology and Soils) of this ES. During construction the excavation would be carefully monitored to identify any contaminated materials that might be present in the ground. Any contaminated material that is excavated would be treated in accordance with environmental best practice. This could include removal to a suitably licensed disposal facility or on-site remediation. The advice of Natural Resources Wales and contaminated land specialists would be consulted.

Haulage of Materials

2.8.20 The main materials that would be transported onto site in bulk have been estimated following several preliminary design iterations. Table 2.8 summarises these bulk quantities. Imported materials would be delivered via the closest site access point to the point of work and from there proceed on site haul roads.

Table 2.5: Indicative Bulk Quantities to be transported

Material	Estimated Quantity	Numbers of loads[6]
Aggregates	25,032 tonnes	1430
Ready-mix concrete	40,706 tonnes	1566
Pre-cast concrete	2,589 tonnes	130
Steel	7,064 tonnes	353
Asphalt	15,011 tonnes	750
Plastic (eg. pipework)	7739 m	155

2.8.21 These estimated quantities result in an estimated 4384 loads delivering to the site over the 23-month construction period; with peak summer weekday truck movements being estimated at 10/day.

Road and land drainage

2.8.22 Pre-earthworks drainage ditches or filter-drains would be installed along the periphery of excavated slopes. These would ensure that any surface run-off entering the site is directed away from the construction operations to suitable discharge points.

2.8.23 It is envisaged that the construction of the permanent attenuation would be carried out as part of the pre-earthworks process in order to serve where appropriate as temporary settlement lagoons, to prevent silt entering the existing drainage or watercourses.

Sustainable Urban drainage

2.8.24 Since 7th January 2019, certain new developments require a sustainable drainage system (SuDS) to manage surface water. The system must be designed and built in accordance with statutory standards published by the Welsh Ministers. Sustainable drainage systems are designed to manage '*rainwater (including snow and other precipitation) with the aim of reducing damage from flooding, improving water quality, protecting and improving the environment, protecting health and safety and ensuring the stability and durability of drainage system*'[7]. However as confirmed in the October 2019 Welsh Government Sustainable Urban Drainage (SuDS) Newsletter, there are a small number of exemptions allowed in the legislation, including construction related to major roads built by the Welsh Government.

2.8.25 The drainage design for the Junction 15 improvements would be carried out by the Design and Build Contractor in accordance with the Design Manual for Roads and Bridges, Volume 4 Section 2 (2019). The Scheme would incorporate a range of measures intended to meet the equivalent requirements for SuDS. These include the provision of surface water attenuation to provide balancing capacity and controlled discharge into the existing surface water system, and the protection of flood storage capacity where there are risks of surface water and fluvial flooding occurring. Details of the drainage for the Scheme are set out in Chapter 7.

[6] Based on typical haulage vehicles
[7] Implementation of Schedule 3 to the Flood and Water Management Act 2010 for mandatory Sustainable Drainage Systems (SuDS) on new developments (Draft) Frequently Asked Questions; Guidance for local authorities, developers and statutory and non-statutory consultees.
https://gweddill.gov.wales/docs/desh/publications/190108-suds-statutory-guidance-en.pdf

Structures

2.8.26 The Scheme includes a steel beam bridge with a composite reinforced concrete deck over the dual-carriageway and retaining walls around the junction and slip roads. It also includes the extension to the underbridge at Shore Road East and a replacement steel footbridge at Pendalar. The east bound slip roads on the north side will be on a viaduct. These structures vary in size and form to suit the function. A primary constraint for the design of the slip road and overbridge structures along the north side of the A55, relates to maximum settlement criteria for Network Rail assets.

2.8.27 The outline structures design has taken maintenance, buildability issues and environmental constraints into consideration. Construction of structures would be progressed throughout the construction period because the activities are often of long duration. The outline structures design has taken buildability issues and environmental constraints into consideration. Construction of structures would take place all year round as they are less weather susceptible than earthworks operations. The construction sequence has been determined to ensure that the Scheme would be built with minimum disruption to the local environment, local population and the travelling public.

2.8.28 It is planned to commence construction of the following new structures early in the construction programme.

a) Sunnybank Retaining Wall
b) Westbound on-slip bridge over Shore Road East and adjacent retaining walls
c) Extension to the existing Shore Road East underbridge
d) Piling for the viaduct piers north of the A55 may also be undertaken whilst the above works are progressing.

Roadworks

2.8.29 Roadworks activities would include pavement construction, carriageway drainage, kerbing, surfacing, safety fencing, signing, lighting, road markings, cycleway and footways. Pavement construction would be undertaken using conventional pavers and smooth wheeled rollers.

Footpaths, Bridleways and Private Means of Access

2.8.30 Existing footpaths, bridleways and private means of access that are affected by the Scheme would be suitably diverted during construction and then returned to the original route, or to a proposed new alignment. Details of these diversions are set out in Chapter 14 All Travellers.

Table 2.9 Summary of Footpaths, Bridleways and cycle routes affected by the Scheme

Route	Description of impact
NCN5 (Penmaenmawr Road East of Junction Improvements)	Provision of temporary route to NCN5 during construction of J15 at junction with Penmaenmawr Road.
Shore Road East	Access would be retained during construction of shared open space improvements at Penmaenmawr Road/Shore Road East.
NCN 5 (Penmaenmawr Road West of Junction Improvements)	Access to be retained during construction of segregated cycleway along Penmaenmawr Road and through

Route	Description of impact
	construction of shared open space improvements at Penmaenmawr Road/Shore Road East.
Footbridge over A55 at Pendalar	Potential temporary impact during construction of replacement bridge. No mitigation proposed.
Pendalar to Shore Road East (Network Rail access track)	Potential temporary impact on route access during resurfacing works.
Llanfairfechan Promenade access	Temporary impact during minor improvement works to improve accessibility for all users.
Mona Terrace	Majority of works would be offline.

2.8.31 Access would always be maintained during construction. Temporary diversions and lane closures would be required to allow construction in parts of the site. They would be constructed to the required standard agreed with Conwy CBC and the North and Mid Wales Trunk Road Agent (NMWTRA), well maintained and kept to the shortest duration possible to complete the works.

Landscaping and Planting Works

2.8.32 Subject to seasonal and construction constraints grass seeding and planting would be undertaken as early as possible in the construction programme to ensure the maximum establishment, growth and coverage by the time the three-year aftercare period is completed. Where feasible, any planting that could be satisfactorily completed in advance of construction would be carried out in the first available planting season. Other areas of planting and seeding would be completed when areas of the Scheme are made available.

2.8.33 Opportunities to translocate younger trees and shrubs by various techniques would be considered and used to provide new plantations or hedges.

2.8.34 The Contractor would carry out landscape and environmental maintenance and monitoring in accordance with the Maintenance Environmental Management Plan (MEMP) for three years following completion of the works.

2.8.35 The details of the proposed landscape works are set out in Chapter 9 Landscape Effects and shown on the Environmental Masterplan (EMP) in Appendix 2.6.

2.9 Temporary measures during construction

Site construction compounds and land for required for construction

2.9.1 Temporary working space would be required outside the permanent land take for the Scheme and this land has been identified and included within the draft Compulsory Purchase Order. Land required on a temporary basis would be taken to allow efficient, safe construction and to minimise the environmental impacts and would be used for the contractors compound, materials storage areas, haul roads and to provide adequate space to erect boundary fences, divert services and install drains and culverts.

2.9.2 The contractor’s construction compound would contain the main construction site office, stores, plant maintenance facilities, welfare facilities and car parking. The compound and storage areas

would be secured against theft and vandalism through the provision of fencing, lighting, CCTV, mobile and fixed security personnel as appropriate to the location.

2.9.3 The compound would be located close to the construction site. In the case of Junction 15, which is surrounded by roads and residential properties, the only locations available are relatively close to residential properties. Residents would experience adverse effects due to the proximity and so measures to mitigate these effects would be included within the layout and boundaries of the compound. The construction stage impacts of the Scheme and the proposed mitigation are described in this Environmental Statement.

2.9.4 The site of the compound has been identified and included within the Compulsory Purchase Order. The area, located on land between the A55 and the former Conwy County Council offices in The Heath, lies to the west of the existing Junction 15, would be taken for the duration of construction and fully restored on completion. The area is shown on the Environmental Masterplan in Appendix 2.6.

2.9.5 During the construction phase the number of people expected to be working on site, and to make use of the compound, is anticipated to average 50 with an estimated peak of 100. It is anticipated that most of the labour force would be sourced locally with local subcontractors employed. However, some specialist or skilled labour may be required from outside the locality.

Site Access and Site Traffic

2.9.6 Main site access points would be established, and internal site haul roads would be developed to enable deliveries to arrive at the intended destination within the site and to minimise the interface with the public. All site access points would be clearly signed on the road network.

Traffic management and road closures during construction

2.9.7 The requirements for traffic management have been carefully considered in design to minimise the disruption to road users during construction. Before a contractor commences construction of the Scheme they will have developed a plan for traffic management throughout the construction period so that all the existing routes would remain open and access would be maintained to all residential areas around the junction.

2.9.8 During normal working two lanes would be maintained in both directions on the A55. There would be short-term requirements for single line working. A 50mph speed limit would be imposed on all sections of public road passing through a work site to ensure the safety of the road users and workforce. Junction 15 will be closed for the majority of the construction period and access to Llanfairfechan will be via Junction 14 (which itself will be improved in advance of the works).

2.10 Construction Management

2.10.1 Civil Engineering contractors normally operate an Integrated Management System (IMS) which would be accredited to appropriate British and international standards. The system would form the foundation for the management of the construction works and would integrate the requirements to manage health and safety, the environmental protection, construction quality and public relations into a Contract Management Plan (CMP) to clearly define standards, processes, procedures, organisation, roles responsibility and key performance indicators.

2.10.2 Under the overall control of the CMP would be:

A. Health and Safety Management; (see Section 2.10.3);
B. Construction Environmental Management (CEMP) (see Section 2.10.5);
C. Quality management (see Section 2.10.10); and
D. Public Relations (See Section 2.10.11).

Health and Safety Management

2.10.3 In accordance with current Health and Safety legislation, approved codes of practice and a Health and Safety Policy, the contractor would:

A. Provide and maintain a place of work that is safe and without risk to the health and welfare of all its employees, subcontractors and the general public.
B. Provide and maintain plant and systems of work that are safe with minimum risk to health.
C. Provide appropriate information, instruction, training and supervision to ensure the health and safety at work for all employees.
D. Allocate sufficient resources to enable the policy to function effectively.
E. Seek to continually improve health and safety performance.
F. Consult with and maintain good relations with employees, trade unions representatives, the Health and Safety Executive and other relevant organisations.
G. Review operational performance using appropriate measures. Review accident investigation reports and audit information.

2.10.4 Site specific risk assessments and method statements would be produced by the contractor, prior to any work activates 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.

Construction Environmental Management Plan (CEMP)

2.10.5 Chapter 20, Management of Environmental Effects, sets out the approach to environmental management. An outline of the Construction Environmental Management Plan (CEMP) is included in Appendix 2.2.

2.10.6 The CEMP is a live document that is developed and updated through the detailed design and construction stages. Development and implementation would be managed throughout by the Environmental Coordinator. The CEMP would ensure that construction activities are planned and managed in accordance with all the environmental requirements identified in the Environmental Statement.

Register of Environmental Actions and Commitments (REAC)

2.10.7 The REAC is a schedule of all environmental matters that have been agreed as part of the Scheme. It will include commitments to complete actions such as surveys, monitoring or reporting, or consulting with stakeholders; or commitments to provide mitigation or enhancements as part of the Scheme. A draft of the REAC is included in Appendix 2.3. During detailed design, construction and operation the REAC will be used record how the successful contractor implements planned mitigation and enhancements.

2.10.8 The key to effective environmental management during the construction phase lies in the comprehensive training of the workforce. This would be controlled by a full-time site-based Environmental Clerk of Works (ECoW). The ECoW would be managed by the Environmental

Coordinator (ECO), to:

a) Administer the CEMP and assist in the production and review of environmental content of method statements.
b) Provide guidance to the site team in dealing with environmental matters.
c) Raise awareness of site environmental issues.
d) Assist with obtaining and programming any licences from regulatory authorities such as the Natural Resources Wales (NRW).
e) Monitoring site performance against the CEMP, raising standards and reporting to site management.

Environmental Masterplan

2.10.9 The environmental mitigation measures incorporated within the design of the Scheme are illustrated on the Environmental Masterplan (see drawings in Appendix 2.6 A to C, Volume 3). The masterplan drawings have been prepared in accordance with DMRB Volume 10 (2008). The landscape and environmental design proposals for the proposed new section of highway are described in Chapter 9 Landscape and Visual Effects.

Quality Management

2.10.10 The future contractor's on-site construction management team would ensure that proactive quality control is achieved by:

A. Defining and coordinating an agreed Inspection & Test Plan (I&TP) and regime for each element of work.
B. Setting the acceptance criteria for the I&TP to meet all the relevant design, specification and Employer's requirements.
C. Adopting an open Non-Conformance Reporting (NCR) process detailing corrective and preventative actions.
D. Monitoring timely close out of NCR to prevent jeopardising follow on work which would otherwise be compliant.
E. Maintain essential documentation plus sufficient documentation to demonstrate that the product has been installed in a compliant manner.
F. A materials-testing laboratory, with UKAS Accreditation or similar, would carry out the defined compliance sampling.

Public Relations

2.10.11 Construction works on the scale required for the Junction 15 Improvements would result in some inconvenience and disruption to residents and travellers, although traffic management and limits on construction noise would be implemented to keep these problems to a minimum. Where construction works could have significant impact on neighbouring properties the affected parties would be advised of these works prior to their commencement.

2.10.12 During the works it will be important that there are effective channels of communication in place to keep all interested parties informed of activities and to quickly address any complaints or queries. A full time Public Liaison Officer (PLO) would keep the public and affected landowners informed of progress and advise on forthcoming activities. During the construction phase they would be based in the site office. The PLO would be the first point of contact for any concerns or queries and a dedicated telephone number would be provided for members of the public to use.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 3 ALTERNATIVES CONSIDERED

RAMBOLL Bright ideas. Sustainable change.

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3. ALTERNATIVES CONSIDERED

3.1 Chapter introduction

3.1.1 This chapter of the Environmental Statement (ES) outlines the main alternatives considered during the development of the Scheme and sets out the main reasons for the selection of:

- The junction options;
- Changes to local roads;
- Selection of the design which is included within the draft Statutory Orders.

3.1.2 The current EIA Directive requires that an ES should include *'A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking account of the effects of the project on the environment'*[1].

3.1.3 This chapter includes an outline account of the main and reasonable alternatives to the Scheme that have been considered by the Welsh Government and its advisors, taking account of their potential environmental impacts.

3.2 Previous studies

3.2.1 The two roundabouts at Junctions 15 and 16 and the dual carriageway formed part of the Llanfairfechan and Penmaenmawr Bypasses which were completed in October 1989. Penmaenbach and Pen y Clip tunnels were first built in the 1930s to carry a single carriageway road, but as part of the planned A55 improvements a second tunnel at Penmaenbach was completed in June 1989, while Pen y Clip tunnel was completed in October 1993. The designs were based on traffic forecasts available at that time. Traffic volumes have increased, and the strategic importance of the A55 Trunk Road has grown.

2003 - 2007

3.2.2 Following a closure of the Penmaenbach headland in 2003 / 2004 for maintenance, a study was carried out to consider the highway geometry between Junctions 15 and 17, including consideration of grade separated junctions at Junctions 15 & 16. Increased traffic flows and road safety issues were evident. Safety concerns in tunnels were given more emphasis along the route following the EU Tunnel Directive 2004/54/EC and the subsequent Road Tunnel Safety Regulations 2007, which came into force in June 2007.

3.2.3 The initial study and assessment of the junctions was completed by Capita Symonds in 2005. This study included three options for Junction 15 and six options for Junctions 16. Increased traffic flows and road safety issues have been evident for a time and a study in 2005 identified A55 route improvements including options for grade separation at Junctions 15 and 16. The study also highlighted other safety issues relating to lay-bys, direct accesses and hard strip

[1] The 2011 EIA Directive requires the following to be included within an ES. *'An outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account environmental effects'* (Article 5, 3(d) Directive 2011/92/EU). Directive 2011/92/EU has been amended by Directive 2014/52/EU. Although the transitional measures in place mean that the provisions of Directive 2011/92/EU remain applicable for the Scheme, the requirements of Directive 2014/52/EU have been taken into account within this ES, where practicable. Directive 2014/52/EU amends Article 5, 3 as follows. *'A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment'*. (Article 5, 3(d) Directive 2011/92/EU).

provisions along the route.

2008

3.2.4 In February 2008 Atkins was commissioned by the North and Mid-Wales Trunk Road Agency (NMWTRA) to examine road safety improvements along the A55 in the vicinity of Llanfairfechan and Penmaenmawr, with a focus on considering options for improving Junctions 15 and 16 by removing the at-grade roundabouts. These are the only at-grade roundabouts on the A55 and both are considered to a cause increased journey times and poor journey time reliability. The safety hazard posed by incidences of stationary traffic backing-up into Pen-y-Clip and Penmaenbach Tunnels was also an important consideration.

3.2.5 In April 2008 the '*One Wales: Connecting the Nation – The Wales Transport Strategy*' was developed and published by the Welsh Assembly Government. In the foreword of the strategy Ieuan Wyn Jones Assembly Member (AM), Deputy First Minister and Minister for the Economy & Transport, stated that among '*the five key areas where substantial progress is anticipated*, were '*Improving links and access between key settlements and sites across Wales and strategically important all-Wales links; enhancing international connectivity, and increasing safety and security'*.

3.2.6 Part of the 2008 Atkins study was consideration of environmental matters associated with the options put forward. The report *A55 Jct15 & 16 Study Preliminary Planning Report – Environmental Issues* was published in April 2008. At that stage, no consultation with the statutory bodies had been carried out, but various public sources of environmental data were used. The study considered the potential impacts and environmental constraints of noise, air quality, landscape, townscape, biodiversity, soil, heritage and water environment and then made recommendations for further work and consultations required.

2009

3.2.7 Stakeholders, including local councillors were consulted on the proposed options at a workshop and an initial Stage 1 WelTAG appraisal was completed and a preliminary environmental assessment carried out. This study which was completed in April 2009 concluded that new grade separated options should be progressed to provide safety improvements.

3.2.8 In January 2009, *Environmental Report* was published by Atkins. This report covered a much more detailed assessment of all the options under consideration and was prepared as part of the WelTAG 2008 Stage 1 appraisal. The report covered an assessment of environmental constraints associated with all the options for Junctions 14, 15, 15A, 16 and 16A.

2011

3.2.9 In February 2011, following inclusion of the scheme in the Welsh Government's National Transport Plan, Atkins was instructed to review the options, address potential alternatives and hold an Options Workshop. The scheme options and cost estimates developed up to that time were reviewed and new options developed and priced.

> Following the review the report concluded that while '*the benefits have not been the subject of assessment at this stage, the need and the anticipated positive effects associated with the project do not appear to have diminished despite a small reduction in traffic flow.'*

The review found that there were two alternatives at Junction 15 that appeared to provide value for money. The report stated that the *'environmental impacts arising from the improvements will be complex to assess especially considering the nature of the site and existing landscape'.*

2013

3.2.10 In 2013, the Minister for Economy, Science and Transport, Edwina Hart's written statement (dated 10th July 2013) included a commitment to improve the efficiency of the network across A55/A494 dual-carriageway between J11 (Llandygai) and Welsh/English Borders in the east by introducing emergency verge refuges. Several studies were undertaken with the purpose of progressing schemes so that physical works could be carried out.

2015

3.2.11 The A55 /A494 Network Resilience Phase 2 Feasibility Report led to a programme of physical improvement works, which were implemented between September 2014 and March 2015, during and after significant incidents, with the objective of maintaining or improving traffic flow on the dual carriageway network. This included the installation of Emergency Crossing Points (ECP) and the construction of 8 hardened verges at strategic locations between A55 Junction 11 at Llandygai to the West and the Welsh/English borders to the east. The works also included closure of 12 laybys with road markings. The study also identified improvements to junctions including Junction 15.

3.2.12 A commitment for improvements at Junctions 15, to be constructed by the end of 2020, was included in the National Transport Finance Plan 2015 (NTFP). To progress the scheme and to further develop certain elements Welsh Government appointed Corderoy assisted by TACP to act as the Employer's representative through the design development and statutory processes for both Junctions 15 and 16. Some early environmental surveys were carried out.

3.2.13 TACP, as part of the Employer's Representative team were commissioned by Welsh Government in August 2015 to undertake a Phase 1 habitat survey and initial protected species assessment to inform the proposed improvement works at Junctions 15 and 16 of the A55 in North Wales. The report, entitled *A55 Junctions 15 and 16 Improvements – Ecological Statement October 2015*, was produced incorporating an up-to-date desktop study and site surveys and an ecological overview, listing potential impacts and mitigation and further surveys that were recommended.

2017

3.2.14 On the 28th April 2017 the Cabinet Secretary for Economy and Infrastructure announced that a commission to investigate options to improve journey times, reliability and the resilience of the A55 corridor from Holyhead to Post House (Chester) would be undertaken. This would include associated routes such as the A494 corridor from the Ewloe Interchange to Drome Corner, Strategic Diversion Routes (SDRs) and Tactical Diversion Routes (TDRs). WSP were commissioned by the North and Mid Wales Trunk Road Agent (NMWTRA) to undertake a WelTAG Stage One Study to improve resilience of the A55/ A494 dual carriageway network in North Wales. The report A55 / A494 Network Resilience Study WeTAG Stage 1 Report was published in October 2017 by WSP on behalf of NMWTRA.

3.2.15 The study concluded that, *'In recognition of the strategic importance of the route, the current approach to managing the A55 / A494 exceeds the statutory requirements for a rural dual carriageway and adopts a number of provisions that would normally be associated with motorway management, e.g. Traffic Management Centre and Traffic Officer Service. Current performance levels consistently meet or exceed standards. During normal operating conditions the route performs well with some localised congestion during peak traffic flows. The route however is vulnerable during incidents or significant road work events due to a combination of topographical and infrastructure constraints and lack of viable diversion routes. The route runs close to capacity during normal traffic flows and is above capacity at peak times.'*

3.2.16 The study findings and recommendation were that a total of 33 unique problems have been identified across the study area and these have been grouped into key themes, of which one, Environment and Sustainable Travel, is relevant to this ES. The proposals set out in the study report included short, medium and long-term measures for the whole A55 corridor, of which a number are relevant to the A55 corridor from Junction 14A to 16A, although are not necessarily included in the current scheme:

Short term	Improve NMU Crossings -Penmaenbach Beach Subway
	Increase VMS signage (fixed or mobile) along the A55 & A494 between each junction
	Increased Emergency Crossing Provision Operation
Medium term	Improve non-standard junctions
Long term	Expressway 2 Lane; whole corridor reduced number of junctions
	New Diversion Route A55 J12 (Tal y Bont) -J14 (Madryn): New Parallel Route
	New Penmaenbach Tunnel
	Penmaenbach Eastbound Marine Embankment: 120kph Design Speed
	Provision of Hard shoulder (network wide)

3.2.17 The decision was made by Welsh Government to procure an ECI contractor to develop the improvements schemes for Junctions 15 and 16, with tender procedures commencing in 2015. Carillion with Ramboll, RML and YGC were awarded the Early Contractor Involvement (ECI) contract in 2017.

3.3 The current study (2017 onwards)

3.3.1 Work under the ECI contract commenced in late 2017 but was halted following the liquidation of Carillion. Ramboll, RML and YGC were reappointed by Welsh Government to continue with developing the schemes under a new consultancy contract.

What is WelTAG?

3.3.2 Welsh Government adopted the Welsh Transport Planning and Appraisal Guidance (WelTAG) in 2008 as a suitable method of appraisal for assessing proposed strategies, plans and schemes. WelTAG is intended to provide information about significant economic, environmental and social impacts so that decision makers can judge the merits of proposals using a consistent approach.

3.3.3 Applying the WelTAG appraisal method, the options for Junction 15 have been compared against the Transport Planning Objectives and the criteria of Welsh Impact Areas, the 'three pillars of sustainability' that underlie policy in Wales: the economy, the environment and society. These include legal requirements and the desire to protect and enhance the condition of the built and natural environment.

3.3.4 The Transport Planning Objectives and Welsh Impact Areas underpin the appraisal process by allowing each option to be appraised to see if it is likely to succeed in addressing problems and achieving the objectives. When a proposal performs poorly against Welsh Impact Areas it is unlikely to gain support from the Welsh Government.

WelTAG Stage 1

3.3.5 The team began work by reviewing the WelTAG Stage 1 Assessment in the light of the newly published WelTAG 2017 guidance and held a Public Information Exhibition (PIE) in December 2017. The WelTAG Stage 1 built on previous development work by considering the outcome of the 2008 consultation work by Atkins. The options that were presented were those prepared by previous consultants with the addition of an option developed by the Carillion team at tender. The options are shown in the WelTag Stage 2 Reports in Appendix 3.2 and in the EIA Screening Report in Appendix 4.2.

3.3.6 The Public Information Exhibitions (PIE) were held on the 13th, 14th, and 15th December 2017, with a day in Llanfairfechan, Penmaenmawr and Dwygyfylchi. The exhibition was well attended with 762 people registered as attending the exhibition. Five options for Junction 15 and four options for Junction 16 were presented together with the project objectives. Based on the comments received in written responses, both the project objectives and the proposed options were reviewed, and further alternative options were developed.

3.3.7 The questions posed in the questionnaire did not explicitly invite responses of an environmental character, although open questions were asked regarding the stakeholder's options preferences. Several environmental matters associated with the existing A55 were identified, primarily traffic noise and visual impact. Other environmental issues include air quality, greenhouse gas emissions, landscape and townscape impacts, biodiversity, soil, heritage and the water environment.

3.3.8 The communities in the vicinity of Junction 15 are affected by issues relating to housing, income, employment, health, access to services and community safety. Many of these social issues are exacerbated by the communities' reliance on the A55, including the effect that the A55 has in severing continuity between the communities and the coast.

WelTAG Stage 2

3.3.9 Following the Stage 1 review, a WelTAG Stage 2 Workshop was held on the 7th February 2018. Transport Planning Objectives (TPO) for Junctions 15 were reviewed and updated. These are set out in Chapter 2.

3.3.10 Five options for Junction 15 (A to E) were developed in more detail than previously and were then appraised so that a comparison between them could be made. All the options include:

a) Removal of the Junction 15 roundabout;
b) Retention the link through to the Promenade via Shore Road East;
c) Closure of the existing bus gate onto Penmaenmawr Road;
d) Retention of the existing bus stops;
e) Removal of the footbridge over the A55 at Tyddyn Drycin.

3.3.11 The options are shown in Appendix 3.2 and described in the following paragraphs

Difficulties encountered during the development of options

3.3.12 The proximity of the railway and coast to the north and residential areas to the south of the A55 have been the greatest constraint on the development of the options. Further concerns have been:

a) Achievement of suitable horizontal and vertical alignments to the required standards within the corridor;
b) Limitations on reducing the vertical alignment of the dual carriageway because of the need to retain the underpass for Shore Road East;
c) Sea level which limits the lowest vertical alignment of any road passing under the dual carriageway;
d) Retaining sea views across the A55 from as many residential properties as possible;
e) The presence of residential properties close to the existing road in critical locations;
f) Avoidance of any entry into the area below the Mean High Tide line.

3.3.13 The following paragraphs describe the options in turn and explain some of the advantages and disadvantages that have influenced an option might be rejected or considered further. These descriptions do not include mitigation or enhancement measures. Mitigation such as visual screening and noise barriers, for example, would result in reduced environmental impacts. The mitigation proposals are described in detail in the environmental assessment chapters of the ES. These options are illustrated in the WelTAG Stage 2 Report, which is included in Appendix 3.2.

3.3.14 All five options will remove the roundabout and associated road surfacing including the yellow rumble strips. This will change traffic noise by replacing the noises created by vehicles passing over the rumble strips, slowing down, crossing the roundabout and accelerating to cruising speed. Instead, traffic will pass through the junction without slowing.

Junction 15 Option A

3.3.15 The dual carriageway would remain on a similar alignment to the existing situation, but widened slightly to the south, with west-bound on and off slip roads provided. There would be no east-bound on and off slip roads which would reduce access to the A55 for residents of Llanfairfechan and therefore increase the number of vehicles passing through the town centre to use Junction 14A for eastbound access to the A55. The west bound slip roads would extend to join Penmaenmawr Road (west), with staggered junctions for Shore Road East and Penmaenmawr (east). East of the junction Penmaenmawr Road (east) would be realigned into a cutting into a field to the south and the former alignment closed off. With east bound access at Junction 15 no longer possible, Junction 14A (Madryn) might have to be improved by providing wider and longer slip roads on the east bound carriageway of the A55. None of the measures for this option require any significant changes in vertical alignment from the existing situation. There would be no demolitions of residential properties required for this option.

Junction 15 Option B

3.3.16 The dual-carriageway would be realigned to the south bringing the A55 mainline up to 8m closer to Penmaenmawr Road on the eastern side of the existing roundabout to accommodate a grade-separated junction with the four slip roads to provide full east and west entry and exit from the A55. To accommodate the elevated WB sliproads an embankment would be required onto land to the south along the A55 for around 500m east and west. A new railway bridge and viaduct would link Penmaenmawr Road with the Promenade on the north side and it is considered likely that one or two properties on the Promenade would be demolished to accommodate the link. There was concern during the PIE that the proposed link to The Promenade, whilst improving access for residents, could open this area to HGVs and Coaches to the disbenefit of residents.

3.3.17 To the south of the junction it is also likely that several properties on land adjacent to existing roundabout would be demolished. West bound slip roads at Junction 14A would not be widened and improved.

3.3.18 The slip roads on tapering embankments would rise to around 6 metres above the dual-carriageway to meet a new bridge over the A55 which would connect Penmaenmawr Road to the east and west bound slip roads. Whilst these slip road embankments could reduce the noise of fast-moving traffic on adjacent sections of the A55, they would also cut off views to the sea for some residents and be more visible in views than the existing A55 for many more. On the south side of Junction 15 the eastern length of Penmaenmawr Road would cut deeper into the hillside to the south, while a new junction would connect to the western length of Penmaenmawr Road. A railway access ramp would also provide off the north side of the junction.

Junction 15 Option C

3.3.19 At Junction 15 the dual-carriageway would remain on a similar alignment at similar level with the new slip crossing below the existing. The slip-road cutting would affect adjacent properties and gardens on the south side of the junction. The west bound off slip-road would be moved much closer to properties to the east of Junction 15 on Penmaenmawr Road and would result in 4 properties being demolished. With no westbound on slip-road or eastbound off slip-road, traffic requiring these movements would have to drive through the town centre of Llanfairfechan to use Junction 14A.

Junction 15 Option D

3.3.20 The dual-carriageway would remain on a similar alignment at similar level with the new slip crossing below the existing. A grade-separated junction with the four slip-roads to provide full east and west entry and exit from the A55 is proposed. To accommodate the westbound slip roads the embankment would be widened onto land to the south along the A55 for around 350m east and west. The eastbound slip roads would rise on embankment up to 6 metres above the existing A55 level to meet a new bridge to cross over the A55 and westbound on slip road at the site of the existing roundabout. No link over the railway to the Promenade is proposed. To the south of the junction it is likely that 16 properties immediately adjacent to the existing roundabout would be demolished and a further 13 would be at risk to accommodate the westbound off slip, subject to more detailed surveys and design. South of the bridge the link road would descend on an embankment to connect with Penmaenmawr Road to the west of Shore Road East. West bound slip roads at Junction 14A would not be widened and improved.

Junction 15 Option E

3.3.21 The dual-carriageway would remain on a similar alignment at similar level with the new slip crossing below the existing. A grade-separated junction with the four slip-roads to provide full east and west entry and exit from the A55 is proposed. To accommodate the westbound slip roads, the dual carriageway and embankment would be widened onto land and gardens to the south for around 450m east and 250 metres west. No link over the railway to the Promenade is proposed and Junction 14A would not need to be widened and improved.

3.3.22 Westbound slip-roads would extend on an embankment 5 metres above ground level to meet Penmaenmawr Road, where a new roundabout would be required. This would be located on land currently occupied by The Heath (Conwy County Council offices), which would be demolished.

3.3.23 Eastbound slip-roads would be raised on embankment 6 metres above the existing dual carriageway and cross the A55 on a bridge and so connect to Penmaenmawr Road at the location of the existing roundabout. Penmaenmawr Road would be re-aligned slightly south before meeting the new roundabout on the site of the Heath. The seaward outlook of houses on that road would be adversely affected, while the terrace of houses and gardens close to Shore Road East would be surrounded by embankments and new roads. The large building, known as The Heath, which has historical and cultural significance within the Llanfairfechan Conservation Area, would be demolished to be replaced by a roundabout. The roundabout would be located close to the primary school.

3.4 Statutory consultation on the options

3.4.1 Over a 12-week period from the 4 June 2018 to 28 August 2018 the public were consulted on the Options described above. Information on the options, including plans, was set out in a brochure. The brochure, general project information, and a questionnaire were displayed on the Welsh Government website for the duration of the consultation period. The consultation was publicised using posters, press releases and letters to local premises. Key stakeholders were separately invited to provide their views.

3.4.2 To ensure the maximum public exposure, three public exhibitions were held on the 12, 13 and 14 June in Dwygyfylchi, Penmaenmawr and Llanfairfechan. Each event was open to the public from 10:00 until 20:00. The BBC and ITV news and the North Wales Chronicle and North Wales Pioneer reported on the exhibitions.

3.4.3 Those who attended could view the options on large display boards which were supplemented with visualisations. The Project Team attended the events to discuss the various options and any concerns raised by members of the public. Paper versions of the consultation document and questionnaires were available at these events. Copies were also deposited in some key locations within the local communities.

3.4.4 A total of 738 people attended the public consultation exhibitions. A total of 362 completed questionnaires were received. Responses were also received from members of the public and other key stakeholders including the Conwy County Council, Penmaenmawr and Llanfairfechan Town Councils, North Wales Fire Service, North Wales Police, North and Mid-Wales Trunk Road Agent, Network Rail, Bus operators, Natural Resources Wales, Sustrans, Cycling UK, Dwr Cymru Welsh Water, and Movement Along Welsh Routes.

3.4.5 Further meetings and presentations in the form of 3D visualisations were held during September 2018, giving more detail on the junction options to provide a better understanding of the likely effects. Three events were held, where the visualisations were presented, one for Llanfairfechan Town Council, a second for a group of local residents in Llanfairfechan and the third was a public meeting in Dwygyfylchi.

3.4.6 Analysis of the questionnaires and other responses shows that there is support for improvements along the A55 Junctions between Junctions 14 and 16A in particular improvements to Junctions 15 and 16. However, there is no clear consensus regarding the preferred options i.e. there are some differences of opinion from the public responses and key stakeholders organisations in terms of preferred options.

3.4.7 The various consultations and responses from stakeholders to public exhibitions, has shown that there is support for an improvement to solve the transport problems at Junctions 15, with most respondents viewing the removal of the roundabouts as important to improving the transport network in the area.

3.4.8 The preferred option has been selected following a rigorous assessment of each. These included appraisal against the Project Objectives (set out in Chapter 2, Section 4). The preferred option must also satisfy performance requirements set out in Welsh Transport Appraisal Guidance 2017, which include the:

A. Ability of the option to prevent, or solve the problem now and in the future;
B. Ability of the option to meet the objectives set and improve the social, cultural, environmental and economic well-being of Wales;
C. Short and longer-term impacts of the options in delivering multiple benefits across the four aspects of well-being and to maximise contribution to all seven well-being goals;
D. Deliverability of the options;
E. Robustness to uncertainty and potential to drive long lasting change.

3.4.9 Based on the questionnaire responses and key stakeholder engagement, there is no clear consensus in favour of any single option at the junction, but key concerns were identified in the responses from key stakeholders and organisations, local communities and the public and these have also been taken into consideration.

3.4.10 The preferred Option D for Junctions 15 performs best when measured against the project objectives and the WelTAG criteria and addresses stakeholder concerns in the following ways:

A. By providing four-way traffic movements as recommended by key stakeholders, including NMWTRA, Emergency Services and the Bus Operators that regularly operate on the A55, thus comparing favourably against Options A and C.
B. By minimising the number of residential properties that would need to be demolished, whilst still retaining four-way movement. This compares with Option B which requires the demolition of properties immediately adjacent to the junction and also along Penmaenmawr Road and the promenade.
C. By minimising the visual impact of the new junction on both the promenade and the village, as compared to the impact on the scheme that would occur if Option B was chosen.
D. By ensuring that the proposed scheme does not affect Ysgol Pant Y Rhedyn thus reducing the potential adverse impact on air quality and safety implications to the school community as compared to Option E.
E. By minimising the traffic impact on Penmaenmawr Road in comparison to Options A, B, C and E.

F. By minimising the impact on the Menai Strait and Conwy Bay Special Area of Conservation, as compared to Option B.

3.5 Minister for Economy and Transport's decision

3.5.1 The Preferred Route was announced by the Minister in April 2019, having taken into account the technical, social, economic and environmental aspects of the scheme and the outcome of the Public Consultation, the Cabinet Secretary decided to adopt Junction 15 Option D to address the transport problems identified in the A55 Junctions 15 and 16 Improvements project. A requirement to develop a junction arrangement through further preliminary design to minimise the need to demolish property and minimise impact on the local area was included. A TR111 Plan was published to protect the entire Junction 15 Option D route for planning purposes. The TR111 plan shows the Preferred Route as a broad black line. This is indicative only and may change slightly during the next stage of design. The TR111 plan is included in Appendix 3.1.

3.5.2 The Minister stated that by publishing a TR111 plan,

> *'we protect the route/options under the Town and Country Planning (General Development Procedure) Order 1995. This means that the Local Planning Authority will refer to the Welsh Government all future planning applications that are near the Preferred Route/Options. You may inspect the TR111 plan at the offices of Conwy Council, Conwy and at the WG Offices in Llandudno Junction, Conwy.*
>
> *In certain circumstances, any owner having difficulty selling property on the line of the route may apply for blight. If any case meets set criteria, we will purchase the property.*
>
> *The protection of the preferred route/options does not commit us to the line/layout of that route/option. We are only committed once the Line Order/Slip Road Orders are made, described in the next section "What happens next"'.*

3.5.3 The Preferred Route, Option 'D' has already been described in Chapter 2.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 4 METHODOLOGY

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4. ENVIRONMENTAL IMPACT ASSESSMENT METHOD

4.1 Chapter introduction

4.1.1 This chapter of the Environmental Statement (ES) sets out the approach taken in undertaking the Environmental Impact Assessment (EIA) of the proposed Scheme. The chapter describes the overall approach to the assessment of the likely effects of the Scheme proposals. It also includes details of consultation undertaken with statutory environmental bodies and key stakeholders during the assessment process. The EIA assesses the likely impact of the scheme proposals on several environmental topics. Further details of the environmental topics and any specialist methods used in the assessment are provided in each topic chapter of this ES.

4.2 Legislative Framework

Environmental Impact Assessment (EIA)

4.2.1 The legislative framework for EIA is set by the EIA Directive (2014/52/EU) that came into force in May 2014. The regulations to transpose the 2014 Directive for projects under the Highways Act came into force on 5th December 2017 under The Environmental Impact Assessment (Miscellaneous Amendments relating to Harbours, Highways and Transport Regulations 2017).The main changes to the Directive include revisions to how screening and scoping are undertaken and the requirements for a Screening Report that sets out the likely significant effects as well as outlining any mitigation measures. The Directive also requires new topics to be considered in the EIA process and that competent experts with sufficient expertise are used in the preparation of the Environmental Statement.

4.2.2 As set out in Chapter 1 Introduction of this ES, there is no statutory provision to the form of an ES. Section 105A of the Highways Act states that the ES must contain the information referred to in Annex IV of the EIA Directive 2014/52/EU. Annex IV is included in Appendix 4.1. That information must include at least[1];

a) A description the site, design, size and any other relevant features of the project.
b) A description of the likely significant effects of the project on the environment.
c) A description of the features of the project or measures envisaged to avoid, prevent or reduce and, if possible, offset any likely significant effects of the project on the environment.
d) A description of the reasonable alternatives studied by the project authority which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.
e) A non-technical summary of the information mentioned in paragraphs (a) to (d).
f) Any additional information specified in Annex IV that is relevant to the specific characteristics of the project, or type of project, and to the environmental features likely to be affected.

4.2.3 This ES provides the information required by the Highways Act 1980 together with other relevant information listed in the EIA Directive (2014/52/EU) (as amended). Together, the information supplied within this ES is considered to provide a clear understanding of the likely significant effects of the Scheme on the environment.

[1] EIA Regulations 2017; Schedule 2 Amendments to the Highways Act 4(4)

Assessment of Impacts on European Sites (AIES)

4.2.4 In accordance with Regulation 63 of the Conservation of Habitats and Species Regulations 2017 and the Habitats Directive (92/43/EEC), an Assessment of Implications on European Sites (AIES) has also been prepared to consider the possible effects of the Scheme on European sites. The findings of the AIES are reported separately to the ES in a Statement to Inform Appropriate Assessment (SIAA).

Water Framework Directive

4.2.5 In accordance with the Water Framework Directive[2], an assessment of effects on Water Framework Directive watercourses has been undertaken and is provided in Appendix 7.1 of this ES.

4.3 EIA Screening (Determination)

4.3.1 EIA is an iterative process that evolves alongside a development proposal. The process occurs in a series of steps, which include screening, scoping, assessment and reporting. Screening and Scoping, which are the first steps, are described here.

4.3.2 EIA is a means of identifying and collating information to inform an assessment of the likely significant environmental effects of a project. The process requires consideration of the likely changes to the environment as a result of the project, through comparison with the existing and likely future baseline conditions in the absence of the proposed scheme.

4.3.3 The requirement to complete a statutory Environmental Impact Assessment (EIA) and publish an Environmental Statement only applies to certain projects that are deemed to exceed certain thresholds and are predicted to have a significant effect on the environment. The process for deciding whether it is necessary to carry out an EIA and publish an Environmental Statement (ES) is called Screening.

4.3.4 DMRB (2008) Volume 11 Environmental Assessment Section 2 Environmental Impact Assessment Part 3 'Screening of Projects for Environmental Impact Assessment (HD47/08) sets out four steps to appropriate screening. These are summarised in Table 4.1[3]. DMRB is being updated over the course of late 2019 and 2020 and these changes will affect the screening process in the future. For Junction 15 screening was conducted before the new guidance was published, but the method applied to the project accords with the additional requirements set out in the new EIA Directive (2014/52/EU.

4.3.5 A screening exercise was undertaken in 2018 and 2019 to establish if the project falls within the thresholds of an Annex I or II project and if it is classified as a Relevant Project as set out in Table 4.1 above. The Record of Determination (RoD) concludes that the project is classified as an EIA development and determined that a Statutory Environmental Impact Assessment is required. The primary reasons for this determination is that;

A. The project lies adjacent to Natura 2000 sites.
B. The project is visible from Snowdonia National Park but the lies outside the designated area.

[2] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
[3] DMRB Volume 11 Section 2 Part 3 HD 47/08 paras 1.6 – 1.20

C. There is the potential for the project to have significant effects on several environmental topics including ecology, cultural heritage, landscape and townscape, motorised and non-motorised users and community facilities.

4.3.6 During the Screening exercise it was identified that because the Junction 15 and Junction 16 schemes were geographically separate with no connecting Line Order, a separate statutory process would be required for each junction improvement. For this reason, to maintain the separation of legal procedures a separate ES would have to be prepared for each junction. As a result, the junctions have become two Schemes with their own sets of Draft Orders, ES and AIES.

Table 4.1: The steps to screening a project

Requirements of screening	Result for this scheme
Step 1 Deciding if the Project Falls within Annex I or II of the EIA Directive	The Scheme falls below the Annex II because it would not involve the construction of a motorway or express road of four or more lanes, nor would it constitute a realignment or widening of a two-lane road or less to provide four lanes over a continuous length of 10km.
Step 2 Deciding if the Annex II Project is a 'Relevant Project'	The scheme exceeds the Annex II threshold of 1 hectare and is therefore a 'Relevant project' for constructing or improving a highway where the area exceeds 1 hectare or where any such area is situated in whole or in part in a sensitive area.
Step 3 The Determination of a 'Relevant Project' for the Purposes of the EIA Regulations	Based on the criteria set out in Annex III an assessment of the Scheme indicates that the Scheme is considered likely to significant effects on the environment The focus of the determination is based on the question 'Is the project being considered likely to have a significant effect on the environment?'
Step 4 Reporting the Determination	A Record of Determination (RoD) has been prepared based on the results of the screening assessment.

4.3.7 A copy of the Screening Report and RoD is included in Appendix 4.2 and 4.3

4.4 EIA Scoping

4.4.1 The screening exercise determined that an EIA is required, and this is recorded in the RoD referred to above and included in Appendix 4.4. The next step of the EIA process is to clearly define the scope and contents of the EIA.

4.4.2 The process of identifying the matters to consider within the EIA process is known as scoping. Scoping is an important preliminary procedure which sets the context for the EIA. DMRB Volume 11 Section 2 Part 4 (HA 204/08) *"Scoping of Environmental Impact Assessments"* provides guidance on the scoping a project[4]. *"Scoping can be an internal process and an external activity in which stakeholders are engaged in defining the assessment activities".*[5] *The scoping was carried in accordance with the above the guidance, not the updated 2019 version and so was correct at the time of writing*[6]. DMRB is being updated over the course of late 2019 and 2020

[4] Volume 11 Section 2 Part 4: HA 204/08
[5] Volume 11 Section 2 Part 4: HA 204/08 para 1.3
[6] The updated DMRB includes new guidance for scoping in the form of LA103.

and these changes will affect scoping in the future. For Junction 15 scoping was conducted before the new guidance was published, but the method applied to the project accords with the additional requirements set out in the new EIA Directive (2014/52/EU).

4.4.3 The results of the scoping exercise are reported and used to provide the basis for further assessment throughout the project. The preparation of a Scoping Report is the means by which the scope of the EIA is clearly defined and agreed with key stakeholders and Statutory Environmental Bodies (SEB's) often through the forum of an Environmental Liaison Group (ELG).

Environmental Liaison Group Meetings (ELG)

4.4.4 The ELG is an ideal forum where environmental issues associated with the Scheme can be discussed and the scope of the EIA agreed with SEB's and key stakeholders. The inaugural meeting of the ELG for the A55 Junctions 15 & 16 Improvements was held on 9th May 2018.

4.4.5 A copy of the Scoping Report is provided at Appendix 4.3 of this ES. The purpose of the Scoping Report was to identify the proposed scope of the EIA process and to set out the proposed assessment methodologies for comment. It also identified areas proposed to be scoped out of the assessment.

4.4.6 This ES considers the legislative requirements, the nature, size and location of the Scheme, the responses provided by consultees, and includes the information required by the EIA Regulations 2017. Together, the information supplied within this ES is considered to provide a clear understanding of the main or likely significant effects of the Scheme on the environment.

Content of the Environmental Statement

4.4.7 Based on the scoping report and the requirements of the Design Manual for Roads and Bridges, the volumes and sections that make up the content of this ES is set out in Table 4.2 below:

Table 4.2: Scope of this Environmental Statement (ES)

Volume 1 : Environmental Statement	
Chapter	**Title of Chapter**
1.0	Introduction
2.0	Scheme Description
3.0	Assessment of Alternatives
4.0	EIA Methodology
5.0	Legislation and Policy Context
Chapter	**Environmental Topics**
6.0	Geology and Soils
7.0	Drainage and Water
8.0	Nature Conservation
9.0	Landscape
10.0	Cultural Heritage
11.0	Community Assets (including Agricultural and land use)
12.0	Air Quality
13.0	Noise and Vibration

Volume 1 : Environmental Statement	
14.0	All Travellers
15.0	Material Assets and Waste
16.0	Climate Change
17.0	Risk of Major Accidents and Disasters
18.0	Population and Health
19.0	Cumulative Effects
20.0	Management of Environmental Effects
21.0	Conclusions
22.0	Glossary
Volume 2 : Figures	
Including all figures and drawings to accompany the text	
Volume 3 : Appendices	
Including specialist reports forming technical Appendices to the main text in Volume 1	
Non-Technical Summary: Summary of this ES using non-technical language	

4.5 EIA Regulations 2017 – Additional Environmental Topics

4.5.1 In addition to the standard range of environmental topics covered in DMRB Volume 11[7], the EIA Regulations 2017 that implement the EU Directive 2014/52/EU require additional topics to be considered as part of the EIA. Welsh Government guidance sets out how the topics are to be addressed in the Environmental Statement within the framework established in DMRB Volume 11. DMRB is being updated over the course of late 2019 and 2020 and these changes will affect the content and scope of the future EIA. For Junction 15 the EIA addresses the additional requirements set out in the new EIA Directive (2014/52/EU).

Assessments of Material Assets

4.5.2 Annex IV of the EIA Directive includes reference to 'material assets'. The phrase 'material assets' has a broad scope, which may include assets of human or natural origin, valued for socio-economic/community or heritage reasons. Material assets are in practice considered across the range of standard DMRB topic areas within the ES. Materials associated with construction are considered in Chapter 15 Materials, therefore, no separate consideration of material assets is considered necessary.

Climate Change

4.5.3 The 2017 amendments to the EIA Directive place an emphasis on climate change and the likely significance effects of the project on climate and the vulnerability of the project to climate change. Although the provisions of Directive 2011/92/EU remain the relevant consideration for the Scheme, the requirements of the amended Directive in relation to climate change were considered, as a matter of best practice. Predicted changes to future environmental conditions and climate change is set out within each ES chapter where appropriate. Resilience to climate change was considered during design, particularly regarding future flood risk (Chapter 7) and air quality (Chapter 12).

[7] DMRB Volume 11 Section1 Part 1 HA 200/08 Table 1.1 Structure of DMRB Volume 11 Environmental Statement

4.5.4 Effects of the Scheme on Climate has also been considered through an assessment of atmospheric emissions associated with use of the Scheme. A carbon assessment was undertaken and is reported in Chapter 16 Climate Change. This report sets out carbon emissions associated with the construction and operation of the Scheme.

Assessments of Radiation and Heat

4.5.5 The EIA Regulations require a description of the likely significant effects of the project on the environment resulting from the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances and the disposal and recovery of waste.[8]

4.5.6 Given the nature of the Scheme, no significant radiation or heat effects are anticipated, and these effects were scoped out of the assessment. Other emissions referred to above are covered under the other relevant environmental topics.

Risk of Major Accident and Disaster

4.5.7 Scoping identified that accidents or disasters that caused the closure of the road, could isolate communities that rely on the A55 corridor for access to the road network and to public and emergency services. The Scheme is located on the coast and close to watercourses and coastal protection measures could influence flood risk which could close the A55 or affect land and communities nearby. It is considered necessary to examine the potential risk of major accidents and disasters in Chapter 17.

Assessments of health-related matters

4.5.8 The 2017 EIA Regulations 7 A(a) (a)[9] state that an EIA should consider the likely significant effects and risks of a project on population and human health. An assessment of the health impacts associated with the Scheme was undertaken. This assessment is discussed in ES Chapter 18 Population and Human Health.

4.5.9 Health Impact Assessment (HIA) and Equality Impact Assessment (EqIA) are a key part of the appraisal process for major transport schemes in Wales. The Welsh Government has statutory duties to promote well-being and racial, disability and gender equality. Public Health Wales has published their Long-Term Strategy (2018 to 2030), entitled 'Working to Achieve a Healthier Future for Wales'[10], to improve the quality and length of life for all members of the community. Social Impact Assessment (SIA) is often developed as an independent SIA report; however, social, health and equality impacts are intrinsically linked and reported in ES Chapter 18 Population and Human Health.

4.5.10 A combined assessment covering health, social and equalities effects has therefore been undertaken for the Scheme. This assessment considers how the Scheme may influence public health and well-being in the areas surrounding the proposed road improvement through environmental and socio-economic pathways. The assessment also considers, where possible, the distribution of impacts and any potential disproportionate impacts of the Scheme on sensitive community groups.

[8] The Environmental Impact Assessment Regulations 2017 5(1)(c)
[9] The Environmental Impact Assessment Regulations 2017 7A(a)
[10] Public Health Wales, Long Term Strategy 2018-30, available at: (http://www.wales.nhs.uk/sitesplus/documents/888/Long%20Term%20Strategy_English_single%20pages%20%28print%20version%20191118%29.pdf)

4.6 Environmental Assessment Methodology

Relevant EIA Guidance

4.6.1 The relevant EIA guidance has been followed and documents listed below referred to in undertaking the EIA and the preparation of the ES. While DMRB 2008 has been withdrawn since this assessment was carried out, the advice it contains remains relevant and useful. The application of the 2008 and 2019 versions of DMRB are set out in Chapter 1 of this ES.

4.6.2 The references below are to general guidance and do not refer to specific guidance referred to under specific environmental topic areas.

Design Manual for Roads and Bridges (DMRB) Volume 11, Section 1 Aims and Objectives of Environmental Assessment HA 200/08 (Highways Agency et al., 2008a, as amended).

DMRB Volume 11, Section 2 General Principles of Environmental Assessment, including HA 201/08, HA 202/08, HA 204/08, HA 205/08 and HD 48/08 (Highways Agency et al., 2008 b, c, d, e, f).

DMRB Volume 11 Section 4 Part 1: Assessment of Implications (of highway and road projects) on European Sites (including Appropriate Assessment HD 44/09.

Interim Advice Note 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment'. Wales Only (Welsh Assembly Government, 2010).

Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment - IEMA 2004)

The State of Environmental Impact Assessment Practice in the UK. Special Report (Institute of Environmental Management and Assessment, 2011).

Environmental Impact Assessment Guide to Delivering Quality Development (IEMA July 2016)

4.6.3 Other topic specific legislation and good practice guidance has been considered and details of these can be found in the topic chapters within this ES.

4.7 Assessment Methodology for each Environmental Topic

4.7.1 The assessment of each environmental topic forms a single chapter within this ES, and will contain details of:

a) Legislation and policy context relevant to the topic;
b) Assessment method used.
c) Description of the baseline environmental conditions including any predicted changes to future environmental baseline conditions;
d) Identification of potential environmental effects including;
    i. Permanent and temporary impacts;
    ii. Direct, indirect and secondary impacts;
    iii. Cumulative impacts;
    iv. Effects arising during the construction and operational phases;
    v. Identification of mitigation and monitoring measures, where appropriate;
    vi. Evaluation and assessment of the significance of identified effects and;
    vii. Legislation and policy relevant to the topic
e) Identification of mitigation and monitoring measures
f) Evaluation and assessment of the significance of identified effects.

4.7.2 Legislation and National and Local Planning Policies relevant to the particular environmental topic will be reviewed and referenced. General policies that are not specific to an environmental topic will be covered in Section 5 Legislative and Policy Context.

Assessment method used

4.7.3 Each topic chapter provides details of the methodology for baseline data collection and the approach to the assessment of effects. Each environmental topic has been considered by a specialist in that area. The identification and evaluation of effects has been based on the information set out in the Scheme description and construction details contained within Chapters 2 and 3 of this ES, EIA good practice guidance documents and relevant topic specific guidance where available.

4.7.4 Cumulative effects with other proposed developments and inter-relationships between topic areas are assessed within Chapter 17 of this ES.

4.8 Identification of the Baseline Environmental Conditions

4.8.1 An ES requires enough data to form the basis of the assessment. Each topic chapter includes a description of the current (baseline) environmental conditions. This is based on the study area identified for each topic chapter. Where appropriate, study areas have been agreed in consultation with statutory consultees. In some instances, more than one study area has been defined in accordance with relevant standards and guidance for that topic.

4.8.2 The following scenarios have been considered (without the Scheme), in the relevant assessments, for comparison against the situation with the Scheme in place. These could include:

a) The existing baseline conditions at the time of survey/writing (2017-2019) depending on the availability of existing data and new surveys;
b) During construction (Spring 2022);'
c) Opening Year that follows completion of the Junction improvement works, when the scheme would be open to traffic– End 2023.
d) Design Year, 15 years after opening – Spring 2038.

4.8.3 Baseline data has been obtained from existing sources (including published and unpublished data sources, surveys by others), from surveys commissioned specifically for the Scheme, or both. Future baseline scenarios have been informed by extrapolation of the currently available data by reference to, for example, Government policy, other planning applications, climate change and expert judgement of the individual topic specialists. Clearly the more distant a future baseline is, the greater the uncertainty is in relation to the conditions that would pertain at that time.

4.8.4 A programme of surveys for the Scheme were carried out between October 2017 and Autumn 2019 to provide additional data for the design and the EIA. These included noise and air quality baseline surveys, further ecological surveys, summer and winter landscape and visual surveys, ground investigation, non-invasive archaeological investigations, farm surveys and interviews, non-motorised users and traffic surveys and water resources surveys.

4.8.5 Each topic chapter identifies the limitations of the assessment and whether there were any difficulties encountered in compiling the information that is presented in this ES.

4.9 Assessment Environmental Effects

4.9.1 The EIA process requires the identification of the likely significant environmental effects of the Scheme. This includes consideration of the likely effects during the construction and operational phases.

4.9.2 Volume 11, Section 2 of the DMRB (HA 205/08 para 2.3)[11] provides guidance on the determination of significance of environmental effects for highway schemes. This includes consideration of the following, which are discussed in the following sections:

a) Assigning Environmental value (or sensitivity) of a resource or receptor;
b) Assigning magnitude of impact;
c) Assigning significance;
d) Cumulative effects.

4.10 Sensitivity or Value of Receptors

4.10.1 'Receptors' are defined as '*individual environmental features that have the potential to be affected by a scheme*'[12]. For each topic, baseline studies have informed the identification of potential environmental receptors. Some receptors will be more sensitive to certain environmental effects than others. The sensitivity or value of a receptor may depend, for example, on its frequency, extent of occurrence or conservation status at an international, national, regional or local level.

4.10.2 Sensitivity is defined within each ES topic chapter and takes into account factors including the following.

e) Vulnerability or susceptibility of the receptor to change;
f) Recoverability of the receptor (ability to recover from a temporary impact);
g) Importance of the receptor.

4.10.3 The assessment process examines how the proposed Scheme will impact on environmental receptors (people, heritage, air, water soils and species). Each receptor will have been identified in baseline surveys and desk studies and is given a value based on rarity or sensitivity to change. As a general guide, the definitions set out in Table 2.1 of HA205/08 have been taken into account except where topic guidance requires otherwise. This includes a five-point scale for assigning environmental sensitivity as shown in Table 4.3.

[11] The updated DMRB sets out this advice in LA104
[12] DMRB Volume 11 Section 2 Part 7 HA 218/08 Glossary of Terms

Table 4.3 Environmental Sensitivity (or value) and Typical Descriptors

Environmental Sensitivity	Typical descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	High or Medium importance and rarity, regional scale, limited potential for substitution.
Low (or lower)	Low or medium importance and rarity, local scale.
Negligible	Very Low importance and rarity, local scale.
Based on Table 2.1 of HA205/08 (Highways et al., 2008e)	

4.11 Magnitude of Impact

4.11.1 The DMRB defines an 'Impact' as: 'Change that is caused by an action; for example land clearing (action) during construction which results in habitat loss (impact)' (Highways Agency et al., 2008g).

4.11.2 For each topic, the likely environmental impacts have been identified. The likely environmental change arising from the Scheme has been identified and compared with the baseline (the situation without the Scheme). Impacts are divided into those occurring during the construction and operation phases.

4.11.3 The categorisation of the magnitude of impact for a given topic generally takes account of factors such as:

h) Extent (Area and distance);
i) Duration (how long a time it will last);
j) Frequency (how often will it occur);
k) Reversibility (will the effect be undone or repaired).

4.11.4 When undertaking an EIA, environmental impacts are classified as either permanent or temporary, as appropriate. 'Permanent' changes are those which cannot be reversed (e.g. permanent land take) or will last for the foreseeable future (e.g. noise from generated road traffic). 'Temporary' are short term impacts that can be reversed. Within the assessments applied in this ES the following has been used as a guide, unless defined separately within the topic assessments:

Short-term: one to three years;

Medium-term: four to nine years;

Long-term: greater than nine years.

4.11.5 Impacts are also defined as either 'Adverse' or 'Beneficial'. Depending on discipline, they may also be described as:

Direct: Arise from activities associated with the Scheme. These tend to be either spatially or temporally concurrent.

Indirect: Impacts on the environment that are not a direct result of the Scheme, often produced away from the Scheme or as a result of a complex pathway.

4.11.6 Where environmental impacts are 'Episodic', the Frequency of the events can be predicted.

4.11.7 The magnitude of the impact is ascribed to a receptor where it is influenced by the Scheme (see Table 4.3). For example, an area of habitat might be unaffected, partially affected or destroyed.

4.11.8 As a general guide, the definitions set out in Table 2.2 of HA205/08 have been considered (except where topic guidance requires otherwise). This includes a five-point scale for assigning impact magnitude as shown in Table 4.4.

4.12 Significance of Effects

4.12.1 The approach to assigning the significance of an effect relies on professional judgement of the environmental topic specialist. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale. The significance categories are set out in Table 4.5 below from HA205/08 Table 2.4.

4.12.2 The DMRB[13] defines an 'effect' as a 'term used to express the consequence of an impact (expressed as 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource' (Highways Agency et al., 2008g).

4.12.3 The magnitude of impact on a receptor is combined with the value/sensitivity/importance of that receptor to determine the significance (see Table 4.6). For example, a significant effect may arise as a result of a relatively modest impact on a resource of national value/sensitivity, or a large impact on a resource of local value/sensitivity. In broad terms, therefore, the significance of the effect can depend on both the impact magnitude and the value or sensitivity of the receptor.

4.12.4 An 'effect' is therefore the consequence of an impact (expressed as the 'significance of effect'). This is identified by considering the magnitude of the impact and the sensitivity or value of the receptor. This is reported using the matrix set out in Table 4.6 below.

Table 4.4: Five-point scale for assessing Magnitude of Impact

Magnitude of Impact	Typical descriptors
Major	**Adverse:** loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial: large scale or major improvement of resource quality, extensive restoration or enhancement; major improvement of attribute quality.
Moderate	**Adverse:** loss of resource but not adversely affecting integrity; partial loss or damage to key characteristics, features or elements.
	Beneficial to, or addition of key characteristics, features or elements; improvement of attribute quality.
Minor	**Adverse:** some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial: minor benefit to or addition of one (maybe more) key characteristics, features or elements; some beneficial impact on attribute, or a reduced risk of negative impact occurring.

[13] DMRB Volume 11 Section 2 Part 7 HA 218/08 Glossary of Terms used in Volume 11, Sections 1 and 2

Magnitude of Impact	Typical descriptors
Negligible	**Adverse:** very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial: very minor benefit or positive addition of one or more characteristics, features or elements.
No change	**Adverse/beneficial:** no loss or alteration of characteristics, features or elements, no observable impact in either direction.
Based on Table 2.2 of HA205/08 (Highways et al., 2008e)	

Table 4.5: Arriving at the Significance of Effect Categories

		MAGNITUDE OF IMPACT				
		No Change	Negligible	Minor	Moderate	Major
ENVIRONMENTAL SENSITIVITY (VALUE)	Very High	Neutral	Slight	Moderate Large	Large Very Large	Very Large
	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
	Negligible	Neutral	Neutral	Neutral Slight	Neutral Slight	Slight

Table 4.6 Descriptors of the Significance of Effect Categories

Significance Category	Typical Descriptors of Effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of International, National or Regional Importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may enter this category.
Large	These beneficial or adverse effects are likely to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.

Significance Category	Typical Descriptors of Effect
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
Based on Table 2.3 of HA205/08 (Highways Agency et all., 2008e	

4.12.5 Each chapter defines the approach taken to the assessment of significance. Where appropriate, topic chapters have adopted the general approach set out in DMRB HA 205/08 (see Table 4.5). The evaluation of significance for each topic will take into account industry and professional guidance; codes of practice; policy objectives regulations or standards; advice from statutory consultees and other stakeholders, as well as expert judgement of the EIA practitioners, based on specialist experience. For some topics, a simplified or quantitative approach is considered appropriate.

4.12.6 Where more than one significance level is provided, professional judgement has been used to determine the significance of effect. Slight, moderate, large or very large effects may be beneficial or adverse.

4.12.7 Except where guidance requires otherwise, the significance of effect is described using the terms very large, large, moderate, slight and neutral. The broad definitions of these terms are provided in Table 4.6.

4.12.8 In terms of the EIA Regulations, significant effects are generally those where the significance of the effect is 'moderate' or greater. It should be noted however that, as described in Table 4.5, a significant effect in EIA terms simply means that the effect should be given careful consideration in the decision-making process.

4.13 Mitigation and Monitoring Measures

4.13.1 DMRB Volume 11 Section 1 Part 7 (HA 218/08) defines mitigation measures as follows; "Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects." Legislation also provides the Overseeing Organisation with powers to: "acquire land for the purpose of mitigating any adverse effect which the existence or use of a highway constructed or improved by them, or proposed to be constructed or improved by them, has or will have on the surroundings of the highway. " (Highways Act 1980 (as amended), Part XII, Section 246)

4.13.2 DMRB (HA 205/08 para 1.41) states that the "mitigation of significant adverse environmental effects should be dealt with as an iterative part of the option choice, planning and design stage. Failure to do so may result in failure to deliver the project; and failure to avoid, reduce or remedy significant adverse environmental effects, particularly where land is not secured to allow delivery or future maintenance".

4.13.3 The DMRB (HA 218/08) defines two types of mitigation measures as essential and desirable mitigation;

Essential mitigation Mitigation which the Overseeing Organisation has the statutory power to achieve*;*

Desirable mitigation A measure considered to be environmentally beneficial but that cannot usually be achieved using statutory powers. For example, third party agreement may

be required.

4.13.4 It also includes a description of enhancement as;

Enhancement, a measure that is over and above what is required to mitigate the adverse effects of a project. This could also be interpreted as desirable mitigation.

4.13.5 The development of mitigation and monitoring measures is part of an iterative EIA process. Measures included in the Scheme will have been developed throughout the EIA process in response to the findings of initial assessments. In some cases, these measures may result in enhancement of environmental conditions. Essential mitigation measures can include the following[14]:

Primary mitigation: measures incorporated within the Scheme design sometimes referred to as embedded mitigation. These are often intended to avoid or minimise adverse effects considered in the design process and that may not readily be recognisable as mitigation. These measures are a fundamental part of the design and incorporated within the scheme shown on the Environmental Masterplans (EMP).

Secondary mitigation: additional measures identified during the EIA process to further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are supplementary to those measures in (1) above and are also shown on the EMP and best managed through the environmental management plan and is recorded in the Register of Environmental Actions and Commitments (REAC).

Tertiary mitigation: good practice measures to be adopted during construction to avoid and minimise environmental effects, such as pollution control measures identified in a Construction Environmental Management Plan (CEMP) and monitoring to ensure that is effective in a Handover Environmental Management Plan (HEMP).

4.13.6 Some forms of mitigation require a controlling mechanism or legal undertaking to be implemented but are under the control of the 'Overseeing Organisation' and therefore are regulated and have greater certainty of delivery.

4.14 Assessment of Environmental Impacts

4.14.1 The purpose of an EIA is to identify and evaluate the environmental effects associated with the proposed development. These are assessed based on the magnitude of the effect (both before and following mitigation) and the sensitivity of the receiving environment.

4.14.2 In Wales, HA 205/08 recommends assignment of significance before and after the consideration of mitigation measures is undertaken to allow for the case or reason for, and effectiveness of mitigation to be described.[15]

Monitoring of Mitigation

4.14.3 The requirement for monitoring during construction or following completion of construction has been considered. A description of proposed monitoring measures is provided within each topic chapter of this ES. Monitoring would be reported in annual Environmental Monitoring Reports and on completion of aftercare a final environmental monitoring report will be prepared.

[14] IEMA Delivering Quality Development-Annex A: Classifying the three types of Environmental Impact Assessment mitigation
[15] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 2.9

4.14.4 Mitigation and monitoring measures proposed during the construction phase are set out in the Pre-Construction Environmental Management Plan in Appendix 2.2. The Register of Environmental Actions and Commitments (REAC) in Appendix 2.3 provides an overview of the key mitigation and monitoring proposed for the Scheme.

4.14.5 The determination of impact significance will be undertaken against the environmental baseline and be based on the significance matrix included in Table 4.5 this chapter. The section will then be presented in sub-sections:

- Impact Assessment: with inherent and standard mitigation measures implemented;
- Residual Impact Assessment: with inherent/standard and actionable mitigation measures implemented.
- Cumulative Impacts of the proposed scheme and other developments will be covered in ES Chapter 20.

4.14.6 For the purposes of the assessment, certain measures are an integral part of the Scheme and are therefore taken into consideration in the 'without mitigation' assessment. Those measures, which include careful adjustment of the vertical and horizontal alignment, for example, form part of the Scheme design, are briefly mentioned within Chapter 2 and are set out within each topic chapter of this ES.

4.15 Benefits of the Scheme

4.15.1 Enhancements of the Scheme would go further than the conventional approach to mitigation. Normally an ES will include measures such as avoidance of an impact, or if the impact cannot be avoided, it will include mitigation or replacement. Enhancement goes further to improve on the circumstances that existed before the Scheme is implemented to provide benefits. The delivery of these benefits is encouraged by the following two items of legislation.

Environment (Wales) Act 2017

4.15.2 Central to this Act is the need to adopt a new, more integrated approach to managing natural resources in order to achieve long-term sustainability and improved resilience of natural systems. The Act provides an iterative framework that ensures that managing our natural resources sustainably will be a core consideration in decision-making.

4.15.3 The Act includes a new biodiversity duty intended to reverse the decline and secure the long-term resilience of biodiversity in Wales.

Enhancement (Well-Being of Future Generations (Wales) Act 2015)

4.15.4 Enhancement goes further than the conventional approach to planning a scheme of development. Normally an ES will include measures such as avoidance of an impact, or if the impact cannot be avoided, it will include mitigation or replacement for the consequences. Enhancement goes further to improve on the circumstances that existed before the scheme is implemented. In Wales, the Future Generations Act 2015 places a duty on public organisations to achieve seven sustainability goals.

Figure 4.1: The Well-being Goals of the Future Generations Act 2016

4.15.5 Part 2, Section 2 of the Act defines the relevant meaning of sustainable development; as *'the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals.'* Public Bodies are required to set objectives for their actions which should be '*in accordance with the 'sustainable development principle', which means the body 'must act in a manner which seeks to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs'.*

4.15.6 The Scheme will include measures, or enhancements, that will contribute to the achieving the goals. These will be separately identified. Enhancements will be separately listed in the Chapter 21 Conclusions.

4.16 Assessment of Cumulative Effects

4.16.1 EIA Directive 2011/92/EU, as amended, requires the EIA to consider cumulative effects. Cumulative effects result from multiple actions on receptors and resources over time and are generally additive or interactive (synergistic) in nature. Cumulative impacts can also be considered as: '*…impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*.'[16]

4.16.2 Types of major developments for consideration were identified for inclusion within the cumulative effects assessment:

a) Development under construction.
b) Application(s) permitted but which are not yet implemented.
c) Submitted applications not yet determined, and which, if permitted, would affect the proposed development in the scoping request.
d) Development identified in the adopted and emerging development plan (with appropriate weight being given as they move closer to adoption), recognising that information on any relevant proposals will be limited.

4.16.3 A review of the following sources was undertaken:

4.16.4 A key source of proposed developments in closest proximity to the site is the Conwy County Borough Council planning authority website to:

a) Adopted and emerging Local Plans

[16] European Commission, 1999.

b) Planning Inspectorate website, to identify any Nationally Significant Infrastructure Projects in the vicinity of the Scheme.
c) Adopted and emerging Local Plans
d) Planning Inspectorate website, to identify any Nationally Significant Infrastructure Projects in the vicinity of the Scheme.

4.16.5 Advice and guidance on the assessment of cumulative effects is given in HA 205/08[17] and HD 48/08[18] (Highways Agency et al., 2008e and 2008f). Additionally, IAN 125/09(W) acknowledges that *'as yet there is no industry standardised approach'*[19] *to the assessment of cumulative effects. However, the cumulative assessment should nevertheless differentiate between permanent, temporary, direct, indirect and secondary effects, positive and negative'* (Welsh Assembly Government, 2010).

4.16.6 Relevant guidance taken into account in the assessment of cumulative effects includes:
a) HA205/08 Principles of Environmental Assessment – Assessment and Management of Environmental Effects (Highways Agency et al., 2008).
b) Welsh Assembly Government (2010) Interim Advice Note 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment' Wales Only.
c) Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2015).
d) Advice Note 9: Rochdale Envelope (Planning Inspectorate, 2012).

4.16.7 The cumulative effects of the Scheme in conjunction with other proposed developments have been assessed and the findings are presented within Chapter 20 of this ES.

Inter-relationships

4.16.8 Consideration of inter-relationships is a requirement of the EIA Directive. Interrelationships refer to the combined effect on individual (or groups of) receptors or resources from more than one source or type of environmental effect (e.g. noise, loss of amenity, visual impact on a dwelling). Inter-relationships are also considered within Chapter 20 of this ES.

4.17 Consultation

4.17.1 This section summarises the consultation undertaken with stakeholders at key stages during the development of the Scheme. Further details of the comments received (where relevant to the EIA process) are set out within each topic chapter of this ES.

4.17.2 During development of the Scheme, consultation has been undertaken with, or information requested from, several organisations including (but not limited to) Statutory and non-statutory consultees, interest groups, commercial, industrial and business operators, The general public (mainly from the local and surrounding communities).

4.17.3 The process also centred on engagement with key stakeholders in order to establish the proposed scope and level of detail required for the draft Plan's associated environmental, health and equality assessments. Key stakeholders, Listed in Table 4.7 and Table 4.8 included statutory consultees and those with a stake or significant interest in transport issues relevant to the economy, environment and society in North Wales and beyond.

[17] DMRB Volume 11 Section 2 Part 5 HA 205/08 IV Determining Significance of Cumulative Effects paras 2.13 – 2.16
[18] DMRB Volume 11 Section 2 Part 6 HD 48/08 para 3.23 & Table 3.2
[19] IAN 125/09 Section 3 2nd para

4.17.4 A Public Information Exhibition (PIE) was undertaken during three days in December 2017, based in community buildings in Llanfairfechan, Penmaenmawr and Dwygyfylchi. A bilingual Information Leaflet about the Scheme was delivered in advance to the relevant communities. Exhibition boards were displayed and members of the project team, including technical experts, were available to answer any questions and explain how the public could express their opinions formally.

4.17.5 Feedback at the exhibition was invited from those who attended the exhibition through a questionnaire survey and enquiry form. The feedback was taken into consideration during subsequent selection and development of the route options.

Statutory Public Consultation

4.17.6 The options were then shown to the community during a 12-week Public Consultation in June, July and August 2018. A Public exhibition was held between the 12th and 14th of June 2018, with a viewing held for local politicians in Conwy Business Centre in the evening of Monday the 11th June 2018. Subsequent day-long exhibitions were held in Llanfairfechan, Dwygyfylchi and Penmaenmawr in June 2019. Once again feedback was invited and received using questionnaires.

Statutory environmental consultees

4.17.7 An integral part of the Consultation process are the Environmental Liaison Group meetings. These were held with key environmental consultees during the Scheme evolution. Those who attended were invited to comment on the Scheme Objectives and Environmental Objectives and subsequently to comment on the EIA Scoping Report. The Scoping Report sets out the proposed scope of the EIA, and the assessment methodologies.

4.17.8 The approach to consultation during the EIA process has built on the consultation undertaken at previous stages. Statutory bodies have been consulted throughout the development of the Scheme and meetings held with key consultees.

4.17.9 Meetings with farm owners and tenants have been organised throughout the process, including completion of a questionnaire relating to existing land uses. Some landowners and tenants attended the PIE and responded to the statutory Public Consultation and were able to provide comments using the exhibition questionnaire and through discussions with technical staff who attended.

4.17.10 Other key stakeholders involved in the consultations include Sustrans, North Wales Ambulance, Fire Service, Public Transport organisations, Road Haulage Association, Freight Transport Association, Businesses in Penmaenmawr, Dwygyfylchi and Capellulo, and farm businesses affected by the Scheme.

Table 4.7: Statutory and public stakeholders

Organisation	Representative or department
Welsh Assembly	Local Assembly Member
Welsh Government	Technical Approvals Authority Technical Standards and Departures

Organisation	Representative or department
	Lands and Orders Network Management Route Manager Environmental Science Advisor
Conwy County Borough Council	Chief Executive Officer Head of Services Leader of the Council Infrastructure Cabinet Member Councillor for the wards affected Head of Highways Landscape Officer Transport Planner Ecologist
Snowdonia National Park Authority	Head of Development Management and Compliance
Community Council	Clerk to the Council
Natural Resources Wales	Liaison Officer and Protected Species team
Cadw	Conservation Officer, or the Gwynedd Archaeological Trust representative.
North Wales Trunk Road Agent	Road and soft estate maintenance
Design Commission for Wales	Reviewers
Utilities	various

4.18 The Preferred Route

4.18.1 Following the results of the Public Consultation, a report on the route options and the consultation were submitted to Welsh Ministers with a recommendation for the Preferred Route. A decision was made by Welsh Government on 5th April 2019 to progress with Junction 15 Option D.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 5 POLICY & PLANS

RAMBOLL Bright ideas. Sustainable change.

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5. POLICY & LEGISLATION

5.1 Chapter introduction

5.1.1 The purpose of this chapter is to provide an overarching and strategic legislative and policy context for the Scheme from an environmental perspective. The DMRB[1] advises that environmental planning and management of highway construction and improvement schemes is controlled by a wide range of legislation. As such it briefly describes key legislation and the main planning policies of specific reference to the scheme at European, UK and Welsh levels.

5.1.2 The scheme will be developed and delivered following the procedures under the Highways Act 1980 (as amended). Due consideration will also be given to legislation, national and regional planning policies in the decision-making process. This chapter refers planning policies and other relevant plans and strategies set at a national level by Welsh Government.

5.1.3 Due consideration will also be given to the development planning policies at the local level. The scheme falls almost entirely within the jurisdiction of Conwy County Borough Council as the local planning authority and therefore the relevant policies of Conwy Local Development Plan are included within the chapter. The eastern section of the scheme encroaches marginally within the boundary of Snowdonia National Park Authority where the rearrangement of the existing Junction 15 necessitates some additional land take south of the existing junction. However, this is not considered to be significant in terms of planning policy due to the minor changes in land take.

5.1.4 Specific legislation and policy is also considered further on a topic by topic basis within Chapters 6–18 of this Environmental Statement (ES). Individual chapters also provide further detail on how the design of the scheme has been developed by consideration of the relevant policies.

5.1.5 Table 5.1 to 5.3 below summarises the legislation, National and Regional Planning Policies and other relevant documents together with the local development plans that are considered further in this chapter and a reference to the relevant section of the chapter is given in the right-hand column.

Table 5.1: Key legislation which is relevant to the Scheme at European, UK and Welsh levels

Document Reference	Refer to Section:
Highways Act 1980	5.2
The Environmental Impact Assessment Regulations 2017	5.3
Environment (Wales) Act 2016	5.4
Historic Environment (Wales) Act 2017	5.5
Well-Being of Future Generations Act (Wales) 2015	5.6
Active Travel (Wales) Act 2013	5.7
Wildlife and Countryside Act 1981 (as amended)	5.8
Natural Environment and Rural Communities Act 2006	5.9
Conservation of Habitats and Protective Species Regulations 2017	5.10

[1] DMRB Volume 10 Section 7 Part 1 HA 99/01

Document Reference	Refer to Section:
Climate Change Act 2008	5.11
Human Rights Act 1998	5.12
Planning (Wales) Act 2015	5.13

Table 5.2: National and Regional Planning Policies

Document Reference	Section
National Planning Policy: The Wales Spatial Plan (Update 2008)	5.14
Planning Policy Wales (10th Edition)	5.14.8
Planning Policy Wales: Technical Advice Notes (TAN's)	5.14.11
North Wales Regional Planning Guidance 2002	5.14.13

Table 5.3: Other Relevant Documents at National Level/Welsh Government Plans and Strategies

Document Reference	Section
A Growth Deal for North Wales	5.15.1
Economic Development: Taking Wales Forward 2016-2021	5.15.3
Economic Renewal, A New Direction (July 2010)	5.15.7
Economic Development: Wales - A Vibrant Economy (November 2005)	5.15.10
Wales Infrastructure Investment Plan (2012)	5.15.13
Wales Infrastructure Investment Plan – Mid-point Review 2018	5.15.16
Partnership for Growth: strategy for tourism 2013-2020	5.15.17
North Wales Tourism Strategy 2010 to 2015	5.15.19
One Wales Connecting the Nation- The Wales Transport Strategy (April 2008)	5.15.20
North Wales Joint Local Transport Plan 2015	5.15.24
The Vision for Transport in North Wales	5.15.25
National Transport Finance Plan for Wales (2015)	5.15.32
National Transport Finance Plan for Wales (2017 update)	5.15.36
One Wales: One Planet (May 2009)	5.15.38
Climate Change Strategy for Wales (October 2010)	5.15.42
Conwy Local Development Plan	5.16
Snowdonia National Park Authority: Eryri Local Development Plan	5.17

5.2 Highways Act 1980

5.2.1 The scheme is being promoted and would be constructed using the powers of the Welsh Ministers as Highway Authority in accordance with the Highways Act 1980. These powers have been transferred to them by virtue of the National Assembly for Wales (Transfer of Functions) Order 1999 and the Government of Wales Act 2006.

5.2.2 The powers to construct the new section of trunk road and junction (15) at Llanfairfechan would be obtained through the Statutory Orders which will be published alongside the application in addition to a Compulsory Purchase Order which would enable Welsh Ministers to acquire all land and rights over land necessary for the construction and operation of the proposed scheme.

5.2.3 As part of the legal process, the Welsh Ministers would consider all the responses to the draft scheme and Orders and then decide whether to hold a Public Local Inquiry.

5.3 The Environmental Impact Assessment Regulations 2017

5.3.1 European EIA directives require an EIA to be undertaken in support of an application for development consent for certain types of scheme. The legislative framework for EIA is set by *European Directive 2011/92/EU*, as amended by *Directive 2014/52/EU* (collectively referred to as the EIA Directive). From May 2017 the new EIA Directive EC2014/52/EU, is transposed into the *Harbours, Docks, Piers and Ferries Environmental Protection - The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 (EIA Regulations 2017)* 5th December 2017. The equivalent under town and country planning act is the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016.

5.4 Environment (Wales) Act 2016

5.4.1 Enacted in 2016 by the National Assembly for Wales, the Environment (Wales) Act 2016 provides an iterative framework that ensures managing natural resources sustainably will be a core consideration in decision-making. Natural Resources Wales are the principle organisational body to help deliver the aims of the Act and are required to prepare a number of documents, which include;

a) State of Natural Resources Report;
b) National Natural Resources Policy; and
c) Area Statements.

5.4.2 These documents will help inform the designers of road schemes so that schemes can be delivered in a way that manages natural resources sustainably. The Act also includes provisions to:

d) Tackle climate change, through statutory emission reduction targets and carbon budgeting to support their delivery; and
e) Provide enhancements of benefit to biodiversity.

5.4.3 The Environment (Wales) Act 2016 supersedes the biodiversity duty outlined in Section 40 of the NERC Act 2006 which was relevant to both England and Wales.

5.5 Historic Environment (Wales) Act 2017

5.5.1 The Historic Environment (Wales) Act 2017 was passed by the National Assembly for Wales on 9 February 2016 and became law after receiving Royal Assent on 21 March 2016. It has three main aims:

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

5.5.2 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, the Advisory Panel for the Historic Environment in Wales and;

a) Extending of the definition of a Scheduled Ancient Monument (SAM) to allow recognition and protection of any nationally important sites that provide evidence of past human activity. This will mean many sites on the Historic Environment Record will have protection as will the setting.
b) Amendments to the criminal offences and defences for damage to scheduled monuments and powers of entry to inspect or investigate SAMs and to issue stop notices for SAMs and Listed Buildings.
c) Statutory registers powers to compile and maintain a comprehensive register of parks and gardens of historic interest in Wales, a statutory list of historic place names, and statutory historic environment record for each local authority area in Wales.

5.6 Well-being of Future Generations Act (Wales) 2015

5.6.1 The Well-being of Future Generations Act (Wales) 2015 Act is about improving the social, economic, environmental and cultural well-being of Wales with an overarching aim of creating a Wales we all want to live in, now and in the future. The Act puts in place seven well-being goals shown in Table 5.4.

5.6.2 The 2015 Act places a duty on public bodies in Wales and those listed in the Act to work to improve the economic, social, environmental and cultural well-being of Wales. To help do this they must set and publish well-being objectives and give greater consideration to the long term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach.

5.6.3 The A55 Junction 15 Improvements have been assessed using the Welsh Transport Appraisal Guidance (WelTAG) 2017 procedure. The primary purpose of WelTAG is to allow the comparison of schemes on a like-for-like basis. It achieves this by providing a framework for thinking about proposed changes to the transport system. In particular the procedure gives consideration to sustainability and the seven well-being goals. Each option was assessed qualitatively against the WelTAG criteria to allow the economic, social, cultural and environmental impacts to be assessed as described below. The results of this appraisal were presented during the 12-week public consultation held in 2018. The appraisal findings have been reviewed under the following headings as the Preferred Option design has been developed.

a) Economic – Journey time reliability changes, transport operating costs accidents and local economy;
b) Social and Cultural – Journey quality, accident savings, security, severance,

accessibility/permeability and equality, diversity and human rights;

c) Environment – Noise, air quality, greenhouse gases, landscape and townscape, historic environment, biodiversity and water environment.

5.6.4 Such impacts are clearly aligned to the sustainable development principles as set out in the 2015 Act and the proposed scheme seeks to improve a key piece of infrastructure for future generations in Conwy County Borough, the adjoining Gwynedd (connected by the A55 road corridor) and the wider region and for those visiting from elsewhere.

5.6.5 The Act defines Sustainable Development in Wales as: "The process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals." It sets out five ways of working needed for Public Bodies to achieve the seven well-being goals namely;

a) **Long Term** - The importance of balancing short-term needs with the needs to safeguard the ability to also meet long-term needs.
b) **Integration** - Considering how the public body's well-being objectives may impact upon each of the well-being goals, on their objectives, or on the objectives of other public bodies.
c) **Involvement** - The importance of involving people with an interest in achieving the well-being goals and ensuring that those people reflect the diversity of the area which the body serves.
d) **Collaboration** - Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives.
e) **Prevention** - How acting to prevent problems occurring or getting worse may help public bodies meet their objectives.

Table 5.4: The seven Well Being Goals

Goal	Description of Goal
1. A prosperous Wales	An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
2. A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
3. A healthier Wales	A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.

Goal	Description of Goal
4. A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic background and circumstances).
5. A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
6. A Wales of vibrant culture and thriving Welsh Language	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.
7. A globally responsible Wales	A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

5.6.6 In preparing the scheme proposals, a number of consultation events have been held[2] to address the five ways of working and where the local authority and other public bodies have had the opportunity to comment on the proposals. Additional meetings with the Local Authority have also been held discuss more specific issues such as the emerging Local Development Plan.

5.7 Active Travel (Wales) Act 2013

5.7.1 The Active Travel Act 2013 sets a legal requirement for local authorities in Wales to map and plan for suitable routes for active travel, and to build and improve infrastructure for walking and cycling every year. It creates new duties for highways authorities to consider the needs of walkers and cyclists and make better provision for them.

5.7.2 It also requires both the Welsh Government and local authorities to promote walking and cycling as a mode of transport so that local communities rely less on cars when making short journeys.

5.7.3 In the context of road schemes, there is significant opportunity to reconfigure existing infrastructure so that it better meets the needs of existing and new settlements and facilitates active travel. For example, bypass road schemes can address settlement severance and in doing so provide opportunities for active travel because pedestrians and cyclists would no longer need to compete with significant volumes of vehicular traffic for short journeys in the locality.

5.7.4 The Act sets out that where offline improvements are proposed, the new section of road will allow for existing roads to be declassified. This will allow governments and local authorities to explore opportunities to provide benefits to Non-Motorised Users (NMU's).

5.8 Wildlife and Countryside Act 1981 (as amended)

5.8.1 The Wildlife and Countryside Act 1981 (as amended) (WCA) remains the principal mechanism

[2] https://gov.wales/a55-junctions-15-and-16-overview

for the protection of wildlife in the UK and is in four parts;

a) Part 1 covers the protection of wildlife, including birds, their nests and eggs; wild animals, mammals and wild plants;
b) Part 2 makes provision for the countryside, national parks, the designation of protected areas including Sites of Special Scientific Interest (SSSIs), limestone pavements, National Nature Reserves, and grants by the national nature conservation bodies in England and Wales;
c) Part 3 covers public rights of way, including footpaths and bridleways; and
d) Part 4 deals with miscellaneous provisions.

5.8.2 Schedule 9 of the Countryside and Rights of Way Act (CROW,2000) introduced a new Section to the WCA, Section 28G, which places a duty on the Welsh Government "in exercising its functions so far as their exercise is likely to affect the flora, fauna or geological or physiographical features by reason of which a site of special scientific interest is of special interest" to "take reasonable steps, consistent with the proper exercise of the authority's functions, to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest".

5.9 Natural Environment and Rural Communities Act 2006 (NERC Act)

5.9.1 The NERC Act was designed to help achieve a rich and diverse natural environment and thriving rural communities through modernised and simplified arrangements for delivering UK Government policy. The Act implemented key elements of the (then) UK Labour Government's Rural Strategy published in July 2004 (Defra, 2004).

5.9.2 The NERC Act established Natural England and made amendments to both the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000. Section 40 sets out a duty to conserve biodiversity whereby 'every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity', whilst Section 42 requires the National Assembly of Wales to 'publish a list of the living organisms and types of habitat which in the Assembly's opinion are of principal importance for the purpose of conserving biodiversity'. The NERC Act has now been largely superseded by the Environment (Wales) Act 2016 referred to above in section 5.4.

5.10 Conservation of Habitats and Protected Species Regulations 2017

5.10.1 Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna provides legal protection for habitats and species of European importance. The Directive is transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (the 'Habitat Regulations').

5.10.2 Screening (the first stage in the Habitats Regulations Assessment process) identified that the Scheme had the potential for significant effects on qualifying features of the following European sites:

a) Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC;
b) Liverpool Bay/Bae Lerpwl (Wales) SPA;
c) Traeth Lafan/Lafan Sands, Conway Bay SPA;
d) Coedydd Aber SAC;
e) Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC;
f) Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC;
g) Glynllifon SAC.

5.10.3 The Habitats Regulations requires the competent authority to consider, inter alia, whether the plan or project is likely to have a significant effect on a European site. If there is a likely significant effect an 'appropriate assessment' of the implications of the project for that site must be undertaken either alone or in combination with other plans or projects. This is referred to as a Habitat Regulations Assessment (HRA).

5.10.4 The project can only proceed if it has been ascertained that it will not affect the integrity of the European site (unless there are no alternatives and there are imperative reasons of overriding public interest supporting the project ('IROPI')).

5.10.5 The first stage of the HRA process is to undertake a Test of Likely Significance Effect (TLSE). The TLSE has identified that likely significant effects on qualifying features of European Sites (Liverpool Bay / Bae Lerpwl (Wales) SPA) could not be ruled out.

5.10.6 It is therefore considered necessary for an Appropriate Assessment to be carried out for this project on the qualifying features of these European Sites, in line with DMRB HD44/09 guidance. This is reported as a Habitat Regulations Assessment, a standalone document and as a Statement to Inform Appropriate Assessment outside the content of the Environmental Statement. Under the same Regulations, it is it is considered that it is unlikely that there will be significant effects on the other European Sites referred to above and therefore no further assessment is needed.

5.11 Climate Change Act 2008

5.11.1 The Act imposes a duty on the Secretary of State to reduce UK wide greenhouse gas emissions in 2050 to a level which is at least 80% below the level of emissions in 1990. It also obliges the Secretary of State to set carbon budgets for successive five-year period and to prepare proposals and policies for meeting those carbon budgets. Part 2 of the Act establishes the Committee on Climate Change.

5.11.2 Parts 4 and 5 of the Act impose limited duties and confer limited powers on Welsh Ministers in terms of contributing towards meeting the UK wide carbon targets. The Environment (Wales) Act 2016, imposes specific carbon budgeting duties on Welsh Ministers like those to which the Secretary of State is subject.

5.11.3 Further information on climate change and how the scheme would accord with the principles set out by relevant climate change policies and legislation is set out in Chapter 16 of the environmental statement.

5.11.4 By removing the existing roundabouts, which typically involves hard acceleration and deceleration, a benefit of the A55 Junction 15 Improvements is to minimise stop-start conditions. This will contribute to improved vehicle emissions.

5.12 Human Rights Act 1998

5.12.1 The Human Rights Act 1998 is relevant where there is a need for compulsory purchase to acquire the necessary minimum land to construct the Scheme. Schedule 1 Part II of the Act (The First Protocol Article 1) states that "No one shall be deprived of his possession except in the public interest and subject to the conditions provided for by law". This means that a Compulsory Purchase Order should only be made where there is a compelling case in the public interest. An acquiring authority, including Welsh Ministers, should be sure that the purposes for which it is

making a CPO sufficiently justify interfering with the human rights of those with an interest in the land affected having regard, in particular, to the provision of Article 1 of The First Protocol to the European Convention on Human Rights and, in the case of dwellings, Article 8 of the Convention.

5.13 Planning (Wales) Act 2015

5.13.1 The Planning (Wales) Act 2015 became law in Wales on 6 July 2015. The overall aim of the Act is to provide a modern legislative framework for the operation of the planning system in Wales thereby creating a more consistent planning system that enables development and enhances built and natural environments. The key purposes of the bill are to:

a) Strengthen the plan-led approach to planning. The Bill introduces a new legal framework for the Welsh Ministers to prepare a national land use plan, to be known as the National Development Framework for Wales. The framework will set out national land use priorities and infrastructure requirements for Wales;
b) Make provision for the production of Strategic Development Plans, to tackle larger-than-local cross-boundary issues, such as housing supply and areas for economic growth and regeneration.;
c) Make provision for pre-application consultation, and to require local planning authorities to provide pre-application services;
d) Provide for planning applications for nationally significant projects to be made to the Welsh Ministers. Applicants for planning permission will also be able to apply to the Welsh Ministers for planning permission where a local planning authority is deemed to be poorly performing;
e) Reform the development management system to streamline procedures, to ensure that applications are dealt with promptly, providing certainty for developers and communities;
f) Improve enforcement and appeal procedures. Changes are also made in relation to the recovery of costs for parties involved in planning cases; and
g) Make changes in relation to applications to register town and village greens.

5.13.2 The Act makes provision for the preparation and revision of a National Development Framework (NDF) for Wales. The NDF is a national land use plan which will set out Welsh Government's policies in relation to the development and use of land in Wales. This is scheduled to replace the Wales Spatial Plan (WSP) in 2020.

5.14 National & Regional Planning Policy

The Wales Spatial Plan (Update 2008)

5.14.1 Ultimately, through provisions in the Planning (Wales) Act 2015 the Wales Spatial Plan (WSP) will be replaced by the National Development Framework (NDF) when published, however the current programme suggests publication in 2020 and therefore the WSP remains relevant to this assessment.

5.14.2 The WSP was originally adopted by the Welsh Government in November 2004 and was updated in July 2008 (Welsh Assembly Government, 2008a). The overall role, purpose and principles of the Wales Spatial Plan are set out at paragraph 1.2. They include the following.

- Making sure that decisions are taken with regard to their impact beyond the immediate sectoral or administrative boundaries and that the core values of sustainable development govern everything the Welsh Government does.
- Setting the context for local and community planning.

- Influencing where money is spent by the Welsh Government through an understanding of the roles of and interactions between places.
- Providing a clear evidence base for the public, private and third sectors to develop policy and action.

5.14.3 It is a principle of the Wales Spatial Plan that development should be sustainable. The concept of sustainable development was described by the 1987 Bruntland Commission Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Section 2 of the Well-Being of Future Generations (Wales) Act 2015 provides that, "sustainable development" means the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals.

5.14.4 It is a principle of the Wales Spatial Plan that development should be sustainable. Sustainable development is about improving well-being and quality of life by integrating social, economic and environmental objectives in the context of more efficient use of natural resources.

5.14.5 The Scheme is located in North West Wales – Eryri a Mon as defined by Chapter 17 of the Wales Spatial Plan. The vision for this area is '*A high-quality natural and physical environment supporting a cultural and knowledge-based economy that will help the area to maintain and enhance its distinctive character, retain and attract back young people and sustain the Welsh language*.'

5.14.6 Improvements to transport links and economic infrastructure is identified as a key strategic priority which will contribute to achieving the above vision. Furthermore, the WSP recognises that '*Maximising the opportunities of Holyhead as a major international gateway and the A55 and E22 Trans-European Networks route as a key transportation corridor, particularly between the prosperous economies of Ireland, North East Wales and beyond, whilst ensuring appropriate transport links between the hubs and rural areas are adequate to provide access to services, employment and leisure opportunities*.'

5.14.7 Later in the same chapter the importance of the A55 as a strategic route is supported by the identification of Holyhead Port developments as having *'further potential to enhance the region's status as an international gateway and communications corridor'.*

5.14.8 Under Promoting a Sustainable Economy, the update states that *'The primary corridor for external connectivity into and out of the region is based along the North Wales coast and through the heart of Anglesey to the region's international gateway at Holyhead. This Area benefits from the good connectivity offered on road by the A55 Expressway and the North Wales Coast mainline railway (both of which are part of the Trans European Transport Network).*

Planning Policy Wales (10th Edition)

5.14.9 Planning Policy Wales (PPW) was originally published in 2002 and is the principal and authoritative source of national planning policy, under which local planning authorities prepare their Local Development Plans. PPW 10 (December 2018) is the latest edition of Planning Policy Wales and takes account of the Well-being of Future Generations (Wales) Act 2015. It outlines policies on all the key land use topics, and is supplemented by Technical Advice Notes, Circulars and Policy Clarification Letters.

5.14.10 Edition 10 of Planning Policy Wales (PPW), published on 5th December 2018, 'puts the concept of placemaking into the heart of national planning policy. This ensures planning decisions consider all aspects of well-being and deliver new development which is sustainable and provides for the needs of all people. PPW has been completely reworked to take account of the Well-being of Future Generations Act. The 7 well-being goals and 5 ways of working provide links through the document which is now based around 4 themes:

1. Strategic and Spatial Choices;
2. Active and Social Places;
3. Productive and Enterprising Places; and
4. Distinctive and Natural Places.

5.14.11 Together these promote placemaking with a view to achieving sustainable places. The policy content of PPW has also been updated to deliver wider Welsh Government objectives. Our commitment to decarbonisation has been enshrined in PPW by the promotion of walking and cycling through the planning system and the introduction of an energy hierarchy.'

Technical Advice Notes (TAN's)

5.14.12 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. TAN's cover a range of topics and these are referred to as appropriate within the environmental topic chapters and are set out for reference below. Note some of the TAN's have been withdrawn or time expired and are not listed. Relevant Technical Advice Notes are listed in Table 5.5.

5.14.13 Other documents published by Welsh Government of direct relevance to the development and design of the Scheme can be grouped under the general headings of, economics, transport, environment, and climate change. However, all have been written within the framework of sustainable development, and as such need to be considered collectively as well as individually.

North Wales Regional Planning Guidance 2002

5.14.14 Planning Policy Wales does not provide defined regional; planning policy guidance or a sub-regional planning policy context for the preparation of Unitary Development Plans (UDP). These are now superseded by Local Development Plans (LDP) that will subsequently be superseded by the National development Framework in 2022. In the absence of any guidance, the then Welsh Assembly Government advised local authorities to collaborate in setting strategic policies and objectives that could be used in the preparation of the Wales Spatial Plan.

5.14.15 In response to this, the North Wales Regional Planning Group was formed that consisted of elected Members from Anglesey, Conwy, Denbighshire, Flintshire, Gwynedd and Wrexham Councils and the Snowdonia National Park Authority.

5.14.16 The Regional Planning Guidance covered the period 1996 – 2011 and was scheduled for review on a five-year cycle. The guidance does not appear to have been updated and is therefore time expired and a National Development Plan will override this older guidance in time (2020).

Table 5.5: Technical Advice Notes (TAN's)

Technical Advice Note (TAN)	Subject /Title
1 (January 2015)	Joint housing land availability studies
2 (November 2016)	Planning and affordable housing
3 (September 2009)	Simplified Planning Zones (SPZ's)
4 (November 2016)	Retail and commercial development
5 (September 2009)	Nature conservation and planning
6 (July 2010)	Planning for sustainable rural communities
7 (November 1996)	Outdoor advertisement control
8 (July 2005)	Renewable energy
10 (November 1996)	Tree Preservation Orders (TPO's)
11 (October 1997)	Noise
12 (March 2016)	Design
13 (October 1997)	Tourism
14 (March 1998)	Coastal Planning
15 (July 2004)	Development and flood risk
16 (July 2004)	Sport, recreation and open space
18 (March 2007)	Transport
19 (August 2002)	Telecommunications
20 (August 2002)	Planning and Welsh Language
21 (February 2017)	Waste
23 (February 2014)	Economic development
24 (May 2017)	The historic environment

5.15 Welsh Government Plans and Strategies

A Growth Deal for North Wales – Smart, Resilient and Connected

5.15.1 A Growth Deal for North Wales is an economic initiative seeking investment of £1.3 billion into the North Wales economy. In 2018 it was announced that the scheme will be given £120 million by the Welsh Government. The North Wales Economic Ambition Board (NWEAB) had hoped to secure £335.5m between the Welsh and UK governments. the announcement took the total committed to £240m.

5.15.2 The growth deal is aimed at improving what the region has to offer in a number of areas, including land and property, energy, skills, technology and adventure tourism as well as digital connectivity and transport. A total of 16 projects are planned. A Growth Deal for North Wales Proposition Document acknowledges that the A55 corridor is of key importance to the region as a catalyst for wider economic growth. However, it is not included within the project list as it states that funds are already committed to a number of strategic projects in North Wales on which the Proposition Document will build.

Economic Development: Taking Wales Forward 2016-2021

5.15.3 *Taking Wales Forward 2016-2021* sets out the Welsh Government's programme to drive improvement in the Welsh economy and public services, delivering a Wales which is prosperous and secure, healthy and active, ambitious and learning, united and connected.

5.15.4 Taking Wales Forward 2016-2021 outlines this government's priorities for delivering those improvements. They are ambitious measures, aimed at making a difference for everyone, at every stage in their lives.

5.15.5 The United and Connected commitments include delivery of 'an M4 relief road, and improvements to the A55, the A40 in West Wales and other trunk roads.

5.15.6 Alongside the programme, the Welsh Government have published well-being objectives which set out how we will use the Well-being of Future Generations Act 2015 to help deliver its programme for government and maximise its contribution to the 7 shared national well-being goals.

Economic Renewal, A New Direction (July 2010)

5.15.7 *Economic Renewal, A New Direction* was published in July 2010. It sets out the role that the Welsh Government can play in providing the best conditions and framework to enable the private sector to grow and flourish.

5.15.8 Part 3 of the document encourages investment in high quality and sustainable infrastructure to underpin economic growth. People, businesses and communities need to be well connected within and beyond Wales and to have access to the right facilities and services where they live and work. Investors and indigenous businesses must be able to count on communications, transport, energy and other infrastructure necessary for 21st century enterprise.

5.15.9 The document continues to state that people cannot work if they are not linked to their jobs, training and public services. Businesses cannot operate without access to the labour forces, materials and markets. Furthermore, faster physical connections, such as an efficient and reliable road network, increase productivity because they save time and therefore lower costs. Excellent infrastructure is also a prerequisite for creating the right conditions to enable businesses to locate and flourish.

Economic Development: Wales – A Vibrant Economy (November 2005)

5.15.10 *Wales – A Vibrant Economy* was published in November 2005 and is the strategic framework for economic development in Wales. The main vision of the document is of; 'a vibrant Welsh economy delivering strong and sustainable economic growth by providing opportunities for all.'

5.15.11 As part of the aims for economic development set out in Wales – A Vibrant Economy, one important part of allowing businesses to grow and flourish is by investing in networks and other forms of economic infrastructure whilst always ensuring sustainable development.

5.15.12 It is the view of the policy that more and more businesses are depending on fast, safe and reliable transport networks and services. Improving the productivity of Welsh businesses through reducing journey times for individuals and goods and encouraging international trade through larger and more connected markets provides an attractive investment environment.

Wales Infrastructure Investment Plan (2012)

5.15.13 The Wales Infrastructure Investment Plan for Growth and Jobs (WIIP) is designed to prioritise, scope and coordinate delivery of the Welsh Government's major infrastructure investments, whilst improving the long term economic, social and environmental well-being of people and communities in Wales.

5.15.14 Chapter 1 of the Plan sets a number of high-level investment priorities including: '*Improving transport links, particularly East-West transport links in both North and South Wales'*. This priority is further explored through Chapter 2 of the Plan which outlines an aim to '*secure the most out of the existing road network through well planned maintenance and upgrades to ensure the road network operates more efficiently by:*

- *Prioritising investments which contribute to economic growth – addressing urban congestion and improving access to key areas, and by improving the capacity and reliability of our key east-west corridors.*
- *Being more agile in our approach to developing solutions to underlying problems to address problems that people face every day.* '

5.15.15 The A55 forms one of the key east-west corridors in Wales and the Plan recognises the importance of the route.

Wales Infrastructure Investment Plan – Mid-point Review 2018

5.15.16 This document reports on progress in investment in the infrastructure needs and projects identified in the 2012 plan. With regard to the A55 corridor and the Junctions 15 and 16 schemes it states '*More than £40m is being invested in upgrading the A55 including the design and construction of junctions, slip roads and bridges. The funding will also support the widening of 2.1km of the A55'*.

Partnership for Growth: strategy for tourism 2013-2020

5.15.17 Tourism makes a major contribution to the Welsh economy and Welsh Government assert that *'the prospects for further sustainable growth are good. The competition, however, is also increasing and it will be those tourist destinations that can best satisfy and exceed the needs of their customers that will stand out and perform best in a crowded marketplace. If we do nothing new or fail to make the most of the opportunities that will arise, we will go backwards against our competitors'.*

5.15.18 The whole Wales aims to '*drive higher tourism earnings to deliver maximum value for the Welsh economy*' and to develop tourism activity and specialist markets, secure maximum benefit from major events, promote Wales as a high-quality destination, extend the tourism season, identify funding opportunities to improve the visitor infrastructure and support investment in training and management.

North Wales Tourism Strategy 2010 to 2015

5.15.19 Tourism is vitally important to the Welsh economy, generating £1.8 Billion spend in North Wales each year. The strategy, which covers all six of the North Wales counties, was commissioned by Tourism Partnership North Wales (TPNW) and it sets out how North Wales could achieve its potential over the five years up to 2015. As a key component of an 'outstanding experience' for tourists, efficient transport is listed. This plan for the period 2010 to 2015 has not yet been updated or superseded.

One Wales: Connecting the Nation – The Wales Transport Strategy (April 2008)

5.15.20 This document establishes a national framework for transport planning in Wales and is therefore pertinent to the Scheme.

5.15.21 The main aim of is '*to promote sustainable transport networks that safeguard the environment while* strengthening *our country's economic and social life*.' The One Wales Programme is working towards promoting sustainable transport between communities in different parts of Wales to access services, jobs and facilities where travelling is both easy and sustainable, which will support the growth of the economy.

5.15.22 Connecting the Nation endorses the proposition that a good transport system is central to achieving a vibrant economy and social justice through equality of access and greater mobility. It sees transport as having a leading role to play in adapting to the impacts of climate change. Fundamentally, economic prosperity is at the forefront of Connecting the Nation in order to connect people with businesses for employment and businesses with their customers and suppliers. Chapter 4 of the strategy provides the focus for the national and regional plans.

5.15.23 Table 5.6 sets out the long-term outcomes sought from transport within Wales.

Table 5.6: One Wales: Connecting the Nation Long Term Outcome

One Wales: Connecting the nation long-term outcomes		
Social	**Economic**	**Environmental**
Improve access to healthcare	Improve access to employment opportunities	Increase the use of more sustainable materials
Improve access to education, training and lifelong learning	Improve connectivity within Wales and internationally	Reduce the contribution of transport to greenhouse gas emissions
Improve access to shopping and leisure facilities	Improve the efficient, reliable and sustainable movement of freight	Adapt to the impacts of climate change
Encourage healthy lifestyles	Improve access to visitor attractions	Reduce the contribution of transport to air pollution and other harmful emissions
Improve the actual and perceived safety of travel		Improve the impact of transport on the local environment
		Improve the impact of transport on our heritage
		Improve the impact of transport on biodiversity

North Wales Joint Local Transport Plan 2015

5.15.24 Published in 2015, the North Wales Joint Local Transport Plan is the culmination of collaborative working between the six local authorities in North Wales and was overseen by Taith. This collaborative working is closely linked with wider initiatives under the North Wales Ministerial Task Force and the Economic Ambition Board, together with the statutory plans and policies of each of the authorities. The plan will provide a detailed programme for improving connectivity to, from and within the region for the period 2015 – 2020 and provides a framework for schemes until 2030. '*It sets out a range of interventions and schemes for all modes of travel, some applying across all authorities and some locally based. Schemes respond to the issues for transport in the region and complement those being developed at the national level and across borders'*[3].

The Vision for Transport in North Wales

5.15.25 *'The North Wales Local Authorities aim to remove barriers to economic growth, prosperity and well-being by delivering safe, sustainable, affordable and effective transport networks'.*

5.15.26 The plan is targeted at addressing the key transport issues for North Wales:

- *The ability of the strategic road and rail corridors to provide the necessary good connectivity, for people and freight, within North Wales, to the ports and to the rest of the UK to support the economy and jobs, including tourism;*
- *The lack of resilience of the road and rail networks to planned and unplanned events including extreme weather;*
- *The need for good access to and between the three Enterprise Zones in North Wales;*
- *The lack of viable and affordable alternatives to the car to access key employment sites and other services; and*
- *The need for good road links to / from the trunk road network into the rural areas to help retain the viability of local businesses and support the Welsh language and culture.*

5.15.27 The plan also *'aims to improve connections to key destinations and markets, enhance access to employment and services, increase levels of walking and cycling, bring improved safety and security and at the same time bring benefits and minimised impacts on the environment'.*

5.15.28 The Welsh Government produced the Programme for Government document in 2011, providing the priorities and programme for the term of the Assembly. Whilst there are 12 priority areas, those of crucial relevance to the North Wales Joint LTP are:

- Growth and sustainable jobs – the aim is "*to strengthen the conditions that will enable business to create jobs and sustainable economic growth*";
- Tackling poverty – the aim is "*reducing poverty, especially persistent poverty amongst some of our poorest people and communities, and reducing the likelihood that people will become poor*;" and
- Rural communities - to "*ensure that rural communities remain vibrant and able to offer people an excellent quality of life with access to high quality employment, affordable housing and public services and sustained by reliable and effective infrastructure in terms of broadband, public transport and utilities*."

5.15.29 The relationship of transport to the Programme for Government Priority Areas demonstrates the importance of access, affordable, sustainable and integrated transport to all aspects of Welsh Government priorities.

[3] Forward to the North Wales Joint Local Transport Plan

5.15.30 The plan states that the A483/A55 corridor is of key importance to the region, *'as a catalyst for wider economic growth. The economy of the region is diverse with key sectors being manufacturing, energy and tourism as well as public sector jobs. There are two designated Enterprise Zones – Anglesey, which aims to complement the Energy Island Programme and bring high skilled jobs to the area from major energy investments and Deeside which has ambitions to be recognised as a centre for advanced manufacturing and technology excellence on a world scale'.*

5.15.31 A55 /A494 corridor is recognised as the route into north Wales. A high-level intervention for the plan is to '*develop [the] local Highway Network to accommodate any lack of capacity and resilience issues on the Trunk Road network*. The need to reduce impact to the local network from critical failure of the nationally strategic routes into Wales is also explained.

National Transport Finance Plan for Wales (2015)

5.15.32 The National Transport Finance Plan for Wales 2015 was approved in August 2015. Welsh Government's National Transport Finance Plan was released in July 2015. The plan sets out investment for transport and services, with the delivery of the timescale extending beyond the Plan period 2015 to 2020 thereby setting out a means for the delivery of continuous improvement in the transport system.

5.15.33 The foreword to the plan emphasises that *"Transport has a critical role to play in improving Wales' economic competitiveness and provides enhanced access to jobs and services. When delivering our investment in transport, it is important to focus on how it can serve the needs of businesses to enable them to prosper; and allow people to access the opportunities they need to live healthy, sustainable and fulfilling lives".*

5.15.34 The plan sets out in detail how the Welsh Government proposes to deliver the outcomes set out in the Wales Transport Strategy from 2015 and beyond. The Finance Plan is not a policy document but provides the timescales, budgets and likely sources of financing for Schemes being undertaken by Welsh Government.

5.15.35 A delivery schedule is set out in Annex A of the Finance Plan to cover the next five year period (between April 2015 and March 2020) and in the medium term (beyond April 2020). Under 'Roads – New Road Infrastructure – Schemes to be Constructed', Scheme reference is R18 'A55 Junctions 15 and 16 improvements' with a delivery period of 2015 to 2020.

National Transport Finance Plan for Wales (2017 update)

5.15.36 The National Transport Finance Plan 2017 Update provides information on progress since publication and provides a revised programme for the next three years and beyond. The Plan also sets out:

a) The timescale for financing and delivering the schemes undertaken by the Welsh Government;
b) The estimated expenditure required to deliver the schemes; and
c) The likely sources of financing to allow delivery to take place.

5.15.37 The Update includes reference to R18 'A55 Junctions 15 and 16 improvements' and that Carillion have been appointed as ECI Contractor in September 2017 and that ERDF funding has been secured for the delivery of the scheme. It is well documented elsewhere that in January 2018 Carillion went into liquidation and alternative arrangements had to be made in order to progress with scheme R18.

One Wales: One Planet (May 2009)

5.15.38 One Wales: One Planet was first launched by the Welsh Government in May 2009. This document sets out the objectives to achieving the goal of sustainable development. One Wales: One Planet defines sustainable development as 'enabling all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generations.'

5.15.39 In Wales this means achieving a better quality of life for this and future generations by:

- Promoting social justice and equality of opportunity; and
- Enhancing the natural and cultural environment and respect its limits – using only a fair share of the earth's resources and sustaining our cultural legacy.

5.15.40 One Wales: One Planet also sets out sustainable development as a core principle of the Welsh Government's founding statute. The Welsh Government has a statutory duty to set out how it proposes to promote sustainable development.

5.15.41 Within the document, five main chapters demonstrate the actions that will be taken to deliver sustainability. They are set out under the following headings:

- Sustainable Resource Use;
- Sustaining the Environment;
- A Sustainable Economy;
- A Sustainable Society; and
- The Wellbeing of Wales.

Climate Change Strategy for Wales (October 2010)

5.15.42 The Climate Change Strategy for Wales (Welsh Assembly Government, 2010c) sets out the Welsh Government's plan to tackle the causes and the consequences of climate change. The Welsh Government's key target is to reduce greenhouse gas emissions by 3% per year from 2011.

5.15.43 Section 8 of the Strategy in particular refers to the transport sector, which is most relevant to the Scheme. In order to reduce transport emissions, the Welsh Government sets out the following actions:

a) develop sustainable travel centres and supporting 'Smarter Choices';
b) promote eco-driving, walking and cycling;
c) invest in bus and rail services and improve traffic management; and
d) promote infrastructure of electric and hydrogen vehicles.

Green Corridors Initiative

5.15.44 The Green Corridors on the Welsh Government Trunk Road and Motorway Network initiative was announced by the Transport Secretary, Ken Skates, in July 2018. Over a five-year period the initiative is intended to deliver against the Economic Action Plan 'Prosperity for All'. The initiative is to contribute to creating a sustainable economy, promoting the economic, cultural, social and environmental well-being, and enhancing people's quality of life in Wales.

5.15.45 The Transport Secretary stated that 'Wales has the potential to be a world class sustainable tourist destination and I am pleased to announce my decision to approve a 'Green Corridors on the Welsh Government Trunk Road and Motorway Network' initiative. It will build upon and complement other work already completed or underway to improve the benefits provided by the land associated with the trunk road and motorway network, delivering a range of economic, environmental, social and cultural benefits'.

5.15.46 The priority is to implement measures along the three routes making up the Wales Way (A487, A470 and A55) as well as entrances into Wales on the M4, M48, A483, A5 and A494 Deeside. Work will continue in subsequent years on other gateway routes and strategic sites such as principal towns and cities.

5.15.47 The initiative is an opportunity to investigate and implement nature-based solutions such as vegetated systems for sustainable drainage, tree and shrub planting for earthworks stabilization, restoring or creating habitats, providing safe crossing points for protected species, tree planting to improve structure and age range of the planted area, and introducing wildflower areas or improving the diversity of existing areas. These could arise from the design of new roads and along the existing network. Applying the principles of Green Corridors will set us as an exemplar of best practice, showing innovation in the sustainable management of green transport infrastructure.

5.16 Local Planning Policy: Conwy County Borough Council Local Development Plan, 2013

5.16.1 The Junction 15 improvements lie wholly within the jurisdiction of Conwy County Borough Council. The local planning context is set out within the Conwy Local Development Plan (LDP) 2007 – 2022. The Junction 15 Scheme is being taken forward via the Highways Act (1980) as amended. Consequently, the Scheme is not governed by local planning policy but does have regard to it.

5.16.2 In addition to the LDP, this section also considers other policy and guidance at the local level considered to be of relevance to the ES.

5.16.3 The Conwy County Council LDP was adopted in 2013 and establishes the local policy framework to guide development in the area. The LDP acknowledges the importance of the A55 and rail corridors as a strategic route corridor connecting settlements along the North Wales Coast. The plan also recognises that the focus of future development in the Plan Area should be in highly accessible areas predominantly along the A55 and railway network and on the edge of Urban Development Strategy Areas within the coastal belt (Policy DP/2).

Strategic Policy DP/2 – Overarching Strategic Approach

5.16.4 The Policy advocates development within and on the fringe of urban areas including Llanfairfechan and Penmaenmawr and main villages such as Dwygyfylchi, part of which lies within Snowdonia National Park. The Overarching Strategic Approach defines the framework for the location of development and aims to protect the countryside from encroachment on the edges of villages and to guard against incremental growth.

5.16.5 The Policy identifies urban areas as key in providing opportunities for a combination of market and Affordable Housing for Local Need (AHLN) on both allocated and windfall sites and that settlement boundaries will be amended to reflect the proposed development.

Strategic Policy STR/1: Sustainable Transport, Development and Accessibility

5.16.6 The policy is to locate development where the need to travel can be minimised. Infrastructure such as cycle routes, footways and public transport and the improved accessibility of services should be provided to encourage change of travel behaviour to using these modes of travel for local journeys. This will be achieved by:

5.16.7 Focussing *'future development in the Plan Area in highly accessible locations,* predominantly *along the A55 and railway network within and on the edge of the Urban Development Strategy Area within the coastal belt'*. The policy refers to Policy DP/2 Overarching Strategic Approach (as referred to above).

5.16.8 In line with the Active Travel Act the policy also requires the planning authority to:

- Promote sustainable modes of transport in line with the Policy STR4 Non-Motorised Travel;
- Safeguard land to promote accessible communities that encourage integrated sustainable modes of travel;
- Improve public transport and promote sustainable modes;
- Promote walking and cycling throughout the Plan Area;
- The design and construction of walking and cycling facilities and infrastructure and quality and convenient pedestrian crossings will be improved to make walking and cycling more attractive, direct and safe;
- Transport schemes which lead to improvements in accessibility will be supported in principle.

Policy STR/3: Mitigating Travel Impact

5.16.9 This policy sets out how the planning authority will address undesirable effects of travel such as noise, pollution, impact on amenity and health and other environmental impacts. Where there is need to understand the traffic impact and the transport, social or environmental implications of a proposed development the Council will require developers to submit a Transport Assessment, a Travel Plan and a Road Safety Audit. Where the proposed development is considered to have significant transport implications on a wider area, financial contributions will be required towards improvements in transport infrastructure, in particular to support public transport, cycling and walking, in accordance with the development principles in Section 4 of the LDP.

Policy STR/4: Non-Motorised Travel

5.16.10 The Council will support increased levels of non-motorised travel, including cycle use and walking, by ensuring that travel generating developments are located and designed to facilitate and encourage short distance trips between home, work, schools and colleges, other suitable destinations and for leisure. The policy also indicates that detailed designs and layouts should encourage cycling and walking.

Strategic Policy CTH/1 – Cultural Heritage

5.16.11 This policy states that the council is committed to protecting and, where appropriate, enhancing its cultural and heritage assets. It seeks to Seeking to '*preserve and, where appropriate, enhance* conservation *areas*', historic landscapes, parks and gardens and '*protecting buildings and structures of local importance*'. It also states that a commitment to '*enhancing heritage assets through heritage and regeneration initiatives*.'

Strategic Policy CTH/2 – Development Affecting Heritage Assets

5.16.12 The council's intention is to ensure that '*development proposals which affect a heritage asset* [the list includes Conservation Areas, Listed Buildings, Historic Landscapes and Parks and Gardens] *and/or its setting, shall preserve or, where appropriate, enhance that asset'*.

Strategic Policy NTE/1 – The Natural Environment and NTE/5 Coastal Zone

5.16.13 The importance of the Coast is stressed in this policy, which sets out to conserve and enhance the coastal zone (as part of the natural environment) by regulating development. A key reason is '*to support the wider economic and social needs of the Plan Area.* The Coastal Zone is specifically defined in Policy NTE/5 (see Figure 5.1). Development will only be permitted where it will not cause various adverse effects on coastal landscape character, nature conservation, tourism or coastal defence.

Settlement Boundaries

5.16.14 In some areas of Conwy, the settlement boundaries have been extended to accommodate new allocations for housing. Development outside the new settlement boundaries will not be allowed in these locations in order to protect the natural and historic environment, except in exceptional circumstance for employment and for Affordable Housing for Local Need (AHLN). Llanfairfechan and Penmaenmawr are classified as urban areas (refer to Strategic Policy DP/2) whose settlement boundaries can be amended to reflect the proposed development. The junction 15 scheme falls wholly within the settlement boundary of Llanfairfechan.

LDP Land allocations in Llanfairfechan

5.16.15 The scheme proposals for Junction 15 are geographically limited to a localised area around the existing junction. Therefore, local development plan policies will be considered to a similarly local geographical area and where they may have relevance to the scheme proposals. The policies considered most relevant are summarised in the table below, however the Local Planning Authority may consider other policies are relevant and require further consideration.

Table 5.7 Local Plan Policies relevant to the location of the Scheme

Title of Policy	Policy Reference
Settlement Boundaries	DP/2, HOU/1, HOU/2, HOU/6, EMP/1, EMP/2
Contingency Housing Allocation	HOU/1
Conservation Areas	DP/6, CTH/1, CTH/2
Historic Parks and Gardens	DP/6, CTH/1, CTH/2
Coastal Zone	DP/6, NTE/1, NTE/5, TAN 14 Coastal Planning
Safeguarding Hard Rock and Sand and Gravel resources	MWS/1, MWS/2, MWS/3

Contingency Housing Allocation (Strategic Policy HOU/1-Meeting the Housing Need)

5.16.16 The LDP shows a 2.45-hectare area allocated as contingency for 45 dwellings (Policy HOU1). The contingency site referred to as Land West of Penmaen Park in the LDP is a sloping green field site located south east of and adjacent to Penmaenmawr Road close to and overlooking junction 15. Contingency sites are allocated in the LDP as reserve sites should other land allocated for housing not come forward as anticipated. The proposed Scheme will take a portion of this land allocation. This area is shown in Figure 5.1.

Conservation Areas (refer to Strategic Policy CTH/1 Cultural Heritage)

5.16.17 The Policy seeks to preserve and where appropriate enhance Conservation Areas and enhancing heritage assets through heritage and regeneration initiatives. Llanfairfechan has two Conservation Areas. These contain most of the Listed Buildings in the settlement:

Town Centre: Extending along Penmaenmawr Road from Shore Road East as far west as the gateway to Bryn y Neuadd, with much of Station Road and Village Road, to include the older parts of the town.

The Close: An estate of houses lying on the north east side of Llanfairfechan designed in the Arts and Crafts style, mostly by a single architect, Herbert Luck North. The earliest houses were built in the years before the First World War and the last around 1941. Most of the houses in The Close are listed.

5.16.18 The scheme affects the Town Centre Conservation Area along Penmaenmawr Road. Refer to Chapter 9 Landscape and Visual Effects and Chapter 10 Cultural Heritage for more details

Historic Parks and Gardens (refer to Policies DP/6, CTH/1 and CTH/2

5.16.19 Two designated designed landscapes on the Cadw Register lie within Llanfairfechan and are close to the A55 and Junction 15 respectively. These are listed in Table 5.8.

Table 5.8: Parks and Gardens on the Cadw Register

Site	Description and location
Bryn y Neuadd (now a hospital)	An extensive park and garden west of Llanfairfechan lying immediately adjacent to and south of the A55. The park that once overlooked land sloping down to the sea lies to the west of Llanfairfechan separated from the sea by the A55 that now forms its northern boundary, immediately adjacent to the A55. Extensive mid nineteenth-century landscape park with formal Italianate garden and extensive kitchen garden laid out by the eminent Victorian garden designer Edward Milner.
Wern Isaf (formerly known as Rosebriars)	Grade II Listed Arts-and-Crafts house and garden situated in Penmaen Park on the eastern edge of Llanfairfechan with views out to sea and Ynys Seiriol. Designed and laid out by the architect of the house, Herbert Luck North in 1900, the layout of terraces is carefully integrated with the plan of the house giving a strong sense of unity to the whole. The essential setting of the garden extends south-west to Penmaenmawr Road with significant views identified north-west across the sea to Ynys Seiriol.

Coastal Zone (Policy NTE/5)

5.16.20 The Policy relates to the promenade that lies north of junction 15, the A55 and railway line. The policy seeks to control development along the coastline and recognises that the coastline of Conwy is a significant factor in attracting visitors to the area. '*Due to the role which tourism and recreation plays in the local economy it is important to maintain and enhance the attractiveness of the area through the development of improved facilities*.'

Minerals

5.16.21 The plan includes measures intended to safeguard the supply of minerals to meet the needs of industry and the community.

Policy MWS/3 – Safeguarding Hard Rock and Sand and Gravel resources

5.16.22 To the east of Llanfairfechan is an extensive area of safeguarded hard rock mineral reserve associated with the existing quarries. This reserve extends from the coast southwards and includes the line of the existing A55. A coastal strip of sand and gravel reserves are also safeguarded and this zone also lies under the existing A55.

5.16.23 The safeguarding policy resists development within the reserves to avoid direct or indirect harm to the long-term viability of working those resources. Exceptions would be if the need for development outweighs the need to protect the mineral resource or; b) Where such development would not have a significant impact on the viability of the mineral being worked or; c) Where the mineral is extracted prior to the development.

5.17 Snowdonia National Park Authority (SNPA) Policies

5.17.1 The boundary of the Snowdonia National Park Authority lies approximately 1.5 kilometres south of Junction 15 and the existing A55 route corridor. The SNPA boundary lies beyond the settlement of Llanfairfechan to the south and at the foothills of northern Snowdonia Carneddau mountain range designated as an Area of Outstanding Natural Beauty. (AONB)

5.17.2 It is considered unlikely that there will be any direct or significant detriment to the SNPA planning policies. Any indirect or significant effects on the setting of the Snowdonia National Park or AONB will be addressed in the individual environmental topic chapters.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 6 GEOLOGY & SOILS

RAMBOLL Bright ideas. Sustainable change.

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6. GEOLOGY & SOILS

6.1 Chapter introduction

6.1.1 This chapter considers the likely significant effects on and from Geology and Soils associated with the construction and operation of the Scheme. The specific objectives of the chapter are to:

a) Describe the geology, soils and contaminated land baseline;
b) Describe the assessment methodology and significance criteria used in completing the impact assessment;
c) Describe the potential effects, including direct, indirect and cumulative effects;
d) Describe the mitigation measures proposed to address likely significant effects; and
e) Assess the residual effects remaining following the implementation of mitigation.

6.1.2 This chapter is supported by:

a) Appendix 6.1 Envirocheck Report and Historical Ordnance Survey Maps;
b) Appendix 6.2 Geotechnics Factual Ground Investigation Report; and
c) Appendix 6.3 Contaminated Land Risk Assessment (Table 6.16).

6.1.3 For details of the project description, reference should be made to Chapter 2: The Scheme.

6.1.4 This assessment assumes the use of standard construction techniques and practices commensurate for works of this nature, and full compliance with UK legislation and guidance including Pollution Prevention Guidelines. The final installation techniques and their sequencing would be determined by the construction works contractor in consultation with the relevant authorities. In addition, incorporated mitigation measures are described which have been included in the Scheme design to reduce identified impacts.

6.1.5 As part of the consideration of Geology and Soils the assessment considers designated geological sites, hydrogeology (groundwater), contaminated land, geohazards and geotechnical issues associated with the Scheme.

6.1.6 Sites can be designated for their importance in terms of geology, for example, exposures of the rock represent a good example of a particular rock type or contain a specific geological feature.

6.1.7 Hydrogeology relates to the groundwater present in the soils and rocks beneath the Scheme. Groundwater is an important resource and is vulnerable to various impacts, particularly those associated with construction. With regards to groundwater it should be noted that whilst this chapter considers groundwater quality and hydrogeology the issue of groundwater and potential influences on surface water are addressed in Chapter 7: Road Drainage and the Water Environment.

6.1.8 The presence of contaminated land has the potential to affect both the Scheme and the surrounding environment as a result of development activity. Although the assessment of contaminated land is not a formal requirement under the EIA Regulations or specific legislation (Part 2A of the Environmental Protection Act), it is covered by planning guidance and an assessment of contamination has been undertaken to confirm whether any environmental effects could arise.

6.1.9 The assessment of geohazards and geotechnical issues is similarly not a formal requirement of the EIA regulations. 'Geohazards' is a term covering a broad range of geological and ground

related hazards such as landslips, underground mining and compressible soils. Geotechnical issues dictate the foundation design for the Scheme which could lead to environmental effects.

6.1.10 Consideration of agricultural land classification has been addressed within Chapter 11: Community and Private Assets.

6.2 Legislation, Policy Context

6.2.1 This section outlines the legislation, policy and guidance relevant to the assessment of potential effects on and from geology and ground conditions associated with the Scheme based on the following:

a) National Legislation and Policy;
b) Local Planning Policy; and
c) Guidance and Industry Standards.

National Legislation

Geological features

6.2.2 Geological features can have protected status nationally. National legislation relating to geological sites is limited but it is covered by:

a) Countryside Act 1968;
b) Wildlife and Countryside Act 1981 (as amended); and
c) Environment Act 1995.

6.2.3 Nationally Protected Sites are designated as Sites of Special Scientific Interest (SSSI) and/or as part of National Nature Reserves (NNR).

Hydrogeology

6.2.4 With regard to groundwater the following national legislation is relevant:

a) EC Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution caused by certain dangerous substances;
b) European Union (EU) Water Framework Directive (2000/60/EC); and
c) Environmental Permitting Regulations (EPR) (2010) and amendments.

6.2.5 Under the Water Framework Directive (WFD), the Environment Agency has divided the UK into a series of River Basin Districts and has prepared River Basin Management Plans (RBMPs) for each. These documents set out the current situation within each District, with respect to the key objectives, and discuss how they can be met in order to comply with the WFD, and if not, why not. As well as surface water features, groundwater is also included under the RBMPs.

Contaminated Land

6.2.6 The following national legislation and policies are considered to be relevant to contaminated land issues:

a) Part 2A of the Environmental Protection Act (EPA), 1990;
b) Contaminated Land (Wales) Regulations 2006; and
c) Contaminated Land (Wales) (Amendment) Regulations 2012.

6.2.7 UK legislation on contaminated land is principally contained within Part 2A of the Environmental Protection Act 1990 which establishes a legal framework based on the principle of a 'suitable for use' approach taking into account the land use and environmental setting, with remedial action only required where there are unacceptable risks to human health and/or the environment.

6.2.8 Part 2A of the Environmental Protection Act 1990 was implemented by The Contaminated Land (England) Regulations 2006 and accompanying statutory guidance (DEFRA, 2012). Part 2A takes a risk-based approach to defining contaminated land, in the statutory guidance "risk" means the combination of:

a) The likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and
b) The scale and seriousness of such harm or pollution if it did occur.

6.2.9 For a risk to exist there needs to be one or more contaminant source-pathway-receptor linkages by which a relevant receptor might be affected by a contaminant(s). For land to be determined as 'contaminated' under the legislation and, therefore, require remedial action, all three elements of a contaminant linkage must be present. There is a test of the significance on the receptor which requires that there is evidence that:

a) Significant harm is being caused;
b) There is a possibility of significant harm being caused; and/or
c) Pollution of controlled waters is being, or is likely to be, caused.

6.2.10 The statutory guidance indicates that normal background levels of contaminants in soil should not be considered to qualify as contaminated land.

6.2.11 Part 2A requires local authorities to inspect their areas with a view to identifying contaminated land, and to do this in accordance with the statutory guidance. Under Part 2A, risks should be considered only in relation to the current use of the land. When considering risks in relation to any future use or development, the local authority should assume this would be carried out under the planning regime.

National Policy - Planning Policy Wales

Geological Features

6.2.12 Planning Policy Wales (PPW) notes that planning authorities should protect the features and qualities for which Geoparks and Regionally Important Geodiversity Sites (RIGS) have been designated and they are encouraged to promote opportunities for the incorporation of geological features within the design of development.

6.2.13 PPW also notes that some statutory Sites of Special Scientific Interest (SSSI) are also designated for their nationally important geological or geomorphological features, and that planning authorities have a duty to further the conservation and enhancement of these features.

Contaminated Land

6.2.14 PPW provides a number of policies relating to contaminated land.

6.2.15 When considering development proposals PPW indicates planning authorities should take into account the nature, scale and extent of surface and subsurface hazards which may pose risks to health and environment, to ensure that:

a) New development is not undertaken without an understanding of the risks, including those associated with the previous land use, pollution, groundwater, subsidence, landslips, rock falls, mine and landfill gas emissions and rising groundwater from abandoned mines;
b) development does not take place without appropriate remediation or precautions; and
c) consideration is given to the potential impacts which remediation of land, including land contamination, might have upon the natural and historic environment.

6.2.16 Planning authorities should also take into account the nature, scale and extent of land contamination which may pose risks to health and the environment so as to ensure the site is capable of effective remediation and is suitable for its intended use. In doing so, development management decisions need to take into account:

a) potential hazard that contamination presents to the development itself, its occupants and the local environment; and
b) the results of a specialist investigation and assessment by the developer to determine the contamination of the ground and to identify any remedial measures required to deal with any contamination.

6.2.17 PPW notes there are two areas of interface between the planning system and the contaminated land regime; where land is already designated as contaminated land under Part IIA and the owner wishes subsequently to develop the land, and the second where a development proposal may introduce changes to a site which may result in land potentially meeting the definition of contaminated under Part IIA.

6.2.18 In both circumstances, PPW notes that the onus remains with the developer to ensure that the development of the site will remove any unacceptable risks and the planning authority in making development management decisions will need to ensure that the land is suitable for its proposed use and would not meet the legal definition of contaminated land under Part IIA.

Ground Instability

6.2.19 When considering development proposals PPW considers that planning authorities should take into account the nature, scale and extent of ground instability and that planning decisions will need to take into account the potential hazard that instability could create to the development itself, to its occupants and to the local environment.

Conwy Local Development Plan 2007-2022 Adopted October 2013

Geological Features

6.2.20 Geological features can have protected status locally. Regional or local sites that are not legally protected can be taken into account by planning authorities; these sites are known as Local Geological Sites (LGS) (formerly known as Regionally Important Geological and Geomorphological Sites or RIGS) and have a similar status to Sites of Importance to Nature Conservation (SINCs or SNCIs).

6.2.21 Strategic Policy NTE/1 of the Conwy Local Development Plan relates to the Natural Environment and indicates the Council will seek to regulate development so as to conserve and, where possible, enhance the Plan Area's natural environment, countryside and coastline. With regards to geological features this policy indicates this will be achieved by measures including:

a) Safeguarding the Plan Area's biodiversity, geology, habitats, history and landscapes through the protection and enhancement of sites of international, national, regional and local importance, in line with Policy DP/6 which relates to development proposals complying with national planning policy and guidance; and
b) Protecting the Coastal Zone in line with Policy NTE/5 – 'The Coastal Zone'.

6.2.22 Strategic Policy NTE/1 indicates that geodiversity relates to geological and geomorphological features. Such features include the Little Orme, which hosts a limestone pavement, and Llanddulas caves (both of which are outside of the Scheme). Some sites have statutory protection such as Sites of Special Scientific Interest. In addition, Regionally Important Geological and Geomorphological Sites are designated by regional groups on the basis of their scientific, educational, historic and aesthetic value. Planning applications that are likely to impact on these areas will be subjected to Policy DP/6.

6.2.23 Policy DP/6 which relates to national planning policy and guidance, subjects all planning applications to up-to-date planning guidance to avoid unnecessary repetition throughout the LDP.

Contamination

6.2.24 No specific policy has been included within the Local Development Plan which relates to contaminated land.

6.2.25 Strategic Policy NTE/1, which relates to the natural environment, indicates the Council will seek to regulate development so as to conserve and, where possible, enhance the Plan Area's natural environment, countryside and coastline. One of the measures indicated relates to "preventing, reducing or remedying all forms of pollution including air, light, noise, soil and water, in line with Policy DP/6."Strategic Policy DP/1 relates to sustainable development principles and indicates development proposals should also where appropriate "Protect the quality of natural resources including water, air and soil in line with Strategic Policy NTE1."

Instability

6.2.26 Policy NTE/5 – The Coastal Zone considers the undeveloped coast will be protected as it will rarely be the most appropriate location for new development. The developed coast, by contrast, may provide opportunities for restructuring and regenerating existing urban areas. Where new development requires a coastal location, the developed coast will normally provide the best option, provided that due regard is paid to the risks of erosion, flooding or land instability.

Geohazards

6.2.27 The concept of "geohazards" covers a wide range of potential ground conditions that could affect a development or be affected by development. There is not a defined list of what constitute geohazards in any legislation or guidance, however, for the purposes of this assessment, the following have been considered:

a) Brine Compensation Areas;
b) Coal Mining Affected Areas;
c) Mining Instability;

d) Potential for Collapsible Ground Stability Hazards;
e) Potential for Compressible Ground Stability Hazards;
f) Potential for Ground Dissolution Stability Hazards;
g) Potential for Landslide Ground Stability Hazards;
h) Potential for Running Sand Ground Stability Hazards;
i) Potential for Shrinking or Swelling Clay Ground Stability Hazards;
j) Unexploded Ordnance; and
k) Radon Affected Areas.

Geotechnical Issues

6.2.28 Ground conditions influence geotechnical design, in particular the design of foundations, for example, in areas of soft ground. This area is covered by British Standards and Eurocodes.

6.3 Relevant Guidance

Land Contamination: Risk Management

6.3.1 Contaminated Land Report (CLR) 11 'Model procedures for the management of land contamination - contaminated land report' provides the technical framework for structured decision making about land contamination. CLR 11 is due to be withdrawn and replaced early in 2020 by guidance 'Land contamination: risk management' although the scope, framework and purpose will remain the same as this is based on CLR 11. Guidance provided in CLR 11 advocates a phased approach to risk assessment comprising:

a) Tier 1: Preliminary Risk Assessment (PRA) – first tier of risk assessment that develops the outline conceptual model (CM) and establishes whether there are any potentially unacceptable risks;
b) Tier 2: Generic Quantitative Risk Assessment (GQRA) – carried out using generic assessment criteria and assumptions to estimate risk; and
c) Tier 3: Detailed Quantitative Risk Assessment (DQRA) – carried out using detailed site-specific information to estimate risk.

6.3.2 Each of tier of the risk assessment follows the same basic steps buts adds site specific details and further certainty into the assessment as the stages progress. The steps comprise:

a) Identify the hazard - establish contaminant sources;
b) Assess the hazard - use a source-pathway-receptor (S-P-R) pollutant linkage approach to find out if there is the potential for unacceptable risk;
c) Estimate the risk - predict what degree of harm or pollution might result and how likely it is to occur by using the tiered approach to risk assessment; and
d) Evaluate the risk - decide whether a risk is unacceptable.

British Standards

6.3.3 BS10175:2011+A2:2017 provides recommendations and guidance relating to the investigation of land potentially affected by contamination and land with naturally elevated concentrations of potentially harmful substances, to determine or manage any risks.

Design Manual for Roads and Bridges (DMRB)

6.3.4 LA 109 Geology and Soils of the DMRB provides guidance on the requirements for considering the potential effects of highways projects on soils and rocks along with effects from contamination on human health, groundwater and surface water. Reference is also provided to

RIGS, Local Geological / Geodiversity Sites.

Other Sources

6.3.5 A number of sources have been used to assess the soil and groundwater contamination and the ground gas results in the Baseline section, these have been referenced below:

a) DEFRA, March 2014. The Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination;
b) LQM/CIEH, 2014. Suitable 4 Use Levels (S4ULs);
c) The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015;
d) The Water Supply (Water Quality) Regulations 2010;
e) The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015;
f) BS3882 2015 Specification for topsoil;
g) BRE Special Digest 1 (2005) Concrete in aggressive ground;
h) Health and Safety Executive in Workplace Exposure Limits HSE EH40/2005;
i) BR211, 2015. Radon Guidance on protective measures for new buildings;
j) Series 600 Earthworks Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works (February 2016 Amendment); and
k) Series NG 600 Earthworks Notes for Guidance on the Specification for Highway Works Volume 2 (February 2016 Amendment).

6.4 Study Area

6.4.1 The assessment has been undertaken for the Scheme construction works area and up to 500m. The key justification for this 500 m buffer is to identify potential historical land uses which may have contributed to contamination issues within the area and potentially sensitive land uses in the surrounding area that could be impacted if contaminants were mobilised. It is considered that other geological and ground condition issues are also covered by such a buffer.

6.5 Methodology

6.5.1 The methodology outlined below is considered to be applicable for the construction and operational stages.

Definition of Study Area

<u>Scope of the Assessment</u>

6.5.2 The scope of this assessment comprised the following:

a) A review of whether any protected geological features were likely to be impacted by the Scheme;
b) A review of historical land uses and potentially contaminative land uses;
c) A review of the geological and hydrogeological setting;
d) A review of the mining history of the area and potential implications on the Scheme;
e) A review of geo-hazard issues and the associated implications on the Scheme or potential effects arising from the Scheme;
f) A review of the existing potential for ground gas and radon;
g) A review of the potential for encountering Unexploded Ordnance (UXO);
h) A review of environmental regulatory information relating to issues such as waste management, industrially permitted sites, water abstractions and discharges;

i) Review of information obtained from the 2019 ground investigation and historical ground investigations;
j) Consultation with the Conwy County Borough Council Contaminated Land Officer and Natural Resources Wales;
k) Consultation and liaison with Network Rail during design and construction;
l) Undertake a review of the proposed works for the construction and operation phases against the baseline information and provide an assessment of the potential impacts and mitigation measures that might be required.

Desk-based Assessment

6.5.3 A review of published information on historical site uses and environmental conditions relating to the Scheme was undertaken. The assessment considered:

a) Protected geological features;
b) Historical land use and potentially contaminative land uses;
c) Geological and hydrogeological setting;
d) The potential for mining and implications for the Scheme;
e) Potential geohazards issues and the associated implications on the Scheme or potential effects arising from the Scheme;
f) The potential for ground gas and radon;
g) Environmental regulatory information relating to issues such as waste, industrially permitted sites, water abstractions and discharges; and
h) Potential for unexploded ordnance (UXO).

6.5.4 Information was obtained from the following sources:

a) Landmark Envirocheck Environmental Database Information (referred to as the "Envirocheck Report" in this chapter) (included as Appendix 13.1);
b) Historical Ordnance Survey (OS) Maps provided with the Envirocheck Report;
c) British Geological Survey (BGS) including maps and historical borehole logs;
d) Environment Agency Groundwater Vulnerability Map and Source Protection Zones provided with the Envirocheck Report;
e) Zetica Unexploded Bomb Risk Map[1];
f) Geotechnics, September 2019. Ground Investigation A55 Junctions 15 and 16 Improvements. Prepared for Ramboll UK;

Historical Ground Investigation

6.5.5 The following previous ground investigation information has been obtained for the Scheme which were carried out to inform the design and construction of the existing A55:

a) Terresearch Ltd, March 1983. North Wales Coast Road A55 Stage 3 - Llanfairfechan Contract K. Prepared for Transport and Highways Group, Welsh Office;
b) Norwest Holst Soil Engineering Ltd, March 1985. Site Investigation Report - North Wales Coast Road (A55) - Stage 3 - Pen y Clip / Llanfairfechan Site Investigation Contract S. Stage 1 – Llanfairfechan Volume 1 Factual Report. Prepared for Welsh Office;
c) Norwest Holst Soil Engineering Ltd, March 1985. Site Investigation Report - North Wales Coast Road (A55) - Stage 3 - Pen y Clip / Llanfairfechan Site Investigation - Contract S. Stage 1 – Llanfairfechan Volume 2 Interpretative Report. Prepared for Welsh Office.

[1] https://zeticauxo.com/downloads-and-resources/risk-maps/

6.5.6 The exploratory hole records are also provided on the British Geological Survey website [2].

Site Walkover and Surveys

6.5.7 Site walkovers have been undertaken on the 25th September 2018. Additional site visits were undertaken during the ground investigation from May to August 2019.

Method of Baseline Data Collection

Ground Investigation Information

6.5.8 An intrusive investigation was completed by Geotechnics in 2019 to obtain information on contamination and geotechnical data along the alignment of the Scheme. The ground investigation was based on the findings of desk based information and construction proposals.

6.5.9 This investigation comprised:

a) 15 no. cable percussion boreholes (BH101 to BH114B) up to 41.0m bgl;
b) 2 no. windowless sample boreholes (WS101 and WS102) to 5.0m bgl; and

6.5.10 Combined gas and groundwater monitoring wells were installed at the following locations:

Table 6.1: Monitoring Well Installation Details

Monitoring Well	Response Zone Depth (m bgl)	Strata Screened
BH101	3.0 – 7.0	Peat / Sand
BH102	3.0 – 5.0	Sand
BH104	3.0 – 7.0	Sand and Gravel
H105	3.0 – 6.0	Gravelly Clay
BH106	5.0 – 10.0	Sand and Gravel
BH109	1.0 – 9.6	Sand and Gravel
BH110	3.0 – 4.4	Gravelly Clay
BH111	0.5 – 2.0	Made Ground
BH114B	6.0 – 12.0	Gravelly Clay

6.5.11 Soil and groundwater samples were taken during the site works and tested for a range of potential contaminants.

Soil

6.5.12 A total of 17 no. soil samples were tested for parameters from the following suite:

a) Metals (see list below)[3];
b) pH;
c) Water soluble sulphate;
d) Total organic carbon;
e) USEPA speciated 16 polyaromatic hydrocarbons (PAHs); and

[2] Geoindex Onshore: http://mapapps2.bgs.ac.uk/geoindex/home.html
[3] Metals suite: arsenic, antimony, barium, boron, cadmium, chromium (III and VI), copper, lead, mercury, nickel, selenium, vanadium and zinc.

f) Petroleum hydrocarbons – as TPHCWG.

6.5.13 A selected number of soil samples were also analysed for the following:
a) Asbestos screen (13 no.);
b) Volatile Organic Compounds (VOCs) (4 no.);
c) Semi-Volatile Organic Compounds (SVOCs) (4 no.); and
d) USEPA speciated 16 polyaromatic hydrocarbons (PAHs) – road cores (6 no.).

Soil Leachate

6.5.14 A total of 6 no. soil samples were tested for the following parameters following leachate preparation (BS EN 12457 2:1 extract):
a) Metals (see list for soils above);
b) pH;
c) Sulphate;
d) Total organic carbon;
e) PAHs;
f) Petroleum hydrocarbons – as TPHCWG;
g) Hardness;
h) Conductivity; and
i) Ammoniacal Nitrogen.

Groundwater

6.5.15 A total of 2 no. groundwater samples were recovered in August 2019 (BH101 and BH102) and a further 6 no. samples (BH101, BH102, BH104, BH105, BH110 and BH114B) in October 2019 and tested for the following parameters:
a) Metals (see list for soils);
b) pH;
c) Sulphate;
d) Sulphide;
e) Total organic carbon;
f) PAHs;
g) Petroleum hydrocarbons – as TPHCWG;
h) Hardness;
i) Conductivity; and
j) Ammoniacal Nitrogen.

6.5.16 BH111 was dry so could not be sampled.

Groundwater Level and Ground Gas Monitoring

6.5.17 Five rounds of groundwater level and ground gas monitoring have been undertaken on the following dates:
a) 8th July 2019;
b) 23rd July 2019;
c) 6th August 2019;
d) 14th August 2019; and
e) 28th August 2019.

6.5.18 The following parameters were recorded:

a) Methane (%) – peak and steady state;
b) Carbon dioxide (%) – peak and steady state;
c) Oxygen (%) – peak and steady state;
d) Hydrogen sulphide (parts per million (ppm)) – peak and steady state;
e) Carbon monoxide (ppm) – peak and steady state;
f) Flow rate (litres / hour) – peak and steady state;
g) Water level (metres below ground level (m bgl)); and
h) Barometric pressure (millibars (mb))

6.6 Significance Criteria

6.6.1 This section sets out the methodology by which the impacts have been assessed include tables which outlining how the sensitivity of the receptor and magnitude of impact have been defined.

Sensitivity Criteria

6.6.2 There are no formal guidance documents defining a framework for the specific assessment of impacts with regard to geology and soils. Some aspects of this assessment, for example, contaminated land, do have a structured approach based on risk assessment and where appropriate this has been taken into account in making the assessment. Therefore, conclusions have been drawn on the significance of each effect through reference to relevant legislation and professional judgement.

6.6.3 In determining whether an effect is significant or not, the sensitivity of the receptor and the magnitude of the impact are combined. Sensitivity, magnitude and significance criteria were developed for the geology and soils baseline for the Scheme. These are detailed in Tables 6.2 to 6.4.

Table 6.2: Sensitivity Criteria

Sensitivity	Criteria
Negligible	Designated Geological Sites: not a designated geological site. Hydrogeology: Receptor is unproductive strata in hydrogeological terms. Geotechnical: Development not sensitive to ground movement
Low	Hydrogeology: Receptor is a Secondary B aquifer. Contaminated Land: No contamination present. Low sensitivity land use in terms of contamination. Geohazards: No evidence of geohazard/s on the Scheme, within 100 m depth beneath the Scheme or within 250m. Geotechnical: Development has low sensitivity or not sensitive to low levels of ground movement.
Medium	Designated Geological Sites: Receptor is locally designated for its geological importance via the planning authority (Local Geological Sites). Hydrogeology: Receptor is a Secondary A aquifer or other aquifer providing water for agricultural or industrial uses with limited / local connection to surface water. Contaminated Land: Contamination present but unlikely to represent Significant Harm or SPOSH*. Moderate sensitivity land use in terms of contamination**. Geohazards: Geohazard/s are present in the vicinity but are unlikely to be present in the Scheme, within 30 m to 50 m of the ground surface beneath the Scheme or within 50 m of the Scheme. Geotechnical: Development has moderate sensitivity to ground movement.
High	Designated Geological Sites: Receptor designated for its geological importance on a national (SSSI/NNR) or international basis. Hydrogeology: Receptor is a Principal aquifer providing locally important resource or supporting a river ecosystem. Contaminated Land: Contamination present and is likely to represent Significant Harm or SPOSH. High sensitivity land use in term of contamination**. Geohazards: Geohazard/s present within the Scheme, or at depths of less than 30 m beneath the Scheme or within 50 m of the Scheme. Geotechnical: Development highly sensitive to ground movement.

Sensitivity	Criteria
Very High	Hydrogeology: Receptor is a Principal aquifer providing a regionally important resource and / or supporting a site protected under UK and EC legislation for ecology and nature conservation. Contaminated Land: Site designated as Part IIA statutory contaminated land. High sensitivity land use in term of contamination**. Geohazards: Geohazard/s present at shallow depth beneath the Scheme and / or adjacent to the Scheme. Geotechnical: Scheme highly sensitive to ground movement which is likely to result in structural failure.
* Significant Possibility of Significant Harm (SPOSH) is a term defined in the statutory guidance for contaminated land and defines the intervention level where a remediation notice can be served. ** If either of these situations exists, a Contaminated Land Qualitative Risk Assessment is needed to assess whether significant harm or a significant possibility of significant harm (SPOSH) exists. Groundwater sensitivity takes account of guidance provided within DMRB LA113 for estimating the importance of water environment attributes but this has been modified for the sensitivity categories within the Junction 15 EIA Scoping Report.	

Designated Geological Sites

6.6.4 This aspect considers the sensitivity and potential impacts on sites protected because of their geological importance. Impacts could arise from direct damage to such features though it also possible that construction works can be beneficial, for example, forming new rock exposures in cuttings.

Hydrogeology

6.6.5 This aspect considers the sensitivity and potential impacts on groundwater resources. These could arise from alterations in site conditions or from contamination or changes in hydrology but could also be direct impacts from construction, for example, loss of fuels or oils into an important aquifer. In this respect there are links between hydrogeology, contaminated land and hydrology. Therefore, whilst this heading considers groundwater quality and hydrogeology the issue of groundwater flooding and potential influences on surface water are addressed in Chapter 7.

Contaminated Land

6.6.6 This aspect addresses the risks specifically associated with historic contamination that may be present in the Scheme including potential impacts on human health, ecology and other sensitive receptors.

6.6.7 The sensitivity criteria consider two aspects of contamination, firstly whether significant harm or a significant possibility of significant harm (SPOSH) is likely to be present or not. This links to Part 2A of the Environmental Protection Act that covers the concept of statutory contaminated land and cases where remediation may be needed regardless of whether the Scheme is developed or not. The second aspect is the sensitivity of the Scheme in terms of the end use. Low sensitivity end uses would be ones not used extensively by humans or ones where the Scheme is unlikely to give rise to exposure to contamination. Moderate sensitivity land uses are considered to be commercial / industrial land uses (as discussed in current guidance) whilst high sensitivity end uses would be residential land uses.

6.6.8 Under current guidance and best practice, the assessment of the effects of contamination is based on risk assessment. If contamination is present then a qualitative risk assessment would be required in addition to any impact assessment, for the purposes of the EIA it has been assumed that this would be necessary for all sites with a moderate or high sensitivity end use.

6.6.9 Contaminated land links to geotechnics since some geotechnical engineering activities (particularly piling) have the capability to alter risks/impacts.

6.6.10 This chapter utilises desk study information and information from a ground investigation in order

to assess the potential impacts from contaminated land.

Geohazards

6.6.11 This aspect represents a range of potential ground related hazards including mine workings, ground dissolution, slope stability and collapsible / compressible soils (including peat). Such features can represent a risk to human life, for example, where construction works cause slope failures, or may affect the construction work needed to carry out a project. Mine workings represent a particular issue as not only can they affect construction requirements, they can also cause environmental impacts if they are affected by construction work.

6.6.12 Desk study information and information from the recent and historical ground investigation have been used to inform the assessment of geohazards.

Geotechnical Issues

6.6.13 Ground conditions can influence road pavement and structures foundation design. These have not been explicitly covered in the assessment. However, the ground conditions define the geotechnical requirements of the Scheme, and these activities can give rise to environmental impacts. The options that might be used for the Scheme have formed the basis for the assessment of various issues including contaminated land and geo-hazards.

Impact Magnitude

6.6.14 The criteria used to determine the magnitude of a potential impact is defined in Table 6.3. Assessment of magnitude includes consideration of the amount and intensity of disturbance and duration, such as whether it is temporary or permanent.

Table 6.3 Magnitude Criteria

Magnitude	Geologically Protected Area / Hydrogeology
No Change	No change from baseline conditions.
Negligible	Very minor change from baseline conditions.
Minor	Some detectable change to protected geological site or hydrogeological conditions. Development changes site conditions and resulting exposure to contamination represents a low risk to receptors* Development unlikely to be affected by geohazard/s and unlikely to alter any geohazard/s on or near the site.
Moderate	Evident change to protected geological site or hydrogeological conditions resulting in temporary or consequential changes to baseline. Development changes site conditions and resulting exposure to contamination represents a moderate risk to receptors* Development may be affected by geohazard/s or could alter a geohazard/s on or near the development.
Major	Large scale change to protected site or hydrogeological receptor. Change likely to be permanent / long term. Development changes site conditions and resulting exposure to contamination represents a high or very high risk to receptors* Development represents a near or certain probability of encountering geohazard/s and/or altering geohazard/s over a wider area.

* Based on the risk definitions in CIRIA C552 (2001)[4] using a qualitative risk assessment.

[4] Rudland, D. J., Lancefield, R. M., and Mayell, P. N., 2001. Construction Industry Research and Information Association (CIRIA) C552 Contaminated Land Risk Assessment - A Guide to Good Practice.

Significance Criteria

6.6.15 The following information has been considered as part of considering the significance of the effects:

a) Status of the effect (beneficial or adverse);
b) Duration of the effect (short or long term);
c) Permanent or Temporary;
d) Direct or Indirect; and
e) Significance (significant or not significant).

6.6.16 There are no formal guidance documents detailing specific assessment criteria of effects with regards to geology and soils. However, conclusions can be drawn on the significance of each effect through reference to relevant EIA legislation and guidance, professional judgment, evaluation against the effect assessment criteria detailed below.

Status of the Effect

6.6.17 The status of the effects have been assessed by considering whether the Scheme would have a beneficial or adverse effect on the receptor, and whether the Scheme would lead to a change in exposure.

Timescales

6.6.18 In assessing the effect, the likely length of the effect has been considered. These have been summarised under the following timescales:

a) Short term – construction phase which is anticipated to be approximately 24 months; and
b) Long term – operational phase.

Permanent or Temporary

6.6.19 In assessing whether an effect is permanent, the effect would be regarded as one which is not reversible and would last for the lifespan of the Scheme and beyond.

6.6.20 A temporary effect was considered to be one that is reversible or where it ceases to be an issue at some point during the Scheme construction or operation.

Direct or Indirect

6.6.21 Direct effects are considered to arise from activities associated with the Scheme.

6.6.22 An indirect effect is one which is not considered to arise directly from the Scheme or one which is already present and may continue after it has been constructed.

Significance of Effect

6.6.23 Significance has been assessed using the matrix in Table 6.4. Consideration has been given to the need for mitigation measures for moderate and above effects.

6.6.24 The combination of magnitude and sensitivity have been combined to provide a matrix categorisation of effect. Effects considered to be significant are classed as 'moderate' or greater.

Table 6.4: Significance Criteria

		Magnitude of Impact Degree of change)				
		No change	Negligible	Minor	Moderate	Major
Sensitivity (or value)	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or large
	High	Neutral	Slight	Slight or Moderate	Moderate or large	Large or Very Large
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large

Assessment for Contaminated Land

6.6.25 Current guidance and best practice for the assessment of contaminated land is based on risk assessment. Under current guidance risk assessment is based on the "Source - Pathway – Receptor" approach. This risk assessment can be either qualitative or quantitative.

6.6.26 For a risk to be considered plausible a pollutant linkage must be "present and operating", i.e. all three components of the model need to be present. The aim of the risk assessment is to identify, on a qualitative basis, the extent to which linkages may be present and the risks associated with them.

6.6.27 The assessment of whether Source – Pathway – Receptor linkages are present is based on a Conceptual Site Model (CSM) developed specifically for the Scheme. A Conceptual Site Model has been developed for the Scheme to confirm the extent to which any linkages may be present.

6.6.28 If no contamination sources are considered to be present then the risk assessment has not been developed any further than the Conceptual Site Model. Scenarios have been assessed for the construction and operational phases.

6.6.29 This approach is considered to be consistent with current guidance and best practice and results in a proportionate approach to assessing contamination and to addressing sites where contamination is very unlikely to be present.

Limitations to Assessment

6.6.30 Interpretation of the ground conditions has been undertaken using exploratory hole records from the 2019 ground investigation. It is possible there could be some variations between the ground conditions encountered in the Scheme.

6.7 Consultations

6.7.1 Table 6.5 below summarises the consultation responses received regarding Geology and Soils and provides information on where and/or how they have been addressed in this assessment.

Table 6.5: Consultation Responses

Consultee and Date	Type of Consultation	Issue/s Raised	Response/Action Taken
Conwy County Borough Council (Simon Cottrill, Principal Environment Officer, Regulatory and Housing Services) 28th November 2019	Telephone call	Initial discussion relating to Council records on areas of potential contamination within the Scheme.	Discussion indicated known areas of potential contamination had been identified. Arrange meeting to discuss potential contamination issues relating to the Scheme.
Conwy County Borough Council (Simon Cottrill, Principal Environment Officer, Regulatory and Housing Services) 5th December 2019	Meeting	Discussion on records held by the Council relating to areas of potential contamination and historical evidence obtained as part of the ES preparation. Discuss information obtained from recent and historical ground investigation and potential risks identified relating to the Scheme.	Discussion indicates that known areas of potential contamination have been covered. No potential significant additional issues relating to ground conditions / contamination and the proposed works were identified from the meeting. Council to review ES Chapter when submitted.

Potential Effects Scoped Out of Assessment

6.7.2 The decommissioning phase has been scoped out of the scope of the assessment for Geology and Soils.

6.8 Baseline Environment

6.8.1 This section contains the environmental assessments for Junction 15. A summary of the likely significant effects associated with the Scheme, the proposed mitigation and any residual effects is included in Section 6.10.

Geology

6.8.2 The British Geological Survey 'Geology of Britain Viewer' and 1:50,000 geological map shows that the solid geology within the Scheme comprises mudstones and siltstones of the Nant Ffrancon Subgroup which are Ordovician in age.

6.8.3 Less than 150m to the south of the eastern end of the Scheme is an igneous intrusion comprising pyroxene-quartz microdiorite which is also Ordovician in age.

6.8.4 Bedrock below the sea to the north of the Scheme is indicated as comprising mudstone, siltstone and sandstone which are of Cambrian and Ordovician (undifferentiated) age.

6.8.5 The near surface superficial deposits in the Scheme comprise mainly Devensian Till (glacial till) which is Quaternary in age comprising diamicton which the British Geological Survey [5] indicate is a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.

[5] https://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=TILL

6.8.6 Storm beach deposits (predominantly gravels) and coastal zone deposits (predominately clay and silt) are located to the north of the A55. Alluvial fan deposits (sand and gravel) are present within the Scheme in the southern part of Llanfairfechan.

Figure 6:1: Bedrock Geology [6]

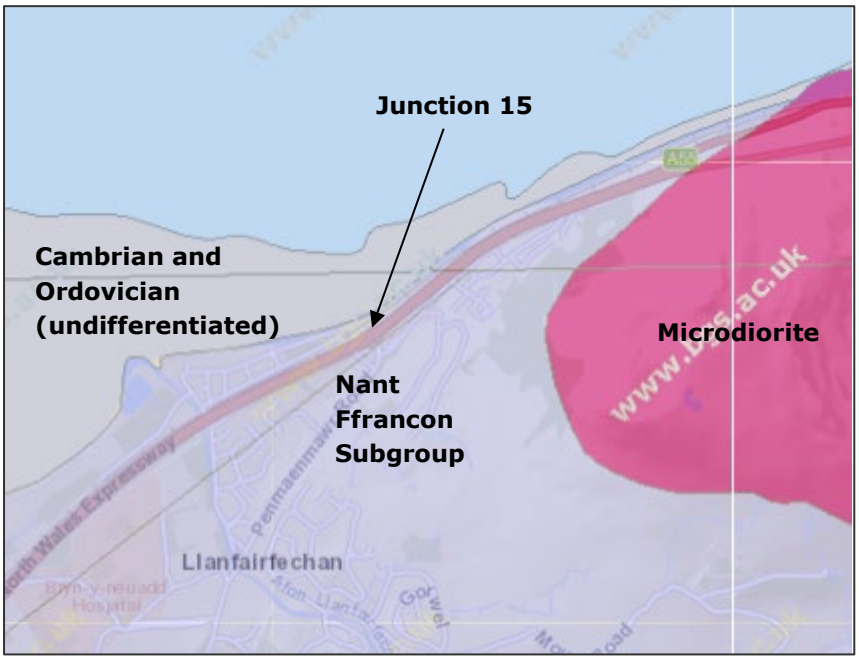
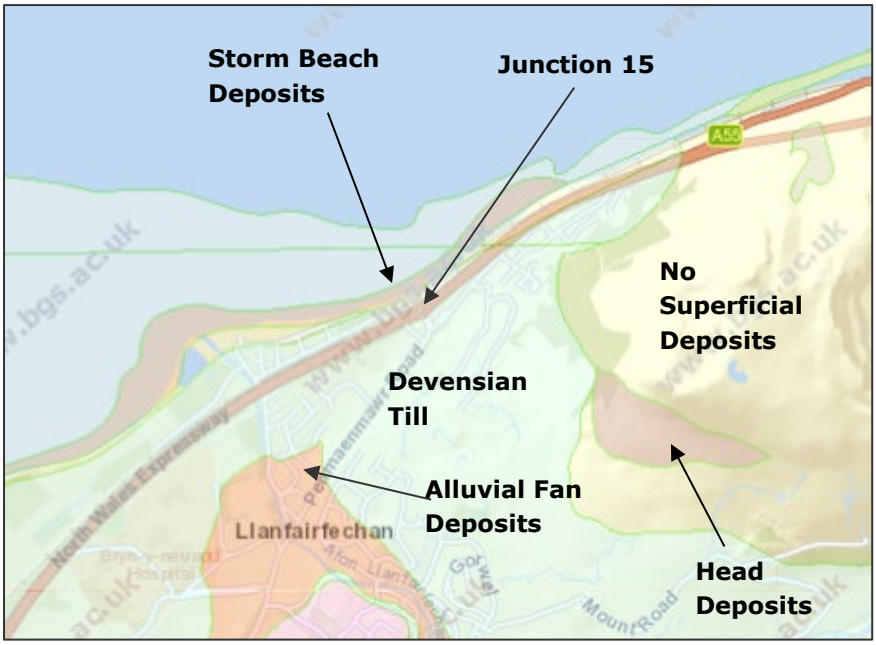


Figure 6:2: Superficial Geology 6



6.8.7 Made ground is not shown on the published mapping, although it is likely to be present in associated with previous developments, including the A55 and access roads.

6.8.8 A geological fault is shown orientated northeast to southwest within the Nant Ffrancon Subgroup

[6] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

which crosses through part of the Scheme with downthrow to the north.

6.8.9 There is no evidence of coal mining or non-coal related mining within the Scheme. However, extensive quarrying has been undertaken on the top and north side of hill to the south of the A55 (within the area identified as comprising microdiorite bedrock).

Protected Geological Features

6.8.10 No protected geological features are present within the Scheme or within 500m of it.

Historical Records – Ground Conditions

6.8.11 Previous ground investigation information has been obtained from historical borehole records provided on the British Geological Survey website. These historical exploratory holes were carried out to inform the original design and construction of the A55.

6.8.12 The records indicate that anthropogenic deposits (made ground / fill) are present which 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.

6.8.13 The stratigraphy identified on the logs is considered to represent the fluctuating depositional systems associated with glaciation, sea level fluctuations and the dynamic coastal environment.

6.8.14 Close to the existing Junction 15 roundabout the bedrock was observed at a depth of approximately 14m below (original) ground level and was described as a moderately to highly weathered mudstone.

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

Ground Investigation (2019) – Ground Conditions

6.8.16 The ground conditions encountered by Geotechnics during the ground investigation undertaken for the Scheme in 2019 can be summarised as follows:

Table 6.6: Ground Conditions

Strata	Depths to Base (m bgl)	Typical Description
Topsoil	0.30	Variable slightly sandy slightly gravelly clay, gravelly clayey or silty sand. Gravels of mudstone, sandstone, limestone and quartz. Occasional to many rootlets Encountered in BH107 / BH107A, BH108 and BH110
Made Ground	0.50 - 4.70	Variable clay, sand, and gravel with occasional cobbles. Gravels include brick, concrete and slate, with occasional sandstone, mudstone, tarmacadam, coal, glass, wood, plastic, metal. Asphalt road surfacing in BH102, BH114 / BH114A / BH114B, WS101 and WS102. Encountered in all exploratory holes except BH107, BH107A, BH110. Greatest thickness from BH109 in material described as slightly clayey Gravel with high cobble and boulder content which has been interpreted as made ground.

Strata	Depths to Base (m bgl)	Typical Description
Superficial Deposits - Alluvium	2.6 - 14.6	Variable sandy and / or gravelly clay, sandy silt, sand, silty sand, clay with decayed rootlets and bands of peat (BH114A and BH114B). Organic alluvium as peat or clayey peat with rootlets and wood fragments in BH101 (2.0-4.0m), BH102 (2.10-2.90m) and BH114 (2.70-4.00m) Encountered in BH101, BH102, BH104, BH106, BH109, BH114 / BH114A / BH114B
Superficial Deposits – Glacial Till	4.40-39.01 (base not proved)	Variable sandy and gravelly clay, gravelly clay, gravelly clayey or silty sand, sandy clayey gravel Encountered in all exploratory holes except BH101, BH109A / BH109B.
Nant Ffrancon Subgroup - Bedrock	31.0 - 41.0 (base not proved)	Extremely weak to strong dark grey or black MUDSTONE. Discontinuities subvertical to vertical closely spaced or extremely closely spaced with occasional clay infill. Encountered in BH104, BH105, BH106 and BH109

6.8.17 No visual or olfactory evidence of potential contamination was noted in arisings during the ground investigation, although inclusions have been encountered within the made ground, such as tarmacadam, metal and coal which have the potential to give rise to contaminants being present.

6.8.18 The following evidence of 'organic' odours were encountered which were all associated with natural strata:

a) 'Organic odour' from 2.00m to 4.00m bgl was noted in BH101 associated with peat;
b) 'Slight putrid odour' from 2.00m to 2.90m bgl in BH102 associated with peat;
c) 'Slight organic odour' from 5.45m to 7.10m bgl within BH109 associated with slightly gravelly, slightly silty sand; and
d) 'Organic odour' from 2.70m to 4.00m bgl in BH114 associated with peat.

Designated Geological Features

6.8.19 No protected geological features have been identified within the Scheme or within 500 m of it.

Hydrogeology

6.8.20 The following aquifer classifications have been identified for the superficial deposits and shallow bedrock strata beneath the Scheme and within 500m from the Envirocheck Report and British Geological Survey [6] website:

Table 6.7 Aquifer Designations

Strata	Aquifer Designation	Descriptions
Till Devensian Till Cambrian and Ordovician (undifferentiated) bedrock	Secondary undifferentiated	Secondary undifferentiated aquifer is assigned in cases where it has not been possible to attribute either category Secondary A or B to a rock (or soil) type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
Nant Ffrancon (bedrock)	Secondary B	Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Strata	Aquifer Designation	Descriptions
Storm Beach Deposits Alluvial Fan Deposits	Secondary A	Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.8.21 The Envirocheck Report does not indicate the site is not located within groundwater abstraction Source Protection Zones (SPZ) and none have been identified within 1km.

6.8.22 The British Geological Survey [2] website does not show any records of water wells within 500m.

6.8.23 The Envirocheck Report does not contain any records of groundwater abstractions within 500m of the Scheme.

6.8.24 There is a record of surface water abstraction from the River Llanfair for 'municipal grounds: lake and pond throughflow' less than 100m from the western end of the Scheme.

Field Evidence of Groundwater

6.8.25 Groundwater strikes were encountered during the Geotechnics ground investigation site works as follows:

Table 6.8: Groundwater Strikes

Monitoring Well	Depth (depth after 20 minutes) (m bgl)	Strata of Groundwater Strike
BH101	3.0 (2.90)	Peat
BH102	2.90 (2.80)	Sand
BH104	7.50 (1.00)	Gravelly Clay
BH105	9.00 (9.00)	Sand
BH106	3.00 (2.80)	Sand
BH114B	6.30 (2.60)	Gravelly Clay

6.8.26 Groundwater level monitoring has been undertaken by Geotechnics following the ground investigation site works with the following depths recorded:

Table 6.9: Groundwater Level Monitoring Depths (m bgl)

Monitoring Well	Response Zone	08/07/19	24/07/19	06/08/19	14/08/19	28/08/19
BH101	3.0 – 7.0	2.64	N/R*	N/R*	N/R*	N/R
BH102	3.0 – 5.0	1.71	N/R*	N/R*	N/R*	N/R
BH104	3.0 – 7.0	N/R	N/R*	N/R*	N/R*	N/R
BH106	5.0 – 10.0	N/R	N/R	4.00	Damaged	N/R
BH109	1.0 – 9.6	4.93	5.00	4.75	4.80	4.70
BH110	3.0 – 4.4	4.40	1.50	1.78	1.95	1.75

Monitoring Well	Response Zone	08/07/19	24/07/19	06/08/19	14/08/19	28/08/19
BH111	0.5 – 2.0	Dry	Dry	Dry	Dry	Dry
BH114B	6.0 – 12.0	12.00	N/R*	N/R*	N/R*	N/R
N/R = Not recorded N/R* = Not recorded as water level data logger installed						

Historical Records – Groundwater

6.8.27 Historical exploratory hole records obtained from previous ground investigation by Terresearch in 1983 to inform the construction of the existing A55 provide some information on groundwater levels encountered during the site works.

6.8.28 Records indicate groundwater was typically encountered associated with granular superficial strata.

6.8.29 Groundwater levels are indicated to vary from 5.3m AOD (approximately 1m below original ground level) near Station Road which is located to the west of the site to 4.2m AOD (1m below original ground level with localised evidence of artesian groundwater pressure) adjacent to Victoria Gardens before reducing to approximately 3m AOD (1m to 2m below original ground level) around Shore Road East bridge and the location of the existing Junction 15 roundabout.

6.8.30 Further east, groundwater level is indicated to rise to approximately 8.75m AOD (approximately 1.0m to 4.5mbgl) where it is considered to be perched on the underlying glacial till.

6.8.31 Artesian effects were described in five boreholes with the maximum artesian pressure recorded as being 1.4m above ground level (6.0m AOD) in borehole K11 to the west of the site near Station Road. The artesian pressures were confined below impermeable surface layers.

6.8.32 Where groundwater / piezometric levels were recorded as artesian, they were compared visually with, and seen to coincide reasonably well with high tides which has been noted on the historical logs.

Historical Land Uses

6.8.33 A summary of the historical land uses has been provided within Table 6.10 from a review of the Ordnance Survey (OS) maps provided with the Envirocheck report for the Scheme and main features or changes within 500m.

Table 6.10: Junction 15 Historical Site Uses

Date	Scale	On Site	Surrounding area (within 500m)
1888/1889	1:10,000 1:2,500	Much of the Scheme is open land. Penmaenmawr Road is present. A number of buildings are present to the north of Penmaenmawr Road, including the Victoria Pub, residential properties, and a chapel.	Much of the surrounding area to the south is open land. The existing railway line is present close (north) to the Scheme. A station is shown approximately 160m west of the Scheme, with railway sidings extending to within 80m.

Date	Scale	On Site	Surrounding area (within 500m)
		Shore Road East is present with a number of dwellings at its northern end.	The promenade area further to the north west of the Scheme (immediately north of the railway line) is partially developed with the present-day residences. Beyond this is a beach and the sea. A number of dwellings are present to the south-east of the eastern end of Penmaenmawr Road. Numerous buildings are shown extending to within 250m to the south west at Llanfairfechan.
1900/1901	1:2,500 1:10,000	Limited changes are shown within the Scheme.	A convalescent home (The Heath) is shown north of Penmaenmawr Road, between the Victoria Pub and the chapel and the land to the north-west has been landscaped. More recently, this building had housed the Conwy Council Infrastructure Services. Further houses are present within the promenade area to the north west. Mona Terrace is shown to the east of the site (south of the present day A55). A crane is shown at the railway sidings to the west of the site.
1914	1:2,500	A conveyor associated with quarrying activities to the south (extending to within approximately 70m of the site) extends into the eastern end of the site area to the north of Penmaenmawr Road. Railway sidings are shown connecting to the existing railway north of the site.	A school is now present connected to the chapel, west of the Heath Convalescent Home. The main area of quarrying is shown between approximately 100m and 200m to the south of the site connecting to the site via an 'incline'. A number of structures are shown with a 'crushing mill' labelled. A number of earthworks are shown in this area which appear to are presumably stockpiles of quarried material. A nursery is shown approximately 20m to the south of the site which includes a glass structure. Victoria Gardens, within the promenade area have been developed including a shelter and public conveniences.
1920	1:10,000 (partial map)	No significant changes	No significant changes.
1938	1:10,000	No significant changes.	No significant changes.

Date	Scale	On Site	Surrounding area (within 500m)
			A 'pumping station Llanfairfechan UDC sewage works' is shown to the west of Station Road
1953	1:10,000 (partial map)	No significant changes. The conveyor to the east of the site is no longer present.	No significant changes.
1963	1:10,000	No significant changes.	The land to the south-east of the site (south of Penmaenmawr Road), where the incline was previously indicated has been developed as residential streets. The pumping station to the west of Station Road is no longer shown.
1967/1969	1:2,500 1:10,000	A cul-de-sac extends into the western end of the site area as part of wider residential development of Llanfairfechan. A garage is shown to the north of Penmaenmawr Road at its eastern end, this extends beneath the footprint of the westbound A55 carriageways. The railway sidings associated with the quarrying are no longer shown and cutting is shown to the north of the garage. A garage is indicated to the east of Station Road (south of the railway) at the western end of the site area.	The railway sidings to the west of Station Road are no longer shown. The area to the south-west of the site, east of Station Road has been developed as residential streets. A cutting is now shown to the south of Penmaenmawr Road A tennis court and putting green are now shown in Victoria Gardens. The school has been extended to the north-west. A garage is shown immediately north of Penmaenmawr Road approximately 200m south of the A55 (within the current area of Maes Dolfor)
1988/1989	1:10,000 1:2,500	Shore Road East appears truncated in preparation for construction of the expressway and the properties at its northern end are no longer shown. To the east of the existing roundabout no structures are now shown, presumably demolished to make way for the expressway.	No significant changes. A number of residential properties along Maes Dolfor are now shown to the south of the western end of the site area. An electric substation is shown north of the above properties. The area of quarrying to the south of the eastern end of the site is no longer shown.
1992/1994	1:2,500 1:10,000	The A55 expressway including the roundabout and slip roads is now show with a dashed outline. Buildings have been removed (including the garages) to make way for the expressway earthworks and Shore Road East passes beneath the embankment. Penmaenmawr Road has been truncated at its eastern end where it	In the area west of Station Road the A55 crosses the former railway sidings. A garage is shown immediately south of Penmaenmawr Road (opposite the garage previously noted within the Maes Dolfor area).

Date	Scale	On Site	Surrounding area (within 500m)
		meets the expressway and a footbridge is now present close to this position.	
2000	1:10,000	A55 shown as complete.	No significant changes.
2006	1:10,000	No significant changes.	No significant changes.
2015	Aerial Image	No significant changes.	A residential property is shown being constructed at the former garage south of Penmaenmawr Road
2018	1:10,000 Aerial Image	No significant changes.	No significant changes. Three houses are shown at the former garage south of Penmaenmawr Road

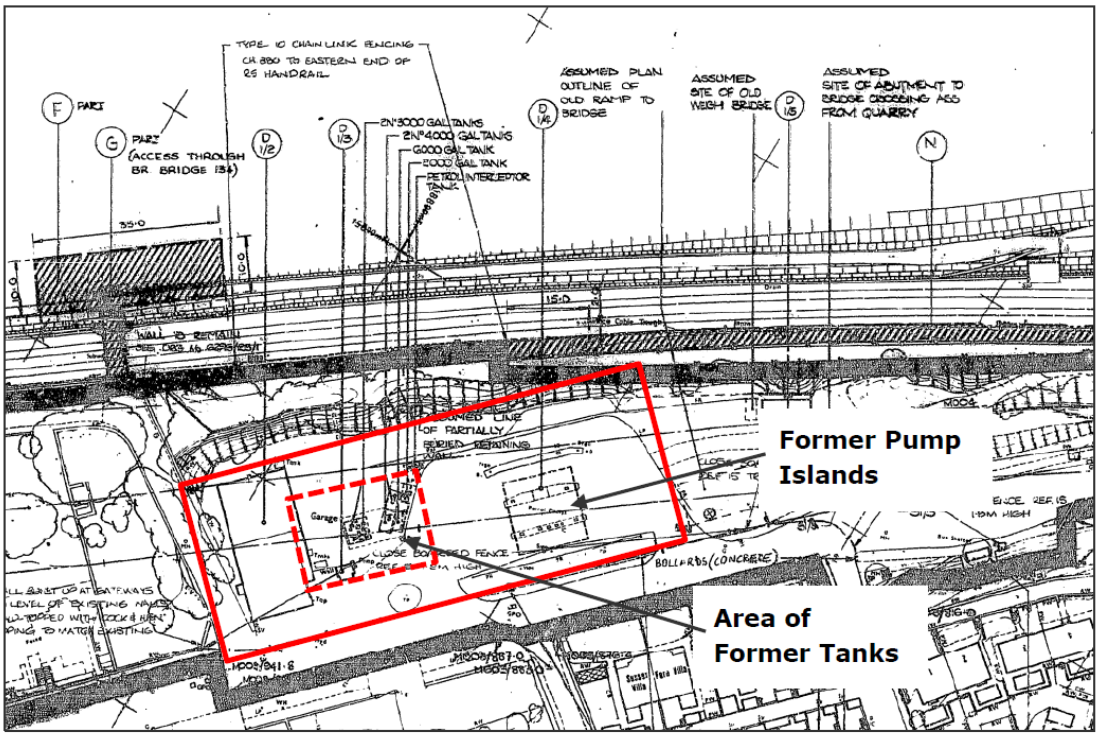
Historical Site Plans

6.8.34 A number of drawings have been obtained from NMWTRA dating from 1987 which relate to the construction of the A55.

6.8.35 One of the plans (ref: 6295/SC/1) includes the Mona Garage, which was identified on historical maps at the eastern end of the site area. The extract below shows the location of 6 no. underground tanks at the former garage, along with 3 no. above ground tanks close to the former garage building and the petrol pumps.

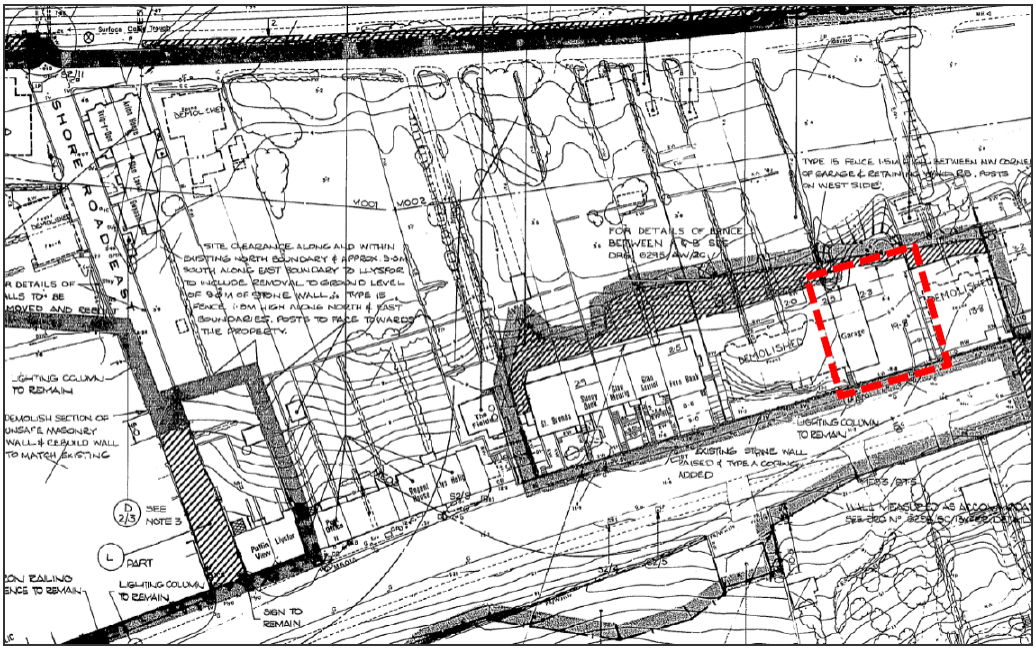
6.8.36 Some other features are also marked to the east of the Mona Garage which appear to have been associated with the former quarry.

Figure 6:3: Plan Showing Former Mona Garage



6.8.37 Another plan (ref: 6295/SC/2) shows a garage was also present close to the Scheme although this appears to have been for car repairs rather than fuel dispensing. This garage is located approximately 20m south of the A55 / 60m east of Junction 15, immediately north of Penmaenmawr Road. This garage was not identified on historical maps and it is still present as derelict building.

Figure 6:4: Plan Showing Former Garage off Penmaenmawr Road



6.8.38 No drawings have been obtained for the western end of the Scheme.

Historical Potentially Contaminating Land Uses

6.8.39 The historical OS maps obtained with the Envirocheck Report and previous reports show a number of historical potentially contaminating land uses on or within 500m of the site compounds which have been summarised below:

Table 6.11: Historical Potentially Contaminating Land Uses

Feature	Location
Garage / petrol station (Mona)	Onsite – eastern end of the site area
Garage	Onsite – western end of the site area (east of Station Road)
Quarrying (including railway sidings)	Onsite - at eastern end of the site area
Garage	Approx. 20m south of A55 / 60m east of Junction 15. Not identified on historical maps.
Railway Sidings (west of Station Road)	Approximately 70m west of the site area (west of Station Road)
Railway	Earliest historical maps to present, adjacent to the northern site boundary
Garage	North of Penmaenmawr Road (in Maes Dolf), approximately 200m south of the A55

Feature	Location
Garage	South of Penmaenmawr Road (in Maes Dolf), approximately 200m south of the A55
Electricity Substations	Various within 500m (none within site area)

6.8.40 Further information has been provided below on the garage within the Scheme which is indicated within the Terresearch (1983) report as Mona Garage petrol station.

Current Potentially Contaminating Land Uses

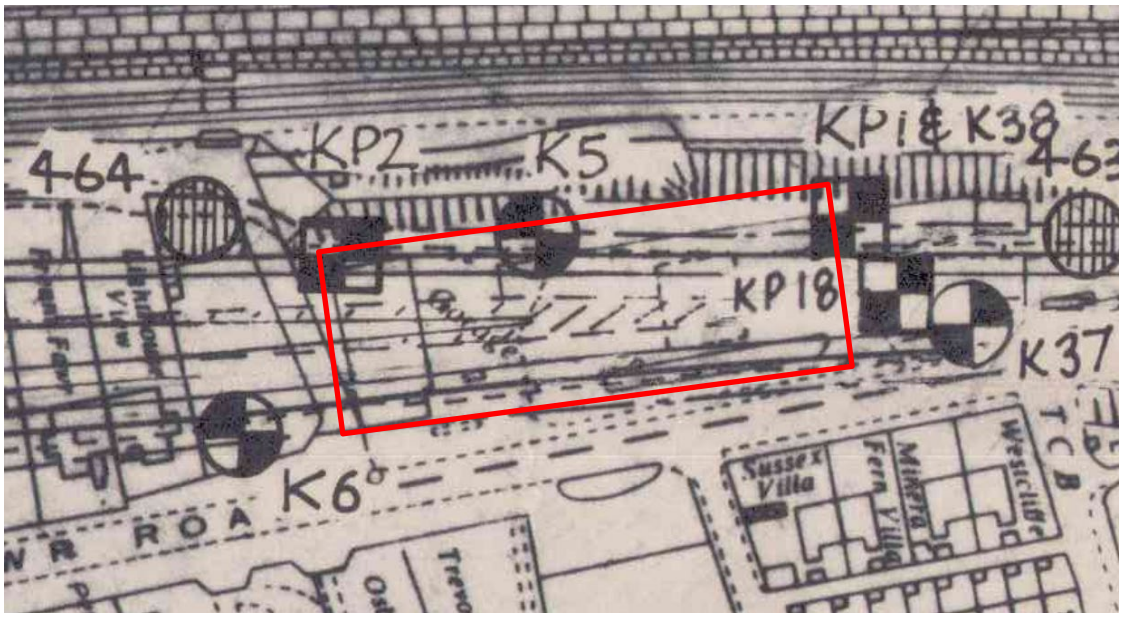
6.8.41 No existing potentially significant contaminating land uses have been identified on or within 500 m of the Scheme.

6.8.42 However, made ground / fill is likely to be present associated with the construction of the A55 and other roads within the Scheme.

Previous Ground Investigation - Contamination

6.8.43 Terresearch (1983) undertook a number of exploratory holes along the proposed route of the existing A55 which included the area around the former Mona Garage as indicated on the figure below.

Figure 6:5: Plan Showing Former Mona Garage



6.8.44 KP2 was located close to the north west corner of the former garage building and K5 to the north of the underground tanks. K37, K38 and KP18 were located to the east of the pump island.

6.8.45 Terresearch encountered made ground in the exploratory holes closest to the garage (Borehole K5 and K6, trial pit KP1, KP2 and KP18) which included ash and clinker, no visual or olfactory evidence of potential contamination was recorded on the logs.

6.8.46 Terresearch indicate that KP18 was carried out to investigate the nature of the made ground

between boreholes K37 and K38 in the vicinity of Mona Garage. A large number of concrete blocks were encountered along with a concrete plinth in trial pit KP18. These obstructions could relate to features associated with the former quarry identified on historical maps which extended into this area.

6.8.47 No soil or groundwater contamination test results are provided within the Terresearch ground investigation report. However, Terresearch indicate a water sample was obtained from trial pit KP18 was thought to contain traces of petrol or diesel oil. The sample was tested for the presence of toluene, phenols and coal tar, with no traces of these compounds detected. Terresearch indicate the possibility of spillages of these materials cannot be ruled out given the proximity of the Mona Garage.

Contaminated Land – 2019 Ground Investigation

6.8.48 The results of the testing for soil and groundwater have been screened against the following

Assessment Criteria:

a) Human Health: Assessment criteria derived using data from S4ULs prepared by LQM/CIEH (2015) and DEFRA C4SLs (2014)[7]. The 'commercial' land is based on the low sensitivity of the Scheme and guidance in Series NG 600 Earthworks (Volume 2) for general fill which considers there is a very low risk of exposure to the public from any contaminants in the fill. Assessment criteria for a 'public open space - park' land use have also been considered should materials be used near surface in areas of soft landscaping (within c.0.25m to 0.5m of the ground surface) to protect future site users, although this would be conservative for roadside areas where access is limited;
b) Water Quality: Environmental Quality Standards (EQS) for 'saltwater' and 'other surface waters' have been adopted as the primary criteria for assessing water quality due to the proximity of the site to the Menai Straights and surface water features which flow into the Menai Straights. Comparison has also been made against the Drinking Water Standards based on the presence of aquifers beneath the Scheme and where EQS have not been published;
c) Phytotoxicity (toxicity to plants): Criteria provided for metals (copper, nickel and zinc) within BS3882 2015 'Specification for topsoil' and BS 8601:2013 'Specification for subsoil and requirements for use' have been used to consider risk to plants within landscaping areas based on soil with pH>7 (from soil testing results for pH); and
d) Ground Gas: Health and Safety Executive in Workplace Exposure Limits HSE EH40/2005.

6.8.49 The assessment criteria outlined above for human health and water quality (soil leachate and groundwater) have been used to provide an initial screen of chemical test results and it is likely these assessment criteria would be conservative, particularly the EQS for surface waters.

Ground Investigation - Contamination Assessment

6.8.50 The Geotechnics 2019 ground investigation included sampling and analysis for soils and water for the presence of contamination. The following summary is based on the information obtained from the ground investigations in 2019 which is included as Appendix 6.1.

Soil Contamination Results

6.8.51 A review of the chemical testing results for the soil samples has identified one slight exceedance

[7] Based on a sandy soil comprising 1% soil organic matter converted from total organic carbon (TOC results).

of the assessment criteria for a public open space land use (1.3mg/kg) for dibenzo(ah)anthracene at 2.8 mg/kg from made ground in BH108 but not the commercial assessment criteria (3.5 mg/kg). The exploratory hole log shows that coal and tarmacadam was present within the made ground at this depth.

6.8.52 Further assessment of the PAH results obtained from BH108 at 0.5m has been undertaken using double ratio plots for benzo(a)anthracene:chrysene and fluoranthene:pyrene. The results obtained are indicative of a coal derived source rather than a petroleum or coal tar source.

6.8.53 No asbestos was identified within the samples tested by the laboratory.

6.8.54 Generic assessment criteria have not been published for construction workers for soil contaminants. The presence of contaminants could represent a risk to construction workers during excavations given their proximity to soils although the concentrations of contaminants in soils encountered are considered low.

Road Cores – Coal Tar

6.8.55 Samples from two of the road cores (PC101 at 0.04-0.1m, 0.1-0.25m, 0.25-0.33m, and PC104 at 0.1-0.18m, 0.18-0.25m, 0.25-0.34m) have been tested for PAHs to provide an indication as to whether coal tar binder could be present.

6.8.56 The results obtained for PAHs (as sum of USEPA 16 compounds) are below the lower analytical detection limit except for 95 mg/kg within PC101 at 0.1-0.25m. The results for benzo(a)pyrene were below the lower analytical detection limit except for 5.2 mg/kg within PC101 at 0.1-0.25m.

6.8.57 All of the road cores were sprayed with PAK aerosol marker spray which has been used as a screen for coal tars as it discolours in the presence of PAHs above 125 mg/kg (as sum of the USEPA 16 compounds) as indicated within guidance provided by ADEPT [8]. No reaction / colour change was observed on any of the cores indicating that PAHs are low. The results of the PAK marker testing are provided within the Geotechnics Factual Ground Investigation Report in Appendix 6.2.

6.8.58 Based on guidance provided by ADEPT [8], the results from chemical testing and PAK marker testing do not indicate that coal tar is likely to be present.

Phytotoxicity

6.8.59 No exceedances of the criteria for potentially phytotoxic metals (copper, nickel and zinc) have been obtained from the soil samples tested.

Soil Leachate Contamination Results

6.8.60 Zinc (20 µg/l) in made ground from BH108 at 1.0m bgl exceeds the saltwater EQS of 7.9 µg/l (which is based on 6.8 µg/l + ambient background concentration of 1.1 µg/l).

6.8.61 Arsenic (20 µg/l) in made ground from WS102 at 0.5m exceeds the drinking water standard (10 µg/l) but not the EQS (25 µg/l).

[8] ADEPT, August 2019. ~Managing Reclaimed Asphalt – Highways and Pavements

6.8.62 Localised exceedances of EQS have been obtained for PAHs as follows:

a) Made ground in BH109 at 0.2m: Benzo(b)fluoranthene (0.03 µg/l) compared to an EQS of 0.017 µg/l and Benzo(ghi)perylene (0.02 µg/l) compared to an EQS of 0.0082 µg/l;
b) Made ground in BH108 at 1.0m: Benzo(ghi)perylene (0.02 µg/l) compared to an EQS of 0.0082 µg/l;
c) Made ground in BH101 at 0.2m: Benzo(b)fluoranthene (0.02 µg/l) and Benzo(k)fluoranthene (0.02 µg/l) compared to an EQS of 0.017 µg/l

6.8.63 Naphthalene is present in WS102 at 0.5m at 0.35 µg/l, although this is well below the MAC-EQS of 130 µg/l.

6.8.64 Petroleum hydrocarbons have been encountered in the sample of made ground tested from BH108 at 1.0m at 150 µg/l, all within the C10-35 aliphatic fractions. No UK water quality standards have been published for petroleum hydrocarbons, although the results would not exceed the World Health Organization (WHO) guide values for TPHCWG fractions in drinking water (300 µg/l published for EC10-12 and EC12-16 aliphatic fractions).

6.8.65 No visual or olfactory evidence of petroleum hydrocarbons was noted within the arisings from BH108, and although gravels of coal were present the results for PAHs were low and the aromatic petroleum hydrocarbon fractions were all below the lower detection limit.

6.8.66 Ammoniacal nitrogen in made ground from BH102 at 1.10-1.55m exceeds the salt water EQS of 0.02 mg/l when converted to unionised ammonia (0.055 mg/l based on 10°C soil temperature). In addition to temperature, pH also affects the mobility of ammonia and results when converting to unionised ammonia. This sample comprised made ground with a soil pH of 11 which is likely to be associated with the presence of concrete fragments which were encountered during the ground investigation within this strata.

Groundwater Contamination Results

6.8.67 Two groundwater samples have been obtained from BH109 (Sand and Gravels) and BH110 (gravelly Clay) in August 2019. A further six samples were obtained in October 2019 from the following locations:

a) BH101 (Sands and Gravels);
b) BH102 (gravelly Clay);
c) BH104 (gravelly Clay);
d) BH105 (Sand);
e) BH110 (Sand); and
f) BH114B (gravelly Clay).

6.8.68 A limited number of exceedances were obtained for metals above the 'saltwater' EQS relating for copper and zinc all from natural strata:

a) Copper [9]: BH102 (6.8 µg/l) and BH114B (5.2 µg/l)
b) Zinc (EQS 7.9 µg/l): BH101 (15 µg/l), BH102 (14 µg/l), BH104 (9.6 µg/l) and BH114B (21 µg/l)

[9] Salt water EQS for copper is based on dissolved organic carbon (DOC), the exceedances in BH102 and BH114B were identified in samples where the DOC is >1 mg/l (DOC estimated from total organic carbon)

6.8.69 The results for petroleum hydrocarbons, SVOCs and VOCs are below the lower analytical detection limits.

6.8.70 The majority of PAHs were at or below the lower detection limits. None of the results exceed the EQS or drinking water standards.

6.8.71 The results for conductivity (3,130 µS/cm) in BH109 slightly exceeds drinking water standard (2,500 µS/cm) which could be indicative of saline intrusion from sea water.

Ground Gas Results

6.8.72 Five rounds of ground gas monitoring has been undertaken by Geotechnics from the 8th July to the 28th August 2019 on monitoring wells installed during the ground investigation in 2019.

6.8.73 Barometric pressure during the monitoring period ranged from 1001 to 1021 millibars.

6.8.74 The results of the gas monitoring have been assessed using guidance provided in the Health and Safety Executive Workplace Exposure Limits HSE EH40/2005 to consider the risks to workers in confined spaces and also the lower explosive limit for methane. As the development comprises a road scheme it is not considered appropriate to derive a gas screening value to determine the 'characteristic situation' for gas in accordance with BS8485:2015 as this guidance is based on considering risks to new buildings.

6.8.75 A summary of the results obtained from the monitoring has been provided below:

Table 6.12: Ground Gas Monitoring Results Summary

Monitoring Well	Response Zone (m bgl)	Strata	Flow (litres / hour) - Peak	Flow (litres / hour) – Steady	Methane (%) Peak	Methane (%) Steady	Carbon Dioxide (%) Peak	Carbon Dioxide (%) Steady
BH101	3.0 – 7.0	Peat / Sand	-0.2	-0.2	0.0	0.0	0.1	0.1
BH102	3.0 – 5.0	Sand	-0.2	-0.2	0.0	0.0	0.2	0.2
BH104	3.0 – 7.0	Sand and Gravel	-0.2	-0.2	0.0	0.0	0.1	0.1
BH106	5.0-10.0	Sand and Gravel	-0.20.0	-0.20.0	0.2-0.5	0.2-0.5	0.5-0.8	0.5
BH109	1.0 – 9.6	Sand and Gravel	-0.2-0.0	-0.2-0.0	0.0-0.1	0.0-0.1	0.1-1.1	0.1-0.8
BH110	3.0 – 4.4	Gravelly Clay	0.0	0.0	0.1	0.1	0.7-1.8	0.7-0.9
BH111	0.5 – 2.0	Made Ground	-0.3 – 0.0	-0.3 – 0.0	0.0-0.1	0.0-0.1	0.1-2.0	0.1-2.0
BH114B	6.0 – 12.0	Gravelly Clay	-0.2	-0.2	0.0	0.0	0.5	0.5

6.8.76 The gas monitoring results for carbon dioxide, carbon monoxide and hydrogen sulphide have been assessed against the short term and long term workplace exposure limits as indicated by the Health and Safety Executive in Workplace Exposure Limits HSE EH40/2005. The results of this assessment are summarised in the table below:

Table 6.13: Comparison of Ground Gas Results to Workplace Exposure Limits

Substance	Long Term Workplace Exposure Limit (8-Hour TWA Reference Period - ppm)	Short Term Workplace Exposure Limit (15-minute reference period - ppm)	No. of wells with long term exceedances	No. of wells with short term exceedances	Peak Concentration
Carbon Monoxide	30	200	3	1	293 ppm in BH102
Hydrogen Sulphide	5	10	0	0	0 ppm
Carbon Dioxide	5000 (0.5%)	15000 (1.5%)	4	2	2.0% from made ground in BH111
ppm: parts per million					

6.8.77 Results have been obtained from the made ground and natural strata for carbon dioxide and carbon monoxide which exceed both the short (BH110, BH109, BH111, BH106) and long term (BH110 and BH111) workplace exposure assessment limits.

6.8.78 Exceedances for carbon monoxide were obtained from BH102 (Round 1), BH106 (Round 2) and BH114B (Round 1) on one occasion. The majority of results were below the lower detection limit.

6.8.79 No exceedances of the lower explosive limit (5%) for methane were obtained.

6.8.80 The methane and carbon dioxide encountered during gas monitoring is likely to be associated with presence of carbonate minerals and / or organic material within the made ground and superficial deposits. Such deposits are capable of generating small levels of gas but the soil descriptions do not indicate that significant amounts of degradable materials are present which could generate large volumes of gas.

6.8.81 The source of the carbon monoxide encountered in BH102 (293 ppm), BH106 (113 ppm) and BH114B (153 ppm) is not known, although the results are unlikely to be representative of the gas regime as the monitoring well screens in each of these wells was flooded by groundwater.

Environmental Database Records

6.8.82 The following information has been obtained from the Envirocheck report on Environmental Permits, Incidents and Registers for the Scheme and surrounding area:

a) There are no sites determined as Contaminated Land under Part 2A EPA 1990 within 500m;
b) There are no authorised industrial sites or hazardous substance facilities within 500m;
c) There are 9no. records of pollution incidents to controlled waters within 500m. Two of the records are within the site area relating to Category 3 – Minor incidents, both dated 3rd January 1996 one for accidental spillage (lost load) of algae and the other for fire water / foam. There is one other record within 250m relating to a Category 3 – Minor incident relating to deliberate incident involving industrial solid waste in 1998; and

d) There are 19 no. records of discharge consents within 500m. Four of the records are located in the site area and a further five records within 120m, these are shown as being operated by the Welsh Office – Highways Group for the A55 into Menai Straight and or un-named watercourse and they have all expired. The other six discharge consents within 250m relate to the sewage network (still effective) mainly into freshwater stream / river (Llanfairfechan), and Llanfairfechan railway station (to land) and access road which have expired.

6.8.83 The Envirocheck Report has 8 no. records of current industrial land uses (contemporary trade director entries) within 500m of the Scheme, although none of these are located within the Scheme boundary. These relate to car dealers, car body repairs, garage services, boat builders and repairers, leather goods cleaning (all inactive), with one record for garage services which is still active.

Landfill and Waste Management

6.8.84 The Envirocheck Reports does not provide any records of landfills within 500m of the Scheme.

6.8.85 One area of potentially infilled land is shown adjacent to the eastern end of the Scheme which appears to be associated with former quarrying identified on historical maps.

6.8.86 Two records relating to a potentially infilled water feature are provided within the Scheme which extends beneath A55 to the west of Junction 15. Two further records are potentially infilled water features are provided approximately 470m to the south.

Geohazards

6.8.87 The Envirocheck Report shows the site and areas within 250 m have the following potential ground stability hazards:

a) Potential for collapsible ground – no hazard to very low;
b) Potential for compressible ground – no hazard to very low;
c) Potential for ground dissolution – no hazard;
d) Potential for landslide – very low to low;
e) Potential for running sands – no hazard to moderate; and
f) Potential for shrinking/swelling clays – no hazard or low.

6.8.88 The moderate hazard identified above for running sand relate to the area less than 20m north of the site and is likely to relate to the beach deposits.

6.8.89 The Coal Authority website[10] and information provided within the Envirocheck Report indicates the study area is not located within a coal mining reporting area.

6.8.90 The Envirocheck Report indicates the potential for non-coal mining as being 'highly unlikely' and there are no records provided for man-made mining cavities or natural cavities.

Radon and Ground Gas

6.8.91 The Public Health England website[11] indicates the radon potential for properties ranges from <1% up to a maximum radon potential of 10-30%.

[10] http://mapapps2.bgs.ac.uk/coalauthority/home.html
[11] https://www.ukradon.org/information/ukmaps

6.8.92 No existing or historical landfill sites have been identified within 500 m of the study area.

6.8.93 The Envirocheck report has a number of records relating to potential infilled land within 500 m of the study area which could give rise to ground gas. These relate to infilled water features such as ponds, marsh, river or stream which would be of limited extent. One larger area of potentially infilled land has been identified very close to the eastern end of the site area, this appears to relate to former quarrying.

6.8.94 There site is not located within a coal mining area and there are no known coal workings or shafts within the study area.

Unexploded Ordnance (UXO)

6.8.95 The Zetica Regional Unexploded Bomb Risk map for Isle of Anglesey encompasses the site area. This map shows the site is located in a low bomb risk area.

Contaminated Land Risk Assessment

6.8.96 A qualitative risk assessment for contaminated land has been undertaken for the construction and operational phase. The risk assessment is based on the assumption that standard best practice measures would be implemented during the works, and has been used to identify where additional mitigation measures would be required.

6.8.97 The contaminated land risk assessment for the Scheme has been provided in Technical Appendix 6.3.

6.8.98 Where risks have been identified that may result in potentially significant environmental effects these have been brought forward into the effect assessment.

6.9 Potential Construction and Operational Effects

Identified Sensitive Receptors

6.9.1 The ground conditions have the capability to affect a range of receptors, for the purposes of this assessment the following have been considered as potential receptors:

a) Designated geological sites;
b) Controlled waters - groundwater resources;
c) Human health (construction / maintenance workers, future site users, local residents / general public); and
d) Flora and fauna.
e) Buried concrete;
f) Buried services; and
g) Structures, buildings or roads.

6.9.2 Surface waters could also be considered as a receptor for ground contamination. The main assessment for impacts to surface waters is dealt with under Chapter 7: Road Drainage and The Water Environment; however, reference is made in this chapter where directly relevant to ground conditions.

Assessment of Effects

6.9.3 A full description of the proposed works has been provided in Chapter 2: The Scheme. Those features and assumptions relevant to this chapter are summarised as follows, including best practice methods.

6.9.4 The following key points which bear relevance to the geology and soils chapter are as follows:

Construction Phase

6.9.5 Activities that are likely to be occurring at the site compounds during the construction stage which could involve dealing with the ground or which could affect the ground are as follows:

a) Establishment of a temporary construction compound/s, storage and use of fuels / chemicals – the establishment stage sits prior to the installation of appropriate bunds and other pollution control measures and as such represents the highest risk. All storage areas for fuels and oils would be appropriately bunded in line with best practice guidance;
b) Movement of plant and machinery within the Scheme and to and from the compound/s;
c) Wheel washing facilities would be provided during construction for plant and vehicles;
d) Where waste material is to be disposed of off-site this would be to a licensed waste facility in accordance with Materials Management Plan (MMP);
e) Vehicles moving across soils within the Scheme;
f) Re-use of excavated material within construction works where possible in order to minimise off site material movements, including excavated soils, roads and demolition materials;
g) Piled foundations and / or ground improvement would be required;
h) Soil stripping and excavation/exposure of underlying materials;
i) Topsoil and subsoils would be segregated during construction;
j) Excavations for foundations, drainage works or services; Standard open trenching techniques would be used for excavations;
k) Dewatering of excavations (if required);
l) Storage of materials and stockpiling of excavated soils within the Scheme;
m) People working within excavations;
n) Processing of material to render it suitable for particular uses; and
o) Site won material would be re-used on site wherever possible, subject to relevant geotechnical testing. Imported materials will also be required to provide engineered fill as part of the construction of structures and embankments.

6.9.6 These activities have been considered during the construction stage effect assessment.

Operational Phase

6.9.7 Reasonably foreseeable activities or factors during the operational stage which could affect or be affected by the ground are as follows:

a) Periodic maintenance which could involve small scale excavations;
b) Areas of soft landscaping and planting; and
c) Drainage and storm water attenuation - no planned infiltration into the ground.

6.9.8 Further information on the operation phase has been provided in Chapter 2: The Scheme.

Incorporated Mitigation

6.9.9 Mitigation measures to protect the general public and site workers during the works would be detailed in the Construction Environmental Management Plan (CEMP) to be prepared prior to the construction works commencing and developed to ensure full compliance with relevant and current policy, guidelines and best practice.

6.9.10 The following list presents the assumptions that have been made for the purposes of this ES in terms of incorporated mitigation, with the proviso that the list is not exhaustive:

a) A CEMP will be prepared which would be compliant with all relevant construction best practice and codes of practice. This would include impacts associated with compound establishment and activities such as use of fuels/oils which would be minimised by prioritising establishment of designated areas for fuels and materials storage and construction of pollution control measures;
b) Health and safety measures to protect workers during construction works;
c) Measures would be adopted during the construction works to mitigate environmental effects of ground works such as preventing run-off or dust, including if any temporary excavation and stockpiling of soils were to be required. Where material could be contaminated this is likely to involve the construction of temporary bunds and use of sheeting;
d) Relevant pollution control measures would be observed during construction in line with current legislation and best practice; and
e) Construction would be compliant with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, in order to protect soil quality during excavation right through to reinstatement.

6.9.11 The following tables provide the effects assessments assuming that mitigation measures have been adopted.

Effect Assessment - Construction Stage

6.9.12 The following assessment has been undertaken to determine potentially significant effects for the construction stage.

Table 6.14: Categorisation of Effects – Construction Stage

Potential Impact	Effect Status	Effect Duration	Permanent/ Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Effect	Category of Effect	Significant Effect?	Commentary
Physical damage to designated geological sites	Adverse	Long Term	Permanent	Direct	Negligible	No Change	Neutral	No	No impact as no designated geological sites within 500m.
Impacts on soil or groundwater from construction establishment activities such as use of fuels/oils.	Adverse	Short Term	Temporary	Direct	Medium	Negligible	Neutral or Slight	No	Once the construction compounds are established and management procedures are in place then it is considered that the risk of pollution events would be low, but there is a greater risk during the establishment phase. This would be minimised by prioritising establishment of designated areas for fuels and materials storage and construction of pollution control measures.
Impacts from activities such as material storage, processing, and stockpiling to construction workers or local residents	Adverse	Short Term	Temporary	Direct	Medium	Negligible	Neutral or Slight	No	Low levels of soil contamination identified. Risk minimised by standard practice such as bunds, not storing of stockpiled materials within 10m of water courses and damping down / sheeting during dry windy periods. If contaminated material were to be encountered, this would be segregated prior to treatment (if required) and / or removal to minimise migration of contaminants during excavation works and / or stockpiling (in particular for airborne dust / vapours / odours or run-off). No access to the site by the general public during construction works.
Exposure of construction workers to contaminated land during excavations	Adverse	Short Term	Temporary	Direct	Medium	Minor	Slight	No	Low levels of soil contamination identified. Risks during excavations minimised by adopting standard best practice and control measures along with personal protective equipment for workers if required. Watching brief and protocols for dealing with unexpected contamination during the construction works.

Potential Impact	Effect Status	Effect Duration	Permanent/ Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Effect	Category of Effect	Significant Effect?	Commentary
Exposure of construction workers to ground gas in confined spaces	Adverse	Short Term	Temporary	Direct	Medium	Moderate	Moderate	Yes	Overall concentrations of ground gas are low, although some exceedances of workplace exposure limits have been obtained. Monitoring and PPE will be required for workers in confined spaces and deep excavations (if these are introduced). Works would not increase potential for gas migration off-site.
Migration of contaminants due to construction works	Adverse	Long term	Permanent	Direct	Medium	Negligible	Neutral or Slight	No	Made ground present but only limited contamination has been identified. Construction works unlikely to result in preferential pathways or increase risk of contaminant migration. Risk minimised by standard construction practice. Mitigation could still be required if unexpected contamination were to be encountered during construction works. A remediation strategy would be developed if necessary.
On-site movement of soils – risk of spreading contamination	Adverse	Long term	Permanent	Direct	Medium	Negligible	Neutral or Slight	No	Excavated soils be re-used onsite where possible. Presence of fill / made ground but overall low levels of soil contaminants identified.
Impacts on groundwater from dewatering during excavations	Adverse	Short Term	Temporary	Direct	Medium	Negligible	Neutral or Slight	No	Shallow groundwater encountered during ground investigation within superficial deposits. Majority of excavations would be shallow and / or limited in extent and dewatering (if required) would be temporary. Significant impacts to groundwater therefore not anticipated. Risk minimised by standard construction practice such appropriate storage and disposal of any water removed from excavations.
Risk of encountering ground instability during construction	Adverse	Short Term	Temporary	Direct	Medium	Low	Neutral or Slight	No	Site underlain by deposits with no hazard to low potential for collapsible or compressible deposits and running sands. Potential for landslides identified as very low to low. Risk minimised though appropriate design during construction works. No evidence of mining within the Scheme.

Potential Impact	Effect Status	Effect Duration	Permanent/ Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Effect	Category of Effect	Significant Effect?	Commentary
Direct contact with UXO during excavations or during installation of foundations	Adverse	Short Term	Temporary	Direct	High	Negligible	Slight	No	The potential for encountering UXO is considered low. Watching brief by Contractor during excavations.

Effect Assessment - Operation Stage

6.9.13 The following assessment has been undertaken to determine potentially significant effects for the operation stage.

Table 6.15: Categorisation of Effects – Operational Phase

Potential Impact	Effect Status	Effect Duration	Permanent/ Temporary	Direct/ Indirect	Sensitivity of Receptor	Magnitude of Effect	Category of Effect	Significant Effect?	Commentary
Impacts on ground conditions and groundwater during operational activities	Adverse	Long Term	Temporary	Direct	Medium	No change	Neutral	No	It is assumed standard best practice measures would be employed for activities during the operation stage and on this basis the Scheme would not have a long term impact or when compared to the existing layout. Potential for foundations introducing preferential pathways for contaminant migration is low.
Exposure of ground maintenance workers or local residents to contaminated land during excavations	Adverse	Long Term	Temporary	Direct	Medium	Minor	Slight	No	Low levels of soil contamination identified. Risks during excavations minimised by adopting standard best practice and control measures along with personal protective equipment for workers if required. Watching brief and protocols for dealing with unexpected contamination during excavations. No significant effects identified to the general public.
Exposure of ground maintenance workers to ground gas in confined spaces	Adverse	Long Term	Temporary	Direct	Medium	Moderate	Moderate	Yes	Overall concentrations of ground gas are low, although some exceedances of workplace exposure limits have been obtained. Monitoring and PPE will be required for workers in confined spaces and deep excavations (if these are introduced). Works would not increase potential for gas migration off-site in the longer term.
Direct contact with UXO during excavations	Adverse	Long Term	Temporary	Direct	High	Negligible	Slight	No	The potential for encountering UXO is considered low. Watching brief by Contractor during excavations.
Damage to buried structures and services from aggressive ground conditions	Adverse	Long Term	Permanent	Direct	Medium	Minor	Neutral or Slight	No	Overall levels of aggressive contaminants in soils are low. Buried concrete design and service diversions would take account of aggressive ground conditions.
Risk of ground instability during operation	Adverse	Short Term	Temporary	Direct	Medium	Low	Neutral or Slight	No	Site underlain by deposits with no hazard to low potential for collapsible or compressible deposits and running sands. Potential for landslides identified as very low to low. Risk minimised though appropriate design during construction works. No evidence of mining within the Scheme.

6.10 Effects with Mitigation

6.10.1 The only potentially significant effect identified for the Scheme with regards to Geology and Soils relates to workers in confined spaces (if introduced) during the construction and operation stages. 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.

6.10.2 As described above, a number of standard best practice measures would 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.

6.10.3 The following sections provide further description and detail of mitigation measures in addition to standard best practice measures that would be employed at the site in order to avoid potentially significant effects arising from the construction and operation of the Scheme.

Construction Phase

Dewatering

6.10.4 If it is necessary to remove water from excavations, this would be stored in a controlled way before disposal. Concentrations of contaminants in groundwater are low, although prior to discharge confirmation would be obtained as to whether any water treatment is required for disposal in addition to de-silting.

6.10.5 Mitigation measures would be implemented if shallow groundwater is encountered during excavations or from stockpiling of excavated materials from below the water table to minimise the potential for surface run-off during the construction phase. These would comprise lining of bunds and pumping to remove groundwater from excavations.

6.10.6 If it is necessary to remove greater than 20m^3 per day of groundwater from excavations then consultation would be undertaken with NRW and a permit obtained if required for dewatering. Discharge of groundwater back into the ground or into surface water would not be undertaken without prior consent from the NRW.

6.10.7 Dewatering of excavations, if required, may have a temporary effect on the shallow local hydrogeological regime but should not have any permanent effect on groundwater flow.

Contaminated Land

6.10.8 No evidence of any significant contamination has been encountered within the Scheme. On this basis, no specific remediation measures are considered to be required for existing contaminants in the area of the Scheme.

6.10.9 Notwithstanding this there would be a need to manage these materials as they are excavated and, where appropriate, re-used. A Materials Management Plan (MMP) in accordance with the CL:AIRE Definition of Waste: Development Industry Code of Practice would be implemented as part of the CEMP to address this requirement.

6.10.10 The majority of existing materials would remain in-situ during the construction works and would be covered by the road construction and soft landscaping which would limit infiltration and potential for exposure to underlying soils. Materials excavated from the Scheme would be re-

used onsite where possible or otherwise removed off site for recycling, disposal would only be used as a last resort if no beneficial use can be found. If any localised contamination were to be encountered during excavations, this material would need to be delineated and may require treatment before for re-use or removal off-site.

6.10.11 It would be necessary to prepare a specification for existing site won materials or imported new fill material for use as part of the construction works to provide acceptability criteria for geotechnics and contamination. This specification would form part of the MMP.

6.10.12 The potential for the Scheme to cause significant lateral migration of gas is considered low. The hard cover introduced as road surfacing during construction would be of limited lateral extent and largely similar to the existing road layout, and only very low flow rates above the lower instrument detection limit have been obtained during gas monitoring indicating there is only a limited volume of gas within shallow strata and this is being generated at a very low rate.

CEMP

6.10.13 An overarching mitigation measure which would contribute towards addressing the construction phase impacts is the development of a project specific CEMP. These would need to incorporate specific measures to address the significant impacts identified for the construction and operation phases.

6.10.14 It would be necessary to ensure that mitigation measures are implemented to prevent off-site migration of contaminants as dust / vapours or run-off during excavations and soil stockpiling. Sheeting of lorries would be undertaken for material importing and exporting materials offsite to mitigate risks from dust. No specific mitigation is considered to be required for asbestos in soils, although the implementation of mitigation measures for dust would also ensure the risks from asbestos remain low.

6.10.15 A protocol would be prepared to address unexpected contamination, should this be encountered, during excavations for the construction works and this would need to be incorporated into the CEMP.

6.10.16 As noted above, a MMP would be put in place and this would include details of how excavated soils would be managed on site including, where appropriate their re-use on site.

6.10.17 Following the implementation of mitigation, the significance of the effect is considered to be negligible or low.

Foundations

6.10.18 Where piled foundations or penetration ground improvement are required during the construction works, this would take account of the following guidance:

a) Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. NC/99/73.

6.10.19 Where there is a requirement to install concrete in contact with the ground, this would take account of guidance provided within the following document:

a) BRE, 2005. Special Digest 1 Concrete in Aggressive Ground.

6.10.20 Following the implementation of mitigation, the significance of the effect is considered to be negligible.

Decommissioning of Existing Wells

6.10.21 Any existing monitoring wells which are no longer required would need to be decommissioned in accordance with the following document, and particularly where this has the potential to result in preferential pathways through low permeability strata:

a) Environment Agency, October 2012. Good Practice for Decommissioning Redundant Boreholes and Wells (LIT 6478 / 657_12).

Construction Workers and General Public

6.10.22 Concentrations of soil contamination are low, although slightly elevated concentrations of ground gas have been encountered which could represent a risk to workers in confined spaces.

6.10.23 Potential risks to workers from exposure to contaminants and ground gas would need to be managed through the health and safety plan which could involve the implementation of safe working procedures to prevent exposure to contaminated soils and / or personal protective equipment during the construction works.

6.10.24 Potential risks to general public during excavations would be managed through the implementation of standard best practice measures to prevent off-site migration of dust or run-off during excavations and soil stockpiling along with dust monitoring and sheeting of lorries importing and exporting materials offsite. There should be no direct exposure to soil contamination by the general public during the construction works.

Operational Phase

6.10.25 Following implementation of the mitigation measures outlined above there are considered to be no residual significant effects during the operational phase. The Scheme would provide an inherent level of protection, covering underlying soils with suitable materials used near surface in areas of landscaping and reducing infiltration into the ground due to hard cover and drainage.

6.10.26 Potential risks to workers during excavations would need to be managed through the health and safety plan which could involve the implementation of safe working procedures to prevent exposure to contaminated soils and / or personal protective equipment.

6.10.27 Risks to buried concrete from aggressive ground conditions would be mitigated during the construction works through use of an appropriate concrete mix for foundations.

6.10.28 Mitigation would be incorporated within the road and drainage design through the use of appropriate engineering and drainage measures based on standard best practice to address the potential risk of contaminants entering the infiltration pond.

6.10.29 Following the implementation of mitigation, the significance of the effect is considered to be negligible.

Residual Significant Effects

6.10.30 Following implementation of the mitigation measures outlined above, there are considered to be no residual significant effects during the construction or operational phase.

6.11 Cumulative Effects

Intra-Project Effects

6.11.1 Intra-project effects are considered as those that "occur between different environmental topics within the same proposal, as a result of that development's direct effects" (IEMA [12]).

6.11.2 The following potential direct and indirect intra-project cumulative effects have been considered along with mitigation:

a) Chapter 6: Road Drainage and Water Environment – No potentially significant effects have been identified to the water environment from contamination, including where foundations are proposed. The Scheme would provide an inherent level of protection, covering underlying soils with suitable materials used near surface in areas of landscaping and reducing infiltration into the ground due to hard cover and drainage. Potential for foundations resulting in preferential pathways being introduced increasing the risk from contaminant migration is considered low. Majority of excavations will be shallow and / or limited in extent and if any dewatering were to be required during excavations this would be temporary with impacts minimised by standard construction practice. The requirement has been identified for mitigation to prevent to prevent run-off during excavations and soil stockpiling.
b) Chapter 8: Nature Conservation – No potentially significant soil contamination has been identified and the requirement for mitigation has been identified during construction to prevent run-off and dust when excavating and stockpiling materials. In addition, there should not be any cumulative effects to the water environment following mitigation which could significantly impact on habitats or species.
c) Chapter 12: Air Quality – The requirement for mitigation has been identified to prevent off-site migration of dust during excavations and soil stockpiling along with the movement of soils during construction.
d) Chapter 15: Materials – The proposal is to re-use excavated materials and no potentially significant soil contamination has been encountered. There is still a potential that unexpected contamination could be encountered during construction and this would be managed via a protocol incorporated into the CEMP. If unexpected contamination were to be encountered, and depending on the risks identified, this could result in additional material being removed offsite. However, based on the findings from the ground investigation and previous land uses identified within the Scheme, along with the construction proposals, this is unlikely to be significant.

6.11.3 Following the implementation of mitigation, no potentially significant intra-project cumulative effects have been identified.

[12] Institute of Environmental Management & Assessment (IEMA), 2011. Special Report – The State of Enviromental Impact Assessment Practice in the UK

Inter-Project Effects

6.11.4 Inter-project effects have been considered as those where "cumulative effect occurs as a result of the likely impacts of the proposed development interacting with the impacts of other developments in the vicinity" (IEMA [12]).

6.11.5 Chapter 19 sets out the known schemes that could be considered to have a cumulative effect in combination with the Scheme.

6.11.6 In terms of Geology and Soils, the potential for significant cumulative effects in combination with the Scheme, including the proposals for Junction 16, is considered low.

6.12 Conclusions

6.12.1 A number of potential effects have been identified and assessed. However, with the implementation of the incorporated mitigation measures and additional mitigation measures as outlined above it is considered that there would be no residual significant environmental effects as a result of the Scheme.

6.12.2 There would be no long-term significant effect on the groundwater beneath the site from the Scheme and it is considered that the risks associated with the ground conditions can be adequately managed.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 7 DRAINAGE AND WATER

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7. ROAD DRAINAGE & THE WATER ENVIRONMENT

7.1 Chapter introduction

7.1.1 This chapter reports on the likely significant effects with respect to road drainage and the water environment associated with the construction and operation of the Junction 15 Scheme (the 'Scheme').

7.1.2 This chapter is supported by the following figures and appendices:

a) Volume 2, Figure 7.1 – Water Environment: Site Features.
b) Volume 2, Figure 7.2 – Water Environment Designated Sites.
c) Volume 2, Figure 7.3 - NRW Risk of Flooding from Rivers and Sea.
d) Volume 2, Figure 7.4 – NRW Risk of Flooding from Surface Water (3.3 % annual chance).
e) Volume 2, Figure 7.5 - NRW Risk of Flooding from Surface Water (1 % annual chance).
f) Volume 2, Figure 7.6 - NRW Risk of Flooding from Surface Water (0.1 % annual chance).
g) Volume 3, Appendix 7.1 – Assessment of Effects on Water Framework Directive (WFD) Water Bodies.
h) Volume 3, Appendix 7.2 – Flood Consequences Assessment.
i) Volume 3, Appendix 7.3 - Water Quality Assessment.
j) Volume 3, Appendix 7.4 – Correspondence with NRW on Water Quality.

7.2 Relevant Legislation, Policy and Guidance

7.2.1 The assessment has been informed by the legislation, policy and published guidance detailed below.

Water Framework Directive[1]

7.2.2 The Water Framework Directive (WFD) (2000/60/EC) was published in December 2000 and transposed into Welsh law in December 2003 (see 7.2.6). The intention of the WFD 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. For further details of this piece of legislation see Appendix 7.1.

The Groundwater Directive[2]

7.2.3 The Groundwater Directive (2006/118/EC) was created out of Article 17 of the WFD and establishes a framework to prevent the input of hazardous substances and to manage the input of non-hazardous pollutants into groundwater. The Directive was translated into Welsh law through the Groundwater (England and Wales) Regulations 2009[3], which is now revoked and the provisions it included now incorporated into the Environmental Permitting Regulations (England and Wales) (Amendment) Regulations 2010[4]. Measures in the Directive include the criteria by which good groundwater chemical status is assessed and the criteria for the identification of significant and sustained upward trends in groundwater quality. It allows for water quality standards to be set at a national level and take into account the effects of natural geology on

[1] https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF
[2] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0118&from=EN
[3] http://www.legislation.gov.uk/uksi/2009/2902/contents
[4] https://www.legislation.gov.uk/uksi/2010/676/contents

groundwater characteristics.

The Environmental Quality Standards (EQS) Directive[5]

7.2.4 The Environmental Quality Standards Directive (2008/105/EC, as amended by 2013/39/EU) was also created as a result of the WFD (Article 16) and sets out the standards (EQSs) for certain priority and priority hazardous substances considered to be at a European level to be of concern. The aim of the Directive is to reduce or cease/phase out altogether, their presence in the water environment in order to achieve good surface water chemical status in accordance with the provisions and objectives of Article 4 of the WFD. This Directive was translated into Welsh law through The Water Environment (WFD) (England and Wales) (Amendment) Regulation 2015[6].

Floods Directive

7.2.5 The Floods Directive (2007/60/EC) implements the requirement for assessment and management of flood risks across the European Union. It requires member states to assess if all watercourses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. The Directive requires that work be carried out in co-ordination with that undertaken as part of member states' obligations under the WFD.

Water Environment (Water Framework Directive) (England and Wales) Regulations[7]

7.2.6 The Water Framework Directive (2000/60/EC) was transposed into Welsh law in December 2003 through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003[8], later being updated through The Water Environment (WFD) (England and Wales) (Amendment) Regulation 2015[9] and most recently The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[10].

7.2.7 European and national standards for surface water quality have been implemented under these regulations in Wales through The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015[11], whilst those for groundwater have been through The Environmental Permitting Regulations 2010 and onwards[12] and the supporting Groundwater (Water Framework Directive) (Wales) Direction 2016[13].

Flood and Water Management Act[14]

7.2.8 The Flood and Water Management Act (2010) act sets out the roles and responsibilities of all risk management authorities in Wales (the Welsh Government, Natural Resources Wales (NRW), Lead Local Flood Authorities and water and sewerage companies), encompassing integrated management of flood risk to help protect homes, people and businesses. It requires flood and coastal erosion risk authorities to contribute towards sustainable development as part of their duties and makes provision for the establishment of the Flood and Coastal Erosion Committee

[5] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0105&from=EN
[6] https://www.legislation.gov.uk/uksi/2015/324/contents/made
[7] http://www.legislation.gov.uk/uksi/2003/3242/contents/made
[8] http://www.legislation.gov.uk/uksi/2003/3242/contents/made
[9] http://www.legislation.gov.uk/uksi/2015/1623/resources
[10] http://www.legislation.gov.uk/uksi/2017/407/pdfs/uksi_20170407_en.pdf
[11] http://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en_auto.pdf
[12] https://www.legislation.gov.uk/ukdsi/2010/9780111491423/contents
[13] https://gov.wales/docs/legislation/inforcenonsi/environmental/160526-groundwater-direction-en.pdf
[14] https://www.legislation.gov.uk/ukpga/2010/29/contents

for Wales, which was created in 2017 following implementation of The Environment (Wales) Act[15] in 2016 which enacted the committee's creation.

Flood Risk Regulations[16]

7.2.9 These regulations transpose the requirements of the Floods Directive into Welsh law, placing duties on NRW and local authorities to prepare flood risk assessment, flood risk maps and flood risk management plans.

The Bathing Water Regulations[17]

7.2.10 These 2013 regulations update earlier (2008) regulations and implement the requirements of the Bathing Water Directive (2006/7/EC)[18], including specifying water quality requirements at locations identified under the regulations as being bathing waters. It also places duties upon local authorities to manage said water bodies and take measures where, for example, water pollution incidents occur.

Planning Policy Wales[19]

7.2.11 Planning Policy Wales (PPW) provides the overall framework for planning policy in Wales. It outlines the planning approach to development and flood risk and places a requirement for planning authorities to consider the potential impacts of proposed development on the water environment, the impacts of flooding and to take a catchment based approach to flood risk management.

Water Strategy for Wales[20]

7.2.12 This strategy, issued by the Welsh Government, sets out the government's strategy for long term management of Wales' water resources in a sustainable manner whilst supporting the needs of nature, community and business. It places an expectation upon highways authorities to "facilitate the use of natural systems in infrastructure developments and to reinstate or create aquatic features, such as wetlands and natural river channels, where there are benefits for wildlife, communities and customers".

Conwy Local Development Plan 2007-2022[21]

7.2.13 This Local Development Plan was adopted in October 2013 and includes the following policies that relate to the water environment:

Policy DP/3: Promoting Design Quality and Reducing Crime. This policy states that development will only be permitted where they provide sustainable urban drainage systems to limit waste water and water pollution and reduce flood risk in line with national guidance and Policy NTE/8 – 'Sustainable Drainage Systems'.

Policy DP/4: Development Criteria. This policy states that development not be permitted where

[15] https://www.legislation.gov.uk/anaw/2016/3/contents
[16] http://www.legislation.gov.uk/uksi/2009/3042/contents/made
[17] https://www.legislation.gov.uk/uksi/2013/1675/contents/made
[18] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0007&from=EN
[19] https://gov.wales/sites/default/files/publications/2019-02/planning-policy-wales-edition-10.pdf
[20] https://gov.wales/docs/desh/publications/150521-water-strategy-for-wales-en.pdf
[21] http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf

it would have an adverse impact on the quality of ground or surface water.

Policy NTE/1: The Natural Environment. This strategic policy aims to prevent, reduce or remedy all forms of pollution, including that to water, in line with policy DP/6 (which requires all planning applications to be in compliance with national policy and guidance).

Policy NTE/5: The Coastal Zone. This policy requires that coastal development does not adversely affect nature conservation values (which may be part of the aquatic environment) of the zone or interfere with natural coastal processes (which it notes includes flooding).

Policy NTE/8: Sustainable Drainage Systems (SuDS). This policy requires the use of SuDs wherever practicable, with drainage to surface water bodies, surface water sewer or combined sewer (in this order of preference) where this is not the case.

Policy NTE/9: Foul drainage. This policy requires that where development includes hard surface areas used by vehicles it "must include measures such as trapped gullies and petrol / oil interceptors or other suitable methods of pollution control to safeguard against pollution of the water environment". Additionally, it states that the Council will not give planning permission for "any development where it may prejudice the quality of ground or surface water, watercourses or sites of biodiversity importance unless measures are undertaken to mitigate the harm".

(TAN 15): Development and Flood Risk[22]

7.2.14 TAN 15 supports PPW and provides technical guidance in relation to development and flood risks. It provides a means by which the risks associated with river and coastal flooding, as well as flooding caused by additional runoff from development, can be assessed, taking into account the possible effects of climate change and the sustainability aims of the Welsh Government. It allows planning authorities to require developers to assess the suitability of sustainable drainage systems (SuDS) as part of a planning applications and condition their use should they be found to be appropriate.

Design Manual for Roads and Bridges LA113 Road Drainage and the Water Environment[23]

7.2.15 This standard sets out the requirements for assessment and management of the impacts that road projects can have on the water environment for all regions within the UK, including Wales. It provides a stepped process for the assessment of effects associated with surface water, groundwater, flood risk and associated water dependent terrestrial ecosystems.

[22] https://gov.wales/technical-advice-note-tan-15-development-and-flood-risk
[23] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20113%20Road%20drainage%20and%20the%20water%20environment-web.pdf

Environment Agency Protocol for WFD Assessments of Projects in the Estuarine and Coastal Environment.[24]

7.2.16 Natural Resources Wales (NRW) require that the protocol with this Environment Agency (EA) guidance be followed when completing WFD assessments for marine licensing for activities within one nautical mile of the mean low water mark. Although the Scheme does not fall under the requirements of marine licensing, given its location adjacent to the coastal environment and the fact that the highway runoff from it will drain into the coastal environment, this guidance is of direct relevance to the Scheme. The WFD assessment that supports this chapter has been completed utilising the EA protocol, adapted to take account of its terrestrial setting. The assessment is presented in Appendix 7.1.

7.3 Study Area

Spatial Scope

7.3.1 The study area that has been adopted for the Scheme is an approximate 500 m radius from the junction alignments. This allows consideration of surrounding land use and drainage patterns as well as encompassing potential impacts on water bodies designated under the WFD[25].

Temporal Scope

7.3.2 The temporal scope of this assessment covers the existing baseline, to construction (enabling works to completion) plus operational effects, which are considered against the opening year.

Technical Scope

7.3.3 The technical scope of the assessment has been informed by information available on the proposed development, including design elements as described in Chapter 2.

7.3.4 It has also been informed by the Environmental Impact Assessment (EIA) scoping report[26].

7.4 Baseline Conditions

Surface Water Environment

7.4.1 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 (see Figure 7.1). The morphology of the river indicates that it is likely to be subject to flash flows (see Plate 1). With respect to classification under the WFD, the river currently has good status (defined as having biological, structural and chemical characteristics similar to those expected under nearly undisturbed conditions), though it is noted by Natural Resources Wales (NRW) to be failing on hydrological regime quality element of the classification)[27].

7.4.2 Ordnance Survey maps indicate the presence of a number of springs and wells within 500 m of the Scheme, located to the south and southeast, at elevations ranging from 65 m to 110 m

[24] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters
[25] The WFD assessment in Appendix 7.1 utilises a 2 km radius to ascertain if receptors are significantly close or not. All receptors discussed within the WFD assessment are include within this chapter.
[26] Ramboll, February 2019, A55 Junction 15 EIA Scoping Report
[27] Classification relates to changes to water levels and water flows and how they can affect the maintenance of aquatic ecosystems

above Ordnance Datum (AOD) (see Figure 7.1). These features indicate the presence of groundwater close to the surface.

7.4.3 To the west and north of the Scheme, shingle and rock beaches line the coast of the Menai Strait which feeds into Conwy Bay to the north of the Scheme (see Plate 2). With respect to classification under the WFD, the Menai Strait currently has good status whilst Conwy Bay has overall moderate status (i.e. displaying characteristics that show moderate signs of distortion from those expected under undisturbed conditions as a result of human activity), due to the presence of mercury, trichlorobenzenes and the quality of invertebrate populations.

Plate 1- Afon Ddu (Llanfairfechan)

Plate 2– View Eastwards along Beach at Junction 15

Groundwater Environment

7.4.4 The British Geological Survey 'Geology of Britain Viewer' and 1:50,000 geological map (sheet 94) show that the solid geology beneath the Scheme comprises mudstones and siltstones of the Nant Ffrancon Subgroup which are Ordovician in age. The Nant Ffrancon Subgroup are classified by NRW as a Secondary B aquifer[28]. With respect to the WFD, the aquifer is classified as having overall poor status. This is due to failure of the classification tests related to its chemical input into related surface water bodies and also on groundwater dependant terrestrial ecosystems.

7.4.5 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 road and Conwy Bay. These strata are collectively classified as a Secondary (undifferentiated) aquifer[29].

Flooding

7.4.6 A flood consequences assessment is included as Appendix 7.2. Within the Scheme boundary, the

[28] Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

[29] Classification allocated to strata where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

existing A55 and Junction 15 are elevated above the surrounding land such that the road is within Flood Zone 1, with less than a 0.1 % annual probability of flooding from fluvial or tidal flooding (see Figure 7.3). Shore Road East, which passes under the A55 west of Junction 15, lies within Flood Zone 3, considered to have 1 % or greater annual probability of river flooding in any given year or 0.5 % or greater annual probability of flooding from the sea in any given year. West of J15 and either side of the A55 embankment (north and south) the land lies within Flood Zone 3. The land to the south of the A55 lies within the Scheme boundary. This land benefits from sea defences reducing the probability of flooding from the sea, however, it is also at risk of fluvial flooding from the Afon Ddu (Llanfairfechan). Residential areas to the west of the Afon Ddu (Llanfairfechan) and south of the A55 lie within Flood Zone 2, with more than a 0.1 % annual probability of flooding from rivers or the sea (but less than Flood Zone 3).

7.4.7 As the existing A55 and Junction 15 are elevated, flood risk mapping shows limited risk of surface water flooding (see Figure 7.4 to Figure 7.6). What risk there is, is further mitigated by the road drainage system. In low lying areas to the south of the A55 there is a risk of surface water accumulation during extreme rainfall events, though the depth and extent of surface water flooding is restricted by the existing drainage systems along the base of the A55 embankment.

Drainage

Catchment Drainage

7.4.8 A site walkover was undertaken in October 2018. During this, sandbags were observed at a number of properties on the slope rising up to the southeast of the Scheme (in the Park Road area). This was reported by several locals to be in order to prevent flooding of properties during heavy rainfall events, as the surface water drainage system is prone to overloading during such periods.

7.4.9 A rough channel scoured into the slope downslope of Penmaen Park (see Plate 3) indicates the occurrence of short-lived heavy flows off the slopes, towards the Scheme. The channel presented in Plate 3 continues down slope and enters the formal drainage system on the south eastern side of Penmaenmawr Road to the south of the Scheme (see Plate 4). 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.

7.4.10 Drainage from the base of the existing A55 embankment is also shown to connect to the pipes below Shore Road East (in addition to two other pipes under the A55 and railway to sea outfalls).

7.4.11 The existing drainage system is intended to minimise surface water flooding against the A55 embankment. However, it would seem that this system is not able to cope under larger surface water flood events. At this stage it is not clear whether this due to a lack of capacity or disrepair.

Road Drainage

7.4.12 The road pavement at J15 is currently drained from the site mostly using a kerb and gully drainage system, discharging directly into Conwy Bay at three drainage outfalls off the beach to the north of the Scheme (see Figure 7.1). There is currently no treatment or attenuation of road

runoff in the existing system.

Plate 3 – Scoured Channel near Penmaen Park

Plate 4 – Drainage Chamber on Penmaenmawr Road

7.5 Assessment of Effects

Outline Methodology

7.5.1 The assessment contained within this report:

a) Reviews existing information on the water environment in which the site and its surroundings are located, focussed on:
   a. The WFD quality criteria that apply to the designated water bodies that are located within the study area; and
   b. The context of the site with respect to flooding;
b) Identifies potential receptors (be they properties, residents, water bodies themselves or ecology/resources dependent upon them);
c) Assesses the Scheme in terms of how it may interact with the water environment both during construction and operation;
d) Discusses how changes in flood risk may result; and
e) Analyses the significance of the potential environmental risks identified in the context of the proposed development.

7.5.2 A site walkover was undertaken in October 2018 in order to inform the discussions within this report and to visually confirm the site setting.

Assessment Criteria

7.5.3 The criteria used to assess if an effect is significant or not is set out in subsequent sections. This is determined by consideration of the importance of the receptor and magnitude of change.

Importance of Receptor Criteria

7.5.4 For the purposes of this chapter, the level of importance of a given water body is defined as low, medium, high or very high based upon the definitions presented in Table 7.1 to Table 7.3.

Table 7.1: Importance Criteria Examples for Surface Water

Importance*				
Criteria Examples – Surface Water Body				
	Low	**Medium**	**High**	**Very High**
Ecological Value	Has no or minimal ecosystem present	Has an ecosystem that has low sensitivity to water quality or quantity changes	Has an ecosystem that has moderate sensitivity to water quality or quantity changes	Has an ecosystem that has high sensitivity to water quality or quantity changes
	Does not form or supply water to a designated site	Forms or supplies water to a locally designated site (e.g. LNR** or SINC**) where quality of aquatic environment is factor in designation	Forms or supplies water to a nationally designated site (e.g. SSSI**, National Park) where quality of aquatic environment is factor in designation	Forms or supplies water to a European or internationally designated site (e.g. SPA**, Ramsar site) where quality of aquatic environment is factor in designation
	Does not support any protected aquatic flora or fauna	Supports protected aquatic flora and/or fauna of regional/national importance	Supports protected aquatic flora and/or fauna of national importance	Supports protected aquatic flora and/or fauna of European/international importance
Amenity Value	Provides low/no amenity value	Provides amenity value on a local basis (where water immersion sports are rarely practiced)	Is regularly used for recreation (where water immersion sports are practiced regularly)	Function of water body (at location of interest) is for recreation (where water immersion sports are practiced regularly)
	Does not form or supply a designated bathing water	Is a bathing water of local importance/scale	Is a designated bathing water of regional importance/economic significance	Is a designated bathing water of greater than regional importance/economic significance
	Does not support navigation	Supports navigation on a local/small scale basis	Supports commercial navigation, important on a regional basis	Is a major commercially significant navigational water body
Resource Value	Is not used as a commercial or private water supply	Is used as a private water supply for potable water supply purposes	Is used as a local water supply for potable water supply purposes	Is used as a regional water supply for potable water supply purposes
		Is used as a water supply for small scale industrial, commercial or agricultural purposes	Is *used as a water supply for regionally important industrial, commercial or agricultural purposes*	Is used as a water supply for commercially significant/nationally important industrial, commercial or agricultural purposes

Importance*				
Criteria Examples – Surface Water Body				
Replaceability for substitution	Has potential for substitution in short term	May be substitutable in long term	Is not substitutable in short or long term	
Water Quality	Water bodies not having a WFD classification shown in a RBMP** and Q95 ≤0.001m^3/s or Q95 < 1.0m^3/s	Water body not having a WFD classification shown in a RBMP and Q_{95}** >0.001m^3/s	Water body having a WFD classification shown in a RBMP and Q_{95} < 1.0m^3/s	Water body having a WFD classification shown in a RBMP and Q_{95} ≥ 1.0 m^3/s
		Shows a downward trend in hazardous substances;	Does not show an upward trend in hazardous substances;	Shows an upward trend in hazardous substances;
Economic Value	Does not form part of a designated fishery	Is or forms part of a cyprinid fishery	Is or forms part of a salmonid fishery	Is or forms part of a salmonid fishery. Is a designated Shellfish water

* Classifications are based on a combination of the following:

a) Welsh Transport, Planning and Appraisal Guidance (Weltag) (2017)
b) Department for Transport, Transport Analysis Guidance (TAG) Unit A3, Environmental Impact Assessment (December 2015)
c) Highways England, Design Manual for Roads and Bridges LA113 - Road Drainage and the Water Environment (2019)
d) Professional experience

** LNR – Local Nature Reserve, RBMP - River Basin Management Plan, SINC – Site of Importance for Nature Conservation, SPA – Special Protection Area, SSSI – Site of Special Scientific Interest, Q95 - the flow rate equalled or exceeded for 95% of the time.

Table 7.2: Importance Criteria Examples for Groundwater

Importance*				
Criteria Examples – Groundwater Body				
	Low	**Medium**	**High**	**Very High**
Classification	Unproductive strata	Is a Secondary A or B aquifer	Is a Principal aquifer	Is a Principal aquifer
	Is classified as having low aquifer vulnerability	Is a Secondary aquifer classified as having low or intermediate aquifer vulnerability	Is a Secondary Aquifer with high vulnerability or Principal Aquifer with low vulnerability	Is Principal aquifer with high aquifer vulnerability
	Is classified by NRW as not being at risk	Is classified by NRW as probably not being at risk	Is classified by NRW as being probably at risk.	Is classified by NRW as being at risk.
Water Balance	Does not supply baseflow to local rivers	Contributes some baseflow to locally important rivers	Contributes some baseflow to regionally important rivers	Provides significant baseflow to local rivers
	Has poor classification for water balance or effects on groundwater dependent terrestrial ecosystems		Has good classification for water balance or effects on groundwater dependent terrestrial ecosystems	
	Has a poor water balance	Has a moderate water balance	Has good water balance	Has a high water balance
Resource Value	Is not located within a groundwater Source Protection Zone (SPZ)	Is located within a groundwater SPZ 3 (source catchment area)	Is located within a groundwater SPZ 2 (outer catchment)	Is located within a groundwater SPZ 1 (inner catchment)
	Is not used as a commercial or private water supply	Is used as a private water supply for potable water supply purposes	Is used as a local water supply for potable water supply purposes	Is used as a regional water supply for potable water supply purposes
		Is used as a water supply for small scale industrial, commercial or agricultural purposes	Is used as a water supply for regionally important industrial, commercial or agricultural purposes	Is used as a water supply for commercially significant/nationally important industrial, commercial or agricultural purposes
Ecological Value	Does not supply a groundwater dependent terrestrial ecosystem (GWDTE).	Supplies a GWDTE that has species that are not protected or listed. They are abundant / common and not critical for GWDTE functions. Sites of local biodiversity value but not intact, fragile or unique.	Supplies a GWDTE that has species that are not globally common species that are rare in UK, or important to GWDTE functioning. Habitats of high species number or habitat diversity or 'naturalness'.	Supplies a GWDTE that has regionally significant populations of globally threatened or endangered species or species that are important to GWDTE functioning, such as predator or prey species.

Importance*				
Criteria Examples – Groundwater Body				
		Habitats that recover quickly following disturbance (i.e. habitats comprising marine species that readily recolonise disturbed areas).	Habitats that are capable of unassisted recovery to natural conditions following disturbance, although this may require several years (habitats where growing conditions are favourable).	Habitats that are unlikely to return to natural conditions without some intervention, but which are capable of assisted recovery.
Replaceability for substitution	Has potential for substitution in short term	May be substitutable in long term	Is not substitutable in short or long term	

* - see notes below Table 7.1

Table 7.3: Importance Criteria Examples for Flooding

Importance*				
Criteria Examples – Flooding				
	Low	**Medium**	**High**	**Very High**
	Floodplain with limited constraints and a low probability of flooding of residential and industrial properties.	Floodplain or defence protecting 10 or fewer industrial properties from flooding.	Floodplain or defence protecting between 10 and 100 residential properties or industrial premises from flooding.	Floodplain or defence protecting more than 100 residential properties from flooding.

Magnitude of Change

7.5.5 The overarching requirements of the WFD, which have guided the water quality assessment and the separate WFD Assessment are to prevent the deterioration of any water body (regardless of its classification) and to avoid actions that prevent (or contribute to the prevention of) a water body achieving its requirement of 'Good status'. Accordingly, the magnitude of change for effects associated with the operation of the Scheme has been defined according to the following criteria:

Table 7.4: Criteria for Determining Magnitude of Effects*

Magnitude	Criteria	Examples
Major (adverse)	Results in loss of feature	• Non-compliance with water quality/quantity UK standards on a long-term basis. • Measurable changes in groundwater levels or quality in wider groundwater regime with significant impact on local private or public water supplies. • Changes in quantity or quality that result in a reduction in WFD status. • Large scale change to hydrological receptor. Change likely to be permanent/long term. • Loss/deterioration of regionally or nationally important potable water supply. • Significant measurable changes in riverine flow regime hydrodynamics or erosion and deposition patterns. • Significant damage to or loss of aquatic ecosystem which relies on the surface water. • Loss of important fishery. • Changes put at risk protected species or designation status of the water body. • Loss of flood storage/Increase in peak flood level (1% annual probability) >100 mm. • Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. • Potential high risk of pollution to groundwater from routine runoff - risk score >250 (Groundwater quality and runoff assessment). • Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). • Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. • Loss or significant damage to major structures through subsidence or similar effects.
Moderate (adverse)	Results in adverse impact on integrity of feature or loss of part of feature	• Non-compliance with water quality/quantity UK standards on a short-term basis. • Localised changes in groundwater levels or quality with small-scale measurable changes in wider groundwater regime but no significant impact on local private water supplies. • Change in water body but not enough to change its WFD status. • Evident change to hydrological conditions resulting in temporary or long-term changes to baseline. • Loss/deterioration of local water supply. • Moderate measurable change in riverine flow regime, hydrodynamics or erosion and deposition patterns. • Measurable change to aquatic ecosystem which relies on the surface water.

Magnitude	Criteria	Examples
		• Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. • Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. • Calculated risk of pollution from spillages ≥1% annually and <2 % annually. • Partial loss of the integrity of GWDTE. • Reduced productivity of fishery. • Reduction in the economic value of the feature. • Damage to major structures through subsidence or similar effects or loss of minor structures. • Increase in peak flood level (1% annual probability) >50 mm.
Minor (adverse)	Results in minor adverse impact on feature	• Water quality/quantity within UK standards and unlikely to affect most sensitive receptors. • Localised changes in groundwater levels or quality but no appreciable change in wider groundwater regime. • Short term changes that will recover in the short to medium term. • Detectable but modest change to hydrological conditions from baseline. Likely to be temporary. • Loss/deterioration of private water supply. • Small measurable change in riverine flow regime, hydrodynamics or erosion and deposition patterns. • Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. • Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. • Potential low risk of pollution to groundwater from routine runoff - risk score <150 • Minor effects on an aquifer, GWDTEs, abstractions and structures • Increase in peak flood level (1% annual probability) >10mm.
Negligible	Results in an impact on feature but of insufficient magnitude to affect the use/integrity	• No or little change from baseline conditions. • Impact/beneficial change occurs but is insufficient to affect the attribute or to change WFD status. • No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). • Risk of pollution from spillages <0.5%. • Negligible change in peak flood level (1% annual probability) <+/- 10 mm.
Minor Beneficial	Results in minor beneficial impact on feature or a reduced risk of adverse effect occurring	• HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually). • Reduction of groundwater hazards to existing structures. • Reductions in waterlogging and groundwater flooding. • Reduction in peak flood level (1% annual probability) >10 mm.

Magnitude	Criteria	Examples
Moderate Beneficial	Results in moderate improvement of feature	• Enhanced productivity of a fishery. • Reduction in a significant proportion of the effluent in a receiving river, but not sufficient to change its WFD classification. • HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. • Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). • Support to significant improvements in damaged GWDTE. • Reduction in peak flood level (1% annual probability) >50 mm.
Major Beneficial	Results in major improvement of feature	• Improvement in water body WFD classification. • Removal of major existing polluting discharge to a watercourse. • Reduction in peak flood level (1% annual probability) >100 mm.
No Change		• No loss or alteration of characteristics, features or elements; no observable impact in either direction.

* Classifications are based on a combination of the following:
  a) Welsh Transport, Planning and Appraisal Guidance (Weltag) (2017)
  b) Department for Transport, Transport Analysis Guidance (TAG) Unit A3, Environmental Impact Assessment (December 2015)
  c) Highways England, Design Manual for Roads and Bridges LA113 - Road Drainage and the Water Environment (2019)
  d) Professional experience

Significance Criteria

7.5.6 The significance of effect, which is dependent on the importance of the receptor and the magnitude of change, is determined using the matrix presented below. Only effects shown in bold are considered to be significant for the purposes of this assessment.

Table 7.5: Significance of Effects

		Magnitude of Effect				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Importance of Receptor	**Very High**	Neutral	Slight	**Moderate or large**	**Large or very large**	**Very large**
	High	Neutral	Slight	Slight or **moderate**	**Moderate or large**	**Large or very large**
	Medium	Neutral	Neutral or slight	Slight	**Moderate**	**Moderate or large**
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or **moderate**

7.6 Identification of Potential Effects

7.6.1 The Design Manual for Roads and Bridges (DMRB) standard for the assessment of impacts of road drainage and the water environment[23] requires that the following principal types of potential impact be evaluated:

Table 7.6: Assessment Methods

	Method of Assessment	**Relevant to Scheme?**
Impacts on surface waters		
Water quality (routine runoff and spillage)	Routine runoff and surface water quality assessment, spillage assessment (see Appendix 7.3).	Yes – the Scheme will be subject to routine surface water runoff and at risk of spillage incidents.
Hydromorphology	Site specific initial assessment.	No – the Scheme does not involve any changes to existing watercourses or normally-wet ditches[30]. Flow rates at the existing outfalls would be maintained.
Impacts on groundwater		
Water quality (routine runoff and spillage)	Routine runoff and groundwater quality assessment, spillage assessment (see Appendix 7.3).	Yes – while discharge will be to the sea, parts of the road drainage system will be unlined with potential for infiltration to groundwater.

[30] The channel shown in Plate 3 is believed to be normally dry and discharges into the piped surface water drainage system running along Penmaenmawr Road. As such it has little if any value for aquatic ecology. Where Penmaenmawr Road is realigned to the south, the hillside, down which the channel flows, will be cut into. To accommodate this a new cascade and headwall would be installed to convey the flows down the proposed earthwork slope.

	Method of Assessment	Relevant to Scheme?
Groundwater levels and flows	Groundwater level and flow assessment.	No – the Scheme is largely above existing ground level with few cuttings or below ground structures. The most significant cutting is into the hillside south of Junction 15 to allow Penmaenmawr Road to be realigned. Moreover, the proximity to the coast and the lack of groundwater receptors (GWDTEs, groundwater abstractions, surface watercourses relying on groundwater for baseflow) means that an assessment of the impact on groundwater levels and flows has been scoped out.
Groundwater dependent terrestrial ecosystems (GWDTE)	GWDTE assessment.	No - no GWDTEs are present such that an assessment of the impact on GWDTEs has been scoped out.
Flood impacts		
To the Scheme	Flood Consequences Assessment (FCA).	Yes – part of the Scheme is located within a designated flood plain.
Resulting from Scheme		
Others		
Construction phase impacts		Yes – construction would be undertaken under the control of a CEMP, which would ensure protection of the water environment.
Cumulative effects		Yes
Contravention of WFD		Yes

Surface Water Quality (Routine Runoff and Spillage)

7.6.2 In order to assess the potential quality of water being discharged from the operational Scheme, a water quality assessment has been completed utilising Highways England's Water Risk Assessment Tool (HEWRAT) within LA113. This is the tool adopted by the Welsh Government for such purposes.

7.6.3 Further details of this assessment and its outcome are presented in Appendix 7.3, and a discussion as to the implications of the results is included within the WFD assessment in Appendix 7.1. The details of the assessment are summarised in the following paragraphs.

7.6.4 Runoff from the Scheme would be discharged into the Menai Strait water body via three existing outfalls. The runoff has the potential to affect:

a) The chemical quality of the Menai Strait water body;
b) Aquatic ecosystems within the Menai Strait; and
c) Bathing water quality at Llanfairfechan beach.

Chemical Quality

7.6.5 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. The HEWRAT assessment concludes that, with respect to dissolved contaminants, the respective quality thresholds are met for almost 90 % of rainfall events without the need for the dilution that would occur upon discharge to the sea. For the remaining rainfall events routine runoff from the Scheme requires only a small volume of seawater to dilute dissolved contaminants to concentrations below the thresholds given in HEWRAT/LA113. Dilution of runoff is anticipated to take place within a short distance of each sea outfall. Following this, the runoff would be subject to further, significant, dispersion within the coastal water body. Taking the above into account, the water volume with contaminant concentrations above the HEWRAT thresholds is considered to be insignificant (see Appendix 7.3 for details).

7.6.6 The HEWRAT tool is also used to identify potential risks associated with sediment-bound contaminants found in runoff during the intermittent discharges from highway outfalls (see Appendix 7.3 for details). The coastal environment where runoff would discharge is dynamic and subject to currents, waves and tides which would disperse the intermittently discharged fine sediments such that they would not be sufficiently concentrated to be toxic to aquatic organisms living in or near bed sediments.

7.6.7 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 is less than 0.5% and thus that no specific pollution control measures would be required[31]. It should be noted that the removal of the roundabout will decrease the risk of spillage when compared to the current situation and thus will provide betterment in that respect.

Importance	***Magnitude of Effects***	***Significance***
Very high	Negligible	Slight

Aquatic Ecosystems

7.6.8 Chapter 8 discusses the potential effects of the Scheme on the adjacent SPAs and Special Area of Conservation (SAC) in terms of the protected habitats and species within them. The assessment within that chapter concludes that any effects associated with surface water runoff from the Scheme would be neutral.

Importance	***Magnitude of Effects***	***Significance***
Very high	No change	Neutral

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

Bathing Water Quality

7.6.9 With respect to bathing water quality, faecal content and turbidity are the main parameters of concern. Road runoff should not contain any faecal content so the Scheme would not result in any change in that context. Increased runoff from the Scheme during periods of high rainfall could contribute to the turbidity of the sea on a very localised basis during such events, but inclusion of flow attenuation within the Scheme drainage design would assist in negating that.

Importance	***Magnitude of Effects***	***Significance***
Medium	Negligible	Neutral

7.6.10 It is therefore concluded that overall the operational discharge of surface water runoff from the Scheme into the Menai Strait water body results in a negligible magnitude of effect with respect to chemical quality, effects on aquatic ecosystems and bathing water quality. There would be betterment in terms of spillage risk but the scale of this effect, particularly in the context of the size of the receiving water, means that the overall effect is likely to be negligible.

7.6.11 The **overall significance** of the resultant effect is therefore **slight (beneficial)**.

Groundwater Quality (Routine Runoff)

7.6.12 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. Based on the baseline groundwater conditions and the criteria for importance set out above, the groundwater/aquifer underlying the Scheme is considered to be of medium importance. An assessment was made of the potential impact on groundwater quality and is presented in Appendix 7.3. Due to site-specific factors, notably the proximity to the coast and the lack of groundwater abstractions within 500 m of the Scheme, the risk of impacting the groundwater and any receptors that might rely upon groundwater is negligible such that the magnitude of effects is considered 'no change' and the significance 'neutral'.

Importance	***Magnitude of Effects***	***Significance***
Medium	No change	Neutral

Flood Impacts to and Resulting from the Scheme

7.6.13 A flood consequences assessment (FCA) is included as Appendix 7.2. To tie in with the levels of the existing A55, the operational Scheme would also be elevated above the surrounding ground such that the road itself would be in Flood Zone 1, at low risk of fluvial, tidal and surface water flooding. However, the proposed west-bound on-slip requires a widening of the A55 embankment. The new/widened embankment would lie within Flood Zone 3. The embankment would occupy a flood storage volume of approximately 6,500 m^3 (below the 1-in-100 year plus climate change flood level). To compensate for this loss of flood storage volume, an equivalent volume would be 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. The findings of the FCA have been discussed with NRW and in particular the use of flood storage compensation as mitigation for the Scheme. As a result of the discussion, the flood level used to calculate the storage lost/replaced was increased to provide a further safety margin given the change to climate change predictions since the flood level was modelled in 2011. Further detail is given in the FCA (Appendix 7.2).

7.6.14 As noted in the baseline conditions section on flooding, the NRW flood risk maps 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.

7.6.15 Although the Scheme would result in a larger area of impermeable road surface than at present, the new drainage system for road runoff will 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 attenuation ponds and would be confirmed at detailed design stage.

7.6.16 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.

7.6.17 In terms of flood risk vulnerability, under current DMRB standards (LA113[31]), the A55 is classified as 'essential infrastructure' which gives it a very high level of importance. The nearby residential dwellings are classified as 'more vulnerable' giving them a high level of importance. With the compensation storage volume in place, no change to peak flood levels would be expected as a result of the Scheme such that the magnitude of the impact is negligible (based on criteria in Table 7.4, LA113 and LA104[32]).

Importance	***Magnitude of Effects***	***Significance***
Very high/high	Negligible	Slight

[32] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/la104.pdf

Contravention of WFD

7.6.18 A detailed WFD assessment is provided in Appendix 7.1. The assessment concludes 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 (of very high importance). Any changes would be of negligible magnitude of change. The Scheme is thus in compliance with the requirements of the WFD, supports the Western Wales RBMP.

Importance	***Magnitude of Effects***	***Significance***
Very high	Negligible	Slight

7.7 Mitigation Measures

7.7.1 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 watercourse down proposed earthworks slope at the location show in Plate 4;
b) Interception of drainage from road and catchment runoff into existing drainage network by measures including drainage ditches, filter drains and pipes/culverts;
c) Provision of flow attenuation and, where space allows, pollution control measures the nature of which will be determined at detail design stage;
d) Discharge of drainage from the existing network into three existing drainage outfalls on Llanfairfechan beach, discharging surface water drainage into the sea;
e) Provision of compensatory flood storage to offset that lost to the new/widened embankment; and
f) Drainage at the toe of the new/widened embankment which also serves to prevent waterlogging of the flood compensation area during normal conditions.

7.7.2 Detailed Scheme design would take place following submission of the Environmental Statement (ES), however, the design would be likely to include a range of measures intended to meet the requirements of the statutory standards for sustainable drainage systems (SuDS). These include attenuation measures to receive water from the Scheme and from areas where there are risks of surface water flooding. These would act to attenuate flows to existing rates (allowing for climate change) during the operation of the Scheme prior to discharge to existing outfalls (including those which outfall to the sea).

7.7.3 Completion of construction works would be undertaken under the management of a Construction Environmental Management Plan (CEMP) which would include measures protective of the water environment such as management of surface water runoff from exposed earthworks and construction compounds, provision of spills kits and emergency spill procedures. Further details are provided in the pre-CEMP document.

Monitoring Requirements

7.7.4 During the construction phase, monitoring of the works to identify impacts on the water environment would be undertaken. Full details would be included in the pre-CEMP. Monitoring would include, but would not be limited to:

a) Regular visual inspection of all discharges into the existing drainage system and into the sea;

b) Regular inspection of surface water runoff control measures to ensure that sediment is not transported off site; and
c) Regular inspection of plant that contain fuels or chemicals to ensure there is no risk of spillage.

7.8 Significance of Effects

7.8.1 The assessment included in Section 7.6 of this chapter concludes that the Scheme will not result in any significant effects on the water environment.

7.9 Cumulative Effects

Intra-Projects Effects

7.9.1 Intra-project effects are considered as those that "occur between different environmental topics within the same proposal, as a result of that development's direct effects" (IEMA[33]).

7.9.2 The following potential direct and indirect intra-project cumulative effects have been considered along with mitigation:

a) Chapter 6: Geology and Soils - No potentially significant effects have been identified to geology and soils from changes to the water environment. Potential impacts to groundwater quality have been assessed negligible.
b) Chapter 8: Nature Conservation – The impact of the scheme on surface water quality, including that of the adjacent Special Protection Areas (SPA) and Special Area of Conservation (SAC) has been assessed in terms of the protected habitats and species within them. The assessment within that chapter concludes that any effects associated with surface water runoff from the Scheme would be neutral.
c) Chapter 9: Landscape and Visual Effects – The land where the flood compensation storage is to be provided by lowering of the school playing field would be returned to its former use following the works.

7.9.3 Following the implementation of mitigation no potentially significant intra-project cumulative effects have been identified.

Inter-Project Effects

7.9.4 Inter-project effects have been considered as those where "cumulative effect occurs as a result of the likely impacts of the proposed development interacting with the impacts of other developments in the vicinity" (IEMA[33]).

7.9.5 Chapter 19 sets out the known schemes that could be considered to have a cumulative effect in combination with the Scheme.

7.9.6 In terms of Drainage and Water, the potential for significant cumulative effects in combination with the Scheme, including the proposals for Junction 16, is considered low.

[33] Institute of Environmental Management & Assessment (IEMA), 2011. Special Report – The State of Enviromental Impact Assessment Practice in the UK

7.10 Conclusions

7.10.1 The Scheme will result in an increase in impermeable area and thus the amount of surface water runoff being produced, however, the drainage design will include measures to attenuate flow such that no increase in runoff rate would occur which could have impacts on downstream receptors. Where floodplain volume would be occupied by material to construct the widened embankment for the west-bound on-slip, an equivalent compensation volume would be made available for floodwaters so that there would be no net change in peak flood levels.

7.10.2 Water quality assessments for routine runoff (to surface water and groundwater) and spillage risk conclude that the impact of the Scheme is negligible such that no net deterioration in water quality would occur.

7.10.3 It is concluded that, overall, the operational discharge of surface water runoff from the Scheme into the Menai Strait water body would result in a negligible magnitude of effect with respect to chemical quality, effects on aquatic ecosystems and bathing water quality. The Scheme would thus be in compliance with the WFD.

Indication of any Difficulties Encountered

7.10.4 The surface water quality assessment has utilised methods designed for a freshwater environment. This places limitations on the conclusions of that assessment, so it has been utilised to calculate end-of pipe concentrations, the interpretation of which has been undertaken outside of the HEWRAT model.

NRW Correspondence

7.10.5 A draft of this document and its appendices were submitted to NRW for comment. Initially, NRW expressed concerns over the method of assessment for potential water quality impacts. Further information was provided to address these concerns. The correspondence is attached as Appendix 7.4.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 8 NATURE CONSERVATION

RAMBOLL Bright ideas. Sustainable change.

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8. NATURE CONSERVATION

8.1 Chapter introduction

8.1.1 This chapter of the Environmental Statement sets out the assessment of significant effects of the J15 Scheme, on habitats, species and ecosystems. A 'Significant effect' either supports or undermines biodiversity conservation objectives for important ecological features[1].

8.1.2 The Scheme is described in Chapter 2, the 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. The General Arrangement drawings are shown in Appendix 2.6.

8.1.3 There are a number of areas of potential effect pathways from the Scheme that are relevant, and which are considered within this chapter. These include, but are not limited to, the following:

a) Construction activities – ground investigations, vegetation clearance, site preparation; demolition, noise and vibration, habitat loss from land take, pollution incidents; and
b) Operational phase – wildlife casualties, land use change, change in hydrology, lighting, maintenance, road run-off.

8.1.4 This chapter considers the significant ecological effects of each phase of the Scheme in the light of relevant planning policies and legislation.

8.1.5 The baseline has been established through a combination of desk study and field work carried out in 2018 and 2019.

8.1.6 At each stage of the design process the hierarchical principles of 'avoid, mitigate, compensate and enhance' have been assessed as part of the process. The design approach and assessment of alternatives is described in Chapter 2 The Scheme and chapter 3 Alternatives Considered.

8.1.7 An Assessment of Implications on European Sites (AIES) Screening Assessment is also in preparation in accordance with the provisions of the Conservation of Habitats and Species Regulations 2017 and following the guidance of the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 4, Part 1 (HD44/09) (Highways Agency, 2009)[2] and this is reported separately.

[1] CIEEM (September 2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Coastal and Marine*. (https://www.cieem.net/data/files/Guidelines_for_Ecological_Impact_Assessment_in_the_UK_and_Ireland_2018.pdf)

[2] It should be noted that during the preparation of this document, this guidance has now been withdrawn and replaced with LA 115 Habitat Regulations Assessment

8.1.8 The first stage of the HRA process is to undertake a Test of Likely Significance Effect (TLSE). The TLSE has identified that likely significant effects on qualifying features of European Sites could not be ruled out. It is therefore considered necessary for an Appropriate Assessment to be carried out for this project on the qualifying features of these European Sites, in line with DMRB HD44/09 guidance. This is reported as a Statement to Inform an Appropriate Assessment (SIAA) as part of a Habitat Regulations Assessment as set out in LA 115 Habitat Regulations Assessment (formerly HD44/09and is a standalone document outside the content of the Environmental Statement.

8.2 Relevant Guidance and Legislation

Relevant Legislation

8.2.1 The following relevant UK legislation has been considered within this assessment:

a) The Conservation of Habitats and Species Regulations 2017[3]
b) Wildlife and Countryside Act 1981 (as amended)[4]
c) The Environment (Wales) Act 2016[5]
d) Salmon and Freshwater Fisheries Act 1975[6]
e) The Eels (England and Wales) Regulations 2009[7]
f) The Protection of Badgers Act 1992[8]
g) Well-being of Future Generations (Wales) Act 2015[9]
h) Flood and Water Management Act 2010[10]
i) The Hedgerow Regulations 1997[11]

8.2.2 EC Directives 2009/147/EC on the Conservation of Wild Birds (the Birds Directive) and 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) are also relevant. These are implemented in the UK principally through the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017. The Regulations cover the designation and protection of European sites (Special Protection Areas (SPA) and Special Areas of Conservation (SAC)) and the protection of European protected species.

8.2.3 The Birds Directive provides a framework for the conservation and management of, and human interactions with, all wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member State (in the UK delivery is via several different statutes). The Directive applies to the UK and to its overseas territory of Gibraltar. The main provisions of the Directive relevant to the Scheme include:

a) The maintenance of the populations of all wild bird species across their natural range (Article 2) with the encouragement of various activities to that end (Article 3). Article 3 requires Member States to preserve, maintain and re-establish sufficient diversity and area of habitats for all wild birds.

[3] The Conservation of Habitats and Species Regulations 2017 http://www.legislation.gov.uk/uksi/2017/1012/contents/made
[4] Wildlife and Countryside Act 1981 (http://www.legislation.gov.uk/ukpga/1981/69)
[5] Environment (Wales) Act 2016 (http://www.legislation.gov.uk/anaw/2016/3/contents)
[6] Salmon and Freshwater Fisheries Act 1975 (https://www.legislation.gov.uk/ukpga/1975/51)
[7] The Eels (England and Wales) Regulations 2009 (http://www.legislation.gov.uk/uksi/2009/3344/made)
[8] Protection of Badgers Act 1992 (http://www.legislation.gov.uk/ukpga/1992/51/contents)
[9] Well-being of Future Generations (Wales) Act 2015)https://gov.wales/topics/people-and-communities/people/future-generations-act/?lang=en)
[10] Flood and Water Management Act 2010 (https://www.legislation.gov.uk/ukpga/2010/29/schedule/3)
[11] http://www.legislation.gov.uk/uksi/1997/1160/contents/made

b) The identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4). (Together with Special Areas of Conservation designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000). Member States are obliged to take special action for a range of species, which are listed on Annex 1, taking account of their likely extinction, vulnerability to changes in their habitats and their rarity.
c) The establishment of a general scheme of protection for all wild birds (Article 5).
d) Article 6.2 of the Habitats Directive provides a general protection provision for SPAs. Member States must take appropriate steps to avoid habitat deterioration and the disturbance of species for which the site has been designated (insofar as such disturbance would prove significant). Articles 6.3 and 6.4 provide more detailed procedures in relation to plans and projects, which are aimed at ensuring the objective of Article 6.2 is met. Only those plans and projects (or parts thereof) that are considered connected with, or necessary for, site management of the SPA, are exempt. Where a plan or project – either alone or in combination with other `plans and projects' – is likely to have a significant effect on the SPA, then an appropriate assessment must be undertaken.
e) Encouragement of certain forms of relevant research (Article 10 and Annex V).

8.2.4 Birds listed in Annex 1 are afforded special protection. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.

8.2.5 The Habitats Directive ensures the protection of those habitats listed in Annex I, as well as Annex II species, animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation. Core areas of their habitat are designated and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species. A strict protection regime must be applied across the entire natural range of Annex IV species within the EU, both within and outside Natura 2000 sites.

8.2.6 The EU Regulation (1143/2014) on invasive alien (non-native) species entered into force on 1 January 2015. The Regulation imposes restrictions on a list of species known as "species of Union concern". These are species whose potential adverse impacts across the European Union are such that concerted action across Europe is required. This list is drawn up by the European Commission and managed with Member States using risk assessments and scientific evidence.

8.2.7 A network of nationally designated sites has been established through the designation of Sites of Special Scientific Interest (SSSIs) under the Wildlife and Countryside Act 1981 (as amended). The protection afforded under the Act means it is an offence to carry out or permit to be carried out any operation listed within the notification without the consent of the Statutory Nature Conservation Organisation (Natural Resources Wales). The protection afforded to SSSIs is used to underpin the designation of areas at a European level.

8.2.8 The Welsh Government has particular responsibilities with respect to SSSIs under Section 28G of the Wildlife and Countryside Act 1981. An authority to which this section applies has the duty of exercising its functions to take reasonable steps, consistent with the proper exercise of those functions, to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is notified as being of special scientific interest.

8.2.9 All wild birds, their nests and eggs are protected under Part 1, Section 1 of the Act. Birds listed in Schedule 1 of the Act are subject to special protection. Wild animals listed in Schedule 5 are protected under Section 9. Plants listed in Schedule 8 are protected under Section 13 of the Act.

8.2.10 The Act also includes provisions for the control of invasive non-native species (INNS). Under these provisions it is an offence to:

a) Release or allow to escape into the wild any animal which is not ordinarily resident or a regular visitor to Great Britain, or is included in Schedule 9 of the Act;
b) Plant or otherwise cause to grow in the wild any plant which is included in Schedule 9 of the Act.

8.2.11 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.

8.2.12 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.

8.2.13 Section 7 of the Act is similar to the duty in section 42 of the NERC Act 2006 which it replaces. It 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.

8.2.14 The Well-being of Future Generations (Wales) Act 2015 includes a number of well-being goals (Part 2 Section 4), the second of which is 'A resilient Wales' described as:

> *'A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).'*

8.2.15 Schedule 3 of the Flood and Water Management Act 2010 makes SuDS a mandatory requirement for all new developments. The legislation will ensure resilient drainage systems for new developments in both urban and rural areas and came into force from 7th January 2019. Within the regulations is a specific requirement for biodiversity (Standard S5) which states:

> *'The design of the surface water management system should maximise biodiversity benefits'*.

8.2.16 Standard S5 addresses the design of SuDS development and enrich biodiversity value by linking networks of habitats and ecosystems together.

8.2.17 Chapter 5: Legislative and Policy provides the overarching and strategic policy for the Scheme. This section details those which are relevant to ecology and nature conservation.

Planning Policy Wales (Edition 10, 2018)

8.2.18 Edition 10 of PPW[12] was published on the 5th December 2018. Chapter 6 of PPW 10: Distinctive and Natura Places details objective in relation to nature conservation, as well as a number of other environmental topics. These include but are not limited to:

a) Integrating Green Infrastructure and Development;
b) Biodiversity and Resilience of Ecosystems Duty (Section 6 Duty);
c) Protection and Management of Designated Sites;
d) Protection for Non-statutory Designations;
e) Maintaining and Enhancing Biodiversity;
f) Protection of Species;
g) Protection of Trees, Woodlands and Hedgerows; and
h) Protection of undeveloped coastlines.

Technical Advice Note 5

8.2.19 Technical Advice Note (TAN) 5 relates to nature conservation and planning (Welsh Assembly Government 2009)[13] and provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. The TAN provides advice for local planning authorities on:

a) The key principles of positive planning for nature conservation;
b) Nature conservation and Local Development Plans;
c) Nature conservation in development management procedures;
d) Development affecting protected internationally and nationally designated sites and habitats; and
e) Development affecting protected and priority habitats and species.

Action Plan for Pollinators in Wales

8.2.20 The Action Plan for Pollinators (APP) was set up in 2013. The plan aims to reduce and reverse the decline in wild and managed pollinator populations. A review of the APP was update in 2018[14]. The Action Plan sets out four key outcomes, these are:

a) Outcome 1: Wales has joined up policy, governance and a sound evidence base for action for pollinators;
b) Outcome 2: Wales provides diverse and connected flower-rich habitats to support our pollinators;
c) Outcome 3: Wales' pollinator populations are healthy;
d) Outcome 4: Wales' citizens are better informed and aware of the importance and management of pollinators.

[12] Planning Policy Wales (PPW) Edition 10 December 2018 (http://www.mobileuk.org/planning-policy-wales-edition-10.pdf)
[13] Technical Advice Note 5: Nature Conservation and Planning (https://gov.wales/docs/desh/policy/100730tan5en.pdf)
[14] Welsh Government Action Plan for Pollinators Review 2013-2018 and Future Actions (https://gov.wales/docs/desh/publications/180921-action-plan-for-pollinator-review-future-actions-en.pdf)

Green Corridors Initiative

8.2.21 This initiative[15] will deliver against "Prosperity for All" the Economic Action Plan, contributing to the Welsh Government's commitment to create a sustainable economy and promote the economic, social and environmental wellbeing and enhance people's quality of life in Wales. Actions which could be implemented under the initiative include:

a) Tree planting;
b) Introducing wildflower areas;
c) Identifying opportunities for measures to enhance a sense of place;
d) Installing 'gateway features;' such as impact planting.

Local Planning Policy: Conwy County Borough Council Local Development Plan, 2013

8.2.22 The Conwy Local Development Plan 2007-2022[16], adopted in October 2013 guides planning and development in the county, excluding the area of the county within Snowdonia National Park. The following policies are relevant to nature and conservation:

a) Policy NTE/1 – The Natural Environment;
b) Policy NTE/2 – Green Wedges and Meeting the Development Needs of the Community; Policy;
c) NTE/3 – Biodiversity;
d) NTE/5 – Coastal Zone.

8.2.23 The Conwy Local Development Plan is supplemented by non-statutory planning guidance documents. Relevant guidance documents include LDP5 – Biodiversity in planning, Adopted November 2014[17].

8.2.24 A full review of the Local Development Plan commenced in 2017. The Replacement Local Development Plan 2018-2033 is at a Pre-Deposit stage of participation, calling for candidate sites and reviewing the evidence base.

Snowdonia National Park Authority (SNPA) Policies

8.2.25 The boundary of the Snowdonia National Park Authority lies approximately 1.5 kilometres south of Junction 15 Scheme and the existing A55 route corridor. The SNPA boundary lies beyond the settlement of Llanfairfechan to the south and at the foothills of northern Snowdonia Carneddau mountain range designated as an Area of Outstanding Natural Beauty. (AONB).

8.2.26 It is considered unlikely that there will be any direct or significant detriment to the SNPA planning policies relevant to nature conservation.

[15] https://gov.wales/newsroom/transport/2018/180724-green-corridors-improve-gateways-into-wales/?lang=en
[16] Conwy Local Development Plan 2007 – 2022 Adopted October 2013 http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf
[17] Supplementary Planning Guidance LDP5: Biodiversity in Planning https://spp.conwy.gov.uk/upload/public/attachments/621/LDP5_Biodiversity_Adopted_Nov_2014.pdf

Biodiversity Policy

8.2.27 Wales Biodiversity Partnership has produced biodiversity checklists for local authority and public authority staff in Wales. The checklists will assist public and local authorities to take account of biodiversity in their operational activities and will help organisations to remain legal under the Environment (Wales) Act (2016) Biodiversity Duty, Habitats Regulations and other biodiversity related legislation. In addition, the implementation of the checklists and guidance will help build towards the biodiversity outcomes contained in the Environment Strategy for Wales.

Natural Capital and Biodiversity

8.2.28 Natural capital refers to the stock of natural resources that the ecosystem provides, such as water, air, soil and biodiversity that are essential to the functioning of the planet and human well-being and include soil formation, food, climate regulation and renewable energy, often referred to as ecosystem services.

8.2.29 The aim of the ecosystems approach is to ensure the value of these essential services is taken into account when economic decisions are made so that the true cost of decisions are assessed. The Environment (Wales) Act, 2016 sets a duty on public authorities to take account of the resilience of ecosystems and the services they provide.

8.2.30 This chapter can provide information on biodiversity as a resource to support the assessment of ecosystem services. However, it is a complex subject and involves placing a monetary value on such stock, including biodiversity. In general, the maintenance and enhancement of biodiversity is important in terms of the ecosystem service it provides as well as its interaction with other policies, for example in PPW10 Biodiversity and Resilience of Ecosystems Duty (Section 6 Duty) and the Well-being of Future Generations (Wales) Act. A loss of biodiversity can have consequences for human well-being and for the services that people rely on as well as a decline in species diversity, genetic diversity and habitat quality and quantity.

Neighbouring Authorities

8.2.31 The Scheme is not likely to have any effect on nature conservation matters within the scope of neighbouring authorities. The boundary of the Snowdonia National Park Authority lies approximately 1.5 kilometres south of Junction 15 and the existing A55 route corridor.

Relevant Guidance

8.2.32 In addition to the legislation and policy, the following guidance, initiatives and plans are relevant and would be considered during the assessment:

a) Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal and Marine September 2018 (Chartered Institute of Ecology and Environmental Management)[18];
b) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation (Highways Agency)[19];

[18] Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal and Marine September 2018 CIEEM https://www.cieem.net/data/files/ECIA%20Guidelines.pdf
[19] Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation (http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm)

c) DMRB Volume 11, Section 4, Part 1: Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)[20];
d) DMRB Volume 11, Section 2, Part 5, HA 205/08: Assessment and Management of Environmental Impacts (Highways Agency, 2008a)[21];
e) Interim Advice Note 116/08 (W) Nature Conservation in Relation to Bats[22];
f) Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment[23]; and
g) Green Corridors Initiative (Welsh Government, 2018)[24]

8.2.33 Other relevant documents referred to include the following:
a) Phase 1 Habitat Survey – a technique for Environmental Audit (JNCC, 2010);[25]
b) Bat Surveys for Professional Ecologists (2016)[26].

8.2.34 References above, to DMRB Volume 11 are made, although the DMRB (2008) has been withdrawn. New DMRB chapters are being published during 2019, including for biodiversity. However, this assessment was completed before new biodiversity guidance was published and so the withdrawn DMRB was implemented because it is still relevant and provides a useful basis for the assessment method and approach. In the process of reviewing and updating this document, LA108 was published[27]. As such, a review of this against the existing assessment methodology used within this report has been made. The conclusion is that the outcomes of significance of effects would not alter.

8.3 Study Area

Zone of Influence

8.3.1 The 'zone of Influence' (ZoI) has been established based on the features of interest and how they may be affected by biophysical changes as a result of the proposed Scheme and associated activities during construction, operation and restoration.

8.3.2 The zone of influence to inform the desk study for the Scheme extended to:
a) 30 km for Special Areas of Conservation designated for bats,
b) 10 km for other internationally designated sites,
c) 5 km for nationally designated sites such as SSSIs and LNRs, and
d) 2 km for locally designated Wildlife Sites.

[20] Design Manual for Roads and Bridges (DMRB) Volume 11, Section 4, Part 1: Assessment of Implications (of Highways and/or Roads Projects) on European Sites (http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/hd4409.pdf)
[21] DMRB Volume 11, Section 2, Part 5, HA 205/08: Assessment and Management of Environmental Effects http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf
[22] IAN 116/08(W) nature conservation advice in relation to bats https://beta.gov.wales/interim-advice-note-11608w-nature-conservation-advice-relation-bats
[23] Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment (www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian130.pdf)
[24] https://gov.wales/newsroom/transport/2018/180724-green-corridors-improve-gateways-into-wales/?lang=en
[25] JNCC (2010) Handbook for Phase 1 Survey – a technique for environmental audit http://jncc.defra.gov.uk/PDF/pub10_handbookforphase1habitatsurvey.pdf
[26] Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edn). The BAT Conservation Trust, London.
[27] DMRB (Nov 2019) LA108 Biodiversity – Revision 0

8.3.3 For protected and notable species, the desk study area extends to 2km and includes records within the last 10 years.

8.3.4 The proposed study area for ecological field surveys included all land affected by the Scheme and immediately adjacent areas where accessible. For the assessment of ponds, aerial photography and OS base mapping up to a buffer of 500m was used.

8.3.5 The majority of habitat and species have been considered within a ZoI comprising the footprint of the Scheme and its immediate surroundings. However, bat transect surveys included all habitat to be affected by the Scheme, as well as potential connecting habitats and areas surveyed for wintering birds included a wider area to include the intertidal zones. The design of the study areas and ZoI are such so that an assessment of direct impacts on species and habitats within the proposed Scheme footprint during construction and indirect impacts in relation to pollution or disturbance during both the construction and operation of the Scheme can be carried out.

8.4 Baseline Conditions – Approach

Approach to the Identification of Baseline Conditions

8.4.1 In accordance with the relevant guidance, an ecology desk study was undertaken initially in September 2017 and was updated in July 2019. Records were obtained from Cofnod (the biological records centre for north Wales) to identify designated sites and protected habitats or species within 2km.

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

a) TACP (October 2015) A55 Junctions 15 and 16 Improvements Ecological Statement.[28]
b) Atkins (January 2009) A55 Junctions 15 & 16 Study Environmental Report.[29]

8.4.3 The following sections summarise the surveys that have been undertaken to identify the baseline conditions and the assessment of the Scheme to date. The normal validity period for ecology surveys is 2 years and so surveys completed during Key Stage 3 study may require further updating or re-validation during subsequent Scheme stages.

Extended Phase I Habitat Survey

8.4.4 An extended Phase 1 habitat survey was undertaken by an experienced ecologist on 19th October 2017, which was updated in June 2018 and again in June and July in 2019 to include additional areas and when access permissions were gained.

8.4.5 A Phase 1 habitat survey is a standardised method of recording habitat types and characteristic vegetation, as set out in the Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit (JNCC 2010). The Phase 1 survey method is 'extended' through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance (also referred to as 'notable' species). The extent of each observed habitat is mapped in Figure 8.3.

[28] TACP (October 2015) A55 Junctions 15 and 16 Improvements Ecological Statement
[29] Atkins (January 2009) A55 Junction 15 and 16 Study Environmental Report

8.4.6 The presence of any Invasive Non Native Species (INNS) was also noted and marked up on the Phase 1 habitat plan.

Hedgerow Survey

8.4.7 An assessment of hedgerows located within the Scheme footprint was carried out in terms of its wildlife and landscape criteria under the Hedgerow Regulations 1997.[30]. The assessment was conducted in July 2019. The methodology followed that outlined within the Hedgerow Survey Handbook (Defra 2007).[31]. This involved surveying a 30m section of the hedge and counting the number of woody species within each section (as detailed within Schedule 3 of the Regulations). Woodland flora was recorded within the 30m section. Other features noted included:

a) Adjacent land use;
b) Connecting features;
c) Bank height and type; and
d) Management.

Great Crested Newt and other Amphibians Habitat Appraisal

8.4.8 Ponds on and within 500m of the Scheme were assessed for their proximity to the Scheme and habitat connectivity which could be used for dispersal, including hedgerows, woodlands, grassland, ditches and scrub.

Preliminary Roost Assessment – Bats

8.4.9 Trees were assessed, from the ground, for the presence of potential roosting features (PRF) including holes in the trunk and lifted bark, and signs of bat presence including staining and scratch marks. The survey was conducted as part of the extended Phase 1 habitat surveys. Surveyors were equipped with close focus binoculars, high-powered torch and endoscope.

8.4.10 All structures (buildings and bridges) to be directly affected by the Scheme were subject to an external and internal (where access was permissible and possible) inspection. Surveyors were equipped with ladders, close focus binoculars, high-powered torch and endoscope.

8.4.11 The Bat Conservation Trust (BCT) Bat Survey Good Practice Guidelines (BCT. 2016.[32]) were used as a basis to evaluate the site features for their potential to support bats during summer and winter. Table 8.1 gives an indication of the value of a variety of features for bats and has been compiled using the BCT Bat Survey Guidelines and from the experience of RML Ecologists. Structures and trees were assigned a value of between negligible – confirmed.

8.4.12 Wray *et al* (2010).[33] developed a method for the evaluation of bats in environmental assessment which considers various factors including: the rarity of the bat species, number of passes, number of roosts or potential roosts within the proximity and the surrounding habitat. This methodology has been taken into consideration during the assessment and assigning a value to this receptor.

[30] The Hedgerow Regulations 1997 http://www.legislation.gov.uk/uksi/1997/1160/contents/made
[31] Defra, 2007. *Hedgerow Survey Handbook*. A standard procedure for local surveys in the UK. Defra, London.

[32] Collins, J (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edn). The Bat Conservation Trust, London.
[33] Wray *et al* (December 2010) *Valuing Bats in Ecological Impact Assessment* CIEEM IN practice.

Table 8.1 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 of bats but unlikely to support a roost of high conservation concern.	Suitable continuous habitat with good connectivity to the wider landscape such as 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

Bat Activity Surveys – Transects

8.4.13 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.

8.4.14 The transects were walked slowly by the surveyors using visual observations and recordings from bat detectors to identify bat activity and species. 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.

Bat Activity Surveys – Emergence and Return to Roost Surveys

8.4.15 Emergence and return to roost surveys were conducted at properties which may be demolished. 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 of the BCT Guidelines) 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.

8.4.16 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 directly affected by the current Scheme proposals. Surveys were conducted as per the BCT guidelines (Tables 7.1 and 7.3 of the BCT Guidelines) which state that, as a minimum, for buildings with low potential, one survey is required (dusk or dawn) between the months of May – August.

8.4.17 Two emergence surveys were conducted at the two properties beside Shore Road East on the 29th July 2018 and the 15th August 2018. 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.

8.4.18 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.

Deployment of Static Bat Detectors

8.4.19 Anabat Swift Detectors were deployed, placed at areas of higher value for bats which would be affected by the Scheme (i.e. along hedgerows, within woodland plantation) where suitable locations could be accessed, and detectors were not at risk from theft. The detectors were left in-situ for a minimum of five days, between the months of July – September in 2018 at two locations either side of Junction 15 and along the field boundary within the field to the north of Penmaen Park between July – October in 2019.

8.4.20 Generally, the habitat within the Scheme area is considered to be of low value based on the guidance provided in Table 8.1. 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 as well as an Autumn survey conducted in September.

8.4.21 Further details on the method and findings are presented in the bat survey report provided at Appendix 8.1 and Figures 8.4 and 8.5.

Otter Habitat Appraisal

8.4.22 An appraisal of habitat and habitat connectivity which could be used by otters *Lutra lutra* and which may be affected by the Scheme was undertaken October 2017 and updated in in June 2018. This involved conducting a walkover of the site during the extended Phase 1 habitat surveys and surveying areas which were considered to have potential for otters, and which may be affected by the Scheme. This included the Afon Llanfairfechan / Ddu, coastal areas and woodland plantation habitat to the south of the A55. During the appraisal, features[34] were searched for which included:

a) Holts:where a female gives birth and raises cubs;
b) Pathways and slides: Obvious signs where otters have entered into a watercourse, i.e, depressions in vegetation or within banks;
c) Couches; depression, usually in grass where an otter has rested in the same place over a number of occasions;
d) Spraints: otter dropping, usually found in prominent places, i.e. exposed rock boulders and
e) Footprints.

Water Vole Habitat Appraisal

8.4.23 An appraisal of the Afon Llanfairfechn /Ddu and potential habitat connectivity which could be used by water voles and which may be affected by the Scheme was undertaken during the extended phase 1 habitat surveys in October 2017 and updated in in June 2018. The methodology used was taken from Cheshire Wildlife Trust[35], adapted from Harris *et al.*, 2009[36]. Ten habitat features favoured by water voles are scored for presence/absence (1/0):

a) Well developed (>60%) bankside **and** aquatic vegetation that provides suitable food and cover;
b) A good variety of food plants including favoured plants and winter food sources;
c) Suitable refuge areas above extremes in water levels;
d) Soft, earth banks suitable for burrowing (30º to 60º slope);
e) Water permanently present (water levels stable and does not dry up);
f) Open water available for swimming;
g) Ledge or berm present at or close to water level;
h) Lack of damage or erosion to the banks;
i) Slow flowing current or static water;
j) Invasive non-native plant species absent (Japanese Knotweed, Himalayan Balsam).

8.4.24 The scores are then combined into a 'habitat score' which corresponds with water vole habitat suitability:

a) >3 = unsuitable
b) 3 – 6 = Sub - optimal
c) 7 – 10 = Optimal

8.4.25 During the appraisal, field signs were searched for which include footprints, feeding remains, latrines, burrows and evidence of predators (i.e. mink, cats, foxes).

[34] Based on guidance in Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.
[35] Cheshire Wildlife Trust. (2016). Water vole Habitat survey assessment guidelines. Adapted from Harris *et al*., 2009).
[36] Harris, J., Markwell, H. and Raybould, B. (2009), A Method for Assessing Water Vole Habitat Suitability, *In Practise, CIEEM,* **65**, Sept 2009.

Hedgehog Habitat Appraisal

8.4.26 An appraisal of habitat and habitat connectivity which could be used by hedgehogs and which may be affected by the Scheme was undertaken during the extended phase 1 habitat surveys on the 19th October 2017, which was updated in June 2018 and again in June and July in 2019 to include additional areas and when access permissions were gained. Any incidental observations noted during bat activity transects was noted.

Badger Survey

8.4.27 Badger *Meles meles* surveys were undertaken during the Phase 1 habitat surveys conducted on the 19th October 2017, updated in June 2018 and again in June and July in 2019 to include additional areas and when access permissions were gained. Surveys were within the proposed Scheme boundary and adjacent areas including an area of search extending 30m from the Scheme, where access was permissible and possible, following guidance as set out within Harris *et al* (1989)[37]. Within this search area all habitats were systematically surveyed for evidence of badgers, in the form of:

a) Latrines: locations where badgers defecate;
b) Setts: locations where badgers live;
c) Pathways: depressions in vegetation which are continually used by badgers;
d) Scratch marks;
e) Snuffle holes: small excavations, usually in grassland, where badgers forage;
f) Footprints; and
g) Guard hairs: badger hairs left on fence posts, trees stumps, barbed wire etc.

8.4.28 The surveys were undertaken as part of the extended Phase 1 habitat survey in October 2017 and updated in in June 2018. Any evidence observed was marked on the Phase 1 habitat plan.

Dormice Habitat Appraisal

8.4.29 An appraisal of habitat and habitat connectivity which could be used by dormice and which may be affected by the Scheme was undertaken during the extended phase 1 habitat surveys on the 19th October 2017, which was updated in June 2018 and again in June and July in 2019 to include additional areas and when access permissions were gained. An assessment was made based whether habitat within the Scheme footprint included the following (based on Table 4 of the Dormouse Conservation Handbook)[38]:

a) Proximity to habitat with known populations of dormice;
b) Large woodlands within the wider landscape and connectivity to these;
c) Proximity to ancient woodland;
d) Species rich hedgerows and woodlands; and
e) Thick, wide hedgerow connections.

Wintering and Breeding Birds

8.4.30 Overwintering bird surveys have been conducted by Biome Consulting. The survey programme consisted of six 'Through The Tide Counts' (TTTC) 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

[37] Harris S, Cresswell P and Jefferies D (1989) *Surveying Badgers*, Mammal Society
[38] Bright, P. Morris, P, Mitchell-Jones, T (2006) The Dormouse Conservation Handbook (2nd Edition) English Nature.

vegetation/structures (e.g. hedgerows, buildings, sea walls etc.) as a hide or screen to avoid unnecessary disturbance to waders as far as possible.

8.4.31 All waders and wildfowl were recorded, with their locations recorded on a map. Further details on the method and findings are presented in the wintering bird survey report provided at Appendix 8.5.

8.4.32 No site-specific breeding bird surveys have been conducted. However, structures and vegetation within the Scheme footprint will support breeding birds.

Reptile Habitat Appraisal

8.4.33 An appraisal of habitats with the potential to support reptiles was assessed during the extended phase 1 habitat surveys carried out in October 2017 and updated in in June 2018. The survey was based on guidance produced by DMRB.[39] Habitat was assessed based on the following features:

a) Location in relation to species range as assessed from existing records obtained from COFNOD ;
b) Vegetation structure: ideal reptile habitat has a variable structure with a mixture of vegetation heights, scrub, bare patches etc;
c) Insolation and basking sites:reptiles need warm areas on which to bask, these include south facing slopes and/or walls or bareground;
d) Aspect and topography: undulating topography, banks, hummocks, hollows, south-facing slopes are all important for reptiles;
e) Connectivity to nearby good quality habitat: essential to allow colonisation;
f) Prey abundance and foraging opportunity:areas which contain relatively high concentrations of prey species, generally associated with b, c and d;
g) Refuge opportunity: places of shelter such as dense scrub, dry stone walls, logs, tree roots;
h) Hibernation habitat potential: free draining structures, often in south facing banks, which gaps, i.e. dry stone walls and log piles; and
i) Disturbance

8.4.34 The site was then categorised as to whether it provides poor, good or exceptional habitat for reptiles, based on the extent of and occurrence of these features.

Habitat Loss vs Habitat Gain

8.4.35 In order to quantify Biodiversity Net Gain (BNG) the metric provided in CEEQUAL has been used. This involves measuring the percentage area of habitat created relative to the habitat affected using the formula:

$$\frac{A2 - A1 \times 100}{A1}$$

Where:

A1 = area of ecologically valuable habitat within total area of influence of Scheme site at the start of the construction (ha).

[39] DMRB (May 2005) Volume 10 Environmental Design and Management Section 4 The Good Roads Guide – Nature Conservation Part 7 HA 116/05 Nature Conservation Advice in Relation to Reptiles and Roads

A2 = area of ecologically valuable habitat within total area of influence of Scheme site at the end (upon opening) of the construction (ha).

8.4.36 Professional judgement has been applied where habitat created is considered to be more diverse, for example species rich grassland is more valuable than poor semi-improved grassland.

Survey Limitations

8.4.37 The initial phase 1 habitat survey was conducted outside the optimum period which is considered to be between April – September. However, the initial survey was supplemented by surveys conducted in June 2018 and over the summer period of 2019.

8.4.38 Species records obtained from COFNOD are based on surveyor effort and availability, and so a lack of records may be due to lack of survey work in that particular area rather than the absence of the species. However, desk study data was supported by on the ground field surveys.

8.4.39 Initially, ecology field surveys were carried out from publicly accessible locations for the majority of the initial surveys. However, as the Scheme progressed, land access was obtained and repeat, or additional surveys were carried out to ensure adequate coverage.

8.4.40 Due to an increase of potential land take late in the scheme design, trees which fall in close proximity to the proposed construction compounds, to the west of Penmaen Park which have bat roost potential (BRP) have not been subject to activity surveys. The scheme design has accounted for this, and minimises the encroachment upon the tree's root protection zone.

8.4.41 During surveys 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 Road.

8.4.42 Due to late access provisions in 2018, surveys were not conducted within April/May, as such, early season activity including potential transitional commuting behaviour may have been missed. 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.

8.4.43 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.

8.4.44 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.

8.4.45 No return to roost (dawn) survey was conducted to the properties which would be demolished so

as not to disturb the residents. 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. Further surveys would be conducted to inform the derogation licence.

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

8.4.47 Locations for the deployment of statics was constrained by access and the potential for theft or interference from locals. However, the statics were positioned so as to provide supplementary data to the transect surveys, and were positioned so as to capture bats along optimal habitat, i.e. hedgerows.

8.4.48 Limitations encountered during the wintering bird surveys were that 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.

Consultations

8.4.49 The first Environment Liaison Group (ELG) meeting was held in May 2018 with the second held in May 2019 and a third in November 2019. These meetings were attended by representatives of Natural Resources Wales (NRW), Conwy County Council (CCC), Cadw, Welsh Government and North and Mid Wales Trunk Road Agency (NMWTRA). The Environment Liaison Group (ELG) confirmed the environmental objectives for the Scheme, advised on the conduct and content of this Environmental Impact Assessment and on mitigation for environmental effects.

8.4.50 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).

8.4.51 Consultation responses have been received from CCC Ecologist on the 20th January 2020 and NRW on the 23rd January 2020. A summary of these subsequent consultations relating to ecology and nature conservation is set out in Table 8.2.

Table 8.2 Summary of consultation responses

Consultee and date	Comment
CCC Ecologist 02/01/2020	Comments in regard to impacts on wintering birds which are a feature of the designated sites and potential cumulative effects.
	Welcomes the potential to transplant the hedgerow to be lost, within the scheme.
	Requires clarification of ornamental shrub planting.
	Update calculation to creation of species rich grassland.
	Clarification on SuDs required.
NRW 23/01/2020	Broadly satisfied with the conclusions and recommendations within the chapter.

Consultee and date	Comment
	Concur with the assessment and conclusions in respect of GCN.
	Generally satisfied with the assessment and conclusion in respect of bats. Noted that further surveys to the trees located within the field to the north east of Penmaen Park (Target Note 1) will be subject to further survey. Advise moving the pole mounted bat box further south, and we would expect there to be a provision for more than one bat box as way of enhancement.
	Concur with the assessment and conclusions in respect of otters.
	Concur with the assessment and conclusions in respect of water vole.
	Concur with the assessment and conclusions in respect of dormice
	Note and concur with sections in respect to Invasive non-native species
	In agreement that impact on Lavan Sands SPA and Menai Strait and Conwy Bay SAC need to be assessed taking account of the requirements and conservation objectives of the features especially the mobile species both inside and outside of the designated site boundary and will provide comment on the Assessment of Implications of European Sites (AIES) and a Statement to Inform an Appropriate Assessment (SIAA) once it has been submitted. The assessment would also need to take into account the impact on Traeth Lafan SSSI features. In agreement that pollution incidents are likely to be one of the key potential impacts on the designated sites and features of interest. However, this is not sufficiently addressed within the draft Environmental Statement. Specifically, the potential impact of the drainage scheme given the discharge points to the sea within/in close proximity to the designated sites.
	Do not recognise SuDS as a recognised form of ecological mitigation/enhancement, we require that the ecological enhancement element is kept separate. We appreciate the ecological benefit, however, during a pollution incident that benefit is at risk.
	Concur with what has been outlined in respect of monitoring and aftercare.
	In agreement with the monitoring of the habitat created and transect survey approach.

8.5 Baseline Conditions – Results

8.5.1 This section provides a summary of the key findings of the desk study and surveys undertaken to provide the baseline data for the Scheme.

Statutory Designated Sites

8.5.2 Information on statutory designated sites within distances of 30.0 km for Special Area of Conservation (SAC) designated for bats, 10.0 km for other internationally designated sites, 5.0 km for nationally designated sites such as SSSIs and LNRs was obtained through desk study.

8.5.3 Internationally designated sites are shown on Figure 8.1. Nationally designated sites and Wildlife Sites are shown on Figure 8.2.

8.5.4 Seventeen sites have been identified within the search area. The Menai Strait and Conwy Bay SAC, the Liverpool Bay Special Protection Area (SPA) and Traeth Lafan SPA and Site of Special Scientific Interest (SSSI) are located within close proximity to the Scheme and encompass the coastal waters directly north of the junction. The nearest terrestrial designated site is Coedydd Aber SAC and SSSI located approximately 2 km south west of Junction 15. A summary of these designated sites is provided in Table 8.3.

Non-statutory Designated Sites

8.5.5 Two Local Nature Reserves (LNR) are present within 5km, 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 the SPA and SSSI.

8.5.6 Sixteen Candidate Local Wildlife Sites (LWS) are present within 2 km of the survey area. A summary of these Candidate LWS is provided in Table 8.4.

Table 8.3: Statutory Designated Sites

Site name	Qualifying features	Distance from site
International – Special Protection Areas		
Traeth Lafan / Lavan Sands, Conwy Bay SPA UK9013031	Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC: • A130 Oystercatcher *Haematopus ostralegus*, 4,931 individuals representing at least 0.5% of the wintering Europe & Northern/Western Africa population (5 year peak mean 1991/2 - 1995/6) • A069 Red-breasted Merganser *Mergus serrator* • A160 Curlew *Numenius arquat*, (Europe - breeding) 1.1% of the population in Great Britain 5 year peak mean 1991/92-1995/96. • A005 Great crested grebe *Podiceps cristatus* (North-western Europe - wintering) • A162 Redshank *Tringa totanus*	Adjacent to site, coastal
Liverpool Bay / Bae Lerpwl (Wales) SPA UK9020294	Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC: • A065 Common scoter *Melanitta nigra* 56,679 individuals representing at least 10.31% of the wintering NW Europe population (2004/05 – 2010/11). • A193 Common tern *Sterna hirundo* (breeding 360 individuals representing 1.80% of the breeding population in Great Britain (2011 – 2015). • A195 Little tern *S. albifrons* (breeding 260 individuals representing 6.84% of the breeding population in Great Britain (2010 - 2014) • A001 Red throated diver *Gavia stellata* (North-western Europe - wintering) 5.4% of the GB population 5-year peak mean 2001/02 - 2006/07. Population in the SPA 1171. • A177 Little gull *Hydrocoloeus minutus* (non-breeding 319 individuals (2004/05 – 2010/11). Population in the SPA 319. Over winter, the area regularly supports 69,687 individual waterbirds (5 year peak mean 2004/05 - 2010/11) including species exceeding 1% of the GB total or 2,000 individuals: common scoter *Melanitta nigra*, red-throated diver *Gavia stellata*, little gull *Hydrocoloeus minutus*, red- breasted merganser *Mergus serrator* and great cormorant *Phalacrocorax carbo*. (less than 1% GB or less than 2000 Individuals) black headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, common eider *Somateria mollissima*, Northern fulmar *Fulmarus glacialis*, great black-backed gull *Larus marinus*, great crested grebe *Podiceps cristatus*, common murre *Uria aalge*, Northern gannet *Morus bassanus*, Atlantic puffin *Fratercula arctica*, European herring gull *Larus argentatus*, black-legged kittiwake *Rissa tridactyla*,	Approximately 295 m due north

Site name	Qualifying features	Distance from site
	lesser black-baked gull *Larus fuscus*, great Northern diver *Gavia immer*, European shag *Phalacrocorax aristotelis*, razor bill *Alca torda*, velvet scoter *Melanitta fusca*.	
Anglesey Terns SPA (Marine Component) UK9013061	During the breeding season the site regularly supports: • Roseate tern *Sterna dougallii*, 3 pairs representing 5% of the GB breeding population (5 year mean 1992 to 1996) • Common tern *Sterna hirundo*, 189 pairs representing 1.5% of the GB breeding population (5 year mean 1992 to 1996) • Arctic tern *Sterna paradisaea*, 1,290 pairs representing 2.9% of the GB breeding population (5 year mean 1992 to 1996 • Sandwich tern *Sterna sandvicencis*, 460 pairs representing 3.3% of the GB breeding population (5 year mean 1993 to 1997)	Approximately 6.3 km north across the sea
Puffin Island SPA UK9020285	During the breeding season the site regularly supports: • A107 Cormorant *Phalacrocorax carbo*, 556 pairs representing 1.35% of the NW European breeding population (5 year mean 1996 to 2000).	Approximately 7.3 km north across the sea
International – Special Areas of Conservation		
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC UK0030202	Annex I habitats that are a primary reason for selection of this site • 1110: Sandbanks which are slightly covered by sea water all the time • 1140: Mudflats and sandflats not covered by seawater at low tide • 1170: Reefs Annex I habitats present as a qualifying feature, but not a primary feature for site selection: • 1160: Large shallow inlets and bays • 8330: Submerged or partially submerged sea caves	Adjacent to site, coastal
Coedydd Aber SAC UK0030118	Annex I habitats that are a primary reason for selection of this site: • 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)	Approximately 2.4 km due south west

Site name	Qualifying features	Distance from site
	Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC • 1355 Otter *Lutra lutra* • 1106 Salmon *Salmo salar*	
Eryri / Snowdonia SAC UK0012946	Eryri comprises three upland massifs separated by roads, the Carneddau, Glyderau and Yr Wyddfa. All three host a number of biological and geological SSSI features and SAC features: Annex I habitats that are a primary reason for selection of this site: • 3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncete • 6150 Siliceous alpine and boreal grassland • 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine level • 8110 Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani • 8210 Calcareous rocky slopes with chasmophytic vegetatio • 8220 Siliceous rocky slopes with chasmophytic vegetation Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 4010 Northern Atlantic wet heaths with Erica tetrali • 4030 European dry heath • 4060 Alpine and Boreal heath • 6170 Alpine and subalpine calcareous grassland • 6230 Species-rich Nardus grasslands, on silicious substrates in mountain areas (and sub mountain areas in Continental Europe) * Priority feature • 7130 Blanket bogs (* if active bog) * Priority feature • 7150 Depressions on peat substrates of the Rhynchosporio • 7220 Petrifying springs with tufa formation (Cratoneurion) * Priority feature • 7230 Alkaline fen • 7240 Alpine pioneer formations of the Caricion bicoloris-atrofuscae * Priority feature • 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isle Annex II species that are a primary reason for selection of this site • 1393 Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus • 1831 Floating water-plantain Luronium natans • 1106 salmon salmo salar	Approximately 5.6 km due south

Site name	Qualifying features	Distance from site
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC UK0030161	This SAC is a composite of numerous sites to the south of the site. Annex I habitats that are a primary reason for selection of this site: • 6130 Calaminarian grasslands of the Violetalia calaminariae Annex II species present as a qualifying feature at this site, but is not a primary reason for site selection: • 1303 Lesser horseshoe bat Rhinolophus hipposideros	Approximately 20 km south
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC UK0014789	This large composite site includes most of the known maternity roosts in Meirionnydd and some hibernacula and comprises the centre of distribution for lesser horseshoe bats in Wales. The sheltered river valleys provide excellent tree cover and numerous suitable maternity roosts. The presence of Lesser horseshoe bats at this site is a primary reason for its selection as a SAC. Annex I habitats that are a primary reason for selection of this site: • 91A0 Old Sessile oak woods with Ilex and Blechnum in the British Isles • 91E0 Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (Ano-Padion, Alnion incanae, Salicion albea) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitrcho-Batrachion vegetation • 4010 North Atlantic wet heaths with Erica tetralix • 4030 European dry heaths • 9180 Tilio-Acerion forests of slopes, screes and ravines • 91D0 Bog woodland Annex II species that are a primary reason for selection: • 1303 Lesser horseshoe bat *Rhinolophus hipposideros*	Approximately 21.5 km south
Glynllifon SAC UK0012661	This single site in north Wales is both a maternity and hibernation site for a large population of lesser horseshoe bat, comprising about 6% of the UK population. Annex II species present as a primary qualifying feature at this site: • 1303 Lesser horseshoe bat *Rhinolophus hipposideros*	Approximately 28.5 km west

Site name	Qualifying features	Distance from site
National – Site of Special Scientific Interest		
Traeth Lafan SSSI	• Eel Grass (*Zostera noltei*) • Moderately exposed sand • Rockpools (pools and depressions in the mussel bed supporting hydroids or sea firs) • Running water • Saltmarsh • Oystercatcher • Curlew • Redshank • Red-breasted merganser • Great crested grebe	Adjacent to site
Sychnant Pass SSSI	A large area of heath is the dominant vegetation of this site with smaller, areas of bracken and acid grassland of considerable entomological interest.	Approximately 1.4 km due east
Coedydd Aber SSSI	Coedydd Aber is of special interest for its botanical and ornithological interest as well as other species groups including: • Alluvial forests with alder and ash, and old sessile oak woods • Lower plant communities • Woodland birds • Brown trout, salmon and eel • Fungi • Invertebrate communities • Reptiles • Mammals	Approximately 2.4 km due south west
Aber Afon Conwy SSSI	Aber Afon Conwy is of special interest for its marine and terrestrial invertebrate biology. Other features include a high numbers of waders and migratory salmon *Salmo salar*, which spawn in upstream regions of the River Conwy.	Approximately 2.4 km due east
Eryri SSSI	This site has been selected for its features of geological, geomorphological and biological interest including: • Lichen and bryophyte heath • Montane heat, • Dry heath • Wet heath	Approximately 3 km due south

Site name	Qualifying features	Distance from site
	• Blanket bog • Flush and spring • Calcareous grassland • Tall herb and fern ledges • Vegetated scree • Broadleaved woodland communities • Inland rock exposures with crevice vegetation • Low nutrient lakes • Rivers and streams • Chough, peregrine and merlin • Invertebrates • Schedule 8 plants	
Cadnant SSSI	Cadnant is of special interest for its geology.	Approximately 9.5 km due east
National – National Nature Reserve		
Coedydd Aber NNR	A component of the SSSI and SAC. Habitats include: • Old sessile oak woodland • Alluvial forest • Wet woodland • Upload oak and ash woodland • Lichens • Woodland breeding birds • Geological features	Approximately 5 km

Table 8.4: Non- Statutory Designated Sites (Candidate Wildlife Sites)

Site Name	Qualifying feature	Distance from site
Penmaenmawr Old Quarry	An area which comprises a quarry, quarry spoil, revegetated spoil and dwarf shrub heath covering approximately 97 hectares	Approximately 270 m east
Afon Ddu (Llanfirfechan)	River	Approximately 378 m west
Henar	Broadleaved woodland; bracken; scrub; talus	Approximately 500 m south
Penmaenmawr Quarry Heath	Acid grassland; bracken; dwarf shrub heath / acid grassland mosaic; standing water	Approximately 630 m east
Bryn-y-neuadd	A composite site which includes area of coniferous woodland on a former area of ancient woodland covering, approximately 3.8 hectares	Approximately 860 m west
Llanerch Grassland and Woods	A mix of habitats which includes woodland and neutral grassland covering approximately 3.8 hectares	Approximately 930 m south
Coed Nant y Felin	Broadleaved woodland	Approximately 970 m south
Nant y Coed, Llanfairfechan	Area of broad-leaved woodland some of which is classed as ancient woodland, covering approximately 6 hectares	Approximately 1.15 km south
Glan- Y – Mor Elias	Saltmarsh; semi-improved neutral grassland	Approximately 1.34 km west
Madryn grazing marsh and dunes (Glan y Mor Elias)	Area of saltmarsh and dune grassland covering approximately 20.15 hectares	Approximately 1.34 km west
Fridd Mynydd Uchaf	Acid grassland; dwarf shrub heath / acid grassland mosaic.	Approximately 1.35 km south
Mynydd Uchaf Heath	Area of acid grassland covering approximately 32 hectares	Approximately 1.50 km east
Graig Llwyd Heath	Acid grassland	Approximately 1.55 km east
Penmaen Woods	Ancient semi-natural woodland covering approximately 15 hectares	Approximately 1.55 km east
Waun Llanfair	Acid grassland/heath mosaic; dry dwarf shrub heath	Approximately 1.70 km south east
Madryn Reedbed	Reedbed; saltmarsh; standing water	Approximately 1.77 km west

Ancient Semi-natural woodland

8.5.7 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 Scheme's proposals.

Habitats

8.5.8 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.

8.5.9 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.

8.5.10 The habitats recorded within the site and adjacent areas are described in the following paragraphs. The location and extent of habitats present are shown on Figure 8.3. The main habitats identified (with their Phase 1 classification code) were:

a) Mixed plantation woodland A1.3.2;
b) Parkland / scattered trees – broadleaved A3.1;
c) Neutral grassland – semi-improved B2.2;
d) Poor semi-improved grassland B6;
e) Running water G2;
f) Coastland H;
g) Amenity grassland J1.2;
h) Boundaries – hedge intact species poor J2.1.2;
i) Built up areas – buildings J3.6.

Mixed Plantation Woodland A1.3.2

8.5.11 Areas adjacent to the southern and northern boundary of the A55, immediately west of Junction 15 and to the south of Penmaenmawr Rd are areas of mixed plantation woodland. Species present include abundant to frequent mature to semi mature maritime pine *Pinus pinaster* and ash *Fraxinus excelsior* with frequent to occasional hazel *Corylus avellana*, cherry *Prunus avium* and holly *Ilex aquifolium* , dogwood *Cornus sanguinea* and buddleia *buddleia davidii* . The ground flora comprises frequent, tutsan *Hypericum androsaemum*, pendulous sedge *Carex pedula*, ivy *Hedera helix*, herb robert *Geranium robertianum* and bramble *Rubus fruticosus* agg. Within these areas of plantation woodland are occasional stands of mature holm oak *Quercus ilex*, with a large stand within the plantation to the east of Shore Road East (Target Note 2, Figure 8.3).

Parkland / Scattered Trees – Broadleaved A3.1

8.5.12 Penmaen Park occurs to the south which consists of grazed pasture. The field located to the south of Penmaenmawr Rd (north of the park) contains mature scattered trees, including oak *Quercus sp*. and ash which have low – moderate potential to support roosting bats (Target Note 1).

Neutral Grassland – Semi-Improved B2.2

8.5.13 The grassland areas associated with the Heath building have been seeded with a species rich grassland mix and contain frequent bee orchids *Ophrys apifera*.

Poor Semi-Improved Grassland B6

8.5.14 Areas of poor semi-improved grassland are present as a narrow (C. <0.5 m) on the verge of the A55 at Junction 15. Species present include frequent to abundant false oat-grass *Arrhenatherum elatius*, cock's-foot *Dactylis glomerata* and red valerian *Centranthus ruber*.

8.5.15 The grazed pasture to the south of Penmaenmawr Road contained the following species, perennial rye grass *Lolium perenne*, cock's foot and false oat-grass being the most dominant grasses, with meadow grass *Poa* spp, dock *Rumex sp*, common nettle *Urtica dioica*, cleavers *Galium aparine*, dandelion *Taraxacum agg*., ribwort plantain *Plantago lanceolata* and meadow buttercup *Ranunculus acris*.

Running Water G2

8.5.16 Afon Ddu (Llanfairfechan) is located approximately 600 m to the west of Junction 15. This is a relatively fast flowing watercourse, flowing over a substrate of rocks and cobbles, with much of the banks consisting of concrete or stone walls with trees also present on the banks. Japanese knotweed *Fallopia japonica* occurs in small patches along its banks.

Coastland H

8.5.17 To the north of the site beyond the railway line is the coastline. A detailed survey was not carried out at this location as the Scheme will not impact directly upon these habitats. Parts of the coast habitat are designated as a SAC (Y Fenai a Bae Conwy / Menai Strait and Conwy Bay), SPA (Traeth lafan / Lavan Sands and SSSI (Traeth Lafan). The habitat within the survey area consists of a sea wall beyond which is the rocky shore and sand. The tide rises up to the extents of the rocky shoreline.

Amenity Grassland J1.2

8.5.18 Areas of amenity grassland are present to the north west of Junction 15 associated with the amenity areas at the promenade and schools located to the west. Species present within these areas include dominant to abundant perennial rye-grass, white clover *Trifolium repens* and crested dog's-tail *Cynosurus cristatus*.

Boundaries – Hedge Intact Species Poor J2.1.2

8.5.19 A hedgerow is located to the south of the existing tree and shrub planting located to the south of Penmaenmawr Road (HR 1). This was subject to an assessment in terms of its wildlife and landscape criteria as described in Section 8.4.

8.5.20 From the hedgerow survey conducted and the results of the desk study, this hedge does not satisfy the full criteria to be classed as an 'important' hedge under wildlife and landscape criteria. However, a hedgerow may be classed as 'important' due to the presence or recorded presence of a protected animal and plant species (Schedule 5 and 8) within the last five years.

8.5.21 The full survey results of the hedgerow assessment can be seen in Table 8.5.

Table 8.5: Hedgerow Assessment -HR1

Criteria	**Criteria met/justification**
Important?[40]	Yes – hedgerow used by bats for foraging and commuting based on survey results and likely to be used by nesting birds.
Bridleway/path	No
Black Poplar *Populus nigra ssp. betulifolia* /Large-leaved Lime *Tilia platyphyllos* /Small-leaved Lime *Tilia cordata* /Wild Service-tree Sorbus torminalis	No
Number of woody spp[41]/30m	2
Bank/wall	No
Intact (<10% gaps along its length)	Yes
Trees (have a diameter of at least 20 cm, or 15 cm for multi-stemmed trees)	No
3 flora spp.[42]	No
Ditch	Yes - Dry ditch
Connect >4 points (e.g. adjoining hedgerows, ponds, woodlands)	No
Parallel hedge (within 15 m)	No
Woody spp. present	No, only two woody species present • Blackthorn • Hawthorn
Ground flora (notable species in bold)	No notable species recorded. • Common Nettle • Cleavers • Cow Parsley

[40] Presence of protected animal and plant species within the last 5 years (archaeological features were not assessed)
[41] Woody species 'recognised' by the Hedgerow Regulations (1997)

Criteria	Criteria met/justification
	• Dock • Bramble - climber • Honeysuckle - climber • Ivy - climber

Built up Areas – Buildings J3

8.5.22 The built environment around junction 15 is predominantly residential. Buildings within the immediate vicinity of the Scheme proposals include properties along Penmaemawr Road (west of roundabout) which comprise two rendered three storey properties and two storey stone built terraced properties, the council offices which occupy 'The Heath' a large and distinctive looking stone building, Ysgol Pant Y Rhedyn and a chapel.

8.5.23 The two properties to the east of Shore Road East (Target Note 3, Figure 8.3) would be demolished in order to make way for the Scheme.

8.5.24 Properties along Penmaemawr road (east of the roundabout) comprise three storey residential properties converted into flats with rendered facades and slate roofs. A recent development of new build terraced residential properties lie to the east of the these. All these properties are immediately adjacent to south of the A55 road corridor and will be retained.

8.5.25 The A55 carriageway traverses Shore Road East via a boxed concrete and tile clad bridge. The railway crosses Shore Road via a small stone arched bridge. These were assessed for their potential to support bats, but no features were noted.

Priority Habitats

8.5.26 Table 8.6 lists the main habitats found within and adjacent to the site and whether these habitats are listed as Priority Habitats in Section 7 of the Environment (Wales) Act 2016. A value for their ecological significance has also been assigned based on Table 8.11, Section 6.

Table 8.6: Summary of Habitats and Value of Receptors

Habitat Ref	Habitat description	Priority habitat	Value/justification
A1.3.2	Mixed plantation woodland	x	**Lower - Local/** although not classified as a Priority habitat, this habitat has been classified as of local significance due to its situation adjacent to a road network and provides cover and protection for a number of species as well as meeting other planning biodiversity objectives.
A3.1	Parkland / scattered trees broadleaved	✓	**Medium - Regional /** The trees to the north of Penmaen Park are a Priority habitat and have low – moderate potential to support bats as well as being mature and set within a parkland landscape.
B2.2	Neutral grassland semi-improved	x	**Lower - Local/** although not classified as a Priority habitat, this habitat has been classified as of local significance due to its situation within a largely urban landscape as well as meeting other planning biodiversity objectives.

B6	Poor semi-improved grassland	x	**Lower - Local/** although not classified as a Priority habitat, this habitat has been classified as of local significance as it provides habitat for foraging bats and birds as well as providing habitat for birds which are a feature of the SPA as well as meeting other planning biodiversity objectives.
G2	Running water	✓	**Medium - Regional /** the Afon Ddu (Llanfairfechan) is a Priority habitat and provides biodiversity within an urban context as well as meeting other planning biodiversity objectives.
H	Coastland	✓ Subtidal sands and gravels	**International - Very high/** coastal habitats including subtidal sands and gravel and sandflats occur within close proximity to the Scheme and are features of interest of the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC and Traeth/Lafan SSSI.
J1.2	Amenity grassland	x	**Lower - Local/** although not classified as a priority habitat, this habitat has been classified as of local significance as it provides some habitat value.
J2.1.2	Hedge intact species poor	✓	**Medium - Regional /** Hedgerows are a Priority habitat, defined as any boundary line of trees or shrubs over 20m long and less than 5m wide and includes HR1 to the north of Penmaenmawr Rd.
J3	Built up areas – buildings	x	**None /** scoped out of further assessment. Structures with the potential to support bats are assessed under the species section.

Species (Flora)

8.5.27 The desk study identified sixteen notable or protected plant species within a 2.0 km search radius within the last ten years. These are detailed in Table 8.7. None are located within the footprint of the Scheme with the exception of the yellow-wort *Blackstonia perfoliata* which is classified as locally important. This species was noted flowering on the railway embankment east of Llanfairfechan. Most of the records were associated with Pensynchnant local nature reserve.

Table 8.7: Summary of Notable Flora within 2.0 km

Species name	Closest proximity	Level of protection
Yellow-wort *Blackstonia perfoliata*	0 m	Category 3 – Locally important
Bluebell *Hyacinthoides non-scripta*	1.2 km	Category 1 – Schedule 8
Yellow Starry Feather-moss *Campylium stellatum*	1.2 km	Category 2 - Red data book (Wales)
Chalk Comb-moss *Ctenidium molluscum*	1.2 km	Category 3 - LBAP species Conwy
Broad-leaved Helleborine *Epipactis helleborine*	1.2 km	Category 3 - LBAP species Gwynedd
Shining Hookeria *Hookeria lucens*	1.2 km	Category 2 - Red data book (Wales)
Common Feather-moss *Kindbergia praelonga*	1.2 km	Category 2 - Red data book (Wales)
Western Gorse *Ulex gallii*	1.2 km	Category 3 - LBAP species Conwy
Welsh Poppy *Meconopsis cambrica*	1.4 km	Category 2 - Red data book
Oak Fern *Gymnocarpium dryopteris*	1.4 km	Category 3 – Locally important
Mountain Male-fern *Dryopteris oreades*	1.5 km	Category 3 – Locally important

Species name	Closest proximity	Level of protection
Field Maple *Acer campestre*	1.5 km	Category 3 – Locally important
Box *Buxus sempervirens*	1.5 km	Category 2 - Red data book
Lombardy-Poplar *Populus nigra 'Italica'*	1.5 km	Category 3 - LBAP species neighbouring authority SNPA
White Willow *Salix alba*	1.5 km	Category 3 – Locally important
Species of Lichen *Ramalina fastigiata*	1.6 km	Category 3 - LBAP species Conwy

Key (as taken from COFNOD):

Category 1: Species with European and/or UK legal protection, Section 7 Species.

Category 2: Global Red list, British Red Data Book, Nationally Rare & Scarce, Welsh Vascular Plant Red Data List, where these are not identified in Category 1.

Category 3: Locally important species as identified by local experts

8.5.28 No notable plants were recorded during the phase 1 surveys with the exception of field maple which was recorded within the landscape planting.

8.5.29 Protected and notable flora within the Scheme area is considered to be of ***Local*** significance based on the value of ecological receptors provided in Table 8.11, Section 6.

Species (Fauna)

8.5.30 The presence of faunal species within and adjacent to the Scheme has been gathered via desk study (records within 2.0 km and within the last ten years) and from surveys conducted in 2018 - 2019. Detailed accounts of those species for which surveys were considered necessary to inform the EIA are presented in the following paragraphs. A value of each ecological receptor has been assigned based on Table 8.11, Section 6.

Great Crested Newts and other Amphibians

8.5.31 Great crested newts *Triturus cristatus* have been recorded approximately 600 m east of the Scheme location within the quarry, with the common frog *Rana temporaria* and palmate newt *Lissotriton helveticus* recorded approximately 400m due west within residential gardens.

8.5.32 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that given the lack of suitable aquatic and terrestrial habitat within the surveyed area it is unlikely that this species is present.

8.5.33 There is a large water body present to the north west of Junction 15 circa 450m from the nearest proposed Scheme footprint within a recreational park. This pond supports a number of waterfowl and no submerged or emergent aquatic vegetation was present. This pond is therefore considered very unlikely to support great crested newts. No other ponds are present within 500 m of the survey area. Habitats within the Scheme footprint are mostly unsuitable and isolated. The Scheme is not likely to be detrimental to the maintenance of the favourable conservation status of great crested newts at a local, county, regional or UK spatial scale. For these reasons, GCN are not considered an ecological receptor and have been ***scoped out from further assessment***.

Bats

8.5.34 A number of bats including brown-long eared *Plecotus auritus*, lesser horseshoe *Rhinolophus hipposideros*, 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.

8.5.35 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for roosting and foraging bats.

Bat Activity Surveys – Transects

8.5.36 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/Brandt's 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.

Bat Activity Surveys – Emergence and Return to Roost Surveys

8.5.37 A 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 (Target Note 3) during the emergence survey conducted in 2019. One bat seen to emerge from the top of the roof of the rear of 9 Penmaen View, exact location unknown and on another occasion one bat seen to emerge from the top of the roof of the rear of 8 Penmaen View, above the dormer window. These buildings would be demolished as part of the proposed Scheme. 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) the loss of this roost would not be detrimental to the favourable conservation status of bats within their nature range.

8.5.38 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. These buildings would be retained were the Scheme to proceed.

8.5.39 The trees located within the field to the north east of Penmaen Park (Target Note 1) were found to have low – moderate potential to support bat roosts. No emergence surveys have been conducted to these to date as early Scheme proposals did not affect these. However, due to the potential for the requirement of additional land take, the proposed site compound and earthworks may now fall in close proximity to these trees. Noctules were recorded within this area soon after dusk on static detectors placed within this field, as such, it is possible that they could be roosting within these at some stage.

8.5.40 The areas of mixed plantation woodland support 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.

Deployment of Static Bat Detectors

8.5.41 Static detectors deployed in 2018, placed either side of Junction 15 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, no access was available during the 2018 surveys. Statics were placed 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, whiskered/Brandts, natterers and Daubentons, a total of eight species.

8.5.42 There are limited areas of foraging habitat north of the A55, with foraging habitat limited to small areas of landscape planting which is quite exposed to the coast.

8.5.43 Utilising the scoring system detailed within Wray et al (2010, Tables 3 – 5) the commuting and foraging routes associated with Scheme were classified as being of ***local*** importance for common and soprano pipistrelles, natterers, Daubentons, brown long-eared bat and the lesser horseshoe bat and of ***Medium - Regional*** importance for Noctule and whiskered/Brandts. Based on this classification system, noctule species are categorised as rare in Wales.

8.5.44 The state of UK bats[43] 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.

8.5.45 The results of the National Bat Monitoring Programme (NBMP) up to summer 2018[44] 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.

8.5.46 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 and that the scheme would not be detrimental to the favourable conservation status of bats within a local, regional or UK wide spatial context.

8.5.47 Recognising that all bats are afforded protection under European legislation and taking into consideration the results of the surveys, which identified eight species of bats and one roost, the Scheme corridor is considered to be of ***Medium – Regional*** significance for noctule bats and of ***local*** significance for common and soprano pipistrelles, Daubentons, natterers, lesser

[43] The State of UK bats 2017 National Bat Monitoring Programme Population Trends JNCC BCT. https://cdn.bats.org.uk/pdf/State_of_UKs_Bats_2017-2.pdf?mtime=20181101151557

[44] National Bat Monitoring Programme, Annual Report 2018. JNCC, BCT https://cdn.bats.org.uk/pdf/Our%20Work/NBMP/National-Bat-Monitoring-Programme-Annual-Report-2018.pdf?mtime=20190509100258

horseshoe and brown long-eared. The roost is considered to be of ***local*** importance.

Otter

8.5.48 Otters have been recorded from the Afon Llanfairfechan/Ddu approximately 650 m from the Scheme area during the desk study. Any otters commuting/foraging along the coastline are highly unlikely to enter within the Scheme footprint due to the location of the railway line which forms a barrier to the Scheme.

8.5.49 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for otters (this is mainly in respect of Junction 16 and not Junction 15).

8.5.50 Previous monitoring surveys for otters in Wales have shown a continued trend of recovery for the otter[45]. In North Wales the otter has continued to consolidate its range and is now widespread in the Hydrometric areas of Glaslyn/Lleyn, Conwy/Clwyd and Dee with the Conwy Hydrometric Area (66A) showing the largest expansion.

8.5.51 No suitable habitat occurs within the Scheme footprint which provides a secure rest up area or for holts. The habitat to be affected by the scheme is not suitably connected to the Afon Llanfairfechan/Ddu (the source population). As otters have been recorded along the Afon Llanfairfechan/Ddu, otters are considered to be of ***local*** significance.

Water vole

8.5.52 No records of water voles were received during the desk study.

8.5.53 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that the survey area has negligible value for water voles.

8.5.54 The Afon Llanfairfechan/Ddu is not considered suitable to support water voles owing to its relatively fast flow and lack of suitable bankside habitat. No other suitable habitat, including ditches and drains which could support this species are present within the survey area, the habitat score was >3 which is unsuitable. As such, this species has been ***scoped out*** from further assessment.

Hedgehog

8.5.55 Twenty-five records for hedgehog *Erinaceus europaeus* occurring within 2.0 km in the last ten years were highlighted during the desk study. The closest record is within 0 m both of which are road casualties. The nearest live record was 20m from the Scheme, with two noted foraging within a garden. The hedgehog is listed on Section 7 of the Environment (Wales) Act 2016.

8.5.56 The main habitat of interest for this species within the Scheme area is the existing landscape planting (mixed plantation woodland A1.3.2). Given the available potential habitat for this species within the Scheme and records within a close proximity to the Scheme, hedgehogs are considered to be of ***Local*** significance.

[45] NRW (2015) Otter Survey of Wales 2009 – 2010. https://naturalresources.wales/media/4590/osw-5-english-24-06-2015.pdf

Badger

8.5.57 Badgers have been recorded within 2 km of the Scheme area (roadkill) and another record (guard hairs) within Penmaenan woods.

8.5.58 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for badgers.

8.5.59 No evidence of badgers was found during the extended Phase 1 habitat survey. The railway corridor provides suitable habitat for badgers, other suitable habitat includes the open fields to the south which connect to the wider landscape which includes woodland and open fields and includes the field to the north of Penmaen Park.

8.5.60 Badgers are afforded protection under the Protection of Badgers Act. This protection is mainly concerned with welfare and preventing cruelty rather than conservation. As there is suitable habitat to support badgers, mainly within the fields to the north of Penmaen Park, badgers are considered to be of ***Local*** significance.

Dormice

8.5.61 No records of dormice were received from the desk study and there is no suitable habitat present within the Scheme area.

8.5.62 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for dormice.

8.5.63 Dormice can be found in every Welsh county except Anglesey, in low-density populations. Their numbers have fallen by around 20% between 1991 and 2000.[46]. The largest known population of dormice in North Wales is within Bontuchel, near Ruthin within the county of Denbighshire which is subject to ongoing monitoring under the National Dormice Monitoring Project. This is located approximately 45km due east (as the crow flies).

8.5.64 The areas of plantation woodland/scrub is small in extent with virtually no connectivity to larger areas of woodland which could support this species. As such, this species has been ***scoped out*** from further assessment.

Wintering and Breeding Birds

8.5.65 A large number of bird records were received during the desk study, the majority of which relate to species associated with the adjacent SPAs. Records of notable woodland and farmland bird species were also received. Table 8.8 provides a list of Category 1 species noted within a 2.0 km search radius within the last ten years. A large percentage of these were recorded within close proximity to the Scheme.

[46] https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/european-protected-species/dormouse/?lang=en

Table 8.8: Summary of notable birds within 2km

Species name	Closest proximity	Level of protection
Bar-tailed godwit *Limosa lapponica*	0 m	Category 1
Black-headed gull *Chroicocephalus ridibundus*	0 m	Category 1
Brambling *Fringilla montifringilla*	0 m	Category 1
Bullfinch *Pyrrhula pyrrhula*	0 m	Category 1
Chough *Pyrrhocorax pyrrhocorax*	0 m	Category 1
Common scoter *Melanitta nigra*	0 m	Category 1
Goldeneye *Bucephala clangula*	0 m	Category 1
Curlew *Numenius arquata*	0 m	Category 1
Dunnock *Prunella modularis*	0 m	Category 1
Fieldfare *Turdus pilaris*	0 m	Category 1
Firecrest *Regulus ignicapilla*	0 m	Category 1
Great northern diver *Gavia immer*	0 m	Category 1
Herring gull *Larus argentatus*	0 m	Category 1
House sparrow *Passer domesticus*	0 m	Category 1
Kestrel *Falco tinnunculus*	0 m	Category 1
Kingfisher *Alcedo atthis*	0 m	Category 1
Northern Lapwing *Vanellus vanellus*	0 m	Category 1
Long-tailed duck *Clangula hyemalis*	0 m	Category 1
Mediterranean Gull *Larus melanocephalus*	0 m	Category 1
Lesser redpoll *Carduelis cabaret*	0 m	Category 1
Peregrine *Falco peregrinus*	0 m	Category 1
Pied flycatcher *Ficedula hypoleuca*	0 m	Category 1
Red-throated diver *Gavia stellata*	0 m	Category 1
Redwing *Turdus iliacus*	0 m	Category 1
Reed bunting *Emberiza schoeniclus*	0 m	Category 1
Ring ouzel *Turdus torquatus*	0 m	Category 1
Ringed plover *Charadrius hiaticula*	0 m	Category 1
Ruff *Calidris pugnax*	0 m	Category 1
Scaup *Aythya marila*	0 m	Category 1
Skylark *Alauda arvensis*	0 m	Category 1

Species name	Closest proximity	Level of protection
Slavonian grebe *Podiceps auritus*	0 m	Category 1
Song thrush *Turdus philomelos*	0 m	Category 1
Spotted flycatcher *Muscicapa striata*	0 m	Category 1
Starling *Sturnus vulgaris*	0 m	Category 1
Velvet scoter *Melanitta fusca*	0 m	Category 1
Whimbrel *Numenius phaeopus*	0 m	Category 1
Yellow wagtail *Motacilla flava subsp. flavissima*	0 m	Category 1
Yellowhammer *Emberiza citrinella*	0 m	Category 1
Twite *Linaria flavirostris*	0 m	Category 1
Greenshank *Tringa nebularia*	290 m	Category 1
Cuckoo *Cuculus canorus*	162 m	Category 1
Red kite *Milvus milvus*	463 m	Category 1
Black tern *Chlidonias niger*	572 m	Category 1
Garganey *Anas querquedula*	572 m	Category 1
Black-tailed godwit *Limosa limosa*	572 m	Category 1
Linnet *Linaria cannabina*	572 m	Category 1
Little ringed plover *Charadrius dubius*	572 m	Category 1
Baleraic shearwater *Puffinus mauretanicus*	990 m	Category 1
Little gull *Hydrocoloeus minutus*	990 m	Category 1
Black redstart *Phoenicurus ochruros*	990 m	Category 1
Roseate tern *Sterna dougallii*	990 m	Category 1
Grasshopper warbler *Locustella naevia*	1.4 km	Category 1
Merlin *Falco columbarius*	1.4 km	Category 1
Golden plover *Pluvialis apricaria*	1.7 km	Category 1
Hen harrier *Circus cyaneus*	1.8 km	Category 1
Lapland bunting *Calcarius lapponicus*	1.8 km	Category 1
Osprey *Pandion haliaetus*	1.8 km	Category 1
Tree pipit *Anthus trivialis*	1.8 km	Category 1
Key (as taken from COFNOD): **Category 1**: Species with European and/or UK legal protection, Section 7 Species.		

8.5.66 The over wintering bird surveys (October 2017[47]) recorded a maximum of 1,322 oystercatchers *Haematopus ostralegus* 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 was recorded using the recreational amenity grassland areas to the north of the A55 and Penmaen Park to the south. Oystercatcher are a feature of interest of the Traeth Lafan / Lavan Sands, Conway Bay SPA.

8.5.67 Other species noted during the wintering bird surveys (those in bold are features of the SPAs) were mute swan *Cygnus olor,* greater scaup *Aythya marila (*BOCC4[48] Red list, WCA[49] Schedule 1) mallard *Anas platyrhynchos*, goosander *Mergus merganser*, **great crested grebe *Podiceps cristatus***, **red-breasted merganser *Mergus serrator***, **cormorant *Phalacrocorax carbo***, bar-tailed godwit *Limosa lapponica* (Section 7)*,* **curlew *Numenius arquata,* redshank *Tringa totanus*** , ringed plover *Charadrius hiaticula* (BOCC4 Red list, Section 7) and turnstone *Arenaria interpres*.

8.5.68 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. 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.

8.5.69 Full details of the over wintering bird surveys are provided in Appendix 8.5.

8.5.70 No breeding bird surveys were conducted to inform the Scheme as it is felt that desk study data provides sufficient coverage and information to inform the assessment. However, house martins *Delichon urbicum* and swallows *Hirundo rustica* have been observed nesting within the Heath and adjacent properties.

8.5.71 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for breeding birds.

8.5.72 Aside from the SPA habitats, those within the Scheme area which provide suitable foraging, roosting and nesting habitat for breeding and overwintering birds include the plantation woodland, trees, structures, hedgerows, scrub and grassland, including the fields to the north of Penmaen Park.

8.5.73 The peak maximum counts of those species recorded which are features of the Traeth Lafan / Lavan Sands, Conwy Bay SPA relative to the SPA and GB population estimates, as well as the value of these populations, are summarised in Table 8.9. No WeBS data was available for the

[47] Martyn Owen (2018) A55 Junctions 15 and 16 Wintering Bird Survey 2017/2018 Biome Consulting
[48] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746. Available online at britishbirds. co.uk/wp-content/uploads/2014/07/BoCC4.pdf
[49] Wildlife & Countryside Act 1981 (as amended)

Liverpool Bay / Bae Lerpwl (Wales) SPA, as such an evaluation based on the above method was not possible. Species which are features of this SPA recorded within the Scheme area during the TTTC were cormorant, red breasted merganser and great crested grebe, each of these were recorded in low numbers (1 or 2 individuals) as such not in significant numbers.

8.5.74 The value of the population of each qualifying species within the study area has been calculated according to the peak TTTC recorded during the 2017-2018 wintering bird surveys, relative to the estimated population size of the SPA/s. The general rules of classification were as follows:

a) Named qualifying species and those named in the SPA assemblage where the maximum count represented >5% of the SPA population were classified as being of ***Very High/High – International/Nationa*l** significance;
b) Species where the study area maximum count represented 1-5% of the SPA population were classified as being of ***Medium/Low Value – Regional/County*** significance;
c) ***Negligible Value*** – ***Local*** significance was assigned to species whose maximum count in the study area represented 0 -1% of the SPA population;
d) Where no species were encountered, no value was assigned.

Table 8.9: Internationally Important Populations of Regularly Occurring Species within the Traeth Lafan / Lavan Sands, Conway Bay SPA

Species Name	Peak Count	SPA Wintering population (5 yr mean)	% SPA population in study area peak count	GB wintering population estimate [50]	Value (sensitivity of site)
Oystercatcher	1322 (low tide – October 2017)	6306 (exceeds British National Importance threshold)	21%	320,000	***Very High - International***
Red-breasted Merganser	1 (low and mid tide count	76	1.3%	8,400	***Low Value – County***
Curlew	28 (mid tide count January)	1,990	1.4%	140,000	***Low Value – County***
Great crested grebe	2 (high tide count January)	168	1.1%	19,000	***Low Value – County***
Redshank	12 (High tide count February)	1,367	0.8%	120,000	***Low Value – County***

[50] Musgrove *et al* 2013 *Population estimates of birds in Great Britain and the United Kingdom https://www.britishbirds.co.uk/wp-content/uploads/2010/12/APEP3.pdf*

8.5.75 The over winter qualifying species for the designated site, oystercatcher and curlew, utilise the fields to the south of Junction 15 and Penmaen Park for refuge and foraging. Approximately 1.6% of the SPA population of oystercatcher were recorded (105 individuals) and 1.4% of the SPA population of curlew (28 individuals).

8.5.76 The Scheme is considered to be of ***International Importance*** and ***County*** importance for wintering bird assemblages due to the presence of oystercatcher (***international importance*** due to populations recorded within the study area) and curlew (***County importance***) within the fields to the south, and of ***Local*** importance for breeding birds.

Reptiles

8.5.77 Only one record was identified during the data search, this was of an adder *Vipera berus* which was recorded dead on a road near to Nant Y Coed WS, 1.5km due south of the site.

8.5.78 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for reptiles mainly due to the presence of un- managed grassland, hedgerows. Woodland and scrub, which is lacking in Junction 15 and more prevalent in Junction 16.

8.5.79 There is limited suitable habitat to support reptiles present within the survey area, although reptiles may be present within the rail corridor, which would remain unaffected by the Scheme proposals and marginal habitat, which is somewhat isolated or heavily grazed. Habitat to be affected is considered to be of poor suitability to support sustainable populations of reptiles, no presence/absence surveys were deemed necessary. As such this species group has been ***scoped out*** from further assessment.

Invertebrates

8.5.80 The desk study identified fourteen notable or protected invertebrates within a 2.0 km search radius within the last ten years, the majority of which are lepidoptera. These are detailed in Table 8.10.

Table 8.10: Summary of Notable Invertebrates within 2.0 km

Species name	Closest proximity	Level of protection
Wall brown *Lasiommata megera*	373 m	Category 1 - Section 7
Grayling *Hipparchia semele*	373 m	Category 1 - Section 7
Small Pearl-bordered Fritillary *Boloria selene*	924 m	Category 1 - Section 7
White-letter Hairstreak *Satyrium w-album*	928 m	Category 1 - Section 7
Small heath *Coenonympha pamphilus*	373 m	Category 1 - Section 7
Knot grass moth *Acronicta rumicis*	1.9 km	Category 1 - Section 7
Small square-spot *Diarsia rubi*	1.9 km	Category 1 - Section 7
Small Phoenix *Ecliptopera silaceata*	1.9 km	Category 1 - Section 7
White Ermine *Spilosoma lubricipeda*	1.9 km	Category 1 - Section 7

Species name	Closest proximity	Level of protection
Buff Ermine *Spilosoma lutea*	1.9 km	Category 1 - Section 7
Small Pearl-bordered Fritillary *Boloria selene*	924 m	Category 1 - Section 7
Ctenophora pectinicornis	1.0 km	Category 2 - Red data book
Holly Blue *Celastrina argiolus*	242 m	Category 3 – LBAP (Conwy)
Purple Hairstreak *Favonius quercus*	1.6 km	Category 3 – LBAP (Conwy)
Key (as taken from COFNOD): Category 1: Species with European and/or UK legal protection, Section 7 Species. Category 2: Global Red list, British Red Data Book, Nationally Rare & Scarce, Welsh Vascular Plant Red Data List, where these are not identified in Category 1. Category 3: Locally important species as identified by local experts		

8.5.81 A Phase 1 habitat survey and initial protected species survey was conducted by TACP in September 2015 in respect of J15 and J16. Their report states that, in general, the surveyed area is of local ecological value for invertebrates.

8.5.82 No site specific surveys have been conducted for the purpose of this Scheme due to the type and extent of habitats which mostly consist of landscape planting and grazed pasture. Considering the isolated occurrences of the species detailed in Table 8.10, protected and notable invertebrates within the Scheme area are considered to be of ***Local*** significance.

Fisheries

8.5.83 The desk study identified 2 species records within a 2.0 km search radius within the last ten years. These are brown trout *salmo trutta* (100 sub-adults) and eel *Anguilla anguilla* (10 sub-adults). Both species were netted during a fish rescue in respect of works to the Afon Llanfairfechan/Ddu which is located 150 m due west of the scheme at its nearest point. No suitable habitat is within the construction footprint. Migratory fish are considered to be of ***Local*** significance.

Invasive Non-Native Species (INNS)

8.5.84 Three-cornered leek *Allium triquetrum* and Himalayan knotweed *Persicaria wallichii* were highlighted during the desk study recorded on the railway embankment behind the hut café. Other INNS within 2km include Himalayan Honeysuckle *Leycesteria formosa*, Pampas grass *Cortaderia selloana*, wall cotoneaster *Cotoneaster horizontalis* and Entire-leaved Cotoneaster *Cotoneaster integrifolius*.

8.5.85 INNS noted during the phase 1 habitat surveys include Montbretia *Crocosmia x crocosmiiflora* which forms an extensive patch to the south east of Junction 15 (Target Note 4, Figure 8.3). Japanese knotweed *Fallopia japonica* occurs in small patches on the Afon Llanfairfechan/Ddu. No other invasive plant species was recorded.

8.6 Assessment of Effects

Assessment Criteria and Assignment of Significance

8.6.1 The Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018) are the current industry standard for ecological assessment and are therefore considered to be current good practice. The assessment of effects on ecological receptors and the assessment of the significance of effects was therefore undertaken in line with the CIEEM guidance.

8.6.2 The assessment of the significant effects of the Scheme focuses on those ecological features identified through desk study and field surveys as being important. The value of an ecological feature has been determined based on professional judgement and the role of the ecological feature within the landscape, as well as considering its importance within a defined geographical context. Various characteristics contribute to the importance of ecological features including whether it is internationally, nationally, or locally important, the size of habitat or species population, habitat connectivity, rarity and robustness. This includes, for European protected species, consideration of both the current conservation status (CCS) and favourable conservation status (FCS) where this information is available. In cases of reasonable doubt, where it has not been possible to justify a conclusion of no significant effect robustly, a significant effect has been assumed and where uncertainty exists, this is acknowledged.

8.6.3 Table 8.11. categorises the value of ecological features within the defined geographical context

Table 8.11: Value of Ecological Receptors

Value (sensitivity)	Typical Descriptors
Very High – International and European	An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site). A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of an internationally important species, which is threatened or rare in the UK. i.e. it is a UK Red Data Book species or listed as occurring in 15 or fewer 10.0 km squares in the UK. A regularly occurring, nationally significant population/number of any internationally important species.
High – UK or National	A nationally designated site (SSSI, ASSI, NNR, Marine Conservation Zones and Marine Protected Areas). A viable area of a priority habitat identified in Section 7 of the Environment (Wales) Act 2016, or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of a nationally important species which is threatened or rare in the region or county. A regularly occurring significant population/number of any nationally important species, including Schedule 8 plant species.
Medium – Regional	Viable areas of key habitat identified in in Section 7 of the Environment (Wales) Act 2016 or other plans or smaller areas of such habitat which are essential to maintain the viability of a larger whole.

Value (sensitivity)	Typical Descriptors
	Viable areas of key habitat identified as being of Regional value. Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10.0 km squares in the UK or occurs on Section 7 or is relevant account of its regional rarity or localisation. A regularly occurring, locally significant number of a regionally important species. Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
Low - County	Semi-natural ancient woodland greater than 0.25 ha. County/District sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves. Any regularly occurring, locally significant population of a species which is listed in a County "red data book" or similar on account of its regional rarity or localisation. A regularly occurring, locally significant number of a County important species.
Lower - Local	Semi-natural ancient woodland smaller than 0.25 ha. Local sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Wildlife Sites. Sites/features that are scarce within the locality or which appreciably enrich the habitat resource. A diverse and/ or ecologically valuable hedgerow network. A regularly occurring, locally significant number of an important species during a critical phase of its life cycle.

8.6.4 Where a feature has value at more than one level, its overriding value is that of the highest level. For example, a site designated as a SPA for internationally important features and as a SSSI for nationally important features will be considered as being internationally important.

8.6.5 In carrying out the assessment, a general method for the grading of the significance of effects has been adopted to ensure consistency. A significant effect is an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the consequences of the Scheme on the ecology and nature conservation interest.

8.6.6 The assessment of potential and significant residual effects has utilised the following five level magnitude of effects as shown in Table 8.12.

Table 8.12: Magnitude of Effects and Descriptors

Magnitude of Effect	Typical Descriptors
Major	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within an international or national context – **major beneficial effect.** The change is likely to cause a permanent (irreversible) effect on the integrity of an ecological receptor– **major adverse effect.**

Magnitude of Effect	Typical Descriptors
Moderate	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within a regional or county context – **moderate beneficial effects.** The change adversely affects the valued ecological receptor, but there will probably be no permanent effect on its integrity with appropriate mitigation and is reversible – **moderate adverse effect.**
Minor	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within a local context minor beneficial effect. The change adversely affects the valued ecological receptor in the short term but there will be no permanent effect (reversible) – **minor adverse effect.**
Negligible/Slight	The change is likely to restore or retain the status of an ecological receptor –**slight beneficial effect.** The change affects the valued ecological receptor in the short term but there will be no permanent effect (reversible) – **slight adverse effect.**
No change/Neutral	The change has no significant effect on the ecological receptor, either beneficially or adversely.

8.6.7 In addition to the magnitude and whether the effects are beneficial or adverse, the effects will also be assessed for:

a) Extent – the spatial or geographical area over which the effects may occur;
b) Duration – to be characterised in ecological characteristics as well as human time frames;
c) Frequency and timing – e.g. how often an activity occurs and at what times;
d) Reversibility – whether or not the effect on the receptor can be reversed within a reasonable timescale or not.

8.6.8 When undertaking an EIA, environmental impacts are classified as either permanent or temporary, as appropriate. 'Permanent' changes are those which cannot be reversed (e.g. permanent land take) or will last for the foreseeable future (e.g. noise from generated road traffic). 'Temporary' are short term impacts that can be reversed. Within the assessments the following has been used as a guide:

a) Short-term: one to three years (i.e. opening year);
b) Medium-term: four to nine years; and
c) Long-term: greater than nine years (i.e. Design year – 15 years).

8.6.9 In order to provide consistency across the Environmental Statement, a matrix approach has been adopted. However, the CIEEM EcIA guidelines avoid and discourage the use of the matrix approach in ecological assessment as it is considered to have a number of disadvantages for assessing the significance of residual effects[51]. Consideration has been given to the matrix in Chapter 4 using the tables above to assign a category of significant residual effect after mitigation, to ensure consistency across all the topics of the Environmental Statement.

[51] Box, J, Dean M& Oakley, M (2017) *An alternative approach to the reporting of categories of significant residual effects in Environmental Impact Assessment*. In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management 97: 47-50.

Summary Evaluation of Ecological Baseline

8.6.10 It is impractical for an assessment of the ecological effects of the Scheme to consider every species and habitat that would be affected; instead it should focus on 'Valued Ecological Receptors' (VERs) based on their legal protection, designation, rarity etc and whether they are significantly affected by the Scheme.

8.6.11 Species and habitats which are considered to be widespread, not threatened and resilient to the Scheme effects and which will remain viable and sustainable have been scoped out of the assessment. However, where a species or habitat has been 'scoped out' consideration will still be given to safeguarding biodiversity in general in order to comply with relevant plans, policies and initiatives. For example, all habitats listed in Table 8.6 which are not Priority habitats but are of local importance, flora, badger, hedgehogs and invertebrates are not considered to be VERs but are considered important in terms of their biodiversity value and so general mitigation measures are recommended in 8.8. where necessary. In addition, measure to control INNS are provided as part of tertiary mitigation.

8.6.12 Table 8.13 provides a summary of the VERs identified through desk study and site visit, their assigned value and justification for inclusion or exclusion.

Table 8.13: Summary of Valuable Ecological Receptors

Receptor	Value	Justification	VER
Statutory Designated Sites			
Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI	**International - Very high**	Due to its assemblages of waterfowl and wetland birds and location adjacent to the Scheme area. None of the key areas used by the wetland birds will be directly affected. However, there may be direct and indirect effects to associated habitats which are used including the grassland to the north of Penmaen Park, affecting their foraging and refuge habitat. Noise from construction may temporarily displace birds and there will be a small loss of grassland habitat. Oystercatcher and curlew have been recorded within the fields.	✓
Liverpool Bay / Bae Lerpwl (Wales) SPA	**International - Very high**	Due to its assemblages of waterfowl and wetland birds and habitats. None of the key areas used by the wetland birds will be directly affected. In addition, it is considered that the associated effects from the Scheme would not significantly disturb the aggregations of roosting, loafing or feeding waterfowl.	✓
Anglesey Terns SPA	**International - Very high**	Due to its assemblages of breeding birds. None of the key areas used by the breeding birds will be directly affected as the site is located 6.3 km from the Scheme.	x
Puffin Island SPA	**International - Very high**	Due to its assemblages of breeding cormorant. None of the key areas used by breeding cormorant will be directly affected as the site is located 7.3 km from the Scheme.	x
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	**International - Very high**	No significant effects on the features of the Annex I habitats that are a primary reason for selection of this site are envisaged, however the site is in close proximity to the Scheme.	✓
Coedydd Aber SAC/SSSI/NNR	**International - Very high**	No significant effects on the features of the Annex I habitats that are a primary reason for selection of this site are envisaged due to the distance of the site from the Scheme. Otter have been recorded on the coast and also along the Afon Llanfairfechan/Ddu and salmon are likely to occur in the Afon Llanfairfechan/Ddu. Chapter 7 Road Drainage and Water Environment state that no effects upon this river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). The Nant-y-Felin fach flows within the designated sites but there is no hydrological connection to this and the Scheme which could affect the watercourse.	✓ otters and salmon

Receptor	Value	Justification	VER
Eryri / Snowdonia SAC/SSSI	**International - Very high**	No significant effects on the features of the Annex I habitats that are a primary reason for selection of this site are envisaged due to the distance of the site from the Scheme (3 km). Otters have been recorded on the Afon Llanfairfechan / Ddu and salmon are likely to occur in the Afon Lanfairfechan/Ddu, though this watercourse is not directly affected by the Scheme. Chapter 7 Road Drainage and Water Environment state that no effects upon this river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	P Otters and salmon
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	**International - Very high**	No significant effects on the features of the Annex I habitats that are a primary reason for selection of this site are envisaged due to the distance of the site from the Scheme. Lesser horseshoe bats have been recorded on site, in small numbers, i.e. (one or two individuals). However, within a landscape scale, it is more likely that the LH bats occurring on site are from nearby roosts and not commuting from the SAC. The main commuting route for LH bats occurring within this SAC is likely to be along the Conwy Valley. The topography between the Conwy Valley, the SAC and the site is elevated (approximately 600m above sea level) with less habitat diversity, structure and woodland cover, which may fragment the connectivity between the SAC and the Scheme footprint.	x
Glynllifon SAC	**International - Very high**	Lesser horseshoe bats have been recorded on site, in small numbers, i.e. (one or two individuals). However, within a landscape scale, it is more likely that the LH bats occurring on site are from nearby roosts and not commuting from the SAC. The SAC is 28.5 km from the Scheme and habitat connectivity is fragmented.	x
Sychnant Pass SSSI	**National - High**	The site is located 1.4 km due east. None of the habitats or species which are a feature of the SSSI would be significantly affected by the Scheme.	x
Aber Afon Conwy SSSI	**National - High**	The site is located 2.4 km due east from the Scheme. None of the habitats or species which are a feature of the SSSI would be significantly affected by the Scheme though birds which occur within the SSSI including curlew and oystercatcher have been recorded within the Scheme area. These have been included in the designated sites listed above.	x
Cadnant SSSI	**National - High**	No effects envisaged due to distance from the Scheme.	x
Non - Statutory Designated Sites (Local Nature Reserves)			
Nant-y-Coed	**Low – County**	This site is located upstream of Llanfairfechan on the Afon Llanfairfechan/Ddu and will not be affected by the Scheme.	x

Receptor	Value	Justification	VER
Traeth Lafan	**Refer to SPA/SSSI**	This site is a component of the SPA/SSSI as such the higher designation value is awarded.	✓
Non- Statutory Designated Sites (Candidate Wildlife Sites)			
Penmaenmawr Old Quarry	**Lower - Local**	Not affected by the Scheme due to distance.	x
Afon Llanfairfechan (Afon Ddu) also a Priority Habitat	**Medium – Regional**	This habitat would not be directly affected by the Scheme proposals but may be indirectly affected as a result of pollution incidences. Chapter 7 Road Drainage and Water Environment state that no effects upon this river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.	✓
Henar	**Lower - Local**	Not affected by the Scheme due to distance.	x
Penmaenmawr Quarry Heath	**Lower - Local**	Not affected by the Scheme due to distance.	x
Bryn-y-neuadd	**Lower - Local**	Not affected by the Scheme due to distance.	x
Llanerch Grassland and Woods	**Lower - Local**	Not affected by the Scheme due to distance.	x
Coed Nant y Felin	**Lower - Local**	Not affected by the Scheme due to distance.	x
Nant y Coed, Llanfairfechan	**Refer to NNR**	This site is a component of the LNR located upstream of Llanfairfechan on the Afon Llanfairfechan/Ddu and will not be affected by the Scheme.	x
Glan- Y – Mor Elias also a Priority Habitat	**Medium – Regional**	This site is located along the coast and consists of saltmarsh and semi-improved neutral grassland. There could be a potential effect pathway were pollutants to enter into the sea and were washed in the tide and settle upon the saltmarsh habitat.	✓
Madryn grazing marsh and dunes (Glan y Mor Elias) also a Priority Habitat	**Medium – Regional**	This site is located along the coast and consists of coastal grazing marsh and dunes. There could be a potential effect pathway were pollutants to enter into the sea and were washed in the tide and settle upon the saltmarsh habitat.	✓
Fridd Mynydd Uchaf	**Lower - Local**	Not affected by the Scheme due to distance.	x

Receptor	Value	Justification	VER
Mynydd Uchaf Heath	**Lower - Local**	Not affected by the Scheme due to distance.	x
Graig Llwyd Heath	**Lower - Local**	Not affected by the Scheme due to distance.	x
Penmaen Woods	**Lower - Local**	Not affected by the Scheme due to distance.	x
Waun Llanfair	**Lower - Local**	Not affected by the Scheme due to distance.	x
Madryn Reedbed also a Priority Habitat	**Medium – Regional**	This site is located along the coast and consists of saltmarsh, reedbed and standing water. There could be a potential effect pathway were pollutants to enter into the sea and were washed in the tide and settle upon the saltmarsh habitat.	✓
Ancient Woodland			
Ancient Semi-natural woodland sites, including Restored Ancient Woodland and Plantation on Ancient Woodland	**Lower - Local**	Not affected by the Scheme due to distance.	x
Priority Habitats			
Parkland / scattered trees broadleaved	**Medium – Regional**	A priority habitat. The trees to the north of Penmaen Park are a Priority habitat and have low – moderate potential to support bats as well as being mature and set within a parkland landscape.	✓
Running water	**Medium – Regional**	This habitat would not be directly affected by the Scheme proposals but may be indirectly affected as a result of pollution incidences. Chapter 7 Road Drainage and Water Environment state that no effects upon the Afon Llanfairfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.	✓
Coastland	**International - Very High**	Coastal habitats including subtidal sands and gravel and sandflats occur within close proximity to the Scheme and are features of interest of the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC and Traeth/Lafan SSSI.	✓

Receptor	Value	Justification	VER
Hedge intact species poor	**Medium – Regional**	Hedgerows are a Priority habitat, defined as any boundary line of trees or shrubs over 20m long and less than 5m wide and includes HR1 to the north of Penmaenmawr Rd.	✓
Species (Fauna)			
Bats	**Lower Local – Medium Regional**	Recognising that all bats are afforded protection under European legislation and taking into consideration the results of the surveys, which identified seven species of bats and one roost, the Scheme corridor is considered to be of Medium – Regional significance for noctule bats and of Local importance for common and soprano pipistrelles, Daubentons, natterers, lesser horseshoe, brown long-eared. The roost is considered to be of Local importance.	✓
Otter	**Lower Local**	This species may be indirectly affected as a result of pollution events which may affect the habitats upon which they rely. Chapter 7 Road Drainage and Water Environment state that no effects upon the Afon Llanfiairfechan / Ddu (where otters have been recorded) river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.	✓
Wintering birds	**International - Very High – Low County**	The Scheme is considered to be of Very High - International Importance and County importance for wintering bird assemblages due to the presence of oystercatcher (international importance due to populations recorded within the study area) and curlew (County importance) within the fields to the south.	✓
Breeding birds	**Lower Local**	Loss of and disturbance to habitat used for nesting and foraging.	✓
Fisheries	**Lower Local**	This species group may be indirectly affected as a result of pollution events which may affect the habitats upon which they rely. Chapter 7 Road Drainage and Water Environment state that no effects upon the Afon Llanfiairfechan / Ddu river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.	✓

Receptor	Value	Justification	VER
INNS			
Montbretia Crocosmia x crocosmiiflora	**N/A**	Montbretia Crocosmia x crocosmiiflora which forms an extensive patch to the south east of Junction 15, Target Note 4, Figure 8.3). This would be disturbed during construction and land take.	x

Future Baseline Conditions

8.6.13 Rapid, large changes in global temperatures (4°C or more above the pre-industrial temperature by the end of this century) and changes in rainfall patterns will increase the vulnerability of many species to climate change and may lead to the extinction of entire species. Even with smaller amounts of warming, many species will be placed at greater risk. The animals and plants most at risk will be those that:

a) Have no new habitats to move to;
b) Can't move quickly to new habitats;
c) Are already under threat from other factors, such as overharvesting or habitat loss and degradation because of human activity.

8.6.14 Climate change affects biodiversity because species tend to evolve to a specific range of environmental factors such as temperature, moisture, etc. As these factors alter due to climate change, species need to migrate to stay in their optimum environment. Some species are more adaptive, but, for others, a changing environment is a threat to their ability to survive and therefore increases extinction rates and reduces biodiversity.

8.6.15 The ability of species to respond to this climate-enforced migration is also limited by human activity, which has changed land-use and fragmented habitats. When roads, urban areas and agricultural land stand in their way, many species will find it almost impossible to migrate across the landscape. There is therefore a need to facilitate this natural adaptation process by, for example, creating migration corridors of natural habitats and reducing fragmentation.

8.6.16 Extinctions and changes in the number of species in a population will have large but unpredictable effects on food chains. Most ecosystems would struggle to function as they currently do, if large changes in climate happen rapidly within a century or so.

8.6.17 There is the potential for change in the baseline conditions in the medium to long term as a result of climate change. The climate change risk assessment for Wales (January 2012)[52] identified the main potential results of climate change significant to the natural environment to be:

a) Reduction in soil moisture and lower river flows, and an increase in the frequency and magnitude of droughts;
b) Changes in soil organic carbon, although the ways in which it might be affected are not adequately understood at present;
c) Changes in climate space and species migration patterns, which could result in significant changes to biodiversity;
d) Increases in pests and diseases;
e) Changes to coastal and estuarine habitats and species, including a reduction in intertidal area; and
f) Changes to the marine environment, including an increase in disease hosts and pathogens, harmful algal blooms and invasive species. The effects of ocean acidification include adverse effects on shellfish.

8.6.18 The first sector-based chapter of the Draft Climate Change Adaptation Plan for Wales[53] focuses on the actions needed to ensure our natural environmental remains resilient against the impacts

[52] UK 2012 Climate Change Risk Assessment (Defra Project Code GA0204) A climate change risk assessment for Wales January 2012.
[53] Welsh Government Consultation Document. (Number: WG35911). Draft Climate Change Adaptation Plan for Wales 03 December 2018)

of climate change. This document highlighted the following urgent risks:

a) Risks to habitats due to the inability to respond, and opportunities from new species colonisations;
b) Risks to soils from increased aridity / wetness;
c) Risks to agriculture and wildlife from water scarcity and flooding; and
d) Risks to freshwater species from higher water temperatures.

8.6.19 Poleward and upward shifts in species' distribution have been recorded in the UK and on a global scale. In some cases, changes in migration, breeding and flowering dates have resulted in species having difficulties finding food[54].

8.6.20 Within a Scheme concept, measures can be adopted which can assist, even within a small-scale context, biodiversity. For example, by implementing Biodiversity Net Gain (BNG). Biodiversity must be retained, restored and enhanced both for its intrinsic value and for the tangible benefits that it has for society and economy (ecosystem services). Habitats must remain connected and landscape designs must aim to enhance and restore connectivity. The reduction of barriers to movement of species allow species to move as the climate changes.

8.6.21 Other potential effects on the future baseline are the link with the coastal areas and sea level rise, species migration patterns including fish and migratory bird species, increases in INNS, stress to native species therefore decreasing resistance to invasion of INNS, reduction in intertidal habitats including those which are a feature of the designated sites and important habitat for breeding and over wintering bird assemblages. Fisheries including shellfish could also be affected by an increase in water temperature and changes in water quality. There may also be implications on the status of the designated sites and degradation in ecological functionality.

8.6.22 In grassland habitats, reduced summer rainfall and increased evaporation and transpiration could affect species composition.

8.6.23 Overall, climate change and the effects on the natural environment are hard to predict due to a range of interrelated factors, i.e. economic growth, new developments and technologies and the actions which Welsh Government and key organisations are taking to minimise climate risks at present.

8.6.24 Whilst in the long term, rising sea levels may cause a loss of intertidal habitats (which are hard to predict), it is considered that this will not influence the effects of the Scheme on biodiversity within the timescale of construction and opening of the new road Scheme and layout. The A55 would still be in operation as a major traffic route, with the revised layout of J15 not significantly affecting the future baseline of species and habitats, within a local, regional, national, international and global context in comparison to extensive deforestation which occurs on a global scale and the potential removal of Ancient Woodland within the UK to make way for infrastructure.

8.6.25 Chapter 16 states that effects on climate are anticipated to be not significant during the operation of the Scheme. The assessment included in Section 16.11 of this chapter 16 concludes that the Scheme will not result in any significant effects with regards to Climate Change Resilience or in-combination climate impacts.

[54] Climate Emergency and Biodiversity Crisis: The Facts and Figures CIEEM Briefing Paper September 2019

8.7 Identification of Potential Effects

Effects Resulting from Changes in Air Quality

8.7.1 The effects of changes in air quality as a result of the construction and operation of the Scheme are described in Chapter 12: Air Quality. This has shown the potential effects of elevated NOx concentrations on designated sites. The air quality effects are assessed in isolation of other general construction and operation effects due to the complexity of potential effects from increased NOX levels on habitats (including those which are features of the designated sites).

8.7.2 The Air Quality Assessment identified three designated sites within 200m of the Affected Road Network (ARN) of the proposed Scheme. These are the Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC.

8.7.3 Recent monitoring in the area undertaken by Ramboll – adjacent to existing roads south of the A55 highway – recorded an annual mean of NO2 between **13** and **16**µg/m3. These locations are not adjacent to the designated areas but can be indicative of the NO2 levels in the area. Whilst the objective for protection of vegetation / ecosystems is for NOx, it is most likely that NOx levels would be within the objective / Critical Level – as indicated by the APIS System. PM10 and SO2 is not assessed as part of air quality impacts on designated sites.

8.7.4 Habitats within 200m of the ARN which could be affected by Air Pollution include:

a) Moderately exposed sand (including sandbanks);
b) Running water;
c) Saltmarsh;
d) Mudflats and sandflats not covered by seawater at low tide;
e) Hedgerows;
f) Semi-improved neutral grassland, and
g) Broadleaved trees/woodland.

8.7.5 The recommended values within nutrient nitrogen deposition critical load ranges for use in air pollution impact assessment (kgN/ha/yr) and for NOX µg as defined by the Air Pollution information System (APIS) are detailed in Table 8.14:

Table 8.14: APIS Critical Loads

Habitat	N Dep (kgN/ha/yr)	NOX (µg)
Moderately exposed sand	Not sensitive	Not sensitive
Running water	No estimate available	No estimate available
Saltmarsh	upper saltmarsh – 20, lower saltmarsh 30 kgN/ha/yr	30 ug
Mudflats and sandflats not covered by sea water at low tide	No estimate available	30 ug
Hedgerows	10-20 kgN/ha/yr	30 µg NOx (as NO2) m-3
Semi-improved neutral grassland	No estimate available, (for unimproved grassland this is set at 20 kgN/ha/yr	
Broadleaved trees /woodland	10 kgN/ha/yr	No estimate available

Construction Effects - Air Quality

8.7.6 The Scheme is within close proximity to designated sites, as such, there may be a risk that the habitats and features of interest of the sites could be affected by dust. Dust sources from works close to the designated sites include concrete dust during the demolition of existing buildings, and dust from other man-made materials. Earthworks causing silts to be displaced and enter the environment, site clearance and haulage of materials etc.

8.7.7 The Institute of Air Quality Management (IAQM) guidance states that the aim would be to prevent significant effects on receptors through the use of effective mitigation.

8.7.8 The annual mean NOx objective (30µg/m3) is predicted to be met at all designated sites during construction of the Scheme. With appropriate mitigation in place the residual effect of construction is assessed as not significant. Further details are provided in Chapter 12. Air Quality Chapter.

Operational Effects - Air Quality

8.7.9 In the Opening Year of the Scheme, the annual mean NOx objective (30µg/m3) is predicted to be met at the designated site/s and other habitats. The NOx critical level and critical load for nutrient nitrogen deposition is not exceeded within 200 m from the J15 Scheme for both 'Do Minimum' and 'Do Something' scenarios. There is a reduction in NOx concentration and nutrient nitrogen due to the J15 Scheme. Further details are provided in Chapter 12 Air Quality Chapter.

Mitigation for Air Quality Effects

8.7.10 Mitigation measures to control air pollution are described in Chapter 12 Air Quality. The control of dust emissions from construction sites would be set out within a Dust Management Plan which would form part of the Construction Environmental Management Plan (CEMP) that would accompany the Draft Orders and ES for the J15 Scheme or be secured through an appropriately worded planning condition.

8.7.11 The effects of development traffic on local air quality are judged to be not significant with an overall improvement in air quality concentrations. No additional traffic mitigation is therefore required to reduce the direct effects of the development on local air quality.

Conclusions from Changes in Air Quality

8.7.12 The results of the air quality assessment completed for the Scheme demonstrate that there would not be significant air quality impacts on receptors from construction or operational traffic and that NOx and Nitrogen Deposition levels (from APIS) are within the objective / Critical Level / Critical Load.

8.7.13 The increase in NOx concentrations and nitrogen deposition on ecological receptors is unlikely to have a significant effect on the integrity of the receptors given the magnitude of the predicted changes and the limited areas of the habitats affected. The operational air quality effects of the J15 Scheme are judged to be not significant for ecological receptors.

Assessment of Construction Effects

8.7.14 The assessment of construction effects include land take effects e.g. site clearance and land taken for construction of the Scheme, including site access, service diversions, demolition and

topsoil stripping and will be both permanent and temporary. Temporary working space would be required outside the permanent land take for the Scheme and this land would be identified and included within the draft Compulsory Purchase Order (CPO).

8.7.15 Land required on a temporary basis would be taken to allow efficient, safe construction and to minimise the environmental impacts and would be used for the contractors compound, materials storage areas, haul roads and to provide adequate space to erect boundary fences, divert services and install drains and culverts. The total land take required for the Scheme (including land take required temporarily) is approximately 10.55 ha (105,555 m2) in total area. The J15 mainline realignment length is 602 m. The J15 side road length is 460 m. The extent of land-take for the scheme is shown in two drawings in Figure 2.4.

8.7.16 The possible effects arising from construction include increased siltation, noise, release of pollutants and increased temporary lighting. The construction activities associated with the Scheme include:

a) Construction of the main site compounds;
b) Construction of main site access points;
c) Temporary and permanent fencing;
d) Construction of temporary diversions to existing footpath and cycleways.
e) Development of site haul roads;
f) Statutory Undertakers service diversions;
g) Topsoil stripping and stockpiling with archaeological monitoring;
h) Earthworks operations to form embankments and cuttings;
i) Drainage operations;
j) Haulage of materials to and from the site on the existing road network;
k) Construction of the carriageways
l) Side road works; and
m) Accommodation works;

8.7.17 The construction activities are summarised in Chapter 2 The Scheme.

8.7.18 The construction programme for the main works would have a duration of approximately 24 months, commencing early-mid2022 to end 2023. Construction would be anticipated to commence in 2021, with work programmed to take place over period of approximately 24 months. The construction would be completed, and the scheme opened in 2023, followed by a 3 year period of environmental maintenance and aftercare extending until 2026.

8.7.19 Some activities would extend beyond substantial completion. These would include demobilisation of works compounds and seasonally constrained activities such as aftercare landscaping.

8.7.20 In this section, the potential effects of the construction (including land take) on each of the VERs as detailed within Table 8.13 are identified and assessed in the absence of mitigation, then with mitigation in place (Section 8.8) in order to determine the significance of residual effects.

Statutory Designated Sites

8.7.21 There will be no direct land take effects upon habitats within the designated sites as listed in Table 8.13. However, habitats outside of the designated sites are used by birds which are features of interest of the Traeth Lafan / Lavan Sands, Conwy Bay SPA Lavan Sands (oystercatcher and curlew).

8.7.22 Other SPA species noted during the wintering bird surveys are great crested grebe, red-breasted merganser, cormorant and redshank. However, these species have not been recorded on site and are unlikely to utilise land within the Scheme footprint as they are aquatic specialists and do not generally utilise land for breeding and foraging.

8.7.23 The main potential effect upon designated sites and their features of interest would be indirect disturbance as a result of potential pollution incidences and noise due to the proximity of the designated sites and mobility of species which are features of the SPA. Those sites most at risk are Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI, Liverpool Bay / Bae Lerpwl (Wales) SPA and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC.

8.7.24 Those habitats which are features of the Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC are not evident in close proximity to the Scheme. Annex I Habitats which are a feature of interest generally tend to occur to the west towards the Menai Strait. However, extreme pollution events, including spillages may encroach upon these habitats in the absence of control measures. This is also the case for habitats which are features of interest of Traeth Lafan SSSI.

8.7.25 The risk of spillage, and the likelihood of a pollution incident occurring as a result, was determined in the water quality assessment (Appendix 7.3). The risk of a pollution incident at J15 is 1 in ~1300 years. Where discharge is to a sensitive waterbody (such as an SAC, SPA etc), a return period less frequent than 1 in 200 years is acceptable.

8.7.26 The over winter qualifying species for the designated site, oystercatcher and curlew, utilise the fields to the south of Junction 15 and Penmaen Park for refuge and foraging. Approximately 1.6% of the SPA population of oystercatcher were recorded (105 individuals) and 1.4% of the SPA population of curlew (28 individuals). A proportion of this habitat would be lost and/or temporarily disturbed to land take (permanent 0.61 ha and temporary 0.55 ha) though adjacent areas to the south would remain intact. Only a small percentage of oystercatcher were recorded within the construction footprint (up to 25 individuals). The fields are unlikely to be utilised during the construction of the new junction due to noise and potentially lighting which would displace and/or deter birds which are a feature of the SPA's from the construction area.

8.7.27 The Scheme area is considered to be of ***International Importance*** and ***County*** importance for wintering bird assemblages due to the presence of oystercatcher (international importance due to populations recorded within the study area) and curlew (County importance) recorded in small numbers within the fields to the south.

8.7.28 In the absence of mitigation, construction effects, including noise and pollution upon the designated sites and features of interest are considered to be a ***Moderate Adverse*** effect.

8.7.29 A Statement to Inform an Appropriate Assessment will be carried out for these sites.

Non Statutory Designated Sites

8.7.30 There will be no land take effects upon the features of interest of the non-statutory designated sites.

8.7.31 Those non statutory sites which have a hydrological link to the Scheme, either via rivers, outfalls, or the marine environment may be at risk from pollution events during construction, including spillages which may encroach upon these habitats in the absence of control measures. The sites most at risk are considered to be Traeth Lafan LNR (which is a component of the SPA

and SSSI and as such is considered above), Glan- Y-Mor Elias WS, Madryn grazing marshes and dunes WS and Madryn reedbed WS.

8.7.32 Afon Llanfairfechan/Ddu is located 378 m from the Scheme due west. Chapter 7 Road Drainage and Water Environment state that no effects upon the Afon Llanfiairfechan / Ddu river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.7.33 Construction effects upon the Afon Llanfairfechan/Ddu (a receptor of ***Medium-Regional*** importance as it is also a Priority Habitat) are considered to be a ***Neutral*** effect.

8.7.34 Glan- Y-Mor Elias, Madryn grazing marshes and dunes and Madryn reedbed are located 1.34 km and 1.77 km due west and include reedbed, saltmarsh and standing water (receptors of ***Medium – Regional*** importance as they are also a Priority Habitat). Due to the distance of these sites from the Scheme, effects are considered to be ***Neutral.***

Parkland / Scattered Trees Broadleaved A3.1

8.7.35 Wood Pasture and Parkland is classified as a Priority Habitat under Section 7 of the Environment (Wales) Act. Taken in context with the wider landscape to the north, including Penmaen Park, it is considered that the parkland and scattered trees within this this area of land contains some key features associated with the Priority habitat, though on a smaller scale. The parkland has mature parkland trees, some of which have the potential to support roosting bats, is sheep-grazed and is also an area of essential setting for Wern Isaf, a Grade II* Listed building that encompasses most of the hillside.

8.7.36 To accommodate the junction, which has to meet current highway design standards, Penmaenmawr Road would be moved further south, cutting into the adjacent parkland. Land take will be required for construction, landscaping, access, service diversions and as a construction compound. This would result in the loss of poor semi-improved grassland, woodland plantation and hedgerows as well as potentially resulting in the loss of and/or disturbance to mature trees located within the field. In total, the areas of land take within this field is 1.88 hectares.

8.7.37 Other in-direct construction effects to retained habitat may occur from increased dust from demolition and construction, and haulage operations and disturbance during earthworks, and utility diversions where works encroach upon the root protection zone of retained habitats.

8.7.38 A proposed construction compound, water main diversion route and maintenance route fall in close proximity to mature trees located within this field located to the south of Penmaenmawr Rd. Construction works in close proximity to these trees would potentially encroach upon the Root Protection Zone (RPZ) of these, leading to damage and/or removal.

8.7.39 Within this habitat, the extent of habitat lost vs habitat created is shown in Table 8.15.

8.7.40 Due to its classification as a Priority habitat, taking into context with the wider landscape value, this VER is considered to be of ***Medium – Regional Value***. A large area will be lost as a result of land take and may result in the loss of or damage to mature trees (which form a significant feature of the parkland).The loss of mature trees is a conflict of local and government

Biodiversity objectives and policies and cannot be replaced. In the absence of mitigation, the effect is considered to be a ***Major Adverse Effect***.

Running water G.2

8.7.41 The Afon Llanfirfechan / Ddu is located to the west. There will be no land take effects upon this Priority habitat. Construction effects to this habitat is discussed in section 8.7.29 and 8.7.30 (Afon Llanfairfechan/Ddu).

Coastland H

8.7.42 Coastal habitats including subtidal sands and gravel and sandflats occur within close proximity to the Scheme and are features of interest of the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC and Traeth/Lafan SSSI. There will be no land take effects upon any coastal habitats. Other construction effects to coastal habitats are discussed in the sections above.

Hedge Intact Species Poor J2.1.2

8.7.43 Hedgerows are a Priority habitat, defined as any boundary line of trees or shrubs over 20m long and less than 5m wide and includes HR1 to the north of Penmaenmawr Rd. The entire hedge as well as the woodland plantation to the north of the hedge will be lost as a result of land take. The extent of hedgerow to be lost is 0.0219 hectares (260 m in length). This habitat provides commuting and foraging habitat for bats as well as providing refuge for nesting birds and other small mammals, the effects on species are detailed in the following sections.

8.7.44 Due to its classification as a Priority habitat and taking into consideration the loss of the adjacent landscape planting, this VER is considered to be of ***Medium – Regional Value***. All of this habitat will be lost as a result of land take in order to make way for the Scheme. In the absence of mitigation, the effect is considered to be a ***Moderate Adverse Effect***.

Bats

8.7.45 Effects of land take on bats include loss of habitat, destruction of roosts and, possibly, risks of mortality and habitat fragmentation. There would be the permanent loss of foraging and commuting habitat with the removal of the hedgerow and landscape planting which currently occurs to the south of Penmaenmawr Road, plantation woodland to the south west of Junction 15 and also that which runs south, adjacent to the existing A55 and also a small area to the north of the A55.

8.7.46 Two residential properties would be demolished, these occur to the east of Shore Road East, properties 8 and 9 Penmaen View, Penmaenmawr Rd. External and internal inspections were conducted on these, as well as the deployment of static detectors within the loft space and two emergence surveys. No recordings were picked up on the static detectors, however, a common pipistrelle bat was seen to emerge from the roof area of one of the properties during both of the emergence surveys, as such a derogation licence from NRW would be required.

8.7.47 Three species of bat were recorded during the transects conducted in 2018 and four in 2019. These are common and soprano pipistrelle, noctule in 2018 and additionally 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 Llanfairfechan and concentrated around the group of trees within the field to the south of Penmaenmawr Rd and those which line the dry ditch and connect with the hedgerow and plantation woodland.

8.7.48 No bats were seen crossing over the A55 and very few bats, only one or two were noted commuting along Shore Road East and under the bridge to the sea front. Very little activity was recorded adjacent to the A55, as one would expect, and along the transect to the north between the A55 and railway.

8.7.49 Static detectors identified seven species of bat with a number of passes recorded within the field to the south of Penmaenmawr Rd, in particular of the noctule bat where 1342 passes were recorded.

8.7.50 Bats currently utilising the habitat to the south of Penmaenmawr Rd for commuting and foraging would be displaced, and alternative routes and foraging habitat would need to be utilised. Suitable habitat occurs to the southern boundary of the field by way of an existing hedgerow which bats were noted using during the transect surveys. Bats currently utilising the habitat to the south of the A55 would likewise be displaced. Displacement and disturbance would occur through the construction period as a result of noise, and lighting if construction is required outside of the normal hours of work as proposed in Chapter 2. Additionally, although few bats were recorded utilising the underpass at Shore Road East, this may be obstructed during the construction of the new Junction.

8.7.51 Recognising that all bats are afforded protection under European legislation and taking into consideration the results of the surveys, which identified eight species of bats and one roost, the Scheme area is considered to be of ***Medium – Regional*** significance for noctule and whiskered/brandt bats and of ***Local*** importance for common and soprano pipistrelles, Daubentons, natterers, lesser horseshoe, brown long-eared.

8.7.52 In the absence of mitigation, construction effects including noise, light disturbance and loss of habitat upon foraging and commuting bats are considered to be a ***Moderate Adverse*** effect.

8.7.53 The roost is considered to present a lower risk case based on NRW Good Practice Guidance[55]. Utilising the scoring system detailed within Wray et al (2010) the roost is considered to be of ***Lower local*** importance due to the use as a roost by individual bat species of common species (i.e. common pipistrelles) the loss of this roost would not be detrimental to the favourable conservation status of bats within their nature range due to the presence of suitable alternative roosts within adjacent properties. In the absence of mitigation, the loss of the roost is considered to be a ***Minor Adverse*** effect.

Otter

8.7.54 No suitable habitat occurs within the Scheme footprint which provides a secure rest up area or for holts and which is considered to be suitably connected to the Afon Llanfairfechan/Ddu (the source population). As such, there would be no direct land take effects upon otters. The main potential effect from construction activities is pollution which, uncontrolled, could pollute coastal habitats used by otters.

8.7.55 Chapter 7 Road Drainage and Water Environment state that no effects upon the Afon Llanfairfechan / Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

[55] NRW Approach to Bats and Planning GPG 3 (October 2015).

8.7.56 In the absence of mitigation, construction effects (in the form of indirect pollution incidences) to otters (a species of ***Lower Local*** value) is considered to be a ***Slight Adverse*** effect due to the potential effects to coastal habitats.

Wintering Birds

8.7.57 There will be no direct land take effects upon habitats within the designated sites as listed in Table 8.12. However, habitats outside of the designated sites are used by birds which are features of interest of the Traeth Lafan / Lavan Sands, Conwy Bay SPA Lavan Sands (oystercatcher and curlew).

8.7.58 These species utilise the fields to the south of Junction 15 and Penmaen Park for refuge and foraging. Approximately 1.6% of the SPA population of oystercatcher were recorded (105 individuals) and 1.4% of the SPA population of curlew (28 individuals).

8.7.59 Within the wider context of the extent of available habitats, the proportion of habitat lost from land take from the Scheme is minimal and the species mentioned above are not heavily reliant on the habitats offered within the Scheme area.

8.7.60 Construction activities including noise, lighting, pollutants would all displace and deter birds from utilising these fields and areas along the coast in close proximity the Scheme. The majority of over wintering birds, including those recorded on site, utilise the sandbanks during mid and low tide and as such are less likely to be disturbed.

8.7.61 In the absence of mitigation, construction effects upon wintering birds (a receptor of Very High - International Importance and County importance in the form of disturbance to habitat and noise during construction is considered to be a ***Minor Adverse*** effect.

Breeding Birds

8.7.62 Breeding birds would be affected by construction and land take in the form of loss of suitable habitat including plantation woodland, scrub and hedgerows and disturbance and displacement from noise and human presence during construction activities. The effects would be greatest where land take occurs during the breeding bird season (generally considered to be March – August inclusive but the season can be extended or occur earlier depending upon current climatic conditions).

8.7.63 In the absence of mitigation, land take and construction effects in the form of noise upon breeding birds (a receptor of ***Lower Local*** importance) is considered to be a ***Minor Adverse*** effect.

Fisheries

8.7.64 No land take effects which will impact upon this species group are envisaged. Chapter 7 Road Drainage and Water Environment state that no effects upon this river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.7.65 In the absence of mitigation, construction effects to fisheries (a species of ***Lower Local*** value) is considered to be a ***Neutral*** effect.

Assessment of Operational Effects

8.7.66 In this section the potential effects of operation of the Scheme, once open to traffic (year one) and the design year (fifteen years after opening), on each of the VERs as detailed within Table 8.13 are identified and assessed, first without mitigation and then with mitigation (section 8.8) in order to determine the significance of residual effects.

8.7.67 Effects from the operation of the road include (but are not limited to) highway drainage, winter salting, potential increase in public access and vehicles, highway lighting, highway, noise and landscape maintenance works.

8.7.68 The effects of air quality on VERs during the operation of the road have been considered in section 8.1- 8.11 and Chapter 12 and are not repeated in this section.

Statutory Designated Sites

8.7.69 On completion of the Scheme the potential operational effects upon habitats and features of the designated sites include operational pollution incidences (e.g. fuel spills) and noise. It is anticipated that these would not be significant in normal circumstances during the operation of the road.

8.7.70 The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7 Road Drainage and Water Environment. Chapter 7 states that no effects upon the Afon Llanfairfechan / Ddu river are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.7.71 Anticipated noise levels and vibration are set out in Chapter 13, Noise and Vibration. Overall, the amount of traffic is not predicted to increase any more than traffic on the existing road. Noise barriers would be installed along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation.

8.7.72 Within the design year of the road, and also after opening, there is a risk of a major accident which could significantly affect habitats and species which are features of the designated sites. Considering the use of the A55 as a major transport route there is always the risk of major accident which could lead to spilled pollutants entering coastal habitats via the drainage network and watercourses. These effects have been discussed in more detail in Chapter 18 Risk of Major Accident or Disaster. It is worth noting that accidents (and therefore spillages) are ×3 more likely at roundabouts than slip roads, so by removing the existing roundabouts the scheme itself is reducing the risk.

8.7.73 In the absence of mitigation, operational effects upon the designated sites and features of interest are considered to be a ***Moderate Adverse*** effect.

8.7.74 A Statement to Inform an Appropriate Assessment will be carried out for these sites.

Non-Statutory Designated Sites

8.7.75 Potential operational effects upon non-statutory designated sites which have been highlighted as VERs would be the same as those discussed for designated sites.

8.7.76 In the absence of mitigation, operational effects upon the Afon Llanfairfechan/Ddu (a receptor of ***Medium Regional*** importance) are considered to be a ***Neutral*** effect.

8.7.77 Glan- Y-Mor Elias, Madryn grazing marshes and dunes and Madryn reedbed are located 1.34 km and 1.77 km due west and include reedbed, saltmarsh and standing water. Due to the distance of these sites (receptors of ***Medium Regional*** importance) from the Scheme effects are considered to be ***Neutral*.**

Parkland / Scattered Trees Broadleaved A3.1

8.7.78 During the operation of the Scheme, this habitat would be lost/altered and replaced with ornamental shrubs and species rich grassland and open grassland. Upon opening of the Scheme, this will be immature and may be susceptible to lack of water and pollution during the establishment phase which may lead to failure, as such, in the absence of mitigation, the effect is still considered to be a ***Major Adverse Effect***. Within the design year, this habitat would have established, and as such, in the absence of mitigation, is considered to be ***Slight Adverse*** effect. A large area of parkland to the south will remain intact.

Running water G.2

8.7.79 Potential operational effects upon the Afon Llanfairfechan/Ddu would be the same as those discussed for non-statutory designated sites.

Coastland H

8.7.80 Potential operational effects upon coastal habitats would be the same as those discussed for statutory designated sites.

Hedge Intact Species Poor J2.1.2

8.7.81 This Priority habitat will be lost and replaced with native/ornamental shrubs. Upon opening of the Scheme, this will be immature and may be susceptible to lack of water and pollution during the establishment phase which may lead to failure, as such, in the absence of mitigation, the effect is still considered to be a ***Major Adverse Effect***. Within the design year, this habitat would have established, and as such, in the absence of mitigation is considered to be ***Slight Adverse*** effect.

Bats

8.7.82 The main operational effects to bats from the Scheme include the potential effects of lighting required for the new junction and footpaths and also time to adapt to new habitats, including new roosts. The existing road scheme is subject to lighting, which does spill onto the adjacent field to the south, with darker zones retained closer to the hedge / tree line and to the south boundary of the field. Streetlights are located along the footpath within Penmaen Park and also along the road to the south of the field. These are low level with an orange glow and pipistrelle bats were noted foraging around these.

8.7.83 New lighting installed for the Scheme would spill onto the field to the south due to the removal of the existing buffer provided by the vegetation. As vegetation becomes established, in the design year, this would have a screening effect and reduce light spill upon habitat used by bats, including the field to the south of Penmaenmawr Road. In the absence of mitigation, lighting effects upon bats are considered to be ***Moderate Adverse*** upon opening and ***Slight Adverse*** in the Design year.

8.7.84 New roosts would be provided to replace that which would be lost. These would become available for bat use upon opening of the Scheme and within the design year may become occupied.

8.7.85 It is thought that once operational, the new road layout would not increase noise or pollution effects significantly from the existing. Noise barriers would be installed along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation. The effects of traffic noise before and after mitigation are set out in Chapter 13 Noise and Vibration.

8.7.86 With the Scheme open, habitat planting would not have established. Within the design year, the estimated height of the landscape planting would be 10 m in height. This will provide cover and foraging habitat for local bat populations comparable to that which was there pre-construction. Passage along Shore Road East will be maintained, along which trees will be planted, and bat roosts would be installed. In the absence of mitigation, operational effects upon bats are considered to be ***Moderate Adverse*** upon opening and ***Slight Adverse*** in the Design year.

Otter

8.7.87 The main potential operational effect upon otters would be indirect as a result of pollution incidences to habitats upon which they rely (Coastal habitats) which contain refuge, corridors of movement and a foraging resource. Chapter 7 states that no effects upon the Afon Llanfairfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.7.88 The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7 Road Drainage and the Water Environment.

8.7.89 Considering the use of the A55 as a major transport route there is always the risk of major accident which could lead to pollutants entering the coastal and riparian habitats. These effects have been discussed in more detail in Chapter 18 Risk of Major Accident or Disaster. It is worth noting that accidents (and therefore spillages) are ×3 more likely at roundabouts than slip roads, so by removing the existing roundabouts the scheme itself is reducing the risk.

8.7.90 In the absence of mitigation, operational effects upon otters are considered to be ***Slight Adverse*** upon opening and in the Design year. If a major spillage were to occur, say for example from a road traffic accident, the effect could be ***Moderate Adverse*** in the absence of mitigation.

Wintering Birds

8.7.91 Operational effects upon wintering bird assemblages are unlikely to significantly affect the assemblages of birds utilising the fields or adjacent habitats within the designated sites.

8.7.92 It is thought that once operational, the new road layout would not increase noise or pollution effects significantly from the existing. Noise barriers would be installed along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation. The effects of traffic noise before and after mitigation are set out in Chapter 13 Noise and Vibration.

8.7.93 Abundant similar habitat occurs within close proximity to the scheme and includes Penmaen Park and habitats associated with the designated sites. In the absence of mitigation operational effects for wintering birds, with the opening and Design year are considered to be ***Neutral.***

8.7.94 However, as stated previously considering the use of the A55 as a major transport route there is always the risk of major accident which could lead to pollutants entering the coastal habitats, as well an explosion causing species which are a feature of the designated site to temporarily disperse. Where this to happen, effects are considered to be ***Moderate Adverse.*** These effects have been discussed in more detail in Chapter 18 Risk of Major Accident or Disaster. It is worth noting that accidents (and therefore spillages) are ×3 more likely at roundabouts than slip roads, so by removing the existing roundabouts the scheme itself is reducing the risk.

Breeding Birds

8.7.95 The main operational effect upon breeding birds is similar to that of bats and include loss of nesting/foraging habitat until such time that it becomes established and light spill, this effect would be greatest during the opening year and in the absence of mitigation, is considered to be ***Minor Adverse*** effect.

8.7.96 It is thought that once operational, the new road layout would not increase noise significantly from the existing. Noise barriers would be installed. along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation.

8.7.97 As vegetation becomes established, in the design year, this would provide suitable alternative nesting and foraging habitat for breeding birds. In the absence of mitigation effects upon birds in the design year are considered to be ***Neutral***.

Fisheries

8.7.98 Upon completion of the Scheme potential operational effects upon migratory fish and other aquatic species include pollution incidences. Details of the drainage for the Scheme are set out in Chapter 7 Road Drainage and the Water Environment. Chapter 7 states that no effects upon the Afon Llanfairfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.7.99 It is anticipated that operational effects would not be significant in normal circumstances during the operation of the road. In the absence of mitigation effects upon migratory fish and aquatic species in the opening and design year are considered to be ***Neutral***.

8.7.100 Considering the use of the A55 as a major transport route there is always the risk of major accident which could lead to pollutants entering the riparian habitats, and indirectly affecting species which utilise this habitat. In the absence of mitigation, the effect could be ***Moderate Adverse***. These effects have been discussed in more detail in Chapter 18 Risk of Major Accident or Disaster. It is worth noting that accidents (and therefore spillages) are ×3 more likely at roundabouts than slip roads, so by removing the existing roundabouts the scheme itself is reducing the risk.

8.8 Mitigation and Monitoring Measures

8.8.1 DMRB Volume 11 Section 1 Part 7 (HA 218/08) defines mitigation measures as follows; "Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects." Legislation also provides the Overseeing Organisation with powers to: "acquire land for the purpose of mitigating any adverse effect which the existence or use of a highway constructed or improved by them, or proposed to be constructed or improved by them, has or will have on the surroundings of the highway. " (Highways Act 1980 (as amended), Part XII, Section 246)

8.8.2 DMRB (HA 205/08 para 1.41) states that the:

> *'mitigation of significant adverse environmental effects should be dealt with as an iterative part of the option choice, planning and design stage. Failure to do so may result in failure to deliver the project; and failure to avoid, reduce or remedy significant adverse environmental effects, particularly where land is not secured to allow delivery or future maintenance.'*

8.8.3 The DMRB (HA 218/08) defines two types of mitigation measures as essential and desirable mitigation;

a) **Essential mitigation**: *Mitigation which the Overseeing Organisation has the statutory power to achieve*;
b) **Desirable mitigation**: *A measure considered to be environmentally beneficial but that cannot usually be achieved using statutory powers. For example, third party agreement may be required.*

8.8.4 It also includes a description of enhancement as:

c) **Enhancement**: *A measure that is over and above what is required to mitigate the adverse effects of a project. This could also be interpreted as desirable mitigation*.

8.8.5 The development of mitigation and monitoring measures is part of an iterative EIA process. The 'mitigation hierarchy' of avoid, mitigate/reduce, compensate/remediate and enhance has been adopted as part of the process.

8.8.6 Essential mitigation measures can include the following, from IEMA[56]:

a) **Primary mitigation**: measures incorporated within the Scheme design. These are often intended to avoid or minimise adverse effects considered in the design process and that may not readily be recognisable as mitigation. These measures are a fundamental part of the design and incorporated within the scheme shown on the Environmental Masterplans (EMP).
b) **Secondary mitigation**: additional measures identified during the EIA process to further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are supplementary to those measures in (a) above and are also shown on the

[56] IEMA Delivering Quality Development-Annex A: Classifying the three types of Environmental Impact Assessment mitigation

EMP and best managed through the environmental management plan and is recorded in the REAC.

c) **Tertiary mitigation**: good practice measures to be adopted during construction to avoid and minimise environmental effects, such as pollution control measures identified in a CEMP and monitoring to ensure that is effective (HEMP).

8.8.7 Following this guidance, the mitigation measures relevant to this assessment of the ecological effects of the Scheme are outlined in this section. As set out in Chapter 2 the specific ecological mitigation measures incorporated into the Scheme design, together with other proposed mitigation (such as construction good practice) are indicated in the lists below. In assessing the effects of the Scheme, these are assumed to be in place as intrinsic elements of the Scheme and that these would be set out in the CEMP. A Pre-Construction Environmental Management Plan (Pre-CEMP) is provided as an appendix to this ES, included in the Pre-CEMP will be a section detailing and Outline Ecological Management Plan. This outline plan sets out the measures and procedures for reducing impacts on ecological receptors. It outlines the procedures for preconstruction surveys, vegetation clearance, and temporary or permanent measures for protected species.

8.8.8 Some forms of mitigation require a controlling mechanism or legal undertaking to be implemented but are under the control of the 'Overseeing Organisation' and therefore are regulated and have greater certainty of delivery.

Primary Mitigation

8.8.9 Measures to reduce adverse effects include the following mitigation which are integral to the Scheme:

a) Planting design which allows movement of species, i.e. linear habitats including shrub and tree planting which provide cover and shelter;
b) Planting species rich grassland;
c) The implementation of SuDs;
d) Minimise light spill along existing and proposed landscape planting.

Secondary Mitigation

8.8.10 Secondary mitigation includes:

a) Provision of compensatory bat roost (pole mounted bat boxes or integrated or external bat boxes placed on new structures) to replace that which is lost to the Scheme as shown on the Environmental Masterplan (EMP) in Appendix 2.6.
b) Removal of vegetation outside of the breeding bird season (typically March to August but can be earlier or later depending on current climatic conditions);
c) Sensitive timing of the demolition of the bat roost to avoid winter months (optimal for demolition works would be Spring or Autumn); and
d) Removal of and safe disposal of any Invasive Non-Native plants.

Tertiary Mitigation

8.8.11 Tertiary mitigation includes:

a) Toolbox talks to contractors;
b) Pre-commencement site walkovers and surveys as detailed within the CEMP to include surveys to any trees which need to be removed for their potential to support bats roosts;
c) Nesting bird checks if vegetation removal is within the nesting bird season;
d) Pre-demolition bat surveys of the buildings to be removed;

e) Reasonable Avoidance Measures as detailed within the CEMP to include pollution control measures and for the control of INNS;
f) Minimise overnight working so as to avoid disturbance to nocturnal mammals, for example bats.

8.8.12 There is the potential to restore some of the habitat lost, by the installation of an area of Surface Water Attenuation. Although its main function would be for drainage, sensitive design elements including planting could be incorporated, to enhance the area for biodiversity in line with Schedule 3 of the Flood and Water Management Act 2010 (Standard S5).

8.8.13 Further surveys will be conducted as the Scheme progresses, where required, to confirm and/or update the baseline survey. Works are not expected to commence before Mid-2021, and so some surveys conducted in 2018/19 may be out of date by the time of commencement. Surveys to be conducted include, pre-construction surveys for bats and nesting bird checks if potential habitat is disturbed during the nesting bird season.

8.8.14 Site clearance would take into account the seasonal environmental constraints; in particular the clearance of trees, shrubs and hedgerows would be undertaken outside the bird nesting season (typically March to August but can be earlier or later depending on current climatic conditions). Where protected species or their habitats would be likely to be affected, the works would be carried out in accordance with the methods laid out in the CEMP and agreed with an ecologist.

8.8.15 In order to minimise the potential effects of INNS, biosecurity measures designed to manage and control the spread of INNS would be a contractual requirement for construction. Information set out within presented within the CEMP. Contractors to be made aware of INNS which may be encountered on site by way of 'toolbox' talks and posters.

Statutory Designated Sites

8.8.16 The main potential effect to designated sites and features of interest would be as a result of pollution incidences and noise.

8.8.17 Mitigation measures to control air pollution are described in Chapter 12 Air Quality and section 8.7.

8.8.18 Mitigation measures to control noise and vibration are described in Chapter 13, these include noise barriers which would be installed along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation. None are required to mitigate the effects of noise upon bird assemblages due to the existing noise associated with the road network to which birds have become accustomed.

8.8.19 Those habitats which are features of the Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC are not evident in close proximity to the Scheme due to the hightide. Annex I Habitats which are a feature of interest generally tend to occur to the west towards the Menai Strait. The potential effect upon these habitats would be as a result of pollution incidences.

8.8.20 Chapter 7 Road Drainage and Water Environment describes the pollution control measures for works associated with the Scheme to avoid contamination to water courses and the marine environment. Information is also given in the CEMP, identifying the measures proposed to minimise risks of contamination. The pre-CEMP details the Outline Ground and Surface Water Management Plan which would be developed in consultation with Natural Resources Wales

(NRW). It describes the design of each element of surface water management system required to manage surface water runoff during construction and potential risks to surface waters. The mitigation to alleviate potential effects to the watercourse and the marine environment include:

a) Following best practice guidelines including GPPs and CIRIA guidance;
b) The installation of pre-earthworks drainage ditches which would be installed along the periphery of excavated slopes. These would ensure that surface run-off entering the site is directed away from the construction operations to suitable discharge points (one of which is out to sea); and
c) Construction of permanent attenuation ponds which would be carried out as part of the pre-earthworks process in order to serve as temporary settlement lagoons, to reduce the volume of silt entering watercourses or marine/coastal habitats.

8.8.21 Chapter 7 Road Drainage and the Water Environment states that no effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.8.22 With the proposed mitigation construction effects on the designated sites are considered to be a ***Neutral***.

8.8.23 The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7. These will act as attenuation during the operation of the road prior to discharge to existing outfalls (including that which outfall to the sea).

8.8.24 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 biodiversity. This has been discussed in more detail in Chapter 18. It is worth noting that accidents (and therefore spillages) are ×3 more likely at roundabouts than slip roads, so by removing the existing roundabouts the scheme itself is reducing the risk.

8.8.25 Mitigation during the operation of the Scheme (upon opening and the Design year) includes advanced planning of emergency response developed in liaison with emergency services and civil emergency planners to ensure good access and egress from site for police, fire brigade and ambulance to recover vehicles, casualties and reopen road efficiently. The application of measures to contain and control spillages will be implemented so as to avoid pollutants coming into contact with potential pathways to the marine / coastal environment (via outfalls or drainage systems).

8.8.26 With the proposed mitigation, operational effects on the designated sites are considered to be a ***Neutral***.

Non-Statutory Designated Sites

8.8.27 Those non statutory sites which have a hydrological link to the Scheme, either via rivers outfalls, or the marine environment may be at risk from pollution events during construction and operation, including spillages which may encroach upon these habitats in the absence of control measures. The sites most at risk are considered to be Traeth Lafan LNR (which is a component

of the SPA and SSSI and as such is considered above).

8.8.28 Control measures would be the same as those described for designated sites.

8.8.29 With the proposed mitigation, construction and operational effects on non-statutory designated sites are considered to be a ***Neutral***.

Parkland / Scattered Trees Broadleaved ***A3.1***

8.8.30 To accommodate the Junction, the Scheme would result in the loss of poor semi-improved grassland, hedgerows, woodland plantation as well as potentially resulting in the loss of and/or disturbance to mature trees located within the field to the south of Penmaenmawr Rd, which form part of the character of this habitat.

8.8.31 The Scheme would retain mature trees which fall in close proximity to the construction compound by realigning working widths so as to avoid damage/loss. Mitigation measures to protect retained trees, in particular those located in close proximity to the construction activities within the field to the south of Penmaenmawr Rd, include demarcating and fencing off the Root Protection Zone (RPZ) prior to the commencement of the Construction Period in accordance with BS 5837:2012[57]. With the advised mitigation, construction effects upon this habitat is ***Minor Adverse***.

8.8.32 This habitat to be lost will be replaced with plantation woodland, ornamental shrubs, species rich grassland and open grassland which would be established within the first five years. The existing hedgerow is species poor consisting of hawthorn and blackthorn, however both the hedgerow and woodland plantation are used as a foraging and commuting route by notable species including bats and nesting birds.

8.8.33 The proposed habitat to be created will, once established, support foraging and commuting habitat for bats and provide habitat for nesting birds. The created wildflower grassland will be an enhancement to the poor semi-improved grazed grassland.

8.8.34 Within this habitat, the extent of habitat lost vs habitat created is shown in Table 8.15. For the Scheme in general habitat gains and losses are provided in Table 8.16.

8.8.35 In order to quantify Biodiversity Net Gain (BNG) the metric provided in CEEQUAL[58] has been used, as described in section 8.4.35.

Table 8.15: Habitat Lost vs Habitat Gain

Habitat Ref	Habitat	Lost (A1)	Created (A2)	Estimated BNG (%)
J2.1.2	Species poor hedgerow	0.0219 ha	0 ha	-100
A1.3.2	Plantation woodland	0.33355 ha	0.1825 ha *1	-45
B6	Semi – improved species poor grassland	1.5244 ha	0.1880 ha	-87
B2.2	Species rich grassland	0 ha	0.4605 ha *2	+100

[57] BS 5837:2012 Trees in relation to design, demolition and construction. Recommendations
[58] CEEQUAL (December 2015) CEEQUAL Version 5.2 Assessment Manual for Projects UK & Ireland Edition.

Habitat Ref	Habitat	Lost (A1)	Created (A2)	Estimated BNG (%)
N/A	Ornamental shrubs	0 ha	0.3095 ha	+100
N/A	Grassland with bulbs	0 ha	0.1080 ha	+100
Totals		**1.87985 ha**	**1.2485 ha**	**+68**
Notes: *1 includes linear belts and amenity trees and shrubs; *2 includes species rich grassland, rock and scree, heath and moorland				

8.8.36 In consideration of the estimated BNG with the proposed landscape planting and retention and protection of mature trees, the residual effects of the Scheme upon this Priority Habitat is ***minor beneficial***. Areas to the south which fall within this designation will be retained and the habitat created will provide suitable alternative habitat as well as creating species rich grassland. Although there is a loss of overall of existing habitat, generally as the created grassland will be a more diverse mix of species than the existing species poor hedgerow and grassland, overall, the BNG is positive, by using this calculation.

Running water G.2

8.8.37 Control measures would be the same as those described for designated sites.

8.8.38 With the proposed mitigation construction effects on the Afon Lanfairfechan / Ddu (a receptor of ***Lower-Local*** importance) are considered to be a ***Neutral***, no significant effect upon the VER.

8.8.39 With the proposed mitigation operational effects on the Afon Lanfairfechan / Ddu are considered to be a ***Neutral***, no significant effect upon the VER.

Coastland H

8.8.40 Control measures would be the same as those described for designated sites.

8.8.41 With the proposed mitigation construction and operational effects on coastal habitats (a receptor of ***Very High*** / ***International*** importance) are considered to be a ***Neutral***, no significant effect upon the VER.

Hedge Intact Species Poor J2.1.2

8.8.42 The Scheme would result in the loss of a section of hedgerow measuring 0.0219ha (260 m in length). This will be replaced with shrub and tree planting which, once established, will provide a suitable alternative habitat, although not considered a Priority Habitat. The extent of hedgerow to be lost vs shrub planting created is provided in Table 8.15. In consideration of the estimated overall BNG, the residual effects of the Scheme upon this Priority Habitat is ***Slight beneficial***. Although there is the loss of a Priority Habitat, the existing hedgerow is species poor, the proposed shrub planting would be more diverse.

8.8.43 Consideration should be given to the potential to translocate this hedge, in winter, as part of the early works which would provide some form of continued connectivity during the construction period and once established would provide additional habitat to that which is proposed.

Habitat Loss vs Habitat Gain

8.8.44 Table 8.16 below provides a summary of the total areas of habitat lost and created within the Scheme based on the main habitat types found within the surveyed area to be affected.

8.8.45 Based on this calculation, overall the completed Scheme results in a biodiversity net gain. This is most likely attributed to the extent of species rich grassland created, native shrubs, increased ground cover and wet grassland.

8.8.46 The EMP in Appendix 2.6, show the landscape elements. Selection of species for planting and seeding is based on those locally-indigenous species noted to grow in the area and on a small selection of non-native species or ornamental varieties to serve particular purposes including those which attract invertebrates. The lists of species that are considered appropriate are included in Chapter 9 Landscape and Visual.

Table 8.16: Habitat Lost vs Habitat Gain

Habitat Ref	Habitat	Lost (A^1)	Created (A^2)	Estimated BNG (%)
J2.1.2	Species poor hedgerow	0.0219 ha	0 ha	-100
A1.3.2	Plantation woodland	2.2434 ha	0.1825 ha *1	-92
B6	Semi – improved species poor grassland	2.0701 ha	0.2100 ha	-90
J1.2	Amenity grassland	0.08356 ha	0 ha	-100
B2.2	Species rich grassland	0 ha	1.5 ha	+100
N/A	Ornamental shrubs	0 ha	0.6355 ha	+100
N/A	Grassland with bulbs	0 ha	0.6295 ha	+100
A2.2	Groundcover (i.e. scrub)	0.06465 ha	0.1445 ha	+123.5
N/A	Native shrubs	0 ha	0.3080 ha *2	+100
A3.1	Parkland scattered trees/ Individual trees	0.0307 ha	57 nr*3	N/A
Totals		**4.5 ha**	**9.4 ha**	**+141.5**

Notes:

*1 includes linear belts and amenity trees and shrubs;

*2 includes shrubs with intermittent trees;

*3 includes trees on drawing, may change significantly during detail design, not included in calculation as individual trees not ha;

Bats

8.8.47 Highway lighting is already provided along this length of the A55 and on adjacent county roads and within the town of Llanfairfechan. New lighting would be installed along the A55 and at Junction 15 to meet current standards. Luminaires would be designed to emit no light above the horizontal level. LED Luminaires are proposed because these can be more directional and so reduce light spill beyond the road. Lighting will be designed so as to avoid any additional lighting beyond that is required for health and safety. The lighting design will aim to retain 'dark corridors' and also to avoid light spill on habitat created to the south of Penmaenmawr Road and to the north of the Heath carpark nor illuminate any installed replacement roosts to reduce the effects to bat, following guidance as set out by BCT[59].

8.8.48 Lighting will also be required around the main construction compounds to secure against theft and vandalism. This would not be on constantly and activated by sensors.

8.8.49 In order to mitigate for the loss a pipistrelle bat roost, a replacement roost would be provided within land to the east of Shore Road East within tree planting or integrated within / installed onto new structures, for example parapets as shown on the Environmental Masterplan (Appendix 2.6). The advised location is adjacent to the existing roost. The installation of free-standing pole-mounted bat boxes or similar would be suitable for crevice-dwelling bats such as pipistrelles.

8.8.50 Consideration was given as to providing an alternative roost prior to the destruction of the existing roost. However, suitable alternative roost habitat is available within adjacent properties. In addition, installing a temporary bat roost within the Scheme areas during construction is unlikely to be used due to disturbance from construction practices. As such the focus was on post construction mitigation.

8.8.51 The existing roost located within the properties to be demolished would be subject to further surveys and destroyed by demolition under a licence obtained from Natural Resource Wales. Where licences are required, 'ghost' licence applications would be prepared and discussed with NRW in advance of the decision on the Orders, in order to avoid delays when the formal applications are made.

8.8.52 Those trees which cannot be retained and assessed as having bat roost potential (in particular those within the field to the south of Penmaenmawr Rd which are in close proximity to the construction compound and possible water main diversion route) will be surveyed before their removal or pruning. If a bat roost is found, a licence will be obtained from NRW to allow their removal, and a replacement roost will be provided, bat boxes could be placed on the adjacent mature trees.

8.8.53 The proposed habitat to be created will, once established, support foraging and commuting habitat for bats. The created wildflower grassland will be an enhancement to the poor semi-improved grazed grassland and may increase foraging potential.

8.8.54 Consideration should be given to the potential to translocate the hedge located to the north boundary of the field, in winter, as part of the early works which would provide some form of continued connectivity during the construction period and once established would provide additional habitat to that which is proposed.

[59] *Bat Conservation Trust Guidance Note 08/18: Bats And artificial lighting in the UK Bats and the Built Environment Series (2018 ILP*)

8.8.55 With the proposed mitigation construction effects bats are considered to be a ***Minor Adverse***.

8.8.56 With the proposed mitigation, operational effects upon bats would be ***Moderate Adverse*** upon opening and ***Neutral*** within Design Year, once habitat has been established and the replacement roosts have been in situ and may become occupied.

Otter

8.8.57 The main potential effect to otters would be as a result of pollution incidences. Control measures described for the designated sites would mitigate for the potential degradation of coastal habitats used by otters.

8.8.58 Chapter 7 Road Drainage and the Water Environment states that no effects upon the Afon Llanfairfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.8.59 With the proposed mitigation, construction and operational effects upon otters would be ***Neutral*** no significant effect on the VER.

Wintering Birds

8.8.60 The main potential effect upon wintering birds would be as a result of pollution incidences which would impact upon habitats utilised by wintering birds and the loss of grassland habitat to the south of Penmaenmawr Rd.

8.8.61 Control measures described in the CEMP would mitigate for the potential degradation of associated coastal habitats used by wintering birds.

8.8.62 The new road layout would not increase noise or pollution effects significantly from the existing, as such, no mitigation is proposed with the exception of noise barriers which would be installed along the eastbound and westbound carriageway, mainly to mitigate the effects upon residential occupants rather than nature conservation. The effects of traffic noise before and after mitigation are set out in Chapter 13 Noise and Vibration.

8.8.63 Abundant similar habitat occurs within close proximity to the scheme and includes Penmaen Park and habitats associated with the designated sites which displaced birds could use.

8.8.64 With the proposed mitigation, construction and operational effects upon wintering birds would be ***Neutral*** no significant effect on the VER.

Breeding Birds

8.8.65 The main effect to breeding birds would be where vegetation or structures would be removed within the nesting bird season. In order to mitigate for this, vegetation will be cleared, and structures would be demolished outside of the nesting bird season which is generally considered to be March – August inclusive (but the season can be extended or occur earlier depending upon current climatic conditions). Where this is not possible, then an ecologist will conduct an inspection to make sure that no nesting activity is present. If an active nest is found, then works in that area would need to stop until such time that birds have fledged.

8.8.66 The proposed habitat to be created will, once established, support foraging and nesting habitat for birds. The created wildflower grassland will be an enhancement to the poor semi-improved grazed grassland and may increase foraging potential.

8.8.67 With the proposed mitigation construction effects nesting birds are considered to be a ***Neutral***.

8.8.68 With the proposed mitigation, operational effects upon nesting birds would be ***Slight Adverse*** upon opening and ***Neutra***l within Design Year, once habitat has been established.

8.8.69 A potential enhancement within the Scheme design, if feasible, would be to install swift boxes on the north facing wall face of the new overbridge at a height of above 5m free from obstruction as shown on the Environmental Masterplan in Appendix 2.6.

Fisheries

8.8.70 The main potential effect to migratory fish would be as a result of pollution incidences. Chapter 7 Road Drainage and the Water Environment states that no effects upon the Afon Llanfairfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river.

8.8.71 With the proposed mitigation, construction and operational effects upon fish would be ***Neutral*** no significant effect on the VER.

Significance of Residual Effects

8.8.72 The Scheme includes works adjacent to European and nationally- designated sites and would affect habitats which support protected and notable species including bats and birds.

8.8.73 The effects on European Sites have also been assessed separately in an Assessment of Implications of European Sites and an SIAA Statement to Inform an Appropriate Assessment (SIAA) has been produced.

8.8.74 The summary of effects on VERs, described in the preceding sections taking account of mitigation are summarised in Table 8.17.

Table 8.17: Summary of Effects on Valuable Ecological Receptors

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
Land-take and Construction					
Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI/LNR	International - Very high	Pollution effect – increased dust and increased silt etc during construction. Increased noise displacing birds.	Moderate Adverse	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality. Mitigation measures to control noise and vibration are described in Chapter 13 Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7	Neutral
Liverpool Bay / Bae Lerpwl (Wales) SPA	International - Very high	Pollution effect – increased dust and increased silt etc during construction. Increased noise displacing birds.	Moderate Adverse	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality. Mitigation measures to control noise and vibration are described in Chapter 13. Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7.	Neutral
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	International - Very high	Pollution effect – increased dust and	Moderate Adverse	Pollution control measures as outlined within the CEMP.	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		increased silt etc during construction		Mitigation measures to control air pollution are described in Chapter 12 Air Quality Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7	
Coedydd Aber SAC/SSSI/NNR	International - Very high	Pollution effect – increased dust and increased silt etc during construction affecting otters and salmon	Moderate Adverse	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality. Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7	Neutral
Eryri / Snowdonia SAC/SSSI	International - Very high	Pollution effect – increased dust and increased silt etc during construction affecting otters and salmon	Moderate Adverse	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality. Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7	Neutral
Afon Llanfairfechan (Afon Ddu) cWS and Priority habitat running water	Medium – Regional	No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that	Neutral	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality. Mitigation measures to control pollution to waterbodies and the marine	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		receives discharge water from the Scheme (i.e. Conwy Bay).		environment are described in Chapter 7, these include….xxx	
Glan- Y – Mor Elias cWS and Priority Habitat	Medium – Regional	No effect envisaged due to distance	Neutral	None required	Neutral
Madryn grazing marsh and dunes (Glan y Mor Elias) cWS and Priority Habitat	Medium - Regional	No effect envisaged due to distance	Neutral	None required	Neutral
Madryn Reedbed cWS and Priority Habitat	Medium – Regional	No effect envisaged due to distance	Neutral	None required	Neutral
Parkland / scattered trees broadleaved	Medium – Regional	Loss as a result of land take. Potential disturbance during construction activities.	Major Adverse	The Scheme would retain mature trees which fall in close proximity to the construction compound by realigning working widths so as to avoid damage/loss. Working within accordance with BS 5837:2012. Replacement habitat which is more species diverse.	Minor Beneficial
Coastland	International - Very High	Pollution effect – increased dust and increased silt etc during construction	Moderate Adverse	Pollution control measures as outlined within the CEMP. Mitigation measures to control air pollution are described in Chapter 12 Air Quality Mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
Hedge intact species poor	Medium – Regional	All of this habitat will be lost as a result of land take	Moderate Adverse	Replacement habitat which is more species diverse. Consideration to translocate hedge as part of the early works to provide continued connectivity.	Slight beneficial
Bats – pipistrelle roost	Lower Local	Loss of roost	Minor Adverse	Pre-demolition surveys. NRW derogation licence. Replacement roost.	Minor Adverse
Bats foraging and commuting (common and soprano pipistrelles, natterers, Daubentons, brown long-eared bat and the lesser horseshoe bat)	Lower Local	Effects of land take on bats include loss of habitat, destruction of roosts and, possibly, risks of mortality and habitat fragmentation. Displacement and disturbance would occur through the construction period as a result of noise, and lighting if construction is required outside of the normal hours	Moderate Adverse	Sensitive lighting Maintenance of 'dark corridors' Replacement habitat Pre-construction surveys to mature trees if removed	Minor Adverse
Bats foraging and commuting (noctule, whiskered/Brandts)	Medium – Regional	Effects of land take on bats include loss of habitat, destruction of roosts and, possibly, risks of mortality and habitat fragmentation. Displacement and disturbance would occur through the construction	Moderate Adverse	Sensitive lighting Maintenance of 'dark corridors' Replacement habitat Pre-construction surveys to mature trees if removed	Minor Adverse

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		period as a result of noise, and lighting if construction is required outside of the normal hours			
Otter	Lower Local	The main potential effect from construction activities is pollution which, uncontrolled, coastal habitats used by otters. No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	Slight Adverse	Mitigation measures to control pollution to the marine environment are described in Chapter 7.	Neutral
Wintering birds – Oystercatcher	International - Very High	Disturbance and displacement during construction, potential pollution of associated coastal habitats	Minor Adverse	Pollution control measures as outlined within the CEMP would mitigate for the potential degradation of associated coastal habitats used by wintering birds. The new road layout would include noise barriers. No increase in pollution effects significant from the existing is expected, as such, no mitigation is proposed in terms of Air Quality.	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
Wintering birds - Curlew	Low value – County	Disturbance and displacement during construction, potential pollution of associated coastal habitats	Minor Adverse	Pollution control measures as outlined within the CEMP would mitigate for the potential degradation of associated coastal habitats used by wintering birds. The new road layout would include noise barriers. No increase in pollution effects significant from the existing is expected, as such, no mitigation is proposed in terms of Air Quality.	Neutral
Breeding birds	Lower Local	Land take and in the form of loss of suitable habitat including plantation woodland, scrub and hedgerows, disturbance and displacement from noise and human presence during construction activities	Minor Adverse	Site clearance would take into account the seasonal constraints; in particular the clearance of trees, shrubs and hedgerows would be undertaken outside the bird nesting season (typically March to August). Where this is not possible, then an ecologist will conduct an inspection to make sure that no nesting activity is present. If an active nest is found, then works in that area would need to stop until such time that birds have fledged.	Neutral
Fisheries	Lower Local	No effects upon the Afon Llanfairfechan /Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water	Neutral	General mitigation measures to control pollution to waterbodies and the marine environment are described in Chapter 7.	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		from the Scheme (i.e. Conwy Bay).			
Operation – Opening Year and Design Year					
Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI/LNR	International - Very high	Pollution and noise disturbance	Moderate Adverse (opening and design year)	The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7. These will act as attenuation during the operation of the road prior to discharge to existing outfalls (including those which outfall to the sea). Noise barriers would be installed.	Neutral
Liverpool Bay / Bae Lerpwl (Wales) SPA	International - Very high	Pollution and noise disturbance	Moderate Adverse (opening and design year)	As above Noise barriers would be installed.	Neutral
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	International - Very high	Pollution and noise disturbance	Moderate Adverse (opening and design year)	The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7. These will act as attenuation during the operation of	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
				the road prior to discharge to existing outfalls (including those which outfall to the sea).	
Coedydd Aber SAC/SSSI/NNR	International - Very high	Pollution otters and salmon. No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	Moderate Adverse (opening and design year)	As above	Neutral
Eryri / Snowdonia SAC/SSSI	International - Very high	Pollution Otters and salmon. No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	Moderate Adverse (opening and design year)	As above	Neutral
Afon Llanfairfechan (Afon Ddu) cWS and Priority habitat running water	Medium – Regional	No effects upon the Afon Llanfirfechan/Ddu are anticipated as the	Neutral	As above	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).			
Glan- Y – Mor Elias cWS and Priority Habitat	Medium – Regional	Pollution	Slight Adverse (opening and design year)	As above	Neutral
Madryn grazing marsh and dunes (Glan y Mor Elias) cWS and Priority Habitat	Medium - Regional	Pollution	Slight Adverse (opening and design year)	As above	Neutral
Madryn Reedbed cWS and Priority Habitat	Medium – Regional	Pollution	Moderate Adverse (opening and design year)	As above	Neutral
Parkland / scattered trees broadleaved	Medium – Regional	This habitat would be lost/altered and replaced with ornamental shrubs and species rich grassland and open grassland.	Major Adverse – opening year Slight Adverse –Design year	Replacement planting	Minor beneficial once habitat established
Coastland	International - Very High	Pollution	Moderate Adverse (opening and design year)	The design includes a range of measures intended to meet the requirements of the statutory standards for SuDS. These include attenuation measures to receive water from the new roads and from areas where there are risks of surface water flooding. Details of the drainage for the Scheme are set out in Chapter 7. These will act as attenuation during the operation of	Neutral

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
				the road prior to discharge to existing outfalls (including those which outfall to the sea).	
Hedge intact species poor	Medium – Regional	This habitat would be lost/altered and replaced with ornamental shrubs and species rich grassland and open grassland.	Major Adverse – opening year Neutral –Design year	Replacement planting	Slight beneficial once habitat has established
Bats – pipistrelle roost	Lower Local	Adaptation to new roost	Moderate Adverse – opening Neutral –Design year	Alternative roost	Neutral once habitat has been established and the replacement roosts have been in situ and may become occupied
Bats foraging and commuting (common and soprano pipistrelles, natterers, Daubentons, brown long-eared bat and the lesser horseshoe bat)	Lower Local	Effects of lighting required for the new junction	Moderate Adverse – opening Neutral Adverse – Design year	Sensitive lighting/vegetation screening	Neutral once habitat has been established which will provide additional screening from light spill
Bats foraging and commuting (noctule, whiskered/Brandts)	Medium – Regional	Effects of lighting required for the new junction	Moderate Adverse – opening Neutral Adverse – Design year	Sensitive lighting/vegetation screening	Neutral once habitat has been established which will provide additional screening from light spill
Bats foraging and commuting (common and soprano pipistrelles, natterers, Daubentons, brown long-eared bat and the lesser horseshoe bat)	Lower Local	Adaptation to new habitats	Moderate Adverse – opening Neutral Adverse – Design year	Replacement habitat	Neutral within Design Year, once habitat has been established

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
Bats foraging and commuting (noctule/whiskered/Brandts)	Medium – Regional	Adaptation to new habitats	Moderate Adverse – opening Neutral Adverse – Design year	Replacement habitat	Neutral within Design Year, once habitat has been established
Otter	Lower Local	Indirect pollution effecting coastal habitat. No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	Slight Adverse (opening and Design year)	Pollution control measures	Neutral
Wintering birds – Oystercatcher	International - Very High	Once operational, the new road layout would not increase noise or pollution effects significantly from the existing	Neutral	None required specific to bird assemblages though noise barriers would be installed to mitigate noise upon residents	Neutral
Wintering birds – Curlew	Low value – County	Once operational, the new road layout would not increase noise or pollution effects significantly from the existing	Neutral	None required specific to bird assemblages though noise barriers would be installed to mitigate noise upon residents	Neutral
Breeding birds	Lower Local	Loss of nesting/foraging habitat until such time	Slight adverse – opening year Neutral – Design year	Replacement habitat. As vegetation becomes established, in the design year, this would provide suitable	Neutral within Design Year, once habitat has been established

VER	Value	Description of effect	Effect without mitigation	Mitigation	Significance of Residual Effects
		that it becomes established and light spill.		alternative nesting and foraging habitat for breeding birds	
Fisheries	Lower Local	No effects upon the Afon Llanfirfechan/Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay).	Neutral (opening year and Design year)	Pollution control measures	Neutral

8.9 Monitoring and Aftercare

8.9.1 Aftercare would be carried out by the Contractor for a period of 3 years, as required under the contract. This is known as the aftercare period. During that time the contractor would carry out tasks such as grass cutting, weed control, replacement of dead plants, watering, repair of fences, cleaning out ditches, and repair or replacement of bat boxes or other environmental measures. These tasks would be performed to ensure that the seeding and planting survive and successfully establish as new vegetation. At the end of the aftercare period the contractor would hand over the now established and healthily growing landscape and environmental mitigation to the Welsh Governments maintenance organisation the North and Mid Wales Trunk Road Agent (NMWTRA).

8.9.2 Throughout the aftercare period, and for as long as is necessary to fulfil commitments, the contractor and then NMWTRA will monitor the mitigation measures to:

a) Ensure that it continues to develop properly to meet commitments and functions (E.g. trees should grow as planned);
b) Review if it will achieve the commitment and function in the required time period;
c) Check for adverse or changing conditions that might compromise the effectiveness of mitigation;
d) Advise on maintenance interventions that might be required if a failure to meet commitments is identified in a) to c) above; and
e) Once the mitigation achieves full effectiveness monitoring will continue to ensure that it continues to perform its proposed function.

8.9.3 These measures are set out in more detail in Chapter 20 Management of Environmental Effects.

8.9.4 Monitoring during and post construction would be required in order to confirm the effectiveness of mitigation measures and how successful they are, and if not successful, apply measures to rectify this. Details of the monitoring required would be established at the detailed design stage in consultation with NRW and NMWTRA and incorporated into the CEMP and Handover Environmental Management Plan (HEMP).

8.9.5 Requirements for monitoring of protected species (for example installed bat boxes) would be set out in any required EPS licence Method Statements. This would include emergence surveys of the buildings to be demolished and monitoring of bat boxes installed as part of mitigation, between the months of May – September for the first three years during the aftercare period. This would involve an inspection of the bat boxes and one emergence survey conducted between the months of May - August. The measure of success would be uptake of bat boxes by local bat populations.

8.9.6 Monitoring of habitat created would be conducted to see if it continues to be used for foraging by bats noted during the baseline surveys for foraging. Three transect surveys per year for three years to cover each survey season (Spring/Summer/Autumn) would be conducted along the planting installed to the south of Penmaenmawr Rd (as this was the area of most activity). The measure of success would be continued use by the species recorded during the surveys, if not more.

8.9.7 Monitoring for birds which are a feature of the SPAs would be undertaken during construction by the appointed ECOW and any occurrences and behaviour would be noted and reported. It is likely that birds would be deterred by and displaced from utilising the fields due to construction

activities. Key habitats associated with the designated sites would be retained and left undisturbed, and as such these would not be subject to monitoring. It is recommended that the disturbed areas are subject to monitoring based on six 'Through The Tide Counts' (TTTC) with monthly surveys between October and March during the three year aftercare period.

8.9.8 During the contractor's aftercare period, regular monitoring visits (as a minimum at least one visit per year) would be undertaken to monitor the performance of the mitigation, including the establishment of tree, shrub and hedgerow planting.

8.9.9 Reports will be prepared for the Project Manager giving the results of each visit, any requirements for additional maintenance work and indicating how the scheme of mitigation is performing against agreed indicators. An annual report will bring these together at the end of each year of aftercare. At the end of the aftercare period a Handover Environmental Design Performance Report (HEDPR) will be prepared. The HEDPR will accompany the Handover Environmental management Plan to assist NMWTRA in taking on the long-term maintenance.

8.10 Assessment of Cumulative Effects

8.10.1 Cumulative effects result from multiple actions on receptors and resources over time and are generally additive or interactive (synergistic) in nature. Cumulative effects can also be considered as:

> '*…impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*[60].'

8.10.2 Two principal types of cumulative effects are considered: *interrelationships* between effects generated by the Scheme, and the addition or *interaction* of effects generated by one or more other schemes *in combination* with the project being assessed. The cumulative effects of the Scheme have been considered in Chapter 19. Cumulative effects on European Designated Sites would also be addressed in the SIAA.

In-combination Effects

8.10.3 When considering in-combination effects in the assessments, the potential effects of the measure on the feature is the key consideration. A plan or project could have an effect on water quality which in isolation would not be a significant effect but in combination with other effects, could be significant.

8.10.4 The assessment of in-combination effects with 'other development' was identified through a systematic approach consisting of searching and identifying 'reasonably foreseeable' projects and proposals which could have in-combination effects. Other developments are primarily identified within the ZOI identified for the Scheme. Development sites at the margins of the ZOI's could be included and then excluded at a later stage, as the likely effects of the proposed Scheme were more clearly defined.

8.10.5 For ecology and nature conservation, the ZOI's as set out in Section 8.3 have been considered for the in-combination assessment.

[60] European Commission, 1999.

8.10.6 In consultation with the Local Planning Authorities, a short-list of sites was subsequently agreed. The short list includes the following sites, the locations of these are provided on Figure 19.1, appendix to Chapter 19:

a) Land to the West of Penmaen Park;
b) New build residential units at Fernbank, Llanfairfechan;
c) Mineral permission Penmaenmawr Quarry;
d) Abergwyngregyn to Tair Meibion A55 improvements; and
e) A55 Junction 16 improvements.

8.10.7 Each of these in context of these are discussed in Table 8.18.

Table 8.18: Developments Considered for In-combination Effects

Development type	Location / distance from scheme	Planning status	Potential in-combination effects	Potential Magnitude (in the absence of mitigation)
a) 45 Houses within LDP allocation - 2.43 hectares	On site	LDP Housing Contingency - west of Penmaen Park	The potential in-combination effects would result from land take and disturbance during construction. This area is important due to containing characteristics of Wood Pasture and Parkland which is classified as a Priority Habitat under Section 7 of the Environment (Wales) Act. The Junction 15 Scheme already affects this habitat and further development would have a cumulative effect, in particular were it to affect mature trees. This habitat is also used by foraging bats and over wintering birds which are a feature of the designated sites. There may also be additional stress on ecosystems via pollution incidences during construction and operation including air quality and drainage.	**Major Adverse**
b) Land adjacent to Fernbank, Llanfairfechan erection of 8 apartments and 9 dwellings	Adjacent to new Junction	CCCBC Planning code 0/45160 – Refused due to insufficient information regarding surface water and foul drainage facilities	These properties have already been constructed, as such in-combination effects from construction of these properties are negligible. The main in-combination effect would be from increased surface water run-off during construction of the Junction 15 Scheme into a drainage system that has not adequately shown to be sufficient to support this new development, were they to outfall into the same location. This could cause stress upon marine ecosystems. A WFD assessment for J15 has been completed (Chapter 7). The assessment concluded that there would be no detrimental effects on the river from the J15 Scheme as such cumulative effects to the Afon Llanfairfechan/ Ddu would be Neutral.	**Moderate Adverse – Coastal only**
c) Penmaenmawr Quarry, valid until 2042, requires review consent	500 m due east	CCCBC Planning code 0/39392 Minerals Permission, valid until 2042- approved, requires review consent	No in-combination effects envisaged	**Neutral**

Development type	Location / distance from scheme	Planning status	Potential in-combination effects	Potential Magnitude (in the absence of mitigation)
d) Abergwyngregyn to Tair Meibion A55 improvements	2.60 km due west	Approved	Works have commenced on this Scheme. An Environmental Statement and Statement to Inform an Appropriate Assessment has been produced for this Scheme. The ES stated that in the long-term the Scheme would have a beneficial effect on biodiversity provided the mitigation and enhancement measures as set out in the reports was adhered to. Likewise, the Assessment of Implications on European Sites concluded that no significant effects on the Natura 2000 sites were likely provided mitigation measures were followed. It is likely that this Scheme would be completed prior to the commencement on site of the Junction 15 Scheme.	Neutral
e) A55 Junction 16 improvements	5km due east	Key Stage 3 WelTAG	In-combination effects between this Scheme and Junction 15 improvements would occur were both Schemes to be implemented at the same time. These are considered to be the potential increase in pollution affecting air and water quality which could arise both during the construction and operation of the Scheme/s, especially where there are outfalls into the marine environment. Both Schemes result in land-take of habitat utilised by over wintering birds which are a feature of the designated sites. In terms of habitat connectivity, these Schemes are isolated from each other by Penmaenmawr Quarry, as such effects to habitat connectivity between these two Schemes are considered to be Neutral.	Moderate Adverse

8.10.8 Of the Schemes listed in Table 8.18 in-combination effects may occur with three out of the five. The proposed housing development in the field adjacent to Penmaenmawr Rd and land adjacent to Fernbank and as a result of the Junction 16 Scheme, were this to be constructed at the same time as the Junction 15 Scheme.

Inter-relationships

8.10.9 Consideration of inter-relationships have also been discussed in Chapter 19. Inter-relationships refer to the combined effect on individual (or groups of) receptors or resources from more than one source or type of environmental effect (e.g. noise, Land-take, air quality, hydrology) for example, a small area of habitat loss coupled with increased noise disturbance in remaining habitat could together reduce the foraging or refuge habitat available to a species sufficiently to reduce the local population.

8.10.10 In identifying and assessing the likely impacts of the proposed Scheme on ecology and nature conservation, the inter-relationships with the environmental impacts identified in other ES chapters has been considered. These include:

a) ***Chapter 6: Geology and Soils*** – Discharge of contaminated or sediment laden groundwater to the marine and/or riparian ecosystems following dewatering of excavations or foundations works. Contamination of soils, groundwater and surface water from accidental spills and leaks relating to construction plant and fuels/oils. A number of measures have been highlighted within this chapter as being suitable for mitigating the potential effects. These include the protection of soil structure and quality, the protection of controlled water from both general site works, and foundation works and to manage contamination risks.
b) ***Chapter 7: Road Drainage and Water Environment*** – This chapter focused on the construction and operational effects of the proposed Scheme on the water quality on nearby watercourses and marine habitats and associated habitats and species, including those listed as features of interest of the designated sites. Chapter 7 states that no effects upon the Afon Llanfairfechan / Ddu are anticipated as the Scheme is not in direct connection with the river and the river is upstream of the water body that receives discharge water from the Scheme (i.e. Conwy Bay). A WFD assessment for J15 has been completed. The assessment concluded that there would be no detrimental effects on the river.
c) ***Chapter 9: Landscape & Visual*** – The Environmental Masterplan (EMP) and proposed landscaping has been informed by the potential ecological effects of the Scheme on the Valued Ecological Receptors. Net gains and losses in biodiversity have been assessed and sensitive landscaping proposed which creates/maintains connectivity and enhances existing biodiversity or creates new habitat with biodiversity value.
d) ***Chapter 12: Air Quality*** – The modelling of changes in air quality has informed the assessment of the ecological effects on sensitive receptors, in particular the features associated with the designated sites. A qualitive assessment of potential dust effects for the proposed Scheme has been undertaken, based on the effects of receptors within 200m of the ARN. Potential dust impacts would be suitably controlled using best practice mitigation measures. The NOX concentrations are anticipated to be below the relevant AQS objective, and risks from construction dust deposition will be mitigated through the CEMP. Effects are not predicted to be significant.
e) ***Chapter 13: Noise and Vibration*** – The noise and vibration effects upon ecological receptors has been informed by assessments carried out in this Chapter. This includes the assessment of construction vibration, including piling. The approach for controlling construction noise will be to reduce source levels where possible. In some circumstances it may be preferable to use plant which generates a high level of noise if this significantly

reduces the construction time. Noise barriers will be installed.

f) ***Chapter 15: Materials*** - During the construction and operational phase, materials and waste would be present close to the outfall system linked to the marine ecosystem, with potential for run off which could have ecological impacts on species and habitats and on water quality. Working methods to manage and limit these risks are set out in Chapter 20 Environmental Management.

Natural Capital and Biodiversity

8.10.11 Natural capital refers to the stock of natural resources that the ecosystem provides, such as water, air, soil and biodiversity that are essential to the functioning of the planet and human well-being and include soil formation, food, climate regulation and renewable energy, often referred to as ecosystem services. The aim of the ecosystems approach is to ensure the value of these essential services is taken into account when economic decisions are made so that the true cost of decisions are assessed. The Environment (Wales) Act, 2016 sets a duty on public authorities to take account of the resilience of ecosystems and the services they provide. Cumulative effects from the inter-relationships of each discipline in turn can affect biodiversity and ecosystems and the resilience of ecosystems to recover and adapt to change (for example climate change).

8.10.12 The mitigation, management and control of each of the potential cumulative effects of air and water quality, noise and landscape set out within the relevant chapters along with those detailed within this chapter, all go towards protecting biodiversity and replacing that which is lost, which in turn helps to maintain resilient ecosystems.

8.11 Summary

8.11.1 The summary of effects on VERs, described in the preceding sections of this chapter, are summarised in Table 8.17.

8.11.2 The effects on European Sites have also been assessed separately in an Assessment of Implications of European Sites and an SIAA Statement to Inform an Appropriate Assessment (SIAA) has been produced.

8.11.3 This Chapter has assessed the impacts of the Scheme on VERs, taking into consideration mitigation which is an integral part of the Scheme and proposed additional mitigation, compensation or enhancements which would be incorporated into the Scheme.

8.11.4 In the short term there would be a loss of habitat which supports bats and birds. Over time, replacement planting would establish and provide continued connectivity and habitat for a range of species, in line with the Green Corridors Initiative, and would also achieve a BNG which is in line with Acts and Policies to retain/create/enhance resilient ecosystems and retain connectivity.

8.11.5 The proposed species rich grassland is an enhancement to that which was lost which consists of poor semi-improved grassland. This complies with the Action Plan for Pollinator, in particular with Outcome 2.

8.11.6 Protected species licences would be required for works affecting roosting bats. The licence would be obtained from NRW prior to the commencement of demolition works to the bat roost.

8.11.7 The mitigation which is considered to be integral to the Scheme includes standard pollution and noise and vibration control measures during construction as well as sensitive lighting, to be implemented through a CEMP. These documents will ensure that design and mitigation measures will be implemented on-site by the Contractor. The CEMP will identify those responsible for implementing the various management plans. These management plans will compliment and inform one another as well as require regular updates and revisions. Outline versions of these management plans have been prepared at Key Stage 3 and are provided as Appendices to the Pre-CEMP in ES Volume 3 Appendix 2.2

8.11.8 An Environmental Co-ordinator (ECO) would be responsible for the interface between the environmental specialists and engineers. The Environmental Clerk of Works (ECOW) would support the ECO during construction and aftercare.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 9 LANDSCAPE

RAMBOLL Bright ideas. Sustainable change.

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9. LANDSCAPE

9.1 Chapter introduction

9.1.1 This chapter presents the findings of the Landscape and Visual Impact Assessment (LVIA) that has been undertaken for the Scheme.

9.1.2 The Scheme is described in the Environmental Statement (ES) Chapter 2. The Project. Key issues, impacts and effects considered within this chapter include:

a) Permanent and temporary, long term and short term direct physical changes to the existing road corridor and adjacent landscape in terms of landform and surface elements, removal or damage to landscape elements, protected or designated areas;
b) Indirect effects on the character and quality of the landscape in terms of encroachment or effects on the landscape setting of key features and elements, changes in the perception of the landscape through the introduction of new landscape elements;
c) Direct effects on the amenity of visual receptors in terms of changes in views;
d) Indirect effects on views and visual receptors in terms of an altered view leading to changes in public attitude, behaviour and how they value or use a place or area of public open space.

9.1.3 This chapter presents the legislation and planning context, describes and evaluates the baseline landscape resource, views and visual amenity of visual receptors within a defined study area. The likely changes and effects arising brought about by the Scheme during construction and operation, during day and night have been assessed. The significance of the effect is identified in terms of change to landscape character, land use, loss of landscape features and the visibility, scale and appearance of the Scheme. This includes any associated road infrastructure and predicted traffic movement within existing views.

9.1.4 The LVIA includes a combination of desk study review and field work undertaken during 2018 and updated in 2019. Field work was carried out when deciduous trees and plants were in leaf during July 2019 and when the trees and hedgerows were leafless in winter 2018/9. Further site visits were made to review specific receptor impacts and to take summer and winter photographic records from key representative viewpoints.

9.1.5 Mitigation was assessed as part of an iterative design and assessment process. The design approach is described in section 9.8 of this chapter. This chapter should be read together with Figures 9.1 to 9.8 in Volume 2 and Appendices 9.1 – 9.5 in Volume 3 of this ES. The Environmental Master Plans (EMPs) are presented in Appendix 2.6.

9.2 Relevant Guidance: Legislation and Planning Policy Context

Guidance

9.2.1 The assessment of landscape and visual effects was carried out in accordance with the following guidance;

a) 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).
b) Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3), published by the Landscape Institute and the Institute of Environmental Management and Assessment, 2013.

c) LA104 Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15 and IAN 133/10)

9.2.2 Procedural guidance relevant to LVIA is given in Welsh Office and National Assembly for Wales Circulars including:

a) Welsh Office Circular 64/78 – Trees and Forestry (Department of the Environment, Welsh Office 1978 - Advice on tree planting and the preservation of trees and woodlands;
b) Welsh Office Circular 5/93 – Public Rights of Way (Department of the Environment, Welsh Office 1993) – Advice and guidance on recording, maintaining, protecting and modifying the rights of way network;
c) Welsh Office Circular 60/96 – Planning and the Historic Environment: Archaeology (Welsh Office 1996) – The Circular sets out advice on legislation and procedures relating to historic building and conservation areas;
d) National Assembly for Wales (2002) Circular 31/2001 – Countryside and Rights of Way Act 2000 – Provides guidance on access for open air recreation to open country and restricted byways amongst other provisions for public rights of way.

9.2.3 Other relevant guidance documents include the following;

a) LANDMAP a formally adopted approach for landscape assessments, devised and maintained by Natural Resources Wales (NRW), and is available to view online at http://landmap-maps.naturalresources.wales/;
b) Photography and Photomontage in Landscape and Visual Impact Assessment Advice Note 01/11 (Landscape Institute, 2011);
c) Roads in Lowland Areas Design Guide (Welsh Office, 1993);
d) Natural Resources Wales Guidance Notes on LANDMAP including GN4 LANDMAP and the Cultural Landscape (2016), and GN5 LANDMAP and the Geological Landscape (2016).
e) The Green Corridors on the Welsh Government Trunk Road and Motorway Network Initiative (2018).

Legislation

9.2.4 Relevant legislation to the assessment of landscape and visual effects is set out in Article 3 of European Directive 2011/92/EU as amended by 2014/52/EU and advises the need for Environmental Impact Assessment to identify, describe and assess the direct and indirect significant effects of a project on the landscape.

9.2.5 Clause 16 of Directive 2014/52/EU further notes:

> *"For the protection and promotion of cultural heritage comprising urban historical sites and landscapes …the Union is committed to respecting and promoting …the definitions and principles developed in …the European Landscape Convention of 20 October 2000"*; and
>
> *"to better preserve historical and cultural heritage and the landscape, it is important to address the visual impact of projects, namely the change in the appearance or view of the built or natural landscape and urban areas, in environmental impact assessments."*

9.2.6 The following legislation is considered relevant to the Scheme in relation to this LVIA. Other policies not specific to landscape and visual amenity are covered in Chapter 5:

a) National Parks and Access to the Countryside Act 1949;
b) The Countryside and Rights of Way (CRoW) Act 2000;
c) Wildlife and Countryside Act 1981;
d) The Natural Environment and Rural Communities (NERC) Act 2006;
e) Hedgerows Regulations 1997.

Planning Policy Context

9.2.7 Chapter 5 Policy and Plans sets out the overarching and strategic legislative and policy context for the Scheme from an environmental perspective. The following section is a review of specific landscape policies and guidance that was carried out to inform this LVIA.

National Planning Policy: Planning Policy Wales

9.2.8 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.

9.2.9 Landscape policy considerations and guidance are included in Planning Policy Wales (PPW) Edition 10 (December 2018) under the theme "Distinctive and Natural Places". PPW identifies that places which are distinctive and natural, can contribute to the seven goals of the Well-Being of Future Generations Act.[1] It recognises the contribution that landscape can make to the seven goals and that through collaboration, landscapes can be protected and enhanced as well as addressing environmental risks.

Technical Advice Notes (TAN's)

9.2.10 TAN's relevant to the LVIA and the environmental design of the Scheme and mitigation strategy include the following;

a) TAN 6 – Planning for Sustainable Rural Communities (2010) which provides guidance on how the planning system can support sustainable rural communities;
b) TAN 10 – Tree Preservation Orders (1997), which provides guidance on where local planning authorities are to make adequate provision for the preservation and planting of trees when granting planning permission through the process of making Tree Preservation Orders (TPOs);
c) TAN 12 – Design (2016), which provides guidance on how good design should be achieved through the planning process.

Local Planning Policy: Conwy County Borough Council Local Development Plan, 2013

9.2.11 The Junction 15 improvements lie wholly within the jurisdiction of Conwy County Borough Council and the local planning context is set out within the Conwy Local Development Plan (LDP) 2007 – 2022. The LDP states that *"The Plan Area is an area of outstanding landscape ranging from sandy beaches and headlands to sheltered valleys, open moors and natural woodland which borders the mountains of Snowdonia National Park"*[2], a description that that can be applied to the study area of this LVIA. The following policies relate to aspects of landscape and visual amenity and have been considered in this LVIA:

Strategic Policy DP/1 – Sustainable Development Principles: Development will only be permitted where it is demonstrated that it is consistent with the principles of sustainable development and should also where appropriate "Conserve and enhance the quality of valued open spaces, the character and quality of local landscapes and the wider countryside";

Policy DP/4 – Development Criteria: Development proposals, where appropriate and in accordance with the policies of the Plan and Council's Standards provide assets such as open space and safe access from the highway network and enhancement of cycling and pedestrian infrastructure.

[1] Planning Policy Wales Edition 10 Chapter 6
[2] Conwy County Borough Council Local Development Plan, 2013 – paragraph 1.9.2

Planning permission will not be granted where the proposed development would have an unacceptable adverse impact on aspects such as residential amenity, archaeological interests, environmental conditions such as noise, lighting, noxious emissions, wildlife interests and landscape character;

Policy DP/5 – Infrastructure and New Developments: All new development, where appropriate will be expected to make adequate contributions towards new infrastructure to meet the additional social, economic, physical and/or environmental infrastructure requirements;

Strategic Policy NTE/1 – The Natural Environment: the Council will seek to regulate development so as to conserve and, where possible, enhance the Plan Area's natural environment, countryside and coastline including Special Protection Areas (SPA's) and Special Areas of Conservation (SAC's);

Strategic Policy NTE/2 – Green Wedges and Meeting the Development Needs of the Community: The policy aims to prevent coalescence of the settlements and retain the open character of the area. Of particular relevance to the Junction 16 Scheme is Green Wedge 1 between Dwygyfylchi and Penmaenmawr that extends south and to the east and west of the existing roundabout.

Policy NTE/3 – Biodiversity: New development should aim to conserve and enhance biodiversity through avoidance of impacts and creating, enhancing and managing wildlife habitats and natural landscapes including connectivity and integration of biodiversity into the built environment.

Policy NTE/4 – The Landscape and Protecting Special Landscape Areas: The Policy recognises the visual character of the landscapes, seascapes and townscapes is highly valued by residents and visitors and that high priority is given to the protection, conservation and enhancement of this landscape character.

Policy NTE/5 – The Coastal Zone: The Policy aims to maintain and enhance the attractiveness of the area by only permitting development that does not affect the open character of the zone and does not detract from areas of nature conservation or tourism value;

Policy CTH/1 – Cultural Heritage: The council is committed to protecting and, where appropriate, enhancing its cultural and heritage assets such as conservation areas, historic landscape parks and gardens, listed buildings and Scheduled Ancient Monuments (SAM's).

Policy CTH/2 – Development Affecting Heritage Assets: Development proposals which affect a heritage asset, or its setting shall preserve or enhance that asset.

Neighbouring Local Planning Authorities

9.2.12 The Snowdonia National Park Authority is the only neighbouring planning authority and lies circa 1.5 kilometres south of the Scheme. It is not considered likely that the Scheme would have any significant effects on land within the SNPA. Similarly, the Scheme is not readily visible from within the National Park boundary due to distance and intervening topography and vegetation and therefore none of the policies have been considered further.

9.3 Study Area

9.3.1 The study area was established at a radius of 2 kilometres from the centreline of the existing A55 road corridor and Junction 15 roundabout. (Refer to Figure 9.1). This was considered a sufficient area of search to establish baseline landscape conditions given that the Scheme is likely to be limited to within or close to the existing A55 road corridor alignment.

9.3.2 In accordance with IAN 135/10 (W), an initial study area was identified for the assessment of 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) and is presented in Volume 2 Figure 9.2.

9.3.3 A site survey in July 2019 was carried out to verify this initial study area and to identify where potentially significant effects upon the existing landscape resource, views and visual amenity are likely to occur as a result of the Scheme. This resulted in a more focussed Scheme assessment area of approximately 500 metres from the centre line being identified for landscape and visual receptors potentially affected by the Scheme.

9.3.4 The methodology for undertaking the LVIA is described in Section 9.5 and described in more detail within Appendix 9.1. The photographic methodology is included within Appendix 9.2.

9.4 Assessment of Effects (Methodology)

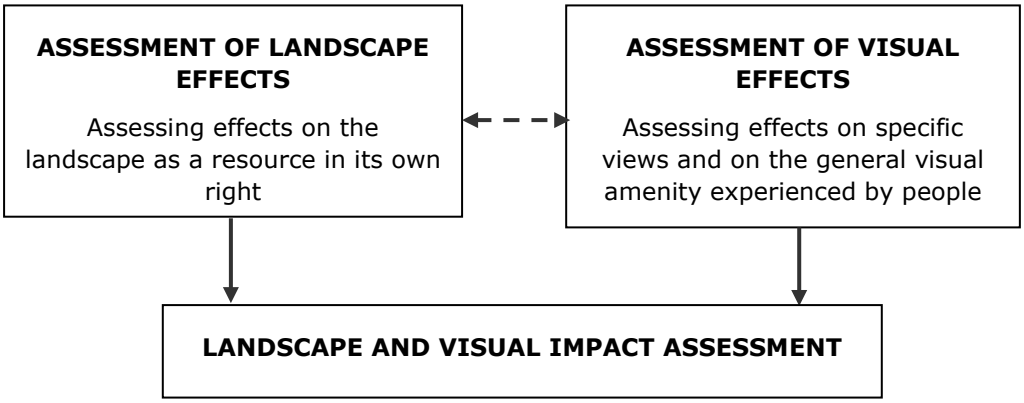
9.4.1 The assessment of landscape and visual effects was carried out in accordance with the methodology described within Interim Advice Note 135/10 (W), Landscape and Visual Effects (Wales Only) (Welsh Government, 2014), which replaces guidance in the Design Manual for Roads and Bridges (DMRB), Volume 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.

9.4.2 Highways England published updated guidance LA107 in September 2019 that replaces DMRB Volume 11 Section 3 Part 5 and IAN135/10. The new guidance has not been followed in this landscape and visual assessment as this had been prepared prior to the publication of LA107. The previous guidance as described in IAN 135/10 (W) has therefore been followed.

9.4.3 The assessment of landscape and visual effects are two separate but related processes and should be clearly distinguished between each other as follows;

- Assessment of landscape effects: assessing effects on the landscape as a resource in its own right; and
- Assessment of visual effects: assessing effects on specific views and on the general visual amenity experienced by people.[3]

Figure 9:1: Landscape and Visual Impact Assessment



[3] Interim Advice Note 135/10 (W) para 2.4

9.4.4 To summarise with guidance from IAN 135/10[4];"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".

9.4.5 A detailed description of the methodology used for undertaking the landscape and visual impact assessment is set in Appendix 9A.

Approach to identification of Landscape Baseline conditions:

9.4.6 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[5] 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 Explorer and 1:50,000 Landranger maps;
e) Aerial photography.

9.4.7 Information contained within LANDMAP's 5 aspect layers forms the basis for LCA's. This is combined with fieldwork assessment to define the LCA's boundaries. Local LCA'S within the study area are identified by:

a) Organizing the landscape into areas of distinct, consistent and recognisable character;
b) Describing the key characteristics such as landcover and pattern, scale and appearance, human interaction and tranquillity, sense of place and scenic quality, seasonal interest and night-time activities;
c) Assessing their condition and quality using criteria described in the methodology;
d) Considering their importance or value using criteria described in the methodology which considers any landscape, ecological or cultural heritage designations, and any assets of local significance without designation that may be valued by the local community;
e) Considering their ability to accommodate the Scheme without unjustifiable change to the baseline condition and/or the achievement of landscape strategies and policies.

9.4.8 The relevant LANDMAP character areas, including each of the five aspect layers, were reviewed with the landscape and visual aspect layer considered to be most relevant. Following a review of LANDMAP, Local Character Areas (LCA's) were prepared and presented in Appendix 9.4. The LCA's were verified by fieldwork assessments were undertaken in July and August 2019 to validate the findings of the desk study.

Approach to Identification of Visual Baseline Conditions

9.4.9 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.

9.4.10 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.

[4] Interim Advice Note 135/10 (W) para 2.4
[5] Countryside Council for Wales is now called Natural Resources Wales

9.4.11 The following features were identified during this process:

a) Potential screening features, including substantial vegetation associated with the existing soft estate, buildings and urban areas;
b) Potential visual receptors such as residential properties, business properties, Public Rights of Way and recreation areas.

9.4.12 Field work was carried out during winter 2018 and summer of 2019. This identified various receptors such as residential properties, users of long-distance footpaths and cycleways, users of the public realm and coastal areas. The number and type of properties from which people would experience a change in view and sensitivity of the viewer is recorded in the Visual Effects Schedule in Appendix 9.5.

9.4.13 To assess the change in view from locations without public access, a combination of desktop aerial photography and field survey was undertaken and professional judgement used to assess the magnitude of change and likely visual effect.

Approach to identification of mitigation measures

9.4.14 Legislation provides the Overseeing Organisation with powers to: *"acquire land for the purpose of mitigating any adverse effect which the existence or use of a highway constructed or improved by them or proposed to be constructed or improved by them, has or will have an impact on the surroundings of the highway"*.[6]

9.4.15 The DMRB[7] identifies two types of mitigation; essential or desirable and defines them as follows[8].

Table 9.1: 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

9.4.16 Determining whether mitigation is essential or desirable is recognised in the DMRB as being reliant on professional judgement of the topic specialist[9]. 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.

9.4.17 Essential mitigation can therefore be guaranteed as part of the Scheme 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*[10]*".* 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*

[6] Highways Act 1980 (as amended) Part XII, Section 246
[7] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 1.64
[8] DMRB Volume 11 Section 2 Part 7 HA 218/08 Glossary of Terms
[9] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 1.64
[10] DMRB Volume 11 Section 2 Part 5 HA 205/08 para 2.9

be described.[10]*"* Therefore an assessment of significance is required without mitigation in place and with mitigation that can be delivered and justified as part of the Scheme.

9.4.18 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.

9.4.19 Land may also be included within the CPO in several locations to provide some further environmental enhancement; this is taken as title for mitigation. Principally this would be as extra land required as essential mitigation to provide compensation for areas of suitable habitat for biodiversity or additional visual screening or landscape integration. Wherever possible this land is taken from severed portions of fields.

Assessment of Potential Effects without mitigation

9.4.20 The current guidance set out in IAN 135/10 (W)[11] states that '*Effects on landscape character should be assessed 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 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'*.

9.4.21 New guidance set out in LA104 Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15 and IAN 133/10) states that the *'Significance of an effect shall be reported after an assessment of the effectiveness of the design and mitigation measures (the residual effect)'*[12]*.* However, the new guidance does not specifically denounce the advice set out in 135/10 (W) that requires an assessment to be made both prior to and following mitigation as outlined above.

9.4.22 For the purposes of this landscape and visual assessment, the assessment of significant effects without mitigation is taken as Year 1 of opening when landscape mitigation measures such as planting have not had time to establish and therefore not deliver any effective mitigation. These will be considered as essential mitigation measures.

9.4.23 Embedded mitigation measures are reported in the project description and not repeated in each environmental topic or factor assessment as advised in LA104 Environmental assessment and monitoring (para 3.24.1).

9.4.24 An initial assessment of likely landscape and visual effects was undertaken during the design process and has identified potential mitigation measures for avoidance and prevention of potential impacts. This has been fed into the design process and used to identify mitigation measures that are embedded into the design of the Scheme and essential mitigation measures that are specific to addressing adverse landscape and visual effects. Mitigation measures are identified in Section 9.8 and the assessment of landscape and visual effects in Section 9.9 and 9.10 respectively.

[11] IAN 135/10 (W) para 3.4
[12] LA104 Environmental assessment and monitoring para 3.25

Consultations

9.4.25 During the LVIA process, consultation has taken place with stakeholders and Statutory Environmental Bodies (SEB's) such as CADW and Natural Resources Wales through the forum of the Environmental Liaison Group. 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.

9.4.26 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.

Limitations of the Assessment

9.4.27 The landscape and visual assessment was carried out from publicly accessible areas such as the local road network, Public Rights of Way and other public areas such as promenades and recreational areas. Individual properties were not visited or inspected during the fieldwork assessment.

9.4.28 There has been no consideration of night-time visual effects as the existing road corridor is lit and the Scheme is located within the existing road corridor. It is therefore considered that there is likely to be no significant change to night-time effects as a result of the Scheme.

9.5 Baseline Conditions

Landscape Baseline

Landscape Character Areas

9.5.1 LANDMAP is an all-Wales landscape resource where landscape characteristics, qualities and influences on the landscape are recorded and evaluated. In reviewing the LANDMAP datasets (Figure 9.3), it was considered that the character areas were set at too broad a scale and did not take sufficient consideration of the significance of the A55 road transport corridor. Further analysis of the landscape character areas within an initial 2-kilometre radius of the Scheme was therefore undertaken and the key landscape elements of the area recorded as part of the baseline assessment.

Landscape Elements

9.5.2 The character areas that fall within (and extend beyond) the 2km Study Area are shown on Figure 9.4 Landscape Character Areas (LCA's) and a description of their physical, perceptual and cultural/social characteristics are included in Appendix 9C. Note that the Landscape Character Area Map also covers a 2 kilometre radius for the adjacent Junction 16 Scheme and associated character areas. As the two Schemes are conjoined, the LCA map covers both study areas. LCA's are generally different for each of the Schemes although there is some limited overlap. The landscape components and elements which contribute to the LCA's potentially affected by the A55 Junction 15 Scheme are described under the headings below:

a) Physical Characteristics:
    - Settlements and Built Environment
    - Landform, Geology and Hydrology;
    - Land cover, vegetation and land use.
b) Perceptual Characteristics:
    - Scale and Appearance;

- Scenic Quality;
- Tranquillity;
- Discordant/Intrusive Features;
- Night-time light sources.

c) Cultural and Social Characteristics

- Historic Features and Elements;
- Human Interaction.

9.5.3 The key characteristics and elements contained within the study area are described below and also described in more detail under the same headings for each of the LCA's identified in Appendix 9C.

Physical Characteristics: Settlements and the Built Environment

9.5.4 The two principle settlements in the conjoined Study area are Llanfairfechan (Junction 15) and Penmaenmawr (Junction 16), approximately 4 kilometres apart. Both are connected by the main arterial A55 that runs through the Penyclip road tunnels pass through the headland of Penmaenmawr that physically and visually separates the two towns.

9.5.5 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. 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 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).

9.5.6 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.

9.5.7 Llanfairfechan expanded in the 20th century with residential land on the hillside slopes of the rising land to the south and east comprising a mix of detached, semi-detached houses and bungalows within the area of Llanfairfechan Uchaf to the west and Nant y Pandy to the east.

9.5.8 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.

9.5.9 Buildings within the immediate vicinity of the Scheme include:

- Properties along Penmaemawr Road (west of existing roundabout) comprise rendered three storey properties and two storey stone built terraced properties, the council offices which occupy 'The Heath' a large and distinctive looking stone building, Ysgol Pant Y Rhedyn and a chapel.
- Properties along Penmaemawr road (east of roundabout) comprise three storey residential properties with rendered facades and slate roofs. A recent development of new build terraced residential properties lies to the east of the three storey properties. All these properties are immediately adjacent to south of the A55 road corridor.

- Properties along south of Penmaemawr road adjacent to Penmaen Park – A mix of Detached and semi-detached properties occupying an elevated position overlooking the existing Junction 15 roundabout, some properties have balconies overlooking the coast.
- Properties on the north side of the railway and at the eastern end of Llanfairfechan Promenade adjacent to Glanmor Road.

9.5.10 The A55 road rail corridor and the existing Junction 15 lie to the north and east of the of the town centre. This is a major road and rail corridor containing many structures including overhead gantries, signs and lighting columns. The road rail corridor has effectively disconnected the town centre from its' promenade area with only two connections providing access along Station Road and Shore Road East, the latter close to the existing Junction 15 roundabout.

9.5.11 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.

Physical Characteristics: Landform, Geology and Hydrology

9.5.12 The physical landform has had a significant effect on the built environment, settlement patterns and historic features within the study area. The town of Llanfairfechan has been built on an alluvial fan where the incised river valley of the Afon Llanfairfechan enters the coastal plain.

9.5.13 Inland, lies the Teiryd Valley which contains the Afon Ddu that flows in a north westerly direction to join with other watercourses (Afon Maes-y-bryn and Afon-Glan-Sais) and form the Afon Llanfairfechan. Within the valley the landscape is enclosed by the topography and woodland along the riverbanks. To the west of the river the land rises towards Garreg Fawr (365m AOD) and to the east land rises towards the circular flat-topped landform of Dinas on which was once located an Iron Age Hillfort (PRN 392).[13]

9.5.14 These landmarks together with Penmaenmawr mountain, reflect the underlying geology of igneous microdiorite (diorite), an extremely hard intrusive igneous rock used in prehistoric times to manufacture stone age axes. More recently and commencing in 1830, the stone was quarried for cobblestones exported to the industrial towns of the north-west of England and crushed stone for use as railway ballast.

9.5.15 Further south the upland mountain pastures continue to rise south beyond the Study area within Snowdonia National Park and towards the peak of Foel Lwyd (603m AOD) and Tal y Fan (610m AOD).

9.5.16 The topography gently rises from the A55 towards Penmaenmawr road. Land to the east of Penmaenmawr Road rises more significantly over fields of pastureland and parkland. Further east towards the now disused part of the Penmaenmawr quarry and the Pen-y-clip tunnel the elevation rises dramatically and appears as a vegetated hillside slope with rocky outcrops at circa 370 AOD. The active part of the Penmaenmawr Granite quarry is located slightly further

[13] Group VII Axe-working sites and Stone Sources, Llanfairfechan, Conwy – CADW, Welsh Government and GAT

east and is hidden from view by the topography. This area is very open and exposed with wide ranging views over Conwy Bay and towards, Anglesey, Puffin Island and the Great Orme.

Physical Characteristics: Land Cover, Vegetation & Land Use

9.5.17 Landcover within the Study Area varies considerably and reflects the diverse landform previously described above. Detailed descriptions of the landcover, vegetation and land use are included for each of the LCA's in Appendix 9C but are summarised below for the study area (Junction 15 only):

- Coastal and intertidal areas comprising mudflats and sand/ shingle beaches on the coast of Conwy Bay;
- Flat rolling lowlands of coastal plain of predominantly pastoral land with small pockets of mixed woodland including some ancient woodland areas;
- Parkland of Bryn y Neuadd – Amenity grassland and contains numerous mature wooded areas and individual trees;
- Roadside plantations along the A55 have matured and are now an important landscape element screening property to the south, particularly along Penmaenmawr Road close to the existing Junction 15 and further west adjacent to the cul-de-sacs of Maes-y-Glyn and Maes Dolfor;
- Parkland trees within Penmaenpark contribute to parkland character of area and provide screening of existing A55 from elevated residential properties to the south;
- Hillside slopes at Gerazim and Penmaenmawr quarry (disused) comprising rocky outcrops, scree and heath vegetation (Gorse, bracken and heather) which provide a colourful yellow and purple display during the summer months;
- Pastoral hillsides comprising a mosaic of field patterns of varying sizes and bounded by dry stone walls. There are also pockets of woodland, hedgerows and relic hedgerows and mature hedgerow trees along field boundaries and scattered trees within fields;
- Y Teiryd Valley with its wooded slopes of Nant y Coed an important wildlife habitat and Local Nature Reserve;
- Upland areas within the Snowdonia National Park – tree cover is sparse in this open and exposed landscape. Vegetation largely comprises of heather moorland and scrub and with the land use primarily upland grazing.

9.5.18 The vegetation within the immediate vicinity of the roundabout comprises roadside trees and shrubs planted during the construction of the road to mitigate the impacts of the road from nearby properties. The vegetation is located adjacent to the carriageways and slip roads to the south of the roundabout and consists of a mix of tree and understorey planting (Pines, ash, hazel, hawthorn, blackthorn, cherry) and some semi-ornamental scrubs on the peripheries of the plots (dogwood, rose, broom, barberry, snowberry, cistus etc) which have now reached maturity. Vegetation and landcover is shown on Figure 9.5.

Perceptual Characteristics: Scale and Appearance

9.5.19 The study area contains several landscape character areas that differ in scale and appearance in a relatively small area. The coastal setting of Llanfairfechan is open and attractive and contrasts in spectacular fashion with the mountainous backdrop of Snowdonia to the south. Manmade features punctuate the landscape in similarly spectacular fashion, with the A55 road and rail corridor forging an urban barrier between the town and coast and the remnants of quarrying activity visible on the hills above.

Perceptual Characteristics: Scenic Quality

9.5.20 The scenic quality of the 2 kilometre study area is generally high but the A55 road and rail corridor is a detractor generating noise and being highly visible with moving traffic and in particular large high sided vehicles highly visible. The scenic quality within the A55 corridor is therefore low and contains other visual detractors such as lighting (leading up to Junction 15), signage, overhead gantries and bridges, concrete and metal barriers, parapets and close boarded fencing. Where there are gaps in the roadside vegetation, particularly east of the roundabout towards the Pen y clip tunnel, there are scenic views out over the coast towards Anglesey, Puffin Island and the Great Orme.

9.5.21 The scenic quality in elevated positions particularly in the upland areas of the Snowdonia National Park 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.

Perceptual Characteristics: Tranquillity

9.5.22 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, high sided vehicles. These effects are apparent both day and night with vehicle headlights and lighting at Junctions.

Perceptual Characteristics: Discordant/Intrusive Features

9.5.23 The A55 is the most discordant and intrusive of features within the study area together with the railway line. Overhead gantries lighting columns and illuminated road signage all add to the discord and intrusiveness of the road corridor. Road traffic, particularly high sided vehicles are also highly visible and audible elements and vary in intensity depending on wind direction and the number of road traffic movements.

Perceptual Characteristics: Night-time light sources

9.5.24 Night-time light sources are primarily the A55 road corridor that is visible for some distance at night together with headlights from moving vehicles and the adjacent road network. The overall effect is a ribbon of light stretching along the coast between the towns of Penmaenmawr and Llanfairfechan. Lights within the town centre and nearby residential areas are not readily visible from the road corridor due to localised topography and roadside planting. Residential properties and the existing roundabout at Junction 15 are night-time light sources as are the properties in Penmaen Park and are visible from the A55.

Cultural and Social Characteristics: Historic Features and Elements

9.5.25 There are several historic features and elements designated as heritage assets within the Study area. Details of the heritage assets are recorded in Appendix 10.1. The most significant in landscape terms are described below. Note the LCA references are for guidance only. The designated sites may be wholly or partially located within individual landscape character areas.

World Heritage Sites

9.5.26 There are no World Heritage Sites (WHS) within the immediate environment of Junction 15 and the A55 road corridor. 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, nineteen miles to the west. Beaumaris Castle also lies approximately 7.5 kilometres to the west. All of these sites fall outside the study area boundary and are considered too distant to be affected by the Scheme. The Scheme would not be readily visible from these locations and not perceptible to the human eye.

Scheduled Ancient Monuments (SAM's)

9.5.27 There are a number of Scheduled Ancient Monuments (SAM's) within the study area primarily on the Carneddau upland areas above the town of Llanfairfechan. There is one SAM within one kilometre of Junction 15 and a further seven within a 2-kilometre radius. The most significant SAM's in relation to the baseline landscape assessment are as follows along with the LCA that they are located within:

- Gwern y Plas Ancient Village -prehistoric period and consists of nine or ten round huts with associated stone walls; (LCA 19);
- Wern Newydd-prehistoric hut circles; (LCA 18);
- Garreg Fawr south of Llanfairfechan designated for its hut groups, ancient fields and cairns is (Located towards the north eastern corner of the character areas; LCA 29, 35);
- Pont y Teiryd Hut Group and Ancient Fields (LCA 30);
- Waun Llanfair barrow- Bronze Age Barrow (LCA 35);
- Dinas Camp Small hillfort on a rounded hillock (LCA 30) –;
- Hut Circles at Clip yr Orsedd (LCA 31);
- Cae'r Haidd Deserted Rural Settlement (LCA29).

Listed Buildings

9.5.28 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, a renowned Arts and Crafts architect. From the early 1900s Luck North moved to Llanfairfechan and built his own house, Wern Isaf where he also designed the garden. Wern Isaf remains as a Grade II* Listed Building located off a private road access from Park Road and lies within a Historic Park and Garden (LCA 19).

Conservation Areas

9.5.29 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 namely:

- Llanfairfechan Town Centre Conservation Area (Extends from the core area of the town towards Shore Road east) (LCA 12, 14);
- Llanfairfechan, The Close Conservation Area – LCA 19. A group of Grade II residential properties in the Arts and Crafts style by Herbert Luck North which are very distinctive in appearance with white rendered facades and steeply pitched roofs.

Parks and Gardens

9.5.30 Wern Isaf Historic Park and Garden (PGW (Gd) 9 (CON) and Wern Isaf Grade II* Listed Building (referred to above) lies south of the A55 and overlooks Junction 15. The site includes an area of essential setting that encompasses steeply sloping land to the west and extends as far as Penmaenmawr Road close to Junction 15 (LCA 19).

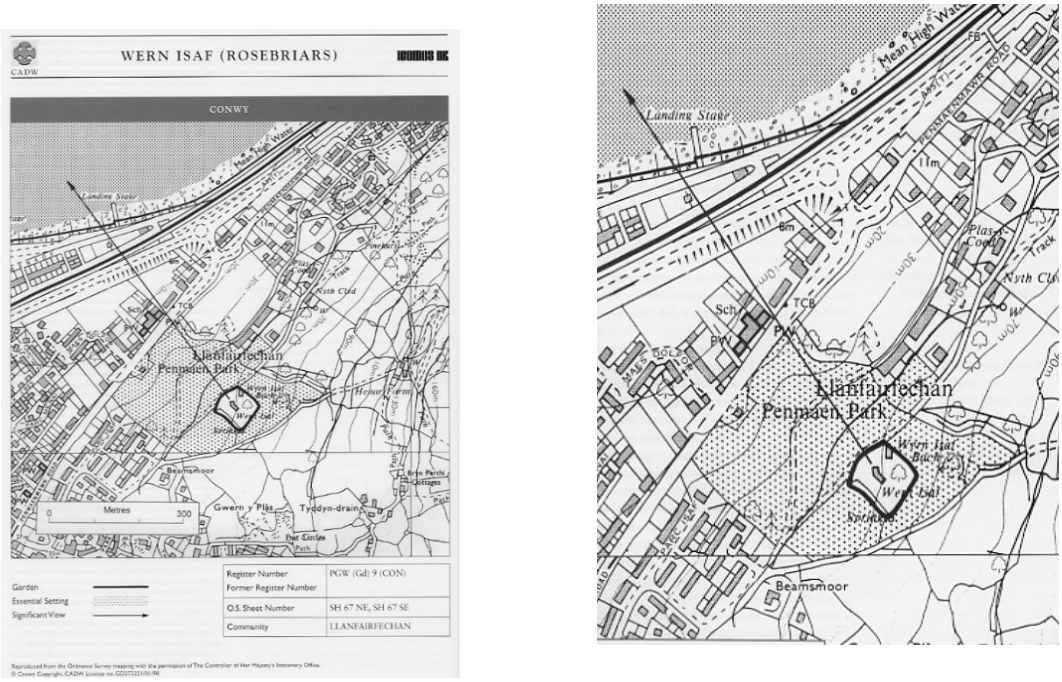


Figure 9:2: Wern Isaf and area of essential setting (dotted tone)

9.5.31 Bryn-y-Neuadd Grade II Historic Park and Garden -PGW (Gd) 3 (CON) is located west of Llanfairfechan. The Park was designed by Victorian garden designer Edward Milner and is noted for its Italianate garden with fine 1850s French cast-iron fountain; stream near former Grand Lodge laid out with artificial pools, waterfalls and rockwork. The house has been demolished and is now the site of a learning disability hospital, mental health unit and a site used by the Ambulance services (LCA 18).

Historic Landscapes

9.5.32 North Arllechwedd Historic Landscape is listed on The Register of Landscapes of Outstanding Historic Interest in Wales by CADW. The designation covers an extensive area within the study area ranging from the coastal area of Traeth Lafan, above the hillside slopes above Llanfairfechan, Penmaenmawr quarry and extending towards the upland areas of Carneddau ridge in north Snowdonia. (LCA 01, 04, 05, 13, 14, 18, 19, 20, 21, 22, 25, 28, 29, 30 & 35)

9.5.33 The area contains a rich wealth of upstanding remains from the prehistoric, medieval and later periods, most notably a Neolithic axe factory site (located at Graiglwyd) and one of the most important concentrations of Bronze Age funerary and ritual monuments in western Britain. The sites, often occurring in groups or cemeteries, include cairns of various forms, stone circles, cists and standing stones.

9.5.34 Evidence of the hut settlements, enclosures and field systems of the succeeding Iron Age and Romano-British periods has survived in an almost unbroken pattern in the valleys and on the intermediate slopes throughout the area. The largest of the Iron Age settlements, Braich y Ddinas hillfort on Penmaenmawr, was destroyed by quarrying earlier this century, but two smaller forts have survived, one at Maes y Gaer above the mouth of the Aber valley and the other, Dinas, sited on a prominent spur above Llanfairfechan.

Long distance routes and Public Rights of Way (PRoW)

9.5.35 National Cycle Route 5 (NCN5) is a long-distance cycle route that runs between Reading and Holyhead, a distance of 381 miles and along the North Wales Coast between Penmaenmawr and Llanfairfechan. The route enters Llanfairfechan town centre from the west along Aber Road before passing through the town centre and onto Penmaenmawr Road and past the existing Junction 15 roundabout. The route continues east through the residential area of Pendalar before crossing the A55 westbound carriageway on an overbridge and continuing east around Penmaenan Point towards Penmaenmawr.

9.5.36 The Wales Coast Path is a recreational route that covers a total of 870 miles with the Chester to Bangor section covering 80 miles. The route approaches Llanfairfechan along the coast before running towards the town centre along Station Road and then east along Penmaenmawr towards the existing Junction 15 roundabout. The route then heads towards the residential area of Pendalar and then inland rising steeply to the south of Penmaenmawr mountain and quarry and continues east across upland areas before descending to Dwygyfylchi. NCN Route 5 is also used as alternative coastal route for the Wales Coast Path.

9.5.37 North Wales Path runs from Bangor in the west to Prestatyn in the east and overlaps the more recent Wales Coast Path in some sections. The route runs along some scenic upland paths above Llanfairfechan and forms circular routes with other public rights of way using the local road network in places (Terrace Walk and Newry Drive).

9.5.38 North of Llanfairfechan and within the study is PRoW 18/01 that runs along the coast west of Llanfairfechan Promenade and forms part of the Wales Coast Path.

9.5.39 East of the town and close to the existing Junction 15 roundabout are PRoW (18/02, 18/03, 18/04, 18/05 and 18/48) that connect the town centre to adjacent residential areas such as Penmaenpark and Pendalar and the upland areas to the south.

9.5.40 South of Llanfairfechan PRoW (18/42 and 18/43) continue up the river valley of the Afon Llanfairfechan to the upland areas south and again to connect to the wider public footpath network and open access land of Snowdonia to the south.

9.5.41 West of Llanfairfechan and within the study area are relatively few footpaths, with the local road network of a rural nature providing access to the lower slopes of Snowdonia.

Cultural and Social Characteristics: Human Interaction

9.5.42 The study area encompasses a wide variety of landscapes that have an equally varied degree and type of human interaction. This interaction has evolved from the prehistoric times with evidence of settlements on the upland moorland (described above) to the present day, with the busy A55 road and rail corridor a major commuting route and the beach and promenade a popular area with the local community and tourism destination. Types and degrees of human

intervention are described for each of the LCA's in Appendix 9C with the principal areas for human interactions within public areas summarised below in Table 9.2.

Table 9.2: Areas of Human Interaction

Area of Human Interaction	Nature of Human Interaction
A55 road and rail corridor;	Commercial traffic and daily commuters; seasonal visitor traffic; emergency vehicles
Local road network;	Local community on daily journeys to and from employment and accessing community and private assets such as schools and places of work
Public Rights of Way	Local community and visitors using footpaths for informal recreation and for connections to recreational trails and long-distance paths; accessing community and private assets such as schools and places of work; residential areas
Recreational Trails/Long Distance Paths /Cycle Paths	Local community and visitors using the North Wales Path, Cycle Route 5 and the Wales Coast Path
Llanfairfechan Promenade	Local community using formal recreational facilities such as boating pool and skatepark and play areas; public realm for general amenity
Llanfairfechan Beach and Intertidal Area	Local community and seasonal visitors for general recreation and sailing; fishing; bird watching commercial bait digging
Llanfairfechan Town Centre;	Local community accessing local public and private assets
Lowland Farmland.	Commercial farming activity and general amenity such as walking and cycling associated with Wales Coast Path

Landscape Character

9.5.43 The physical, perceptual, cultural and social characteristics of the Study area have been outlined above and all contribute to help understand and define the landscape character of the area. Landscape character types are defined as *'distinct types of landscape that are relatively homogenous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they do occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern',* whilst landscape character areas are *'single unique areas and are the discrete geographical areas of a particular landscape type'* [14].

National Landscape Character Areas (NLCA's) [15]

9.5.44 NLCA's are defined at a broad landscape scale throughout Wales. The descriptive profiles for the 48 individual character areas highlight what distinguishes one landscape from another, with reference to their regionally distinct natural, cultural and perceptual characteristics.

9.5.45 The Study area falls primarily within the NLCA03 Arfon with NLCA06 Snowdon to the south east. Arfon is an extensive area stretching south-west from Llanfairfechan along the coastal plain to

[14] IAN 135/10 para 2.9
[15] Natural Resources Wales NLCA03 Arfon

Bangor, Caernarfon and south to Penygroes and beyond to Bryncir in Gwynedd. The summary description describes the area as *"being the lowland area bounded on the one side by the Menai Strait and on the other by the Snowdonia foothills and the adjacent glaciated valleys that open into it. Extending from Penmanen-bach Point in the north east to Bryncir in the south, it includes the Anglo-Norman boroughs of Caernarfon and the cathedral and university city of Bangor."*

9.5.46 There is no specific reference to Llanfairfechan in the NLCA03 Arfon although there is reference to *"a dramatic inland panorama of steeply rising mountains"* as being one of the key characteristics of the area. The NLCA provides a very broad description of the area and focusses on the landscape's further west of the Arfon plateau, Menai Strait and extensive slate quarries of Nantlle.

LANDMAP (Refer to Figure 9.6)

9.5.47 The main LANDMAP Visual and Sensory Aspect that covers the Study area is the SNPVS07Llanfairfechan/Penmaenmawr. The summary description for this area is extracted as follows;

> *"A narrow coastal area, tightly hemmed in by steeply rising mountains to the south (Snowdonia) and the sea to the north (Conwy Bay) providing inherently attractive views out, and the basis for a strong sense of place. Spectacular rocky headlands plunge into the sea at Penmaenbach and Penyclip, dissecting the area but for the A55/railway corridor that forms a dramatic and changing travel experience through the area. Between headlands there are large suburban village settlements: Llanfairfechan, Penmaenmawr and Dwygyfylchi. Historic stone and brick-built cores and wooded suburbs contrast with modern housing estates that are indifferent to natural or historic character. Long-established granite quarries on mountains above Penmaenmawr have resulted in industrial elements (workers cottages, old workings, railhead) some of which are now experienced as heritage. Promenades abut adjacent sandy beaches, but access points and tranquillity are notably eroded by the A55 road."*

9.5.48 Other LANDMAP Visual and Sensory areas adjacent to the above and within the Study area are as follows;

Table 9.3: LANDMAP Visual and Sensory Dataset

Area Unique ID	Area Name	Classification / Evaluation	Summary Description
SNPVS 131	Traeth Lafan	Intertidal/High	*"Extensive area of intertidal mud flats and sand in north-east of county, continuing into Conwy...Inaccessible Part of the Menai Straits, with good views (from edges) across to Anglesey and along the coast to Great Orme .Strong coastal sense of place with great tidal changes, tranquility and additional interest of bird life... Any changes or development would detract."*

Area Unique ID	Area Name	Classification / Evaluation	Summary Description
SNPVS072	Carneddau Uplands	Upland Grazing/High	*"Rough upland heath / grass / rocky outcrops / tranversed by rough tracks & paths. Scattered scrub & trees, with some drystone walls. Impressive borrowed view to sea & Snowdon Massif. Overhead pylon corridor in northern area is major visual detractor."*
SNPVS073	Abergwyngregyn	Hills and scarp slopes grazing/High	*"Coastal hills & valleys - strong borrowed view of coast / sea... Pleasant river environment of fields with conifer & broadleaf woodland. Felling of conifers has occurred and is being replaced with broadleaves in part. Rhododendron is apparent in the woodland in places"*
SNPVS075	Penmaen Mawr quarry	Excavation/Low	*"Slate quarry on hillside - grey monotone with borrowed view of coast."*

National Marine Character Areas (MCA's)

9.5.49 Seascapes, like landscapes, reflect the relationship between people and place and the part it plays in forming the setting to our everyday lives. Marine Character Areas highlight the key natural, cultural and perceptual influences that make the character of each seascape distinct and unique.

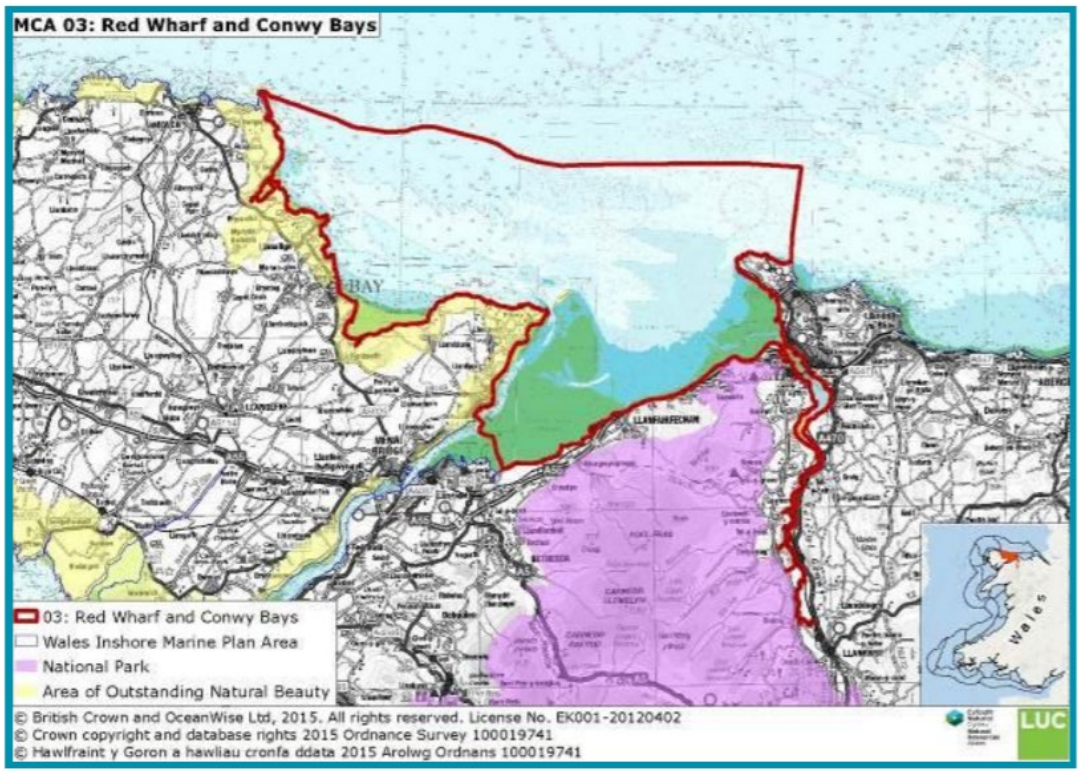
9.5.50 The marine character area that applies to this section of coast is the Red Wharf and Conwy Bays (MCA 03). The area stretches from the Great Orme's Head in the east to the Moelfre headland on the eastern coast of Anglesey to the west and includes Penmon Point and Puffin Island. It covers the three main bays of Red Wharf, Dulas and Conwy and its tidal stretches. Some of the key characteristics of the MCA relevant to the coastal towns of Penmaenmawr and Llanfairfechan are:

- *Broad sand flats and low-lying beaches punctuated by rugged cliffs and prominent limestone headlands;*
- *Extensive intertidal area around the mouth of Conwy Estuary extending westwards and including Lavan Sands;*
- *Significant area within the Liverpool Bay SPA, designated for overwintering populations of red-throated diver and common scoter. Lavan Sands (SPA/SSSI) is also designated for its wintering birdlife, especially the oystercatcher;*
- *Popular tourist destination evidenced by several coastal settlements. Activities include*

swimming, angling and diving, jet-skiing and pleasure trips. There are a number of recreational dive sites along the coast;

- *Rich evidence for a long history of human occupation, with large sections of the adjacent coast designated as Landscapes of Outstanding Historic Interest;*
- *The 12th Century Conwy and Beaumaris Castles (World Heritage Sites) overlook the MCA;*
- *The Wales Coast Path follows much of the coastline in this MCA. Most of the adjacent Anglesey coastline is AONB-designated, reflecting its nationally important scenic qualities. Snowdonia National Park rises up dramatically to the south;*
- *Puffin island a key feature of the seascape setting in views north, with Great Orme being a distinctive feature to the east; forming gateway features into Conwy Bay.*

Figure 9:3: Map extract from Marine Conservation Areas – NRW



9.5.51 The MCA acknowledges Llanfairfechan as a historically important seaside resort and the quarry workings at Penmaenmawr being visible as levels and inclines on the mountainside. It also acknowledges the tunnelling required for the A55 coast road and the mountainous backdrop of Snowdonia. The mountainous backdrop is considered one of the important aspects of the MCA, providing a spectacular landscape setting when viewed from the sea. It makes no reference to the existing A55 road corridor as being a key characteristic or detractor of the area.

Landscape and Ecological Designations

9.5.52 The following is a list of sites within the Study area which have been designated for their landscape and ecological value. A note of which LCA the designated areas fall within has been added for ease of reference:

Sites of Special Scientific Interest (SSSI)

- Traeth Lafan SSSI (LCA 01);
- Aber Afon Conwy SSSI (LCA 02, 04).

Special Area of Conservation (SAC)

- Menai Strait and Conwy Bay SAC (LCA 01, 02, 04).

Special Protection Area (SPA)

- Traeth Lafan SPA (LCA 01, 04);
- Liverpool Bay SPA (LCA 01, 02).

Local Nature Reserves (LNR)

- Traeth Lafan LNR (LCA 01, 02);
- Morfa Aber and Morfa Madryn LNR. (LCA 04);
- Nant-y-coed Nature Reserve (LCA 22);

Ancient Woodland Sites

- Tyddyn-y-coed restored Ancient Woodland (LCA 06);
- Ancient woodland at Gwern y Plas (LCA 19);
- Ancient Woodland at Wern Isaf (LCA 19);
- Y Teiryd Valley Semi Natural Ancient Woodland (LCA 22);
- Llys-y-gwynt covert is a restored ancient woodland (LCA 28).

Local Character Areas

9.5.53 A more detailed appraisal of the local landscape character areas (using LANDMAP as a basis) was undertaken that covered the Study areas of the conjoined Junction 15 and 16 Schemes. The Landscape Character Areas (LCA's) are presented in Appendix 9B each with a description and accompanying map inset and representative photograph. Note that the numbering for each LCA is not sequential for of the Junctions 15 or 16 schemes as these cover both study areas.

9.5.54 The LCA's relevant to Junction 15 are presented in Table 9.4 below.

Table 9.4: A55 Junction 15 Landscape Character Areas (LCA's)

LCA Ref	LCA Name	Junction 15	Junction 16
LCA 1	Traeth Lafan and Dutchman Bank	✓	
LCA 2	Penmaenmawr Beach	✓	✓
LCA 3	Conwy Estuary		✓
LCA 4	Aber and Felin-fach Salt Marsh	✓	
LCA 5	Aber Farmland	✓	
LCA 6	Tyddyn-coed - Mosaic	✓	
LCA 7	A55 Abergwyngregyn to Llanfairfechan	✓	
LCA 8	A55 Llanfairfechan to Pen-y-Clip	✓	
LCA 9	A55 Pen-y-clip to Penmaenbach		✓
LCA 10	Pendyffryn Pasture and Parkland		✓

LCA Ref	LCA Name	Junction 15	Junction 16
LCA 11	Llanfairfechan Promenade	✓	
LCA 12	Llanfairfechan Town Centre	✓	
LCA 13	Llanfairfechan Drycin	✓	
LCA 14	Llanfairfechan Uchaf	✓	
LCA 15	Penmaenmawr Penmaenan		✓
LCA 16	Penmaenmawr Pant-yr-afon		✓
LCA 17	Dwygyfylchi		✓
LCA 18	Llanfairfechan Parkland	✓	
LCA 19	Penmaen Park	✓	
LCA 20	Penmaenmawr Quarries (active)	✓	✓
LCA 21	Penmaenmawr Quarries (disused)	✓	
LCA 22	Y Teiryd Valley	✓	
LCA 23	Fairy Glen Valley		✓
LCA 24	Nant-y-Felin Pasture	✓	
LCA 25	Nant-y-pandy Pasture	✓	
LCA 26	Pant-yr-Afon Pasture	✓	
LCA 27	Capelulo Pasture		✓
LCA 28	Coed y Rhiwiau	✓	
LCA 29	Cae'r Haidd Mountain Pasture	✓	
LCA 30	Y Teiryd Mountain Pasture	✓	
LCA 31	Graig Lwyd Mountain Pasture	✓	✓
LCA 32	Maen Crwn Mountain Pasture		✓
LCA 33	Foel Wen Moorland		✓
LCA 34	Allt Wen Moorland		✓
LCA 35	Moelfre Upland Moorland	✓	✓

Landscape Character Assessment

9.5.55 A total of thirty-five landscape character areas were identified for the conjoined Schemes with twenty-five identified as being within the study area for Junction 15. Each landscape character area is fully described in Appendix 9C with supporting plan and indicative photograph. Each character area has been assigned measures of Landscape Value that when combined with

Susceptibility to Change combined, give a measure of Landscape Sensitivity.

9.5.56 A summary of the landscape character areas relevant to the A55 Junction 15 study area and their value is shown below in Table 9.5. Landscape value is assigned using a five point scale ranging from very high, High, Medium, Low and Poor (see Appendix 9.1).

Table 9.5: Landscape Character Areas (LCA's) for Junctions 15 & 16

LCA Ref	LCA Name	Landscape Value				
		Very High	High	Good	Low	Poor
LCA 1	Traeth Lafan and Dutchman Bank	✓				
LCA 2	Penmaenmawr Beach			✓		
LCA 4	Aber and Felin-fach Salt Marsh		✓			
LCA 5	Aber Farmland		✓			
LCA 6	Tyddyn-coed - Mosaic			✓		
LCA 7	A55 Aber to Llanfairfechan			✓		
LCA 8	A55 Llanfairfechan to Pen-y-Clip				✓	
LCA 11	Llanfairfechan Promenade			✓		
LCA 12	Llanfairfechan Town Centre			✓		
LCA 13	Llanfairfechan Drycin				✓	
LCA 14	Llanfairfechan Uchaf		✓			
LCA 18	Llanfairfechan Parkland			✓		
LCA 19	Penmaen Park		✓			
LCA 20	Penmaenmawr Quarries (active)				✓	
LCA 21	Penmaenmawr Quarries (disused)			✓		
LCA 22	Y Teiryd Valley	✓				
LCA 24	Nant-y-Felin Pasture			✓		
LCA 25	Nant-y-pandy Pasture		✓			
LCA 27	Capelulo Pasture		✓			
LCA 28	Coed y Rhiwiau			✓		
LCA 29	Cae'r Haidd Mountain Pasture	✓				

LCA Ref	LCA Name	Landscape Value				
		Very High	High	Good	Low	Poor
LCA 30	Y Teiryd Mountain Pasture	✓				
LCA 31	Graig Lwyd Mountain Pasture			✓		
LCA 35	Moelfre Upland Moorland	✓				

Sensitivity of the Landscape Receptors

9.5.57 IAN 135/10 (W) recommends that as part of the landscape baseline description," the sensitivity of the landscape should be established by combining judgements of the landscape receptors susceptibility to the type of change proposed and the value attached to the landscape".[16]GLVIA3

9.5.58 Susceptibility to change means "the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline situation" and is described using a three point scale of high, medium and low as set out in Appendix 9A (Table 3) but repeated here for ease of reference.

Table 9.6: Landscape susceptibility to change

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

9.5.59 Detailed landscape character area descriptions are set in Appendix 9C but are summarised below.

LCA 1 - Traeth Lafan and Dutchman Bank

9.5.60 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. Valued as a resource by the local community and as a venue for tourism the landscape is highly susceptible to change from any type of development and therefore highly sensitive.

[16] IAN 135/10 (W) para 3.10

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Very High	High	High

LCA2 – Penmaenmawr Beach

9.5.61 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. Large scale landscape with an open and exposed aspect. Organised pattern determined by tide levels with a moderate texture. 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. The area is already heavily influenced by the A55 and effects from the type of scheme proposed are likely to lead to a moderate change to the landscape baseline/character. Therefore, susceptibility is considered overall to be medium resulting in medium landscape sensitivity.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Medium	Medium

LCA4 - Aber and Felin-fach Salt Marsh

9.5.62 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. 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. Highly susceptible to change from any development.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	High	High

LCA5 – Aber Farmland

9.5.63 The character area is a coastal strip of low-lying farmland located between the busy A55 road corridor and the quiet coastline of Lavan Sands. 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). Highly susceptible to change from any type of development.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	High	High

LCA6 – Tyddyn-coed Mosaic

9.5.64 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. 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. Overall susceptibility is considered to be medium and a landscape of medium sensitivity.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Medium	Medium

LCA7 – A55 Abergwyngregyn to Llanfairfechan

9.5.65 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. 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. Boundaries are a mixture of metal and concrete barriers, timber fences, stone walls. Attractive views out both east and westbound. Well established roadside plantations clearly defines the road corridor and creates green corridor. Some discordant features such as concrete parapets and acoustic barrier fencing on approaches to Llanfairfechan. Existing road corridor of similar in nature to the type of scheme proposed but could lead to a moderate change in the baseline landscape, therefore susceptibility is considered to be medium.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Medium	Medium

LCA8 – Llanfairfechan to Pen-y-Clip

9.5.66 This is a busy transport corridor which provides access to the nearby settlement of Llanfairfechan from the A55 Junction 15 roundabout. 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. Although the A55 may be valued by the local community as a transport corridor and commuting route, the overall landscape value is considered ordinary due to the number of detracting elements. The susceptibility of the existing road corridor to change is considered generally to be low.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Low	Low	Low

LCA11 – Llanfairfechan Promenade

9.5.67 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 is highly valued by the local community and is a significant seaside attraction for visitors and day trippers. The promenade has a spectacular coastal and mountainous setting at the foothills of Snowdonia. The eastern section of the promenade is heavily influenced by the existing A55 road and rail corridor and therefore the susceptibility to change is considered low. However, the western section of the promenade is more susceptible to change.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Low	Medium

LCA12 – Llanfairfechan Town Centre

9.5.68 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. There are several residential properties in the eastern section that overlook the A55 road corridor and beyond towards Anglesey and Puffin Island. The roadside plantations alongside the A55 provides screening of the road from these properties and the school grounds of Ysgol Pant y Rhedyn. 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 area is generally of good quality, but the general setting is eroded by the presence of the road corridor and condition overall medium. Susceptibility is considered medium due to the presence and proximity of the existing A55 road corridor in the eastern section of the area.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Medium	Medium

LCA13 – Llanfairfechan Drycin

9.5.69 The land-use is residential set on steeply sided and elevated land above the A55 road corridor. There are few landscape elements of individual value that contribute to the landscape character. The limited areas of roadside planting 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. Susceptibility to change is considered low as is the landscape sensitivity.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Low	Low	Low

LCA14 - Llanfairfechan Uchaf

9.5.70 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. 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. The area is a well-established townscape with good legibility and is highly susceptible to change from the type of scheme proposed.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	High	High

LCA18 – Llanfairfechan Parkland

9.5.71 The area lies to the west of Llanfairfechan town centre and immediately south of the existing A55 road corridor that forms the northern boundary. The parkland area lies either side of Aber Road with Bryn – y – Neuadd Grade II Historic Park and Garden to the north. Remnants of the parkland remain, with mature parkland trees and woodland copses. 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. The parkland area surrounding Bryn-y-Neuadd Hospital 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 from the parkland setting. The overall landscape value is considered to be medium and susceptibility to change also medium resulting in medium landscape sensitivity.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good/Low	Medium	Medium

LCA19 – Penmaen Park

9.5.72 Penmaen Park lies on the eastern fringe of Llanfairfechan town centre on sloping land overlooking the A55 road corridor and Junction 15 roundabout. The area includes part of the town centre with 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. It is used by the local community and visitors for general recreation and valued as an area of informal amenity. The parkland is also an area of essential setting for Wern Isaf, a Grade II* Listed building that encompasses most of the hillside. The area is visually influenced by the existing A55 road corridor and therefore susceptibility is considered to be medium.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	Medium	Medium

LCA20 – Penmaenmawr Quarries (active)

9.5.73 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 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 good. Susceptibility to change is considered low as the landscape is constantly changing due to the ongoing quarrying activity and could accommodate further change.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Low	Low	Low

LCA21 - Penmaenmawr Quarries (disused)

9.5.74 The area lies south of the A55 road corridor and covers the northern face of Penmaenmawr mountain, a spectacular landmark on the North Wales coast 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., The area is highly scenic with strong cultural associations, but value is lessened by proximity and influence of the existing A55 road corridor. The lower slopes adjacent to the A55 have a low susceptibility to change but this increases to high on the upper slopes further south and east.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Low	Low

LCA22 – Y Teiryd Valley

9.5.75 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 set within a nationally valued landscape of Snowdonia National Park. A network of paths and guided trails run through the woodland and towards the upland areas around Foel Lwyd and Tal y Fan. Nant-y-Coed is a local nature reserve. It is a popular area for general amenity and wildlife related activities and visited generally by local people. It is a peaceful area with a high degree of tranquillity and is therefore considered to be of a high landscape value and highly susceptible to any form of development.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Very High	High	High

LCA24 – Nant-y Felin Pasture

9.5.76 The landscape character area is set on elevated land south and above the western edge and parkland landscape 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 generally open and exposed with views on the lower slopes restricted due to dense roadside vegetation and dry-stone walls along Gwyllt Road and Llanerch Road. This landscape is considered to be highly sensitive to any development and highly susceptible to change.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	High	High

LCA25 - Nant-y-Pandy Pasture

9.5.77 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. The landscape is of 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. This landscape is considered to be highly sensitive to any development and highly susceptible to change.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	High	High

LCA 28 – Coed -y-Rhiwiau

9.5.78 This area covers the wooded slopes of Coed y Rhiwiau and Llys-y-Gwynt Covert on the lower north and west facing slopes of Garreg Fawr approximately 1-kilometre south-west of Llanfairfechan 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. The area is highly susceptible to change, development of any type would have significant effects on the landscape baseline.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	High	Medium

LCA29 – Cae'r Haidd Mountain Pasture

9.5.79 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. 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 and susceptibility to change is therefore considered to be high.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Very High	High	High

LCA30 - Y Teiryd Mountain Pasture

9.5.80 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 very high with high susceptibility to development of any kind.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Very High	High	High

LCA31 – Graig Lwyd Mountain Pasture

9.5.81 The area lies on the northern slopes of Moelfre above the town of Penmaenmawr and immediately east and adjacent to the active quarry. 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 and with some ability to accommodate change that would lead to a moderate change to the baseline landscape.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
Good	Medium	Medium

LCA35 – Moelfre Upland Moorland

9.5.82 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 very high value and could not accommodate any type of development such as a highway scheme.

Landscape Value	Susceptibility to Change	Landscape Sensitivity
High	High	High

9.5.83 The landscape sensitivity of the LCA's is summarised in the table below. There appears to be some correlation between the highly sensitive upland and coastal areas that are highly protected with statutory designations and the landscape of lower sensitivity adjacent to the existing A55 road and rail corridor.

Table 9.7: Summary of Landscape Sensitivity

LCA Ref	LCA Name	Landscape Sensitivity		
		High	Medium	Low
LCA 1	Traeth Lafan and Dutchman Bank	✓		
LCA 2	Penmaenmawr Beach		✓	
LCA 4	Aber and Felin-fach Salt Marsh	✓		
LCA 5	Aber Farmland	✓		
LCA 6	Tyddyn-coed - Mosaic		✓	
LCA 7	A55 Aber to Llanfairfechan		✓	
LCA 8	A55 Llanfairfechan to Pen-y-Clip			✓
LCA 11	Llanfairfechan Promenade		✓	
LCA 12	Llanfairfechan Town Centre		✓	
LCA 13	Llanfairfechan Drycin			✓
LCA 14	Llanfairfechan Uchaf	✓		
LCA 18	Llanfairfechan Parkland		✓	
LCA 19	Penmaen Park		✓	
LCA 20	Penmaenmawr Quarries (active)			✓
LCA 21	Penmaenmawr Quarries (disused)			✓
LCA 22	Y Teiryd Valley	✓		
LCA 24	Nant-y-Felin Pasture			✓
LCA 25	Nant-y-pandy Pasture	✓		
LCA 28	Coed y Rhiwiau		✓	
LCA 29	Cae'r Haidd Mountain Pasture	✓		
LCA 30	Y Teiryd Mountain Pasture	✓		
LCA 31	Graig Lwyd Mountain Pasture		✓	
LCA 35	Moelfre Upland Moorland	✓		

Visual Baseline

9.5.84 This section describes the baseline visual conditions, identifying specifically:

- The extent of possible visibility;
- The different groups or types of people (receptors) who may experience views of the development;
- The viewpoints where they will be affected; and,
- The nature of the views at those points.

9.5.85 The baseline landscape conditions consider various aspects of perceptual characteristics: such as scale and appearance; scenic quality and tranquillity and records any discordant or intrusive features and night-time light sources.

9.5.86 These are useful observations that aid with establishing the visual quality of an area and how this can contribute to the landscape quality and value.

9.5.87 The visual baseline conditions establish the existing visual receptors using the following measures;

a) Use of a digital terrain model to establish a potential Zone of Theoretical Visibility (ZTV) that takes into account basic landform with no other visual barriers plotted and potential. The ZTV will be used to identify potential visual receptors and to define representative viewpoints for consideration in the assessment process;
b) Use of large-scale OS maps and aerial photography to determine where a straight line of sight may be available to the Scheme, taking into account topography and large intervening features such as substantial vegetation and buildings;
c) Site surveys to verify the ZTV, and to assess the views available from footpaths, bridleways, local roads, open space and land with public access;
d) Recording seasonal and night-time variations.

9.5.88 The study area is characterised by its generally high scenic quality due to its' spectacular coastal setting at the foothills of Snowdonia. To the north and north west there are far reaching and expansive views from the existing Junction 15 and surrounding area across Lavan Sands and Conwy Bay to Beaumaris (circa 7.5 kilometres distant) and to Penmon Point Lighthouse and Puffin Island (circa 7.6 kilometres distant). To the north-east there are far reaching views across Conwy Bay towards the Great Orme, approximately 11.5 kilometres distant. The views are extensive and highly scenic, especially when seen against the mountainous backdrop of the Carneddau Mountains and Penmaenmawr Headland.

9.5.89 Visibility varies considerably due to the weather conditions, not only seasonally but also daily and at times from hour to hour.

9.5.90 To the east, Penmaenmawr Mountain is a prominent rocky headland that descends steeply to the coast as a visual barrier preventing views towards Penmaenmawr and further east. Views to the south-east and south are similarly contained by the steeply rising land of Penmaenmawr mountain and the peaks of Tal-y-Fan (circa 5 kilometres) and Foel Ganol (circa 4 kilometres) forming part of the wider the Carneddau mountain range.

9.5.91 To the west and south-west, views are restricted to the short and medium distance by a combination of existing roadside plantations of the A55, the eastern limits of Llanfairfechan town centre and rising localised topography to the south-west.

9.5.92 Overall the Zone of Theoretical Visibility is limited and contained due primarily to the surrounding hills and mountainside of Snowdonia and nearby peaks of Penmaenmawr mountain Garreg Fawr and Foel-Ganol.

9.5.93 The key visual characteristic of the area are the open scenic vistas across the Lafan Sands and Conwy Bay to Anglesey, Puffin Island and the Great Orme. The view of the sea and these landmarks is compulsive and unique and the focus for many visual receptors within the wider area.

9.5.94 The main and highly significant visual detractor in the area is the A55 road corridor, a ribbon of transport infrastructure with a collection of unsightly elements assembled as a continuous linear man-made feature. The road corridor is also highly visible during night-time particularly around Junction 15 with vehicles also adding to the lighting levels.

Representative Viewpoints

9.5.95 Several photographs have been taken from viewpoints surrounding the extents of the Scheme proposals and have informed the visual baseline. The representative view points were selected;

a) From publicly accessible areas;
b) To represent a typical range of visual receptors;
c) To take into account long range, middle and short distance views.

9.5.96 A total of eleven number of representative viewpoints have been taken during the summer and winter months to help inform the visual baseline and identify potential visual receptors. The locations of the viewpoints are shown on Figure 9.9. A detailed description of the nature of the view towards the Scheme is described for each of the viewpoints on the representative viewpoint sheets which area included within Appendix 9.5. The viewpoint photographs have been taken in accordance with the photographic methodology included within in Appendix 9.2.

9.5.97 The key views from the representative viewpoints are described below;

Viewpoint A: Llanfairfechan Promenade

9.5.98 A typical coastal scene with expansive views across Lafan 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.

Viewpoint B: Llanfairfechan Beach

9.5.99 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.

Viewpoint C: Penmaenmawr Road Footbridge

9.5.100 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 not readily visible from promenade set against backdrop of properties in Pendalar.

Viewpoint D: Penmaenmawr Road (east)

9.5.101 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 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.

Viewpoint E: Shore Road East

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

Viewpoint F: Pemaenmawr Road (West)

9.5.103 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.

Viewpoint G: Penmaen Park

9.5.104 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.

Viewpoint H: Maes Dolfor

9.5.105 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.

Viewpoint I: Henar Farm

9.5.106 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.

Viewpoint J: Wern Isaf

9.5.107 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.

Viewpoint K: Garreg Fawr

9.5.108 Views are from the lower slopes of Garreg Fawr and enclosed hut circle of the Gareg Fawr (Hut Groups Monuments and Cairns) Scheduled Monument. Views are highly scenic across the mountains of Snowdonia and coastal plain and beyond towards Bangor and the Menai Strait and Lafan 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.

9.6 Identification of Potential Effects (including Landscape and Visual Receptors)

The Preferred Route and Project Characteristics

9.6.1 The preferred route (Option D) was announced on 5th April 2019 and was subsequently refined following Public Information Events (PIE's) held in June 2019.

9.6.2 The designers followed an iterative design and assessment process, to meet the Scheme objectives. At all stages, as the design was developed and refined to futureproof the Scheme against future predictable circumstances and to support Welsh Government objectives, including

the need to encourage active travel and support the sustainability objectives of the Well-being of Future Generations (Wales) Act 2015. The design team sought to avoid and reduce the potential impacts of the landscape and visual effects, and to incorporate measures required by other environmental disciplines.

9.6.3 The key components of the Scheme are described below. Full details of the Scheme are described in Chapter 2 The Project' and includes primary or embedded mitigation measures. Secondary mitigation measures required to mitigate adverse landscape and visual effects are described in section 9.8 Mitigation Measures.

General Arrangement

9.6.4 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 7.5-8.5 metres in height above the A55 main carriageway. The main carriageway dual carriageway would be moved, up to 6 metres south, towards residential properties along Penmaenmawr Road. As a consequence, the arrangement would affect Penmaenmawr Road (only to construct the new junction) and the link road to the existing Junction 15.

9.6.5 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.

9.6.6 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 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. The change in alignment means that for the property St Brendas, the new westbound slip road would be approximately the same distance away from the property as the existing main carriageway but significantly higher (circa 8 metres) with a retaining wall approximately 3 metres from the property and steep embankment rising above the wall. However, the new link will be further away than the current roundabout exit into Llanfairfechan to the west side of the property. For properties east of St Brendas such as Sunny Bank, Glan meurig, Glan Seiriol and Fern Bank, the height of the west bound off slip would reduce towards the east and return to existing levels towards the centre of the new Fernbank properties.

9.6.7 Two properties on shore Road East adjacent to the existing roundabout would be demolished as part of the Scheme. A new junction off Pemaenmawr Road would be created to maintain access to Shore Road East and maintain access beneath the railway to Shore Road and the Promenade.

9.6.8 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 and westbound slip road on the approaches to the overbridge.

9.6.9 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 height of approximately 12 metres high at Shore Road East 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.

Site Compounds

9.6.10 The Heath is a former council office for Highways, the car park area (circa 2000 square metres) to the rear of the building adjacent to the existing A55 is being considered for site office accommodation. Access would be off Penmaenmawr Road. Additional construction compounds are earmarked at;

a) Land east of Shore Road East (circa 300 square metres); and
b) Junction of Penmaenmawr Road south of existing roundabout (circa 600 square metres).

Accommodation Works

9.6.11 Maintenance routes for construction access and future maintenance operations have been identified in two locations;

a) Maintenance route south of existing A55 between the residential area of Maes Dolfor (west) and Shore Road East;
b) Maintenance/construction access south of new Junction 15 on rising land north of Penmaen Park.

Site Clearance

9.6.12 The Scheme would require the removal of the existing roadside plantations south of the existing roundabout junction and west past Shore Road East for a distance of approximately 350 metres. This mixed plantation was planted as mitigation following completion of the Llanfairfechan By-Pass scheme in 1989. The existing roadside plantation is managed as part of the A55 soft estate and is well established with trees now reaching approximately 15 metres in height.

9.6.13 Other areas of roadside planting in the vicinity of the new/replaced pedestrian footbridge may also be lost.

Construction Phasing

9.6.14 There are currently no details of Construction phasing details of which would be provided by a future Contractor, who would be appointed by Welsh Government, if Welsh Ministers choose to implement the Scheme.

Potential Landscape Receptors

9.6.15 Following the preparation of the landscape baseline and a review of the Scheme and its characteristics, a preliminary assessment on the likely landscape receptors affected by the scheme proposals can be made. This has been undertaken following an appraisal of the Scheme above that have been developed in more detail. Potential landscape receptors identified within the baseline assessment have been scoped out due to a variety of reasons but primarily due to topography, distance, scale and context;

Table 9.8: Scoped In/Out Landscape Receptors

LCA Ref	LCA Name	Landscape Receptors Scoped In/Out		
		In	Out	Commentary
LCA 1	Traeth Lafan and Dutchman Bank	✓		Adjacent to Scheme
LCA 2	Penmaenmawr Beach	✓		Adjacent to Scheme
LCA 4	Aber and Felin-fach Salt Marsh		✓	West of Llanfairfechan
LCA 5	Aber Farmland		✓	West of Llanfairfechan
LCA 6	Tyddyn-coed - Mosaic		✓	West of Llanfairfechan
LCA 7	A55 Aber to Llanfairfechan		✓	West of Llanfairfechan
LCA 8	A55 Llanfairfechan to Pen-y-Clip	✓		Part of Scheme extents
LCA 11	Llanfairfechan Promenade	✓		Adjacent to Scheme
LCA 12	Llanfairfechan Town Centre	✓		Adjacent to Scheme
LCA 13	Llanfairfechan Drycin	✓		Adjacent to Scheme
LCA 14	Llanfairfechan Uchaf		✓	Unaffected/distant
LCA 18	Llanfairfechan Parkland		✓	West of Llanfairfechan
LCA 19	Penmaen Park	✓		Adjacent to Scheme
LCA 20	Penmaenmawr Quarries (active)		✓	Unaffected/distant
LCA 21	Penmaenmawr Quarries (disused)	✓		Possible indirect effects
LCA 22	Y Teiryd Valley		✓	Unaffected/distant
LCA 24	Nant-y-Felin Pasture		✓	Unaffected/distant
LCA 25	Nant-y-pandy Pasture	✓		Possible indirect effects
LCA 28	Coed y Rhiwiau		✓	Unaffected/distant
LCA 29	Cae'r Haidd Mountain Pasture		✓	Unaffected/distant
LCA 30	Y Teiryd Mountain Pasture		✓	Unaffected/distant
LCA 31	Graig Lwyd Mountain Pasture		✓	Unaffected/distant
LCA 35	Moelfre Upland Moorland		✓	Unaffected/distant

9.6.16 The nine Landscape Character Areas (LCA's) identified as being potentially significant landscape receptors 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.

9.6.17 These areas will be the focus of the landscape assessment. Other areas that were described in the baseline assessment will not be taken forward for further assessment and have been scoped out.

Identification of Potential Landscape Effects (without mitigation)

9.6.18 The initial assessment of potential effects has identified the Landscape Character Areas that are likely to be significantly affected by the Scheme. For the initial assessment, the Scheme would incorporate primary or embedded mitigation measures but not secondary measures such as any specific landscape mitigation measures that will be described in Section 9.7.

9.6.19 The landscape assessment deals with the effects of change and development on landscape as a resource.

9.6.20 The first step in landscape assessment is to identify the components of the landscape that are potentially affected by the Scheme, referred to as the 'landscape receptors', and assess the sensitivity of those receptors to the type of development proposed.

9.6.21 The second step is to identify interactions between these landscape receptors and the different components of the development during construction and operation stages to derive the magnitude of change.

9.6.22 Judgements about the sensitivity of the receptor and about the magnitude of the change are then linked to arrive at conclusions about the significance of effects.

9.6.23 The magnitude of change and significance of effect on landscape receptors have been assessed initially without mitigation on a winters day in the year that would open to traffic referred to as Day 1 of opening. Potential impacts of the Construction Period on perceptual qualities have also been taken into consideration.

9.6.24 The significance of a landscape effect is assessed through professional judgement combining the sensitivity of a landscape receptor with the magnitude of the landscape change.

Table 9.9: Sensitivity of Landscape Character Areas (LCA's)

LCA Ref	LCA Name	Landscape Sensitivity		
		High	Medium	Low
LCA 01	Traeth Lafan and Dutchman Bank	ü		
LCA 02	Penmaenmawr Beach		ü	
LCA 08	A55 Llanfairfechan to Pen-y-Clip			ü
LCA 11	Llanfairfechan Promenade		ü	
LCA 12	Llanfairfechan Town Centre		ü	
LCA 13	Llanfairfechan Drycin			ü
LCA 19	Penmaenpark		ü	
LCA 21	Penmaenmawr Quarries (D)		ü	
LCA 25	Nant-y-pandy Pasture	ü		

9.6.25 The potential effects of the Scheme on each of the identified landscape receptors is undertaken below.

LCA 01 – Traeth Lafan and Dutchman Bank

9.6.26 The Scheme would not directly impact on the LCA but the visual context in the vicinity of Shore Road East is likely to be affected by the construction of the new wall north of the railway for the new J15 overbridge and eastbound slip roads. There may also be potential adverse indirect effects during the construction period through noise disturbance caused by piling operations and potential contamination of surface water discharging into Traeth Lafan.

Table 9.10: Assessment of Potential Effects on LCA 01

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
High	Minor Adverse	Moderate Adverse
Year 1 Opening: Summary of Potential Effects	No direct impact. Some visual impact of new wall when viewed from the seaward side. Disturbance to general amenity during construction works and on Day 1 of opening	

LCA 02 – Penmaenmawr Beach

9.6.27 The LCA adjoins LCA1 and lies further east along the coastal zone. As with LCA1 the Scheme would do not directly affect the LCA or the elements within in it. Therefore, the assessment of effects on LCA1 apply the same for LCA2.

Table 9.11: Assessment of Potential Effects on LCA 02

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Medium	Minor Adverse	Slight
Year 1 Opening: Summary of Potential Effects	No direct impact. Some limited and minor visual impact of new wall when viewed from the seaward side. Some minor disturbance to general amenity during construction not likely to be significant.	

LCA 08 – Trunk Road and Railway: (Llanfairfechan to Pen-y-clip)

9.6.28 The existing A55 road corridor is of low sensitivity and the Scheme would generally fall within the same footprint as the existing but would need additional land to the south in order to construct the new junction. This would result in the site clearance and removal of the existing roadside plantations, a key landscape element within the LCA resulting in a major direct impact. The remaining scheme proposals would result in a further urbanisation of the road corridor.

Table 9.12: Assessment of Potential Effects on LCA08

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Low	Major Adverse	Moderate Adverse
Year 1 Opening: Summary of Potential Effects	Loss of existing roadside plantations during site clearance operations. Significant change in landscape character would remain until Year 1 of opening	

LCA 11 – Llanfairfechan Promenade

9.6.29 The Scheme would not directly impact on the LCA but are likely to have a similar effect as on LCA1. 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.

Table 9.13: Assessment of Potential Effects on LCA11

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Medium	Minor Adverse	Slight
Year 1 Opening: Summary of Potential Effects	Loss of existing roadside plantations during site clearance operations and would have minor adverse effect on landscape character. Overall slight adverse effect would remain until Year 1 of opening.	

LCA 12 – Llanfairfechan Town Centre

9.6.30 The Scheme would have a direct but localised impact on this LCA 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 also be lost. The setting of the Conservation Area would also be indirectly affected.

Table 9.14: Assessment of Potential Effects on LCA 12

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Medium	Major Adverse	Large Adverse
Year 1 Opening: Summary of Potential Effects	Demolition of two properties and removal/loss of existing roadside plantations during site clearance operations. Significant adverse effects would remain until Year 1 opening.	

LCA 13 – Llanfairfechan Drycin

9.6.31 This is a landscape of low landscape sensitivity immediately adjacent to the existing A55 road corridor and Penmaenmawr Road and includes the properties of St Brendas, Siunny Bank, Glan Meurig, Glan Seiriol, and Fern Bank to the east. The Scheme would have a direct impact on the area but this will be localised and include components of a similar nature. The existing footbridge would be replaced with a new footbridge providing better access. There would be some significant disruption during the construction period.

Table 9.15: Assessment of Potential Effects on LCA13

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Low	Moderate Adverse	Minor Adverse
Year 1 Opening: Summary of Potential Effects	Moderate adverse effects over and above that already experienced. The existing LCA would remain largely the same with similar urban elements of the road corridor but at higher elevations and with some new structures with similar characteristics of the existing highway corridor.	

LCA 19 - Penmaen Park

9.6.32 The Scheme would have both direct and indirect effects on this LCA but would be of a similar nature to those that currently exist. 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.

Table 9.16: Assessment of Potential Effects on LCA 19

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Medium	Moderate Adverse	Moderate Adverse
Year 1 Opening: Summary of Potential Effects	Loss of existing roadside plantation during site clearance operations and encroachment of scheme footprint into former parkland area. Moderate adverse effect on Landscape character on Year 1 Opening	

LCA 21 - Penmaenmawr Quarries (disused)

9.6.33 This LCA would not be directly or indirectly affects by the scheme proposals and would remain as existing. The setting of the area, high on the hillside overlooking the existing A55 road corridor would also remain largely the same

Table 9.17: Assessment of Potential Effects on LCA 21

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
Medium	No Change	Neutral

Year 1 Opening: Summary of Potential Effects	There would be no noticeable change to the landscape character, features or elements and the setting would remain very similar to the existing.

LCA 25 – Nant-y-Pandy Pasture

9.6.34 This area is some distance from the Scheme footprint and would not be directly affected by either the construction or operational stages of the new road scheme. However, there may be some indirect effects and noise disturbance to the tranquil setting of the area caused by construction and operational activities. Conversely, there may also be some benefits to the perceptual qualities of the area during the operational period if some degree of noise reduction is achievable.

Table 9.18: Assessment of Potential Effects on LCA 25

Landscape Sensitivity	Magnitude of Effect	Significance of Effect
High	Negligible adverse/beneficial	Slight adverse/beneficial
Year 1 Opening: Summary of Potential Effects	There is likely to be no significant change to the perceptual qualities of the area but there may be some slight adverse or beneficial effects associated with noise.	

9.6.35 Judgements regarding the significance of impact on each landscape receptor are summarised in Table 9.19 below.

Table 9.19: Summary Landscape Receptor Magnitude and Significance

Receptor	Sensitivity	Magnitude	Significance of Effects
LCA 01 – Traeth Lafan and Dutchman Bank	High	Slight Adverse	Moderate Adverse
LCVA 02 – Penmaenmawr Beach	Medium	Negligible Adverse	Neutral
LCA 08 – Trunk Road and Railway	Low	Major Adverse	Moderate Adverse
LCA 11 – Llanfairfechan Promenade	Medium	Minor Adverse	Slight
LCA 12 – Llanfairfechan Centre	Medium	Major Adverse	Large Adverse
LCA 13 – Llanfairfechan Drycin	Low	Moderate Adverse	Minor adverse
LCA 19 – Penmaen Park	Medium	Moderate Adverse	Moderate Adverse

Receptor	Sensitivity	Magnitude	Significance of Effects
LCA 21 Penmaenmawr Quarry (disused)	Medium	No Change	Neutral
LCA24 Nant-y-Pandy Pasture	High	Negligible	Slight

9.6.36 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 Scheme, the landscape character of the area here would become more urbanised with the new junction and overbridge and associated slip roads, viaduct and retaining walls. There would be significant loss of the existing roadside plantation, a key landscape element that contributes to the landscape character of the area and further interruption of seaward views for some properties. The existing roadside plantations composed of mature deciduous trees and shrubs are well established and planted around 1990. The removal, together with elements of the new junction described above, would result in a highly urban and exposed environment.

9.6.37 On Year 1 of opening, the landscape character would be open and exposed with the loss of the existing roadside vegetation. The current amenity value afforded by the roadside plantations would be lost and remain so until the re-establishment of any landscape mitigation identified as secondary mitigation measures in Section 9.7. This is likely not to not have any significant effect until established several years after the day one of year one opening.

Potential Visual Receptors

9.6.38 The results of the ZTV indicate that visual receptors are likely to be limited due to the physical characteristics of the area, namely topography, landform and landcover. From the initial baseline assessment and consideration of the Scheme, the potential visual receptors are considered to be as follows;

Table 9.20: Potential Visual Receptors

Aspect from existing J15 roundabout	Potential Visual Receptors
North-West	• Mariners, sailors, fisherman and kayakers at sea in Conwy Bay. • Residential properties on Llanfairfechan Promenade and Glanmor Road. • People and community frequenting Llanfairfechan Beach for recreation and amenity. • People and community frequenting Llanfairfechan Promenade for recreational activities and general amenity including users of play areas and skateboard park.
North-East	• Mariners, sailors, fisherman and kayakers at sea in Conwy Bay. • A55 west bound motorists. • Rail passengers on Holyhead to Chester Mainline. • Pedestrians and cyclists using Wales Coast Path. • People in residential properties at Tyddin Drycin and Pendalar. • People in residential properties on Penmaenmawr Road.

Aspect from existing J15 roundabout	Potential Visual Receptors
South-East	• People in residential properties in Penmaen Park overlooking A55 road and rail corridor. • People in residential property and Listed Building of Rosebriers (Wern Isaf). • People in residential property of Henar Farm. • People using Public Rights of Way and Wales Coast Path in and around Penmaen Park. • People using North Wales Path, Public Rights of Way and open access land in Snowdonia National Park and visitors to Scheduled Ancient Monuments such as the Hut Circles around the peak of Garreg Fawr.
South-West	• Rail passengers on Holyhead to Chester Mainline. • A55 east bound motorists. • People in residential properties on Shore Road East. • Motorists and NMU's using Penmanemawr Road and public footpaths. • People and community in Llanfairfechan Town Centre. • People in residential properties on The Close, Park Road, Parc Henblas and Parc Isaf. • People in Bryn-y-Neuadd Hospital. • People using Public Rights of Way and open access land above Terrace Walk and Gwyllt Road.

9.6.39 The potential visual receptors outlined above have been categorised in terms of their sensitivity and for the purposes of the visual assessment are referenced and described below.

9.6.40 Adapted from IAN 135/10 (W), visual receptors are categorised in terms of their sensitivity as follows;

Table 9.21: 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). • People undertaking informal recreation and enjoyment of the open countryside (e.g. rambling on open access land). • Visitors to Scheduled Ancient Monuments and other areas of historic interest and value.
Medium	• Caravan Parks and temporary accommodation. • Users of outdoor recreational facilities and tourist attractions (eg golf courses) where setting and surroundings is important. • 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.

Sensitivity	Type of visual receptor
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).

9.6.41 The potential visual receptors identified for Junction 15 that will form part of the visual assessment are set out below. The assessment is recorded in a Visual Effects Schedule (VES) as required by IAN 135/10 (W) and presented in Appendix 9.5. Visual receptors have been divided into the following typical receptors;

a) Residential Properties (RP).
b) Non-Residential Properties (NRP).
c) Public Rights of Way (PRW).
d) Land with Public Access (LPA).
e) Roads and Transport Routes (RTR).

Residential Properties

9.6.42 There are several residential properties that are potential visual receptors and these have been identified and grouped into geographical areas in the table below. Under the current Scheme, property No's 8 & 9 Penmaen View would be demolished.

Table 9.22: Identification of potential Visual Receptors – Residential Properties

Residential Properties (RP)		**Sensitivity**	**High**
RP Ref	Property Reference	Location	
RP01	Victoria Terrace	Promenade	
RP02	St. Seiriols and St Elyn, Promenade	Promenade/Shore Road East	
RP03	Flats north of Penmaenmawr Road	East of J15 roundabout	
RP04	Fernbank Estate north of Penmaenmawr Rd	East of J15 roundabout	
RP05	Properties south of Penmaenmawr Road	West of Penmaen Park	
RP06	Properties south of Penmaenmawr Road	East of Penmaen Park	
RP07	Properties south of Penmaenmawr Road	East of Tyddin Drycin	
RP08	Pendalar (1-14)	East of Penmaenmawr Rd	
RP09	Mona Terrace (1-20)	East of Penmaenmawr Rd	
RP10	Penmaen Park	East of Penmaen Park	

Residential Properties (RP)		**Sensitivity**	**High**
RP Ref	Property Reference	Location	
RP11	Wern Isaf	South of Penmaen Park	
RP12	Parc Isaf (Nos 1 – 22 only cul-de-sac)	Off Park Road	
RP13	Properties on site of former Economy Car Centre site	Off Penmaenmawr Road	
RP14	Bryn-y-Mor and Dolfor	Penmaenmawr Road	
RP15	Maes Dolfor (East 1-7 and 37-46 cul-de-sac)	North off Penmaenmawr Road	
RP16	Maes Dolfor (West 8-36)	North off Penmaenmawr Road	
RP17	Maes-y-Glyn (1-12)	East of Maes Dolfor	
RP18	1-2 Bodfair	North off Penmaenmawr Road	
RP19	Penmaenmawr Road (west)	West of Shore Road East	

Non-Residential Properties

9.6.43 There are three non-residential properties that would be potential visual receptors and these are located along Penmaenmawr Road. Visual impact is likely to occur on both aspects of the properties that overlook both the A55 and Penmaenmawr Road.

Table 9.23: Identification of Potential Visual Receptors – Non- Residential properties

Non-Residential Properties		**Sensitivity**	**Medium**
NRP	NRP Reference	Location	
NRP01	Garisim Chapel	Penmaenmawr Road	
NRP02	Ysgol Pont y Rhedyn	Penmaenmawr Road	
NRP03	The Heath	Penmaenmawr Road	
NRP04	The Split Willow	Penmaenmawr Road	
NRP05	Penlan Garage	Penmaenmawr Road	

Public Rights of Way (PRoW)

9.6.44 The users of Public Rights of Way are potential visual receptors and there is a small network of well used footpaths that connect Llanfairfechan Town Centre to Penmaen Park and Pendalar. The paths generally run along elevated land to the south-east that overlooks the A55 road corridor. Sections of the Wales Coast Path also traverse the lower slopes of Penmaen Mawr mountain close to Henar Farm and overlook the existing road corridor and proposed junction.

Table 9.24: Identification of Potential Visual Receptors - PRoW

Public Rights of Way (PRoW)_		**Sensitivity**	**High**
PRoW Ref	PRoW Reference	Location	
18/02	Llanfairfechan Footpath 02 (Penmaen Park)	East of Park Road	
18/03	Llanfairfechan Footpath 03 (Penmaen Park)	East of Park Road	
18/48	Llanfairfechan Footpath 48 (Henar Farm)	South-East of Park Road	
18/04	Llanfairfechan Footpath 04 (Pendalar)	Off Tyddyn Drycin	
18/06	Llanfairfechan Footpath 06 (Henar Farm)	Wales Coast Path	

Land with Public Access (LPA)

9.6.45 There are two areas of land with public access that have been identified as potential visual receptors. Llanfairfechan Promenade is a popular public park with a number of different receptor types and used throughout the year. Penmaen Park is an open area of grassland accessed by the local footpath network and used for informal recreation.

Table 9.25: Identification of Potential Visual Receptors – Land with Public Access

Land with Public Access		**Sensitivity**	**High**
LPA	LPA Reference	Location	
LPA1	Llanfairfechan Promenade	North of Shore Road East/ A55	
LPA2	Penmaen Park	South of A55 and Junction 15	

Local Road Network and Bus Routes (LRN)

9.6.46 There are few local roads in the area close to the Scheme from which visual receptors are likely to be affected by the proposals. Penmaenmawr Road is the main entrance into Llanfairfechan and is also a local bus route and designated cycle route (5). Therefore the users of the road would be potential visual receptors.

Table 9.26: Identification of Potential Visual Receptors – LRN

Local Road Network and Bus Routes		**Sensitivity**	**Low**
POS Ref	POS Reference/Description	Location	
LRN1	A55 Road Corridor	The Scheme east and west of Junction 15	
LRN2	Penmaenmawr Road	East and west of Junction 15	

Identification of Potential Visual Effects (without mitigation)

9.6.47 The assessment of visual effects is undertaken for the following scenarios in accordance with IAN 135/10 (W)[17];

a) During the construction period assuming a maximum visibility and or maximum perceived change and over what period of time;
b) A winters day in the year the project would be open to traffic and be fully operational and a reflection of the operationally non-fully mitigated/maximum visibility scenario;
c) A summers day in Year 15 after opening – note that the existing roadside plantations has taken approximately 30 years to establish.

9.6.48 For the purposes of this visual assessment with no mitigation in place, scenario b) is considered appropriate as it can be seen as a reflection of the operationally non-fully mitigated/maximum visibility scenario. Visual effects of the Construction Period have not been taken into account as these are likely to occur both with and without mitigation measures designed to reduce any significant adverse visual effects. All three scenarios are considered in Section 9.9 with mitigation measures in place with a comparison made between scenario b without mitigation and with mitigation in place.

9.6.49 The representative viewpoints identified in the landscape baseline have been used to identify likely visual effects and potential mitigation measures. This is considered to be proportionate to the extent of the Scheme as these are junction improvements and form part of an incremental change to the existing road corridor. The initial assessment without mitigation on the representative viewpoints is summarised in Table 9.15 below;

9.6.50 The most significant visual impact associated with the Scheme would be twofold;

a) The removal and loss of the well-established existing vegetation and roadside plantations alongside the A55 and the southern verge of Penmaenmawr Road.
b) The construction of a new junction with overbridge, viaduct and slip roads and other associated structures.

9.6.51 Due to the nature of the Scheme, effectively a widening of the existing A55 road corridor, the removal of the existing roadside plantations is largely unavoidable. Additional mitigation measures are also restricted due to the amount of available space constrained by topography, the existing road corridor and local road network and the proximity of the railway line.

[17] IAN 135/10 (W) Annex 2 para 3.1

Table 9.27: Summary of potential Visual Effects

Ref	Representative Viewpoint	Description of Effect	Visual Receptor sensitivity	Magnitude of change (prior to mitigation)	Significance Of Visual Effect
A	Penmaenmawr Promenade	Visual impact of new junction and overbridge	High	Moderate	Moderate/ Large Adverse
B	Llanfairfechan Beach	Visual impact of new junction and overbridge	Medium	Moderate	Moderate Adverse
C	Penmaenmawr Footbridge	New junction and overbridge would lead to further urbanisation of existing road corridor	High	Moderate	Moderate/ Large Adverse
D	Penmaenmawr Road (east)	Realignment of the existing road to connect to new junction layout and widening of existing footway	High	Minor	Slight/ Moderate Adverse
E	Shore Road East/Existing Junction 15	Demolition of properties (8 & 9 Penmaen View), removal of existing vegetation and construction of new junction and overbridge	High	Major	Very Large Adverse
F	Penmaenmawr Road (west)	Removal of existing vegetation adjacent to A55 and Penmaenmawr Road, realignment of Penmaenmawr Road and regrading of rising land to south.	High	Major	Very Large Adverse
G	Penmaen Park	Removal of existing vegetation, realignment of Penmaenmawr Road, construction of new junction and overbridge.	High	Major	Very Large Adverse
H	Maes Dolfor	Removal of existing vegetation adjacent to A55, exposure of views to new elevated sections of new carriageway and moving traffic.	High	Major	Very Large Adverse
I	Henar Farm	Negligible change in view due to distance and intervening landscape elements	High	Negligible	Slight Adverse/ Negligible
J	Wern Isaf (Rosebriars)	Removal of existing vegetation south of A55, exposure of views to new elevated sections of new carriageway and moving traffic.	High	Moderate	Moderate/ Large Adverse
K	Garreg Fawr	No discernible or negligible change due to distance of viewpoint from the Scheme and context of view. Loss of existing vegetation may be just discernible.	High	No Change/ Negligible	Neutral/Slight

9.7 Mitigation Measures

Approach to identification of mitigation measures

9.7.1 Legislation provides the Overseeing Organisation with powers to: "acquire land for the purpose of mitigating any adverse effect which the existence or use of a highway constructed or improved by them or proposed to be constructed or improved by them, has or will have an impact on the surroundings of the highway"[18]

9.7.2 The designers followed an iterative design and assessment process, to meet the Scheme objectives. The design was developed and refined to support Welsh Government objectives, including the need to encourage active travel and support the sustainability objectives of the Well-Being of Future Generations (Wales) Act 2015. The design team sought to avoid and reduce the impacts of the landscape and visual effects, and to integrate the measures required by other environmental disciplines.

9.7.3 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.

Transport Planning Objectives and statutory duties

9.7.4 The measures described in this section are intended to satisfy Welsh Government duties and to meet high level Welsh Government objectives and the Scheme Transport Planning Objectives.

a) Encourage Active Travel in accordance with the Active Travel (Wales) Act 2013;
b) Supports Welsh Government's Well-Being Duty under the Well-being of Future Generations (Wales) Act 2015;
c) Assisting in achieving the seven Well-Being Goals of the Well-Being of Future Generations (Wales) Act 2015;
d) Meeting the Welsh Governments duty under Section 6 of the Environment (Wales) Act 2016.

9.7.5 The relevant Transport Planning Objectives (TPO) for the Scheme also take into consideration the views of stakeholders and aim to reflect the problems of the existing road (refer to Chapter 2). Those TPOs that influence landscape and environmental design are:

- O3 Reduce community severance and provide health and amenity benefits.
- O5 Promote active travel by cycling, horse riding and walking to provide opportunities for healthy lifestyles.
- O7 Deliver a project that is sustainable in a globally responsible Wales, taking steps to reduce or offset waste and carbon.
- O8 Give due consideration to the impact of transport on the environment and provide enhancement when practicable.

Scheme design principles

9.7.6 The objectives set out above have guided the approach to design and mitigation and have been used as the basis for the Scheme Environmental Objectives. These have been agreed with the Statutory Environmental Consultees. These objects, listed in ES Chapter 2 The Project provided the basis for the following design principles:

[18] Highways Act 1980 (as amended) Part XII, Section 246

9.7.7 The design principles are to:

1. Protect the existing landscape:
    a) To respect the historic fabric of the landscape so that, where possible, existing landscape features (e.g. hedges/hedgerows/hedge banks, individual and veteran trees, woodland, water features, public-rights-of-way and field systems it would be retained for future generations;
    b) Protect the Llanfairfechan Conservation Areas, Listed Buildings (LB), Scheduled Ancient Monuments (SAM) and other known cultural heritage sites and their settings;
    c) To optimise mitigation for nearby houses or public areas to minimise adverse effects by providing visual screening, noise attenuation earthworks, planting and boundary treatments in critical locations, and to integrate these measures within the landscape design;
    d) To, where possible, protect existing views to the sea;
    e) integrate the road and its structures with the setting by refining the road alignment, earthworks, footpaths and cycleways and cuttings, planting and boundary treatments to reflect the character and quality of the surrounding landscape;
    f) To, where possible, retain and make best use of existing vegetation, considering translocation of suitable coppiced vegetation wherever a suitable donor site within the Scheme is available at the appropriate time;
2. Introduce new and appropriate landscape features:
    a) To prioritise the early establishment of new planting and vegetation using species that can survive in the local conditions.
    b) To use locally appropriate boundary treatments such as masonry walls and hedges;
    c) Integrate road drainage measures for attenuation and pollution control within the landscape to reduce the risk of pollution and associated impacts on local hydrology and habitats;
3. Protecting and enhancing biodiversity
    a) Protect designated Marine Nature Conservation sites;
    b) Enhance terrestrial biodiversity, and;
4. Protecting and improving connectivity:
    a) Maintain terrestrial habitat connectivity, and so;
    b) Improve connectivity for pedestrians, cyclists for local trips and commuting as well as improved circular routes for recreation and pleasure;
    c) To design for safe maintenance, giving due consideration to access arrangements, costs and liabilities for all mitigation;

Scheme Mitigation and Enhancements

9.7.8 Multidisciplinary working has allowed the designers to develop the design principles and then to apply them to develop appropriate integrated environmental mitigation measures and enhancements within the design. The main components of the design are described in the following paragraphs.

Landform

9.7.9 Cuttings and embankments are formed to allow the required vertical and horizontal alignments of the carriageway to be accommodated within the existing terrain. In the development of a suitable arrangement for the junction, the need for cuttings and embankments is considered

alongside a range of other engineering and environmental criteria.

9.7.10 The Scheme traverses ground that slopes downwards the sea. This means that the existing A55 has a cutting on the south side and an embankment on the north side. This is so extreme at the eastern end of the Scheme, where the A55 emerges from the tunnel portal, that the eastbound carriageway is divided from the westbound by a cutting slope which takes the form of a retaining wall. The Scheme would extend into this section, but the retaining wall is not affected.

Embankment

9.7.11 The vertical alignment of the existing A55 dual-carriageway would not change substantially, the introduction of a grade-separated junction means that slip roads would rise on a combination of viaduct and embankments up to 7.5 metres high to meet the proposed overbridge. These slip roads, on both sides of the A55 would screen views of traffic on the A55 from neighbouring residential areas and would have the additional benefit of reducing traffic noise too.

9.7.12 Road embankments have stable slopes formed at the natural angle of repose for the material from which they are constructed. Typically, this would be a gradient of 1:2 to 1:3. This means that for every metre of height gained, there would be two metres of additional width. For example, an embankment slope 1 metre high would require 2 metres of width, while an embankment 8 metres high would need 16 metres width for the slope on one side. The physically constrained site of Junction 15 leaves little space to accommodate wide embankment slopes. To enable construction of the eastbound slip roads within the constrained space and adjacent to the railway, a viaduct will be constructed on concrete piers.

9.7.13 Where there is sufficient space, to the west of Shore Road East, and on the east side of the slip road between the proposed overbridge and Penmaenmawr Road, embankment slopes of around 1:2 to 1:3 would be formed. To integrate an embankment with its setting, and to replace the established roadside plantations, new trees and shrubs would be planted to replicate the existing situation.

9.7.14 The planting on the slopes would take up to 5 years for the trees and shrubs to have grown sufficiently to reduce the visual impact of the embankment slope. Replacement of the existing noise barrier along the existing road, and any additional length of barrier that is required, would provide around 2 metres of visual screening to the view of traffic. Planting would need 15 years to achieve effective visual screening of the road, traffic and noise barrier.

Cutting

9.7.15 Placing a road in a cutting means that the carriageway would be below surrounding ground level. Traffic can potentially be screened from views by the cutting slopes. A cutting 2m deep would conceal cars in most views, while a 5m deep cutting would screen high-sided vehicles in the same way. Planting on the slope can increase the height of screening.

9.7.16 Penmaenmawr Road is on sidelong ground that slopes down to the sea. There is already a cutting separating the road from the field in Penmaen Park, which lies to the south. Penmaenmawr Road would be moved southwards to accommodate the proposed junction arrangements so that it would cut more deeply into the field. A cutting averaging 8 metres deep would be formed.

9.7.17 The landscape treatment of cuttings varies depending upon the character of the rock or soils from which it is excavated. Softer soil-like material would be cut to a shallow gradient similar to an embankment slope (approximately 1:2). The cuttings on the Scheme are expected to be predominantly into soft materials. If rock is close to the surface in could be revealed in the cutting. Exposed rock must be cut at an angle that is adequately stable, ranging from nearly vertical to 1: 2 or shallower. Assuming that no rock is found, the cutting slope would be planted with a dense belt of trees and shrubs. If rock is exposed and can be made into an attractive feature, the exposure would be retained as a feature and planting would be completely on the slope above.

Boundaries and other linear features

9.7.18 Hedges and wall are important in providing visual containment of local views, and in creating landscape character. In the urban and suburban landscape of the study area boundaries tend to be those around gardens; these are predominantly brick walls, trimmed hedges and mature garden shrubberies. There are also some linear belts of trees and shrubs associated with the existing A55. There are very few boundary features that reflect the rural heritage of the area. Historical photographs show that masonry walls were a prominent feature of Llanfairfechan Promenade and Bryn-y-Neuadd Park, which were built from glacial boulders and later from quarry stone.

9.7.19 Further to the south and west, and away from the coast there are fields enclosed by hedges and drystone walls, but further up the slopes of the surrounding hills drystone walls are ubiquitous. Slate fences are also to be found along short sections of road boundary. Many of these field hedges contain mature trees and there are small pockets of woodland, possibly plantations within the former extent of Penmaen Park.

9.7.20 The effect of the existing A55 has been to sever the coastal strip from the coastal plain and disrupt the pattern of urban and suburban boundary walls. For effective landscape integration it is appropriate to consider reinstating local styles of boundary to define the edge of the road and areas of land taken for mitigation. Traditional masonry walls and hedges are a useful form of landscape and ecological mitigation, providing a low-level visual screen.

9.7.21 Noise attenuation fences would be installed where required and would consist of a vertical post set into the ground and solid panels up to the required height. These could be used as boundary fences, or in combination with other fences to serve multiple functions.

Habitat mitigation, connectivity and protected species

9.7.22 Chapter 8 Ecology and Nature Conservation sets out proposed biodiversity mitigation on land taken for embankments, cuttings and plantations to assist in achieving biodiversity objectives.

9.7.23 The following points would be adopted where possible in the design of landscape mitigation:

a) Tree and shrub planting as specimen trees, belts of shrubs, hedge would be undertaken. Spring bulbs would be planted in suitable location;
b) Proposals to meet the aims of the Green Corridors Initiative including the creation of colourful flower-rich grassland and the development of gateway features at junctions would be implemented;
c) Opportunities to reinstate the bank of trees and shrubs along the south side of Penmaenmawr Road would be required to provide connectivity and nesting habitat for wildlife.

Routes for pedestrians, cyclists and horse riders.

9.7.24 Chapter 14 All Travellers sets out how the Scheme will address the impact on pedestrians, cyclists and horse riders and will set out Active Travel measures would be connected across the Scheme. Active travel routes as well as existing footpaths and cycleways would be incorporated within the Scheme and within the proposed landscape design to provide an attractive and interesting route.

Invasive non-native plants

9.7.25 Where Japanese Knotweed or other INNS is found within the Scheme extents, an eradication programme would be implemented where it falls within or immediately adjacent to the Scheme boundary.

Planting density, layout and design for future maintenance

9.7.26 Planting would be designed to address the required Landscape Function (as set out in DMRB Vol 10). In some cases, an area of mitigation would serve two or three functions, such as Visual Screening and Nature Conservation, and the design would need to reflect this. One of the more critical factors in designing plantations is achieving a naturalistic appearance that is appropriate in the setting. In many cases the natural appearance is enhanced by vegetation management tasks to diversify the canopy using techniques such as selectively coppicing of shrubs and trees on the edges of the plantations to create variety and density in the height of the canopy or irregularity in the margin.

Table 9.28: Landscape Functions as set down in DMRB Vol 10

Reference	Function	Description
EFA	Visual Screening	Dense, consistently spaced trees and shrubs with some use of evergreen plants or faster-growing plants to provide an adequate screen or filter to views by the Design Year (Year 15 after construction).
EFB	Landscape Integration	Low density and irregularly placed planting that would grow to adopt the character of existing vegetation in the surrounding landscape over a period of 15 or more years.
EFD	Nature conservation	Planting carried out with a particular nature conservation function.
Two or more of these together		The priority would be to satisfy both functions with the most important function given priority.

9.7.27 In the interests of the sustainability of the roadside landscape, the cost and ease of maintenance and vegetation management have been considered. Maintenance of the roadside landscape cannot be reduced to nil without the quality of vegetation deteriorating. The greatest costs are grass cutting, hedge cutting and the thinning of established plantations. Measures included in this Scheme should reduce the cost of maintenance by:

a) reducing the frequency of grass cutting by using low fertility soils;
b) avoiding vegetated central reserves and isolated strips of verge between roads;
c) By including access to vegetated roadside areas to reducing the need for traffic

management and lane closures on the A55 Expressway;

d) Avoiding, where possible, areas of vegetation that require intensive maintenance, difficult access or costly tasks;
e) Planting trees at wide spacing, where there is no need for dense screening to be formed, so that thinning of plantations is less intensive;
f) Providing hedges as mitigation only where essential and where safe access for mechanical maintenance is possible;
g) Grazing of large areas of grass where conditions allow this to be achieved safely within secure parcels of land;
h) Providing easements for access to maintain fences and walls.
i) Providing vehicular access to balancing ponds and flood attenuation areas for routine inspection, maintenance and removal of debris.

The selection of species for new planting and seeding

9.7.28 The selection of species for planting and seeding is based on those locally indigenous species noted to grow in the area and on a small selection of non-native species or ornamental varieties to serve particular purposes. The lists of species that are considered appropriate are included in Table 9.18.

9.7.29 In some locations fast-growing trees and bulky evergreens, will be considered to achieve visual screening, wind breaks or as nurse species. Nurse species will grow quickly to provide early visual screening and shelter for the other species and will then be removed when other species achieve adequate height and bulk.

Ash dieback disease

9.7.30 During autumn 2012 confirmed cases of Ash Dieback Disease were discovered in Britain. A number of these cases were in Wales. In 2017, Ash Dieback had been found in over 70% of 10km grid squares in Wales. With the potential for around 98% of ash trees in Britain to die, it is likely that any proposed Ash planting undertaken in the next few years will suffer a similar fate. Until disease-resistant varieties of the species are found planting of Ash trees is unadvisable and so none are included in the proposed planting mixes.

Table 9.29: Proposed species as a basis for selection for landscape planting

(Non-UK natives listed are underlined | **Bold** locally indigenous | ***front line salt tolerance | **Second line salt tolerant | *nurse species)

Species	Wind and salt tolerant shelter	Mixed Woodland	Linear Belts or screening	Rural hedges	Woodland edge	Coastal Scrub	Urban and suburban planting	
							Mass planting	Urban trees
Alder *Alnus glutinosa*	Yes**	Yes*	Yes					
Aspen *Populus tremula*	Yes				Yes			
Austrian Pine *Pinus nigra maritima*	Yes***							Yes***
Beech *Fagus sylvatica*	Yes*	Yes						Yes*
Birch *Betula pubescens*	Yes	Yes*	Yes					
Blackthorn *Prunus spinosa*	Yes***		Yes	Yes	Yes	Yes***		
Cherry *Prunus avium*		Yes	Yes	Yes	Yes		Yes	Yes
Crab Apple *Malus Sylvestris*	Yes	Yes	Yes	Yes	Yes		Yes	
Dog Rose *Rosa canina*					Yes	Yes**		
Dogwood *Cornus sanguinea*	Yes**		Yes	Yes	Yes		Yes**	
Elder *Sambucus nigra*	Yes				Yes	Yes		
Field Maple *Acer campestre*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Goat Willow *Salix cinerea*	Yes***		Yes			Yes***		
Hawthorn *Crataegus monogyna*	Yes***	Yes	Yes	Yes	Yes	Yes***	Yes***	
Hazel *Corylus avellana*	Yes	Yes	Yes	Yes			Yes	
Heather *Erica cinereal / Calluna vulgaris*						Yes	Yes	
Holly *Ilex aquifolium*	Yes**	Yes	Yes	Yes	Yes		Yes	
Monterey Pine Pinus radiata	Yes***							Yes***
Norway Maple *Acer platanoides (&varieties)*	Yes**							Yes**
Oak (Sessile) *Quercus petraea*	Yes	Yes	Yes	Yes				Yes
Osier *Salix viminalis*			Yes				Yes	

Species	**Wind and salt tolerant shelter**	**Mixed Woodland**	**Linear Belts or screening**	**Rural hedges**	**Woodland edge**	**Coastal Scrub**	**Urban and suburban planting**	
							Mass planting	**Urban trees**
Rowan *Sorbus aucuparia*	Yes**	Yes	Yes				Yes**	Yes**
Scots Pine *Pinus sylvestris*	Yes**	Yes*	Yes					Yes**
Sea Buckthorn *Hippophae rhamnoides*	Yes***					Yes***		
Sycamore *Acer pseudoplatanus (&varieties)*	Yes***							
Whitebeam *Sorbus aria*	Yes**		Yes		Yes		Yes**	Yes**
Yew *Taxus baccata*		Yes	Yes				Yes	

Specific Mitigation Measures

9.7.31 The proposed planting areas, together with other landscape and environmental mitigation measures, are shown on the EMPs in Volume 3 Appendix 2.5, and described in the following paragraphs.

A55 Dual carriageway realignment

9.7.32 The existing Junction 15 roundabout would be removed and the dual carriageway would be realigned slightly to the south to allow for the east bound slip roads for the grade separated junction to fit beside the Chester to Holyhead railway. The vertical alignment of the dual carriageway would be broadly similar to the existing. The new road would be constructed with a running surface that should reduce traffic noise.

East bound slip roads

9.7.33 Each single lane slip road would rise to meet the overbridge. The exit slip road would require a 350-metre-long combined embankment and viaduct to rise circa 7.5 metres, while entry slip road would require a 250 metre long embankment. There would be a narrow strip of land available to construct the slip roads and so a viaduct would be constructed on the north side to support the slip road and overbridge above the railway.

9.7.34 Mitigation measures have been developed for the Junction 15 Scheme in consultation with the design team. This has been an iterative process following the announcement of the preferred route option and more detailed design considerations following the Public Information Events held at the end of June 2019. The mitigation measures are illustrated in the Environmental Masterplans (EMP's) in Appendix 2.

Tree Retention

9.7.35 It has been established in the LVIA that the existing soft estate is an important landscape element that contributes to the landscape character of the area and screens the A55 from many sensitive visual receptors. Where retention is feasible to support the long-term health and vigour of the plantation or individual trees (and does not encroach within the Root Protection Area), the area should be fenced off and protected prior to the commencement of the Construction Period using fencing in accordance with BS 5837 Trees in relation to design, demolition and construction. The tree protection fencing would be inspected on a regular basis for damage and maintained throughout the Construction Period. Existing mature trees in the grounds of Ysgol y Plant Y Rhedyn and The Heath would be tagged and earmarked for protection prior to the works commencing.

Site Clearance

9.7.36 There are significant areas of soft estate that would need to be cleared outside the bird nesting period (March – August inclusive depending on seasonality and checks by suitably qualified ecologist). These areas are primarily;

a) South of the A55 between Chainage 0 to 350;
b) East of Shore Road East adjacent to the existing roundabout junction;
c) South of Penmaenmawr Road Chainage 0 to 323;
d) Soft estate in the area adjacent to the existing footbridge (that will be replaced).

9.7.37 Existing topsoil remaining would be tested to establish suitability for re-use and or suitable amendments recommended. If unsuitable as a growing medium the excavated topsoil would be removed off site or used as subsoil elsewhere within the Scheme extents or as part of the Junction 16 proposals.

Chainage 0 – 350 – Maes-y-Llan to Shore Road East

9.7.38 Tree and shrub planting is proposed along the southern verge and embankment of the new westbound slip road for visual screening and landscape integration. New topsoil may be required depending on the quality of the existing to ensure successful establishment and sustained health and vigour of the new planting.

Shore Road East (East)

9.7.39 Properties 8 and 9 would be demolished as part of the Scheme to enable construction of new junction. Individual tree planting is proposed along base of wall and would mitigate the visual impact of new retaining wall and setting of the Conservation Area.

Penmaen View

9.7.40 Hard landscaping with individual tree planting south of Penmaen View would provide new parking arrangements for residents and an area of public realm adjacent to Penmaenmawr Road that forms the eastern gateway to the town.

Penmaenmawr Road Chainage 0-100 (north)

9.7.41 New areas of public realm and car parking is proposed outside existing properties with individual tree planting in grassed verges that would enhance the general streetscape. Areas of species rich grassland would surround a surface water attenuation pond east of the junction with Penmaenmawr Road.

Penmaenmawr Road Chainage 0-323 (south)

9.7.42 South of Penmaenmawr Road a substantial cutting would be planted with ornamental trees and shrubs to screen views of junction and traffic from residents and public rights of way in Penmaen Park. The planting would also enhance the eastern approaches from the new junction into the town and mitigate adverse visual effects of the cutting from residents and users of Penmaenmawr Road.

Overbridge 0 – 125

9.7.43 Some components of the viaduct north of the junction would be treated with a textured finish to mitigate adverse visual effects from the north and for visual receptors and users of the Promenade. However, the pre-cast concrete beams of the viaduct would not be available in a textured finish. Individual tree planting would provide landscape integration of the bridge abutments east and west of the bridge and south of the main carriageway.

Construction

9.7.44 During construction, existing features to be retained would be protected through the implementation of the Construction Environmental Management Plan (CEMP).

9.8 Assessment of Landscape Effects

LCA 01 – Traeth Lafan and Dutchman Bank - Landscape Sensitivity High

9.8.1 The Scheme would not directly impact on the LCA but the visual context in the vicinity of Shore Road East is likely to be affected by the construction of the new wall north of the railway for the new J15 overbridge and eastbound slip roads. There would be no change to physical characteristics, but construction activities are likely to affect perceptual characteristics of peacefulness and tranquillity within a localised area of the LCA.

9.8.2 Construction Phase: There would be potential adverse indirect effects during the construction period through noise disturbance caused by construction operations but limited to the eastern section of the LCA. Night-time operations may also result in some localised adverse effects.

9.8.3 Operational Phase Year 1: The new junction with associated traffic and lighting would be more visually prominent in the eastern section of the LCA. The extended and elevated road corridor would have an urbanising effect but within a limited area resulting overall in a slight adverse effect on the wider LCA.

9.8.4 Operational Phase Year 15: No change from Year 1 as there is no opportunity for landscape mitigation due to the limited space and constraints adjacent to the railway line.

Table 9.30: LCA 01 Traeth Lafan and Dutchman Bank – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Moderate Adverse	Large Adverse
Year 1 Opening	Minor Adverse	Slight Adverse
Year 15	Minor Adverse	Slight Adverse

LCA 02 – Penmaenmawr Beach - Landscape Sensitivity Medium

9.8.5 Penmaenmawr Beach adjoins LCA 01 and extends further east along the coastal zone. As with LCA 01, the Scheme does not directly affect the LCA or the elements within it. Therefore, the assessment of effects on LCA 01 apply the same for LCA 02.

9.8.6 Construction Phase: There would be potential adverse indirect effects during the construction period through noise disturbance caused by construction operations but limited to the eastern section of the LCA. Night-time operations may also result in some localised adverse effects.

9.8.7 Operational Phase Year 1: The new junction with associated traffic and lighting would be more visually prominent in the eastern section of the LCA. The extended and elevated road corridor would have an urbanising effect but within a limited area resulting overall in a slight adverse effect on the wider LCA.

9.8.8 Operational Phase Year 15: No change from Year 1 as there is no opportunity for landscape mitigation.

Table 9.31: LCA 02 Penmaenmawr Beach – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Moderate Adverse	Large Adverse
Year 1	Minor Adverse	Slight Adverse
Year 15	Minor Adverse	Slight Adverse

LCA 08 – Trunk Road and Railway: - Landscape Sensitivity Low

9.8.9 The existing A55 road corridor is of low sensitivity and the Scheme would generally fall within the same footprint as the existing but would need additional land to the south in order to construct the new junction. This would result in a major direct impact with the remaining Scheme would result in a further urbanisation of the road corridor. Landscape mitigation around the junction would replace some of the existing roadside plantations.

9.8.10 Construction Phase: The two-year construction period would commence with site clearance and removal of the existing roadside plantations, a key landscape element within the LCA resulting in a major adverse effect. Two properties (8 & 9 Penmaen View) would be demolished. The ensuing construction period would be highly disruptive within this area and would be unavoidable due to the constrained nature of the Scheme.

9.8.11 Operational Phase Year 1: The new junction would effectively be a modification of the existing road corridor and have an urbanising effect on the LCA due to the scale of the overbridge and slip roads. The realignment of the junction with Penmaenmawr Road would also have an urbanising effect on the eastern approach into Llanfairfechan.

9.8.12 Operational Phase Year 15: Landscape mitigation measures surrounding the junction and along the southern verge of Penmaenmawr Road would establish and integrate the Scheme into the area, effectively replacing the areas of existing roadside plantations lost during the construction period.

Table 9.32: LCA 08 Trunk Road and Railway – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Major Adverse	Moderate Adverse
Year 1 Opening	Major Adverse	Slight Adverse
Year 15	Moderate Adverse	Neutral

LCA 11 – Llanfairfechan Promenade – Landscape Sensitivity Medium

9.8.13 The Scheme would not directly impact on the LCA but are likely to have a similar but more pronounced effect as on LCA 01. This is a popular area for informal amenity valued by the local community and tourists particularly during the summer months. The promenade is also used by local community groups for activities such as sailing. There would be no change to physical characteristics, but construction activities are likely to affect perceptual characteristics associated with general amenity.

9.8.14 Construction Phase: The area would not be directly affected and only the eastern section affected during the construction period through noise disturbance and general construction operations. There would be no access to Shore Road East. There would be moderate adverse effects during the construction period.

9.8.15 Operational Phase Year 1: The Scheme would be more perceptible on the LCA due to the elevated nature of the overbridge and junction with associated lighting, traffic would be more visible on the western slip road. The overall effect would be the encroachment of the road corridor into the eastern area with a reduction in the general amenity value of the promenade. However, this would be localised and not apply to the whole of the area and therefore is considered to have a slight adverse effect.

9.8.16 Operational Year 15: No change from Year 1 as there is no opportunity for landscape mitigation.

Table 9.33: LCA 11 Llanfairfechan Promenade – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Moderate Adverse	Moderate Adverse
Year 1 Opening	Moderate Adverse	Slight Adverse
Year 15	Moderate Adverse	Slight Adverse

LCA 12 – Llanfairfechan Town Centre - Landscape Sensitivity Medium

9.8.17 The Scheme would have a direct but localised impact on this LCA in the vicinity of Shore Road East and Penmaenmawr Road. Two properties on Shore Road East (8 and 9 Penmaen View) would be demolished and the existing roadside plantations, a key landscape element to the rear of nearby properties would also be lost. The setting of the Conservation Area would also be indirectly affected.

9.8.18 Construction Phase: The demolition of two properties and the removal of extensive areas of existing roadside plantations along the A55 and Penmaenmawr Road, would result in a major adverse change and a large adverse effect on the eastern section of this landscape character area. The construction compound is also proposed on land to the rear of the Heath, a former car parking area. The area would be the focus of much construction activity over the two-year period with significant disruption likely as a result of the extensive construction activity.

9.8.19 Operational Phase Year 1: The Scheme would effectively be an enlargement and widening of the existing A55 road corridor to the south with the junction and overbridge elevated above the existing road and roundabout with new signage and lighting more visible at higher levels. Lighting would be more visible at night but seen within the context of the existing road corridor is not considered likely to represent a significant change. However, overall its considered that the Scheme would have a large adverse effect

9.8.20 Operational Year 15: Mitigation planting would replace the existing roadside plantations lost as a result of the Scheme and, subject to successful establishment, screen and integrate the overbridge and westbound slip roads into the localised landscape resulting in a slight adverse effect.

Table 9.34: LCA 12 Llanfairfechan Town Centre – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Major Adverse	Large Adverse
Year 1 Opening	Major Adverse	Large Adverse
Year 15	Moderate Adverse	Slight Adverse

LCA 13 – Llanfairfechan Drycin - Landscape Sensitivity Low

9.8.21 This is a landscape of low landscape sensitivity immediately adjacent to the existing A55 road corridor. The Scheme would have a direct impact on the area but this will be localised and include components of a similar nature. The new junction would result in the westbound off slip being higher than the existing carriageway as it rises to meet the overbridge and obscure views north towards the open sea from existing properties to the east of the junction . The existing footbridge would be replaced with a new footbridge providing better access.

9.8.22 Construction Phase: There would be some general disruption during the construction period with impact on both physical and perceptual characteristics. The existing footbridge would be removed and there would be localised loss of some areas of roadside plantation. These these would be considered to cause a moderate adverse effect in the context of the existing road corridor. Properties immediately adjacent to the new junction would be significantly affected by the works in the construction phase but this would be localised and not effect the wider landscape character area as much.

9.8.23 Operational Phase Year 1: The Scheme would result in a slight loss or damage to the existing road corridor with the addition of a new footbridge. The overall effect on the area adjacent to the existing road corridor is therefore considered slight.

9.8.24 Operational Year 15: No change to Year 1.

Table 9.35: LCA 13 Llanfairfechan Drycin – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Major Adverse	Moderate Adverse
Year 1 Opening	Moderate Adverse	Slight Adverse
Year 15	Moderate Adverse	Slight Adverse

LCA 19 - Penmaen Park - Landscape Sensitivity Medium

9.8.25 The Scheme would have both direct and indirect effects on this LCA but would be of a similar nature to those that currently exist. Extensive areas of well-established soft estate would be lost resulting in an urbanising effect on the eastern section of the area close to the new junction and along the southern verge of Penmaenmawr Road. The north western aspect of the area would experience substantial change in the setting with the new junction and overbridge being a significant feature. There would be direct physical and indirect perceptual changes as a result of the Scheme that would detract from the overall amenity value.

Table 9.36: LCA 19 - Penmaen Park – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Moderate Adverse	Moderate Adverse
Year 1 Opening	Moderate Adverse	Moderate Adverse
Year 15	Minor Adverse	Neutral

9.8.26 Construction Phase: Site clearance operations would have a direct effect on the north western section of this area with removal of existing soft estate plantation and extensive excavation and regrading of the land above and to the south of Penmaenmawr Road resulting in a moderate adverse effect.

9.8.27 Operational Phase Year 1: The cutting would be re-profiled and planted with ornamental trees and shrubs in the first year of completion. There would remain a moderate adverse landscape effect in the first year following construction.

9.8.28 Operational Year 15: Operational Year 15: Mitigation planting would replace the soft estate lost as a result of the Scheme and, subject to successful establishment, integrate the cutting into the adjacent landscape and screen views of the new junction from the south east. The planting would lessen the adverse effect from moderate adverse to minor adverse over the first fifteen years and reduce further to a neutral effect as the planting continues to mature.

LCA 21 - Penmaenmawr Quarries (disused) – Landscape Sensitivity Medium

9.8.29 This LCA would not be directly or indirectly affects by the Scheme and would remain as existing. The setting of the area, high on the hillside overlooking the existing A55 road corridor would also remain largely the same. There may be some effects on perceptual qualities such as noise during the construction period.

9.8.30 Construction Phase: Slight adverse effect due to disruption such as noise caused by construction activities.

9.8.31 Operational Phase Year 1: No Change and a neutral landscape effect.

9.8.32 Operational Year 15: No Change and a neutral landscape effect.

Table 9.37: LCA 21 Penmaenmawr Quarries (disused) – Summary of Landscape Effects

Phase	Magnitude of Landscape Effect	Significance of Landscape Effect
Construction	Minor Adverse	Slight Effect
Year 1 Opening	No Change	Neutral Effect
Year 15	No Change	Neutral Effect

9.8.33 The most significant 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 Scheme, the landscape character of the area here would become more urbanised, with the new junction and overbridge and associated slip roads, viaduct and retaining walls. There would be significant loss

of the existing soft estate plantations during the construction period, a key landscape element that contributes to the landscape character of the area. The soft estate composed of mature deciduous trees and shrubs are well established and planted around 1990. The removal, together with elements of the new junction described above, would result in a highly urban and exposed environment.

9.8.34 Landscape mitigation measures have been described in Section 9.7 and are illustrated on the Environmental Management Plans (EMP's) in Appendix 9D.

Assessment of Visual Effects

9.8.35 The assessment of visual effects is undertaken for the following scenarios in accordance with IAN 135/10 (W).[19];

a) During the construction period assuming a maximum visibility and or maximum perceived change and over what period of time;
b) A winters day in the year the project would be open to traffic and be fully operational and a reflection of the operationally non-fully mitigated/maximum visibility scenario;
c) A summers day in Year 15 after opening – note that the existing soft estate has taken approximately 30 years to establish.

9.8.36 For the purposes of this visual assessment with no mitigation in place, scenario b) is considered appropriate as it can be seen as a reflection of the operationally non-fully mitigated/maximum visibility scenario. All three scenarios are considered below with the effectiveness of mitigation demonstrated between scenarios b and c.

9.8.37 The representative viewpoints identified in the landscape baseline have been used to identify likely visual effects and the effectiveness of mitigation measures. This is considered to be proportionate to the extent of the Scheme as these are junction improvements and form part of an incremental change to the existing road corridor.

Viewpoint A: Llanfairfechan Promenade – Visual Receptor Sensitivity High

9.8.38 The 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 viaduct would be clearly visible set at a significantly higher level (circa 8.5 metres) than the existing carriageway at the same location. The viaduct 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 viaduct would taper down either side of the junction and become less visible progressively to the east and west. The structure would be visible above the railway line to the south of the skatepark and public park. The structure would be highly visible at its highest point and due to its north facing aspect, create a dark, shady area beneath to the existing open aspect. High sided vehicles using the eastbound slip roads will be highly visible and elevated above the existing railway line.

9.8.39 Construction Phase: During construction the Scheme would become the dominant feature in the view with activity being focussed around the new junction and overbridge. The construction of the viaduct adjacent to the railway will be highly visible to nearby receptors and be a significant structure highly urban in character.

[19] IAN 135/10 (W) Annex 2 para 3.1

9.8.40 Operational Phase Year 1: The visual impact would lessen post construction period with less activity and be replaced with moving traffic using the western slip roads. Overall it is considered that this this would be of less visual magnitude resulting in a moderate/large adverse visual effect. Some components of the viaduct would be of textured finish to reduce visual impact and have more aesthetic appeal than a plain concrete finish. However, the scale of the structure is large and even with these mitigation measures the effect of the structure would remain largely the same and of the same magnitude of visual impact.

9.8.41 Operational Year 15: No Change to significance of effect in Year 1 as there are no landscape mitigation measures identified for the post operational years.

Table 9.38: Viewpoint A Llanfairfechan Promenade – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Major	Large/Very Large Adverse
Year 1 Opening	Moderate	Moderate/Large Adverse
Year 15	Moderate	Moderate/Large Adverse

Viewpoint B: Llanfairfechan Beach - Visual Receptor Sensitivity Medium

9.8.42 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 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 viaduct will 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 will be partially lost, partially screened by the viaduct and associated parapets. Vehicles using the eastbound slip road, particularly high sided commercial traffic will be visible.

9.8.43 Construction Phase: During construction the Scheme would become the dominant feature in the view with activity being focussed around the new junction and overbridge. The construction of the viaduct adjacent to the railway will be highly visible to visual receptors of a moderate sensitivity.

9.8.44 Operational Phase Year 1: The visual impact would lessen post construction period with less activity and be replaced with moving traffic using the western slip roads. Overall it is considered that this this would be of less visual magnitude resulting in a moderate adverse visual effect. The piers and parapets of the viaduct would be of textured finish to reduce visual impact and have more aesthetic appeal than a plain concrete finish. However, the distance of the visual receptor of the structure from the beach area could be quite distant and would appear largely the same and therefore result in the same magnitude of visual impact.

9.8.45 Operational Year 15: No Change to significance of effect in Year 1 as there are no landscape mitigation measures identified for the post operational years.

Table 9.39: Viewpoint B Llanfairfechan Beach – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Major	Moderate/Large Adverse
Year 1 Opening	Moderate	Moderate
Year 15	Moderate	Moderate

Viewpoint C: Penmaenmawr Footbridge: Visual Receptor Sensitivity High

9.8.46 The existing footbridge will be replaced as part of the Scheme to incorporate ramped access in order facilitate better access for cyclists and other non-motorised users. It is assumed that the height of the new footbridge will remain at a similar height and therefore the view from the new footbridge will be similar to the existing.

9.8.47 The new junction and overbridge will eclipse views to the east and dominate the middle distance, views towards the promenade may 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 will be lit, and the approaches signed. The overall visual effect will be a further urbanisation of the existing road corridor and the introduction of a new collection of structures at higher elevations than the existing.

9.8.48 Construction Phase: The footbridge would be removed at some point during the construction period and the footpath/cycleway closed until construction of the new footbridge is completed. There will be no visual receptors during this period.

9.8.49 Operational Phase Year 1: The new junction and overbridge would be a more noticeable feature than the existing roundabout due to the height of the overbridge, parapets and associated lighting. There would a noticeable change when viewing the Scheme to the west with the backdrop of the soft estate missing from the view.

9.8.50 Operational Year 15: No Change to significance of effect in Year 1 as there are no landscape mitigation measures identified for the post operational years.

Table 9.40: Viewpoint C Penmaenmawr Footbridge – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Not applicable – bridge closed	Not applicable – bridge closed
Year 1 Opening	Moderate	Moderate/Large
Year 15	Moderate	Moderate/Large

Viewpoint D: Penmaenmawr Road (east): Visual Receptor Sensitivity High

9.8.51 The Scheme 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 visible in the middle distance will be demolished and the existing soft estate to the east removed. Properties to the east of the existing roundabout will remain but views north from the properties would be obscured by the westbound off slip as it rises to meet the new overbridge. The properties, some three stories high would obscure the views of the new slip road and overbridge from Penmaenmawr Road.

9.8.52 There will 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.

9.8.53 Construction Phase: Site clearance for the Scheme would result in a moderate change in the view with the removal of the existing soft estate along the southern verge of Penmaenmawr Road and west of the roundabout. There would be a large amount of construction activity in this area that would become the focal point of the view for most of the period. Properties east of the existing roundabout such as St Brendas, Sunny Bank, Glan Meurig, Glan Seiriol and Fern Bank and the new Fernbank residential development, would experience significant disruption during the construction period but these properties obscure the view of the new junction from receptors on Penmaenmawr Road.

9.8.54 Operational Phase Year 1: Mitigation planting would be implemented during the operational phase but would not change the significance of the visual effect until established. Individual tree planting planted at the junction would take some time to establish.

9.8.55 Operational Year 15: The individual tree planting would improve the general amenity of the area around the new junction and partially obscure some elements of the junction when viewing west down Penmaenmawr Road. Overall, the Scheme would not cause significant effects and by year 15 there would be a slight change in the view. However, views from the properties such as St Brendas, Sunny Bank, Glan Meurig, Glan Seiriol and Fern Bank and the new Fernbank residential development immediately east of the existing roundabout, would be significantly affected by the new junction.

Table 9.41: Viewpoint D Penmaenmawr Road (East) – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Moderate	Moderate/Large
Year 1 Opening	Moderate	Slight/Moderate
Year 15	Minor	Slight

Viewpoint E: Shore Road East/Existing Junction 15 - Receptor Sensitivity High

9.8.56 The existing view across the roundabout and beyond to open sea and Puffin Island will be completely lost due to the Scheme. The new junction will dominate the view with the overbridge rising approximately 7.5 metres above the existing roundabout. Two properties (8 & 9 Penmaen View) adjacent to the roundabout will be demolished. All roadside vegetation will be lost including planting on the southern verge of Penmaenmawr Road.

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

9.8.58 Construction Phase: The Scheme would cause a major change in the view to sensitive visual receptors resulting in a very large adverse visual effect. Although the existing view is of the A55 road corridor, the scale and magnitude of change would be significant and unavoidable.

9.8.59 Operational Phase Year 1: The open views to across the A55 to the open sea would be permanently lost due to the height of the new junction and overbridge. The magnitude of change would reduce to major/moderate following the construction period but the sensitivity of receptor would remain as highly sensitive.

9.8.60 Operational Year 15 Landscape mitigation would be at a lower level and therefore would have limited effects on reducing visual impact from this viewpoint. However, the individual tree planting would contribute to the general visual amenity of the area and therefore the overall visual effect would be moderate adverse.

Table 9.42: Viewpoint E Shore Road East/Existing Junction 15 – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Major	Very Large Adverse Effect
Year 1 Opening	Major/Moderate	Moderate/Large Adverse Effect
Year 15	Major/Moderate	Moderate Adverse Effect

Viewpoint F: Penmaenmawr Road (west): Receptor Sensitivity High

9.8.61 Penmaenmawr Road is the main route into Llanfairfechan from the east and is a well-established streetscape. The buildings along the northern verge form part of a Conservation Area and the southern verge is well established soft estate with mature trees and shrubs.

9.8.62 There will 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 will change significantly and become more urban. Visual receptors on elevated land to the south will be exposed to views of the road and building along the northern verge. Views along the road to the east will be eclipsed by the new junction arrangement. Properties visible on Shore Road East will be demolished and replaced with views of new junction and overbridge.

9.8.63 Construction Phase: Site clearance would cause a major change to the view with the removal of existing roadside plantations along the southern verge of Penmaenmawr Road. There would be major disruption in the area during the construction phase and large adverse effects to a range of visual receptors.

9.8.64 Operational Phase Year 1: The operational phase would represent less change but still remain a moderate change which is readily apparent to the receptor. Mitigation planting would be planted but provide no visual screening or integration until established.

9.8.65 Operational Year 15: With mitigation planting established the visual effects of the Scheme would lessen and continue to diminish as the planting matures. However, the Scheme would still be perceptible to sensitive visual receptors.

Table 9.43: Viewpoint F: Penmaenmawr Road (west) – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Major	Very Large Adverse Effect
Year 1 Opening	Major/Moderate	Moderate/Large Adverse Effect
Year 15	Minor	Slight/Moderate

Viewpoint G: Penmaen Park: Receptor Sensitivity High

9.8.66 Penmaen Park is a residential area of largely detached dwellings set on the hillside overlooking the existing A55 road corridor and Junction 15 roundabout. The scheme proposals are for a new junction arrangement and overbridge at the location of the existing roundabout and for the realignment of Penmaenmawr Road. There will be significant loss of existing roadside plantations that will open up views to the existing road corridor. The new junction will become the focal feature in the view, existing properties that conceal the existing road corridor will be demolished resulting in open views to the new junction.

9.8.67 Construction Phase: 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.

9.8.68 Operational Phase Year 1: 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 Penmanemawr Road and on upper levels of the cutting would be undertaken during this phase but would take time to establish.

9.8.69 Operational Year 15: 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.

Table 9.44: Viewpoint G: Penmaen Park – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Major	Very Large Adverse Effect
Year 1 Opening	Major/Moderate	Moderate/Large Adverse Effect
Year 15	Moderate	Moderate/Large

Viewpoint H: Maes Dolfor: Receptor Sensitivity High

9.8.70 Maes Dolfor is a residential area immediately south of the existing A55 road corridor and west of the existing Junction 15 roundabout. Existing views of the A55 are screened by mitigation planting implemented in circa 1990 as part of the Llanfairfechan By-Pass works. The current proposals remove extensive areas of the mitigation planting as the Scheme encroaches southwards for the construction of the westbound slip road. There is also a requirement for a maintenance track at the base of the embankment to access the soft estate.

9.8.71 Construction Phase: The construction of the new road and westbound off slip requires extensive site clearance of the soft estate, an important landscape element that contributes to the landscape character of the area. The site compound to the rear of the Heath would also be prepared and established. The magnitude of change would be major for the residential area of Maes Dolfor resulting in a very large adverse visual effect.

9.8.72 Operational Phase Year 1: The realigned A55 and westbound on slip would be highly visible on day one of opening. Mitigation planting would be undertaken during this phase and not be effective until established.

9.8.73 Operational Year 15: In Year 15 the mitigation planting on the embankment would be established and afford some screening of the westbound 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 in the existing view but this would be moderate and result overall in a slight adverse effect compared to the baseline conditions.

Table 9.45: Viewpoint H: Maes Dolfor -Assessment of visual effects

Phase	**Magnitude of Visual Impact**	**Significance of Visual Effect**
Construction	Major Adverse	Large Adverse
Year 1 Opening	Moderate Adverse	Moderate Adverse
Year 15	Moderate Adverse	Slight Adverse

Viewpoint I Henar Farm: Receptor Sensitivity High

9.8.74 Henar Farm is set high above the A55 road corridor on the wooded hillside above Penmaen Park approximately 0.5 kilometres south-east of the existing Junction 15 roundabout. There are glimpsed views of the existing A55 road corridor and Llanfairfechan Promenade, more views of these elements may be visible during the winter months when trees are not in leaf.

9.8.75 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.

9.8.76 Construction Phase: Some elements of construction activity may be visible, but this would not represent a significant change in the view.

9.8.77 Operational Phase Year 1: High sided vehicles on the overbridge and eastern slip roads may be visible.

9.8.78 Operational Year 15: No significant change to the existing view.

Table 9.46: Viewpoint I Henar Farm – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Negligible	Slight Adverse
Year 1 Opening	Negligible	Slight Adverse
Year 15	Negligible	Slight Adverse/Neutral

Viewpoint J: Wern Isaf: Receptor Sensitivity High

9.8.79 Wern Isaf is a Grade II* Listed Building and garden set within the upper reaches of Penmaen Park. The viewpoint represents the area of essential setting for Wern Isaf and a 'significant view' north west towards Puffin Island. The parkland is crossed by well used footpaths and is a popular area for informal amenity. The view is highly scenic with the roofs of buildings on Penmaenmawr Road and the Promenade visible above the tree line.

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

9.8.81 Construction Phase: The removal of the roadside plantation would expose the view to a limited section of the A55 road corridor and would remain throughout the construction period.

9.8.82 Operational Phase Year 1: The view of the A55 would remain open to the new section of carriageway and upper sections of the westbound slip road. High sided vehicles would be particularly visible.

9.8.83 Operational Year 15: By Year 15 the views are likely to be screened similar to the existing scenario but the vegetation would not have reached the same maturity.

Table 9.47: Viewpoint J: Wern Isaf – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Moderate	Moderate/Large Adverse
Year 1 Opening	Moderate	Moderate/Large Adverse
Year 15	Negligible	Slight Adverse/Neutral

Viewpoint K: Garreg Fawr

9.8.84 The viewpoint is from the Scheduled Monument of Garreg Fawr Hut Circles on the lower slopes of Garreg Fawr approximately 1.5 kilometres from the Scheme. The town of Llanfairfechan

appears in the middle distance with the properties on the Promenade visible above the tree line. The A55 is not readily visible from this distance and obscured by existing vegetation.

9.8.85 Construction Phase: 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. Some elements of construction activity may be also be visible, but this would not represent a significant change in the view.

9.8.86 Operational Phase Year 1: As above. No discernible change

9.8.87 Operational Year 15: As above. No discernible change

Table 9.48: Viewpoint K Garreg Fawr – Assessment of visual effects

Phase	Magnitude of Visual Impact	Significance of Visual Effect
Construction	Negligible	Neutral Effect
Year 1 Opening	Negligible	Neutral Effect
Year 15	Negligible	Neutral Effect

Table 9.49: Summary of Visual Effects from Representative Viewpoints (Year 1)

Ref	Representative Viewpoint	Description of Effect	Visual Receptor Sensitivity	Magnitude of change (prior to mitigation)	Significance Of Visual Effect	Magnitude of change (with mitigation)	Significance of Visual Effect
A	Penmaenmawr Promenade	Visual impact of new junction, viaduct and overbridge	High	Moderate	Moderate/ Large Adverse	Moderate	Moderate/ Large Adverse
B	Llanfairfechan Beach	Visual impact of new junction, viaduct and overbridge	Medium	Moderate	Moderate Adverse	Moderate	Moderate Adverse
C	Penmaenmawr Footbridge	New junction and overbridge would lead to further urbanisation of existing road corridor	High	Moderate	Moderate/ Large Adverse	Moderate	Moderate/ Large Adverse
D	Penmaenmawr Road (east)	Realignment of the existing road to connect to new junction layout and widening of existing footway	High	Minor	Slight/Moderate Adverse	Minor	Slight/Moderate Adverse
E	Shore Road East/Existing Junction 15	Demolition of properties (8 & 9 Penmaen View), removal of existing vegetation and construction of new junction and overbridge	High	Major	Very Large Adverse	Moderate	Moderate Adverse
F	Penmaenmawr Road (west)	Removal of existing vegetation adjacent to A55 and Penmaenmawr Road, realignment of Penmaenmawr Road and regrading of rising land to south.	High	Major	Very Large Adverse	Moderate	Moderate Adverse
G	Penmaen Park	Removal of existing vegetation, realignment of Penmaenmawr Road, construction of new junction and overbridge.	High	Major	Very Large Adverse	Moderate	Large Adverse
H	Maes Dolfor	Removal of existing vegetation adjacent to A55, exposure of views to new elevated sections of new carriageway and moving traffic.	High	Major	Very Large Adverse	Moderate	Moderate/Large Adverse
I	Henar Farm	Negligible change in view due to distance and intervening landscape elements	High	Negligible	Slight Adverse/ Negligible	Minor	Slight Adverse/ Neutral
J	Wern Isaf (Rosebriars)	Removal of existing vegetation south of A55, exposure of views to new elevated sections of new carriageway and moving traffic.	High	Moderate	Moderate/Large	Minor	Slight/Moderate
K	Garreg Fawr	No discernible or negligible change due to distance of viewpoint from the Scheme and context of view. Loss of existing vegetation may be just discernible.	High	No Change	Neutral/Slight	No Change	Neutral

Residential Properties - Summary of Visual Effects and the VES Appendix 9.5.

9.8.88 The baseline of the existing visual amenity along with an assessment of the visual effects of the Scheme at each group of properties is described in the Visual Effects Schedule (VES). To summarise the findings of the VES, the assessment indicates that of the properties assessed, those closest to the existing A55 road corridor would experience significant adverse effects in particular during the Construction Phase and Year 1 of opening. Mitigation planting around the junctions would lessen the impact to a degree from some receptors by Year 15, but the height of the new junction is difficult to mitigate given the physical constraints of the existing road corridor.

9.8.89 The existing properties such as St Brendas, Sunny Bank, Glan Meurig, Glan Seiriol and Fern Bank that lie close to the existing Junction 15 roundabout, are three storey dwellings that overlook the A55 and have views towards the promenade and beyond, across the sea towards Anglesey and Puffin Island. The recently constructed two storey properties of Fern Bank further east and away from the existing roundabout junction, also have views from the first-floor windows across the A55 and beyond to the open sea. Whilst it is acknowledged these properties currently lie adjacent to the A55 and experience views of passing traffic, the properties do have open attractive views north across the sea to Puffin Island and Anglesey from the upper floor windows. These views would largely be lost or obscured because of the Scheme, most notably due to the proposed acoustic barrier fencing and further north, by the parapets of the overbridge and viaduct. This loss of view cannot be mitigated for, although planting would help to conceal the view of the acoustic barrier fence, the visual impact would be very large adverse due to this loss of view. There would, however, be significant reductions in noise levels to these properties and general amenity as a result of the Scheme. These are reported in Chapter 13 Noise and Vibration.

Non-Residential Properties Summary of Visual Effects and the VES Appendix 9.5.

9.8.90 The non-residential properties along Penmaenmawr Road, in particular Ysgol Pont y Rhedyn, will experience a major degree of change, principally through the loss of the existing soft estate and loss of amenity due to noise disturbance during the site clearance operations .The A55 will become exposed to view and will remain so for some years until the planting mitigation on the southern bank establishes and matures. The existing planting mitigation has taken 30 years to grow to its current height, therefore at Year 15 it is considered the visual effects will be moderate adverse reducing to slight adverse at Year 30.

Public Rights of Way - Summary of Visual Effects and the VES Appendix 9.5

9.8.91 The users of Public Rights of Way that cross the Penmaen Park area (PRoW 18/02 and 18/03) will experience a major magnitude of change during the construction period as many sections of the footpath network overlook the existing roundabout junction that will be replaced with the new junction. Construction activity will be clearly visible for the duration of the works and mitigation planting will take several years to establish to form any degree of visual screening. With the planting established, there will remain views of the new junction and overbridge that would not be mitigated by any planting due to the height of the structure and the elevated nature of the view.

Land with Public Access - Summary of Visual Effects and the VES Appendix 9.5

9.8.92 The areas of land with public access are located close to the existing A55 road corridor such as at Llanfairfechan Promenade will inevitably experience a major change in the view particularly during the site clearance and construction period. The disturbance to visual amenity may result in the visual receptors avoiding areas such as the Promenade during the construction period. The construction of the viaduct for the eastbound on and off slips would be a significant feature in the view elevated above the properties St Seiriols and St Elyn and a major adverse and dominant discordant feature in the view. leading to a very large adverse effect that is difficult to mitigate. People within Penmaen Park use the Public Rights of Way (PRoW 18/02 and 18/03) to access the park for general amenity.

Local Road Network and Bus Routes Summary of Visual Effects and the VES Appendix 9.5

9.8.93 Users of the A55 currently experience glimpsed open views across the sea towards the landmarks of Anglesey, Puffin Island and the Great Orme. To the east and west, the vistas are eclipsed by the headland of Penmaenmawr mountain and the mountainous backdrop of Snowdonia.

9.8.94 The construction of the Scheme would essentially mean that the open views currently experienced will be more contained and impeded by the structures of the new junction leading to a further urbanisation of the road corridor. Eastbound, far reaching views towards the Great Orme and middle-distance views to Penmaen Mawr headland would be impeded by the viaduct , retaining walls and parapets of the eastbound slip roads and overbridge. Westbound, far reaching views towards Anglesey and Puffin Island would be lost on the approaches to the new Junction and impeded by the same structures. Views from the main carriageway would be contained by the structures of the new westbound slip roads. Removal of the roadside vegetation would open up southerly views towards properties of Penmaenmawr Road and Llanfairfechan town centre from the westbound slip roads. Views from those travelling across the new overbridge would be open and far reaching but would be impeded by bridge parapets at the lower level. The overall effect would be the enclosure of the main carriageway with structures to the north and south leading to a enclosed vistas along the road corridor and an urbanisation of the road corridor.

9.8.95 Users of Penmaenmawr Road will experience major change during the construction period. Site clearance operations will be highly disruptive and cause a very large adverse effect that should lessen to large adverse as the Scheme progresses towards completion. Some residual effects will remain but for these users the overall visual effect at Year 15 is considered to be slight adverse.

Residual Effects – Landscape

9.8.96 The Scheme would directly affect the land and area immediately surrounding the existing road corridor. This has been previously affected by the A55 and the landscape character of the area significantly altered as a result of the Llanfairfechan By-Pass constructed in the 1990’s. Therefore, the residual landscape effects with mitigation are a modification of the existing road corridor rather than a whole scale change as with the earlier by-pass scheme. The residual effects are of very large significance with the further urbanisation of a localised section of road difficult to mitigate against due to engineering constraints.

Residual Effects: Visual

9.8.97 The most significant visual impact associated with the Scheme would be twofold;

a) The removal and loss of the well-established existing vegetation and soft estate alongside the A55 and the southern verge of Penmaenmawr Road exposing local residential properties and public assets to views of the road that are currently concealed by roadside vegetation that is effective all year round due to its density and coniferous/evergreen species content
b) The construction of a new junction at a significantly higher level than the existing roundabout with overbridge and slip roads and associated structures immediately adjacent to existing residential properties.

9.8.98 Due to the nature of the Scheme, effectively a widening of the existing A55 road corridor, the removal of the soft estate is largely unavoidable. Additional mitigation measures are also restricted due to the amount of available space constrained by topography, the existing road corridor and local road network and the proximity of the railway line.

9.8.99 The combined effects of the height of the new overbridge and the elevated aspect of many visual receptors, means that the Scheme is difficult to mitigate and residual effects are unavoidable due to these reasons.

9.9 Cumulative Effects

9.9.1 Cumulative effects are 'the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together.'[20]

9.9.2 Cumulative effects assessment recognises two major sources of cumulative effects:

- Type 1 or Intra-project effects – These effects occur where a single receptor is affected by more than one source of impact arising from different aspects of the proposed development; and
- Type 2 or Inter-project effects – These effects occur because of several developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor and will include developments separate from and related to the proposed development.

Methodology

9.9.3 The assessment of cumulative effects draws on the methodology and guidance set out in GLVIA3.

9.9.4 The focus of this assessment of cumulative effects is on likely significant cumulative effects, which are likely to influence decision making and the design of the Scheme, rather than an assessment of every potential cumulative effect.

Scope

9.9.5 The assessment of Type 1 cumulative effects considers other elements of the Scheme detailed in the environmental factors considered in other Chapters of the ES.

[20] *'Assessing the Cumulative Impact of Onshore Wind Energy Development'*, Scottish Natural Heritage, March 2012.

9.9.6 The assessment of Type 2 cumulative effects includes;

a) schemes with planning consent;
b) schemes that are the subject of a valid planning application that has not yet been determined.[21];
c) schemes that are the subject of consideration under the Highways Act.

9.9.7 The schemes to be considered in this assessment of cumulative effects have been agreed with the Local Planning Authority and are described in more detail in Chapter 20.

Type 1 Intra – Project Effects

9.9.8 The assessment of landscape and visual effects takes into account direct impacts on landscape and visual receptors and also potential effects on the perceptual qualities of the landscape such as scenic quality and tranquillity. The baseline landscape describes such qualities and has recorded noise from the existing A55 as a particular factor affecting the perceptual qualities of the surrounding landscape.

9.9.9 Noise is considered a potential cumulative effect that could change the perceptual qualities of the landscape, in particular areas that have tranquil qualities such as the inter-tidal areas of Traeth Lafan and Dutchman Bank, the Promenade and the upland areas such as Nant-y-Pandy Pasture and other moorland areas.

9.9.10 The Noise and vibration assessment (Chapter 13) identifies that there are significant noise impacts particularly during construction that is difficult to mitigate against. During the operational phase, noise impact remains a significant impact. Noise mitigation is required adjacent to the carriageway that involves the construction of 2-3-metre-high noise barrier fencing. This will appear as another roadside element associated with the road corridor and in the context of the Scheme not likely to represent a significant visual cumulative effect, over and above other elements of the Scheme within the road corridor.

9.9.11 The Scheme would result in significant noise effects, particularly during the short-term construction period and also increased noise levels during the operational phase. During construction, noise would affect the perceptual qualities of tranquillity above Llanfairfechan and along Promenade and beach areas. General amenity would be diminished by increased noise levels for local residential properties and users of Public Rights of Way such as the National Cycle Network and long-distance footpaths. During the operational phase, noise mitigation would effectively reduce the noise levels to within 1-3 dB and in some locations such as Fern Bank by circa 5dB and therefore provide some improvement to overall amenity.

Type 2 or Inter-project effects

9.9.12 Chapter 19 sets out known schemes that could be considered to have a cumulative effect in combination with the Junction 15 Scheme.

9.9.13 In terms of cumulative landscape and visual effects, these other known proposed developments are not considered to have a significant effect in combination with the Scheme proposals.

9.9.14 The Scheme proposals for Junction 16 have also been considered in combination with Junction 15. The two Schemes, although geographically not distant from each other, are considered to have no cumulative landscape or visual effects. Effects are very localised and visually not

[21] GLVIA3 para 7.13

connected due to the intervening landform of Penmaenmawr Mountain.

9.10 Summary and Conclusions

9.10.1 The existing A55 road corridor is a significant man-made feature that traverses the highly scenic plain of the North Wales coast at the foot of the Snowdonia mountain range. It is a strategic long-distance route that connects towns and coastal communities in the region including the former quarry towns of Penmaenmawr and Llanfairfechan. The existing road corridor at Llanfairfechan was constructed in the late 1980's and involved extensive planting along its length to screen the road from nearby properties and to integrate the road into the localised landscape.

9.10.2 The A55 Junction 15 Scheme replaces the existing at-grade roundabout with a grade separated junction with an overbridge across the existing A55 with slip roads in both east and west directions. The new structures required for the junction improvements would be significantly higher than the existing A55 and modifications to the local highway network would be needed to create connections to the new junction arrangement.

9.10.3 The Scheme would result in significant and long-lasting landscape and visual impacts on the localised area to the east of Llanfairfechan either side of the existing Junction 15 roundabout. The Scheme would require additional land and involve the demolition of two properties on the edge of Llanfairfechan Conservation Area. The Scheme would have a very large adverse and direct visual effect on the properties east of the existing Junction 15 and at Fernbank. This impact is difficult to mitigate against due to the proximity of the properties to the Scheme, and the height and type of the structures required to form the new junction.

9.10.4 Much of the existing roadside vegetation close to the junction would be lost and as a result reveal previously screened views of the road to local residents on Penmaenmawr Road. The new overbridge would be a significant structure and be highly visible to some local properties, particularly those close to the junction and to those in an elevated and north facing position above the Scheme in areas such as Penmaen Park.

9.10.5 Mitigation measures such as earthworks and planting will be implemented as part of the Scheme to reduce the visual impact of the new structures and to integrate the resulting landform into the localised landscape. The tree and shrub planting would take time to establish and replace the roadside vegetation that would be lost as part of the Scheme. This would reduce the visual impact from certain locations but due to the scale and height of the overbridge and major structures, would not lessen the impact from some nearby properties and public areas such as Llanfairfechan Promenade.

9.10.6 The overall effects of the Scheme would result in the further urbanisation of the existing road corridor with additional man-made features such as the overbridge, viaduct, lighting, gantries and signage further detracting from the existing view along the road corridor. The landscape and visual impact of the Scheme on the wider area would not be significant. The highly scenic qualities of the surrounding area and Snowdonia National Park would remain intact and there would be no significant change to the wider landscape character or perceptual qualities such as the tranquility of the surrounding area.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 10 CULTURAL HERITAGE

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10. CULTURAL HERITAGE

10.1 Chapter introduction

10.1.1 This chapter considers the direct and indirect impact of the proposed Scheme on cultural heritage assets, including buried archaeological features, historic buildings, ancient monuments, historic landscapes and Conservation Areas. It identifies the likely impacts on these heritage assets in terms of the potential for direct physical disturbance and changes within the settings of the assets and assesses the overall significance of effect.

10.1.2 The following stages of the scheme are likely to affect the historic environment:

a) **Construction (including land take):** this is the phase where direct, physical impacts on built heritage assets and buried archaeological remains are most likely to occur.
b) **Operation:** this is the phase during which nearby heritage assets may experience impacts due to visual and acoustic changes within their settings, and there would be changes to the character of the historic landscape.

10.1.3 Physical assets were considered within a 1km study area on either side of the scheme boundary. Within this corridor 119 assets were identified, 108 from the HER, 9 from Field Survey and 2 from the Geophysical survey. Of this total 4 assets are found within the scheme boundary and are potentially directly physically impacted. The remaining 115 assets are outside of the scheme and should not be directly impacted. The assets are listed in Appendix 1. Of these 74 are designated sites with further designated sites between the 1km boundary and 5km. These sites consisted of a total of 35 scheduled ancient monuments (SAM) and 8 listed buildings (LB).

10.1.4 Figure 10.1 shows the location of all the designated sites, Figure 10.2 – 10.4 show the effects on designated and non-designated cultural heritage assets.

10.2 Methodology

10.2.1 Historic Environment TAN 24, (Welsh Government, 2017) replaces *Circular 60/96 Planning and the Historic Environment: Archaeology; 61/96 Planning and the Historic Environment; Historic Buildings and Conservation Areas; and 1/98 Planning and the Environment: Directions by the Secretary of State for Wales.* TAN 24 forms a single document giving guidance for the planning system as it considers the historic environment during development plan preparation and decision making planning and listed building applications.

10.2.2 The historic environment is defined as: *'All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past activity, whether visible, buried or submerged, and deliberately planted or managed.' A historic asset is: 'An identifiable component of the historic environment. It may consist or be a combination of archaeological site, a historic building or area, historic park and garden or a parcel of historic landscape. Nationally important historic assets would normally be designated.'*

10.2.3 Taken together, and set within their cultural context, historic assets contribute to the character and sense of place of different parts of Wales. (TAN 24 section 1.7). TAN 24 uses the *Conservation Principles for the Sustainable Management of the Historic Environment in Wales* (Conservation Principles), published in 2011 as a basis upon which Cadw discharges its statutory duties. Conservation Principles should be used to assess the potential impacts of a development proposal on the significance of any historic asset/assets and to assist in decision-making where the historic environment is affected by the planning process (TAN 24 section 1.10).

10.2.4 Six principles are used:

1. Historic assets would be managed to sustain their values
2. Understanding the significance of historic assets is vital
3. The historic environment is a shared resource
4. Everyone would be able to participate in sustaining the historic environment
5. Decisions about change must be reasonable, transparent and consistent
6. Documenting and learning from decisions is essential

10.2.5 TAN 24 shows that heritage impact assessment is a structured process to enable the significance of a designated asset to be taken into account when considering proposals for change. Information on historic assets in Wales is included in TAN 24. This describes the sources of information on designated historic assets (scheduled monuments, listed buildings and protected wrecks) and areas on the register of historic parks and gardens and the register of historic landscape in Wales. The majority of historic assets are not designated and the largest comprehensive set of data on all known archaeological sites, historic buildings and other components of historic landscape is found in the Historic Environment Records (HERs), maintained by the four Welsh archaeological trusts.

10.2.6 TAN 24 describes the importance of archaeological assets and their fragility and vulnerability to damage. The development management process maintains a presumption that preservation in situ is the preferred option for the management of assets that may be affected by development. TAN 24 outlines the procedures to be followed for the preservation, or where considered appropriate, the excavation and recording of archaeological features. This includes defining the scope of work and monitoring performance. The need to provide a contingency to deal with unexpected archaeological discoveries by the developer is also emphasised.

10.2.7 *Setting of Historic Assets in Wales* (Cadw May 2017) gives guidance on measures to assess the potential visual impact of developments. The introduction to this makes it clear that all individual historic assets, irrespective of their designation, are affected by this guidance.

10.2.8 *Section* 4 of *Setting Historic Assets in Wales* lays out the stages of assessment that are to be followed:

Stage 1: *Identify the historic assets that might be affected by a proposed change or development.*

Stage 2: *Define and analyse the settings to understand how they contribute to the significance of the historic assets and, in particular, the ways in which the assets are understood, appreciated and experienced.*

Stage 3: *Evaluate the potential impact of a proposed change or development on that significance.*

Stage 4: *If necessary, consider options to mitigate or improve the potential Impact of a proposed change or development on that significance.*

10.2.9 The document identifies criteria for the setting of a scheduled monument on which Cadw must be consulted regarding a planning application. Fieldwork has demonstrated that the Scheme is a *'Development likely to be visible from a scheduled monument'.* It also meets the criteria that 'it *is within a distance of 5 kilometres from the perimeter of a scheduled monument and is 100 metres or more in height, or has an area of 1 hectare or more.'* On that basis this assessment considers the setting of designated assets within 5km of the project boundary.

10.2.10 The overall assessment of impacts and effects presented in this assessment is in line with the *Design Manual for Roads and Bridges* (DMRB) *Volume 11, Section 2, Part 5* (HA205/08) (Highways Agency et al., 2008).

10.2.11 DMRB guidance specific to the historic environment is provided in the DMRB Volume 11, Section 3, Part 2 Cultural Heritage (HA208/07) (Highways Agency et al., 2007). This splits the cultural heritage resource into three related sub-topics: Archaeological Remains; Historic Buildings and Historic Landscape. Annex 8 of HA208/07 provides guidance on how the processes described within this section of the DMRB may need to be adapted within the devolved administrations.

10.2.12 Whilst the DMRB guidance has been withdrawn, a replacement chapter addressing cultural heritage has not yet been published. Because the original DMRB provides useful guidance on the assessment and management of environmental effects, including advice on determining the magnitude of impacts and the significance of effects, it is considered to be a valuable and relevant method for this Scheme.

10.2.13 In addition to the above, the following Chartered Institute for Archaeologists' Standard and Guidance documents were utilised within the programme of baseline data gathering:

a) Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2017).
b) Standard and guidance for archaeological geophysical survey (Chartered Institute for Archaeologists, 2014a).

10.3 Relevant guidance

Legislation

10.3.1 The primary legislation applicable to this chapter comprises the Ancient Monument and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990.

10.3.2 **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.

10.3.3 **Planning (Listed Buildings and Conservation Areas) Act 1990:** 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.

10.3.4 **The Historic Environment (Wales) Act 2016** was passed by the Assembly for Wales on 9th February 2016. The Act makes changes to the Ancient Monument and Archaeological Areas Act 1979 and the Planning (Listed Buildings) Act 1990. It also incorporates stand-alone provisions establishing: statutory historic environment records (HERs), a list of historic place names and an advisory panel for the historic environment.

10.3.5 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:

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

10.3.6 **Wellbeing of Future Generations (Wales) Act 2015** requires public bodies in Wales to think about the long-term impact of their decisions, to work better with people, communities and each other, and to prevent persistent problems such as poverty, health inequalities and climate change. There are seven well-being goals which includes '*A Wales of vibrant culture and Welsh Language*' and '*A resilient Wales*'. The Act promotes '*A society which promotes and protects culture and the Welsh language…'*

Planning Policy

10.3.7 **Planning Policy Wales Edition 10 Chapter 6 (Distinctive and Natural Places - Historic Environment) December 2018 (PPW10)** 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. Specifically, this aims to:

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

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

10.3.9 Section 6.1 of PPW 10 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 impact 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.

10.3.10 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 would 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.

10.3.11 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.

10.3.12 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 would 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.

10.3.13 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.

10.3.14 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 would be a material consideration when determining a planning application.

10.3.15 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.

10.3.16 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.

10.3.17 **Technical Advice Note (TAN) 24, The Historic Environment (2017)** underlines PPW10 (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:

1. Heritage Impact Assessment in Wales
2. Managing Change in World Heritage Sites in Wales
3. Managing Change to Listed Buildings in Wales
4. Managing Change to Registered Historic Parks and Gardens in Wales
5. Managing Conservation Areas in Wales
6. Managing Historic Character in Wales
7. Managing Listed Buildings at Risk in Wales
8. Managing Lists of Historic Assets of Special Local Interest in Wales
9. Setting of Historic Assets in Wales

Local Policy and Guidance

10.3.18 **Conwy Local Development Plan 2007 -2022 (LDP)** was adopted in October 2013 and is currently beginning the process of review. The current LDP states in 'STRATEGIC POLICY CTH/1 – CULTURAL HERITAGE, that *the council is committed to protecting and, where appropriate, enhancing its cultural and heritage assets. This would be achieved by:*

a. *Ensuring that the location of new development on both allocated and windfall sites within the Plan Area would 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'.*

10.3.19 Policy CTH/2 'DEVELOPMENT AFFECTING HERITAGE ASSETS states that proposals which affect a heritage asset listed below (a-f), and/or its setting, shall preserve or, where appropriate, enhance that asset. Development proposals would be considered in line with Policy DP/6, where applicable and Policy DP/.

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'*

10.3.20 Policy CTH/3 of the LDP, relating to buildings, states that '*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 would only be permitted where the building's distinctive appearance, architectural integrity and its setting would not be*

significantly adversely affected.'

10.3.21 **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

10.3.22 **SPG LDP14 Conservation Areas** was adopted in July 2015. This document provides generic guidance relating to the approach to development in Conservation |Areas and would be itself supplemented by detailed individual Conservation Area Management Plans. https://spp.conwy.gov.uk/upload/public/attachments/645/LDP14_Conservation_Areas_SPG.pdf

10.3.23 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

10.4 Study area

10.4.1 The study area for historic asset collection was the proposed land take itself and a corridor 1 km beyond the proposed boundary of the Scheme. Where linear or historic landscape features extend beyond the 1 km area, the study area was extended in order to provide sufficient context for the understanding of such features. The desk-based assessment for the Scheme is presented in Appendix 10.3.

10.4.2 For designated heritage assets (e.g. scheduled ancient monuments and listed buildings), whose setting could be affected as a result of change, a further study area was identified to include all such assets within a zone of 5km. The location of designated assets are shown in Appendix 10.1 and listed in Appendix 10.4.

10.5 Baseline conditions

10.5.1 A desk-based assessment of the Scheme was prepared using various sources of data including a walk through survey. Full coverage of the regional HER for the main study area was acquired from the Gwynedd Archaeological Trust (GAT), together with details of defined Historic Landscape Character Areas. Information regarding scheduled monuments, listed buildings and Registered Parks, Gardens and Landscapes of Special Historic Interest was obtained from Cadw and published sources.

10.5.2 A walkthrough survey was conducted in June 2019, and a geophysical survey in late May 2019. Additional visits were undertaken during the summer of 2019 to assess visual and noise impacts on designated sites. The degree to which designated sites could be seen from the project boundary, or views from the designated sites affected were assessed during the site visits.

10.5.3 Geophysical survey in the form of a fluxgate gradiometer survey was undertaken in open and accessible areas alongside the carriageway and in areas proposed for alteration. The areas were selected for survey on the basis of scheme design and impact; effect of land use on the magnetic survey and overall archaeological potential. A report on the results of this programme

of magnetometer survey is presented as Appendix 10.5.

10.5.4 LiDAR information contained in the Lle website (www.lle.gov.wales) was examined and used to provide information on earthworks and topography across the study area.

10.5.5 Available satellite imagery covering the Scheme was acquired from commercial suppliers and examined along with other historic aerial photographs.

10.5.6 The archaeological and cultural heritage assets contained within the area covered by the route option is varied. Many of the assets are from the last two hundred years, with a range of features stretching back through the medieval to the Prehistoric period. A Gazetteer of historical assets in the 1km study area is shown in Appendix 10.6. Designated sites within a wider 2km study area are presented in Appendix 10.4. It should be remembered that there are effectively two study areas: the 1km study area that includes all known assets and the 2km study area that lists designated sites only.

10.5.7 Assets identified in both study areas are discussed below. Each asset in the 1km study area is identified by an ID reference number in brackets, e.g. (63).Those identified in the 2km study area are not given a project specific number.

Designations

10.5.8 **World Heritage Site** (WHS): there are no WHS within the immediate environment of Junction 15. However, The Castle and Town Walls of Edward 1 in Gwynedd, a WHS formed from scattered sites, includes Conwy Castle, around 11 kilometres to the east; Caernarfon Castle, around 26km to the west on the south side of the Menai Strait; and Beaumaris Castle around 7km to the west and on the north side of the Strait.

10.5.9 **Scheduled Ancient Monuments** SAM): There is one SAM within the 1km study area. 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 which lies c 700m from Junction 15. The hut walls are predominantly grass covered. The site is within a small copse.

10.5.10 A further seven SAMs are within a 2km distance of the proposed junction changes at Junction 15 and 34 within 5km. The majority of these are prehistoric in date with one dating to the Medieval period. (Appendix 10.6).

10.5.11 **Listed Buildings**: there are 69 listed buildings within one kilometre of the junction proposals. All but three are graded Grade II, with three at Grade II*. All date to the Post Medieval period or later. Of these 33 are houses designed by the Arts and Crafts architect Herbert Luck North and his business partner Perceval Padmore. The remaining listed buildings within a kilometre of the Junction proposals are predominantly 19th century, and include buildings associated with Bryn y Neuadd, a now demolished house which was built in the 1850s by industrialist John Platt. Also listed are some commercial buildings, a post box and several lengths of traditional slate walling. Wern Isaf, Listed Grade II* lies the closest to Junction 15 at c 400m distant.

10.5.12 Within a 2km distance of Junction 15 are eight further listed buildings. All are listed as Grade II and predominantly relate to agricultural activity. (Appendix 10.4)

10.5.13 **Conservation Areas**: there are two Conservation areas in Llanfairfechan, one covering the Town Centre and one The Close. 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. (Appendix 10.6). The Scheme extends into the Town Centre Conservation Area and the existing Junction 15 is c 50m east of the Town Centre Conservation Area.

10.5.14 **Parks and Gardens:** within 2km of Junction 15 there are two sites 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 Grade II and was designed by Herbert Luck North. Bryn y Neuadd Park and Garden (SH 6743 7452) is Grade II 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. Despite the site being developed as a hospital many of the original garden features survive including a French cast-iron fountain made by Brabezat and Cie in the 1850s. The garden is 600 metres to the west of Junction 15 and its southern boundary is followed by the A55. (Appendix 10.6).

10.5.15 **Historic Landscapes**: the North Arllechwedd Historic Landscape surrounds the settlement of Llanfairfechan. The northern 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. (Appendix 10.6) The Register describes 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 a rich wealth of upstanding remains from the prehistoric, medieval and later periods, most notably a Neolithic axe factory site and one of the most important concentrations of Bronze Age funerary and ritual monuments in western Britain. Abergwyngregyn was the commotal centre of Arllechwedd Uchaf, and a favourite residence of the princes of Gwynedd in the 13th century*.'

10.5.16 **Historic Environment Record** (HER) data: in addition to the designated sites identified above, 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.

Palaeolithic, Mesolithic, Neolithic (to 2200 BC)

10.5.17 Nine sites in the HER date to the Neolithic. These all relate to the Graig Lwyd Neolithic axe factory and are findspots of either finished axes or roughouts. The Graig Lwyd axe factory is sited on the high ground south of Llanfairfechan / Penmaenmawr where extensive 19th century quarrying took place.

Bronze Age (2500 BC to 700 BC)

10.5.18 One site is dated to the Bronze Age period and this relates to the findspot of a stone axe hammer.

Iron Age (800 BC to AD 43)

10.5.19 No sites on the HER date to this period in the study area around Junction 15 and Llanfairfechan.

Prehistoric

10.5.20 One site is noted as 'prehistoric', this is a Graig Lwyd axe roughout (98) and is likely to date to the Neolithic period. All sites noted as pre-Roman in the study area are findspots of stone artefacts.

Roman (AD 43 to AD 410)

10.5.21 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. One site, a possible Romano British hut circle at Tyddyn Drain (100) 700 metres to the south of Junction 15 is recorded. The findspot of a hoard of Roman coins is noted, it was found at the foot of Penmaenmawr mountain, 370 metres to the south east of Junction 15.

Early Medieval (AD 410 to AD 1066)

10.5.22 No assets of the early Medieval period have been identified in the 1km study area.

Medieval (1066 to 1540)

10.5.23 No assets of the Medieval period have been identified in the 1km study area.

Post-medieval (1540-1901)

10.5.24 Ten assets are listed as Post Medieval in date and include a crushing mill (104), a milestone (110), a Wesleyan Methodist Church (107) as well as domestic buildings (e.g.106).

Modern

10.5.25 Four assets are noted as Modern in date, post 1901. These include a Training ground (111) which is now a recreation ground, and the site of St Winifred's school, now demolished (113).

Multi-period

10.5.26 One site is noted as multi-period and this is the line of the Post road, effectively what is now the coast road (115). The route first improved by Thomas Telford in the early years of the 19th century, which continues to be altered and re-routed. As to when the coastal route first came into existence the evidence is less clear. Telford was improving a pre-existing route, however the Roman route, which to the east follows much of the line of the coast route, utilises the uplands to the south in this area.

Unknown Date

10.5.27 There are four assets identified as 'unknown' date. These include three references to mills (117-119) and one a Well (116).

Geophysical Survey

10.5.28 Two anomalies were identified during the geophysical survey. One is a continuous linear feature behind and parallel to houses, most probably a service linked to the adjacent houses. The other

anomaly is an area showing highly magnetized soils and may be an area of dumping, again associated with building work.

Field Walkover

10.5.29 In June 2019 open areas adjacent to the A55 and Junction 15 were examined by walkover survey. Access was possible predominantly through using public rights of way. A total of 1 feature, a track, was identified which dates to the post medieval period. Appendix 10.6.

10.6 Assessment of effects

Value (sensitivity) of resource

10.6.1 The assessment of impacts and effects on cultural heritage receptors was undertaken in accordance with the methodology described in DMRB Volume 11, Section 3, Part 2 (HA208/07) (Highways Agency et al., 2007). This is a Detailed Assessment as described in paragraph 3.9 of HA208/07, which is the level required when there is the potential for significant effects on cultural heritage resources and their setting.

10.6.2 The overall approach to the assessment of the significance of effects is in line with DMRB Volume 11, Section 2, Part 5 (HA205/08) (Highways Agency et al., 2008). This provides guidance on the assessment and management of environmental effects, including advice on determining the magnitude of impacts and the significance of effects.

10.6.3 A more in-depth Heritage Impact Assessment (HIA), concentrating on the key designated heritage assets and their setting in close proximity to Junction 15 has been undertaken and is included as Appendix 10.7. This draws on information within both Chapter 9, Landscape, and Chapter 13 Noise and Vibration and follows guidance set out by Cadw in *Setting of Historic Assets in Wales*, May 2017. (Appendix 10.7).

Receptor Value

10.6.4 In order to reach an understanding of the level of any effect that a scheme may have on a heritage asset, it is necessary to understand the importance of that asset. For example, is it important at a national level or at a local level?

10.6.5 HA208/7 (Highways Agency et al., 2007) provides the following tables for assessing the value (significance) of heritage assets.

Table 10.1: Factors for Assessing the Value of Archaeological Assets

Value (sensitivity)	Factors
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Ancient Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.

Value (sensitivity)	Factors
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.
Unknown	The importance of the resource has not been ascertained.

Table 10.2: Criteria for Establishing Value of Historic Buildings

Value (sensitivity)	Criteria
Very High	Structures inscribed as of universal importance as World Heritage Sites. Other buildings of recognised international importance.
High	Scheduled Ancient Monuments with standing remains. Grade I and II* Listed Buildings. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. Conservation Areas containing very important buildings. Undesignated structures of clear national importance.
Medium	Grade II Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. Conservation Areas containing buildings that contribute significantly to its historic character. Historic Townscape or built-up areas with historic integrity in their buildings or built settings (e.g. including street furniture and other structures).
Low	'Locally Listed' buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Historic Townscape or built-up areas of limited historic integrity in their buildings or built settings (e.g. including street furniture and other structures).
Negligible	Buildings of no architectural or historic note; buildings of an intrusive character.
Unknown	Buildings with some hidden (i.e. inaccessible) potential for historic significance.

10.6.6 Of the 119 assets identified within the Study Area, nine are valued as High, 69 as of Medium value and three are of unknown value. The remaining 38 are of Low value.

10.6.7 Asset 1, 2, 49, 61 and 72-76, are all valued as High. Asset 1 is the scheduled ancient monument of Gwern y Plas hut group; 2 is the Grade II* listed building and Registered Park and Garden of Wern Briars; the Grade II* listed buildings of the Church Institute in Llanfairfechan, Bryn y Neuadd Farmhouse; the two Conservation Areas of Llanfairfechan and the Historic Landscape of Creuddyn.

10.6.8 68 (3-48, 50-60, 62-71 and 79) assets noted as of Medium value are predominantly Grade II listed buildings many of which are Arts and Crafts buildings designed by Herbert Luck North. The remaining asset noted as of Medium value (79) is the Stone Axe working area of Tan y Graig, valued as Medium due to the potential the asset has to contribute to regional research

priorities.

10.6.9 The two of the three assets noted as of unknown value are features identified through the geophysical survey (109,110) while the third, 97, is a site noted on the Historic Environment Record, the Clergy House of Rest, which was demolished as part of previous road alterations.

10.7 Identification of potential effects

10.7.1 The magnitude of an impact is assessed without regard to the value of the heritage asset. In terms of the judgement of the magnitude of impact, this is based on the principle that preservation of the asset is preferred, and that total physical loss of the asset is least preferred.

10.7.2 With regard to buried archaeological remains, it is not always possible to assess the physical impact in terms of percentage loss, and therefore it can be important in such cases to try to assess the capacity of the heritage asset to retain its character and significance following any impact. Impacts resulting from changes within the settings of buried archaeological remains may also be more difficult to assess as they do not involve physical loss of the resource – further information regarding the methodology for assessment of impacts and effects resulting from change within the settings of heritage assets is provided in Table 10.3 which is derived from HA208/07 (Highways Agency et al., 2007).

Table 10.3: Factors in the Assessment of Magnitude of Impact - Archaeological Remains

Impact magnitude	Factors
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting.
Negligible	Very minor changes to archaeological materials, or setting.
No change	No change.

10.7.3 For impacts on historic buildings, the following table for the assessment of magnitude of impacts on historic buildings from HA208/07 (Highways Agency et al., 2007).

Table 10.4: Factors in the Assessment of the Magnitude of Impact – Historic Buildings

Impact magnitude	Factors
Major	Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to setting.
Moderate	Changes to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified.
Minor	Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed.

Impact magnitude	Factors
Negligible	Slight changes to historic building elements or setting that hardly affect it.
No change	No change to fabric or setting.

10.7.4 HA208/07 (Annex 7, para. 7.12.1) (Highways Agency et al., 2007) explains that historic landscapes cannot be destroyed, but that impacts on them can change their character. Impacts should be assessed using evaluated historic landscape character units, not the elements/parcels/components that contribute towards that character. There may be impacts resulting from changes within the settings of identified units, especially with regard to designated historic landscapes. Factors to be used in the assessment of magnitude of change are identified in Table 10.5.

Table 10.5: Factors in the Assessment of Magnitude of Impact – Historic Landscape

Impact magnitude	Factors
Major	Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	Changes to many key historic landscape elements, parcels or components; visual change to many key aspects of the historic landscape; noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate changes to historic landscape character.
Minor	Changes to few key historic landscape elements, parcels or components; slight visual changes to few key aspects of historic landscape; limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited changes to historic landscape character.
Negligible	Very minor changes to key historic landscape elements, parcels or components; virtually unchanged visual effects; very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.
No change	No change to elements, parcels or components; no visual or audible changes; no changes arising from amenity or community factors.

10.8 Physical impact

10.8.1 In the 1km buffer zone on either side of the Scheme boundaries, identified as the study area, 119 assets were identified. Of these 1 has a major impact, 5 a moderate impact, 11 a minor impact, 75 with a negligible impact, 26 with No change and 1 with an unknown impact. Of these 26 have a Neutral significance, 80 have a Neutral/Slight significance, while 3 have a Slight significance, 4 a |moderate/Slight significance, 3 a Moderate/Large significance and 3 are of unknown significance. (Appendix 10.6)

10.8.2 There is a major impact on one feature identified through the geophysical survey, (109). This feature is a continuous linear feature but the impact is major as it is likely to be completely destroyed (or more like redirected) as part of the current proposals.

10.8.3 Moderate impacts on 5 assets, none would be directly physically impacted by the proposed scheme but all are assets of importance, such as Grade II* listed buildings (2, 49, 61), Conservation Area (76) or a feature noted by the geophysical survey (110). Feature 110 is

likely to be destroyed by the proposals.

10.8.4 There are Minor impacts on 11 assets (1,73,74, 75, 79, 104, 111, 112, 113, 116 and 117. 1 is a scheduled monument, Gwern y Plas, which would not be directly physically impacted by the proposals but has the potential to be impacted by changes in noise levels. 73, a registered park and garden, 74 a registered historic landscape and 75 Llanfairfechan Town Centre Conservation Area (The Close) are again not directly physically impacted but potentially would be impacted by changes in sound levels. 104, 111, 112, 113, 116 and 117 are all assets identified through field survey where the setting of the features have the potential to be impacted by proposed changes. Noise levels but also visual impacts are likely.

10.8.5 Seventy-five assets demonstrate a negligible impact, none of this is a direct physical impact but a negligible impact on setting.

10.8.6 Twenty-six assets demonstrate no change in impact. One asset is identified as of an unknown impact (97), this is the demolished Clergy House of Rest. If there are surviving below ground remains these would lie directly in the line of proposed work and would be directly impacted.

10.8.7 Two possible nineteenth century buildings are proposed to be demolished as part of the Scheme. The buildings are No's 8 and 9 Penmaen View. The buildings are not noted on the HER nor are they within the Llanfairfechan Town Centre Conservation Area. Should these properties be demolished, there is a direct and damaging physical impact on the structures.

Table 10.6: Summary of impacts on assets

Impact	No
Major	1
Moderate	5
Minor	11
Negligible	75
No Change	26
Unknown	1
Total	*119*

10.9 Significant effects

10.9.1 The level or significance of an effect is a combination of the importance or value of the heritage asset and the magnitude of impact on that asset. Effects can be adverse or beneficial. Beneficial effects are those that mitigate existing impacts and help to restore or enhance heritage assets, therefore allowing greater understanding and appreciation.

10.9.2 HA208/07 (Highways Agency et al., 2007) provides the following matrix (Table 10.7 and 10.8) for use within all three sub-topics. As explained within HA208/07 (paragraph 5.38 and Annex 5, paragraph 5.13.3), the matrix is not intended to 'mechanise' the process of assessment of the significance of the effect but rather to act as a check that can ensure judgements of importance (value), impact magnitude and significance of effect are balanced. Where the matrix produces a level of effect significance that is clearly unreasonable, the judgements of importance (value)

and impact magnitude should be reassessed to ensure that they can be justified.

10.9.3 Within this chapter of the ES, effects of moderate or greater significance are considered to be 'Significant'.

Table 10.7:Significance of Effects Matrix

		MAGNITUDE OF IMPACT				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
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

Table 10.8: DMRB Descriptors of Significance of Effect Categories

Significance category	**Typical Descriptors of Effect**
Very large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision- making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

10.9.4 Although HA208/07 (Highways Agency et al., 2007) does not provide definitions of the significance of effects specific to the Cultural Heritage topic, the guidance set out in Table 2.3 of HA205/08 (Highways Agency et al., 2008) was taken into account, see Table 10.8.

Impacts on Settings

10.9.5 As described above, HA208/07(Highways Agency et al., 2007) refers to effects on the settings of heritage assets and explains (paragraph 4.19) that setting is a material consideration in government policy relating to the historic environment. In Wales the document *The Setting of Historic Assets in Wales* (2017) has been produced to guide the approach to be taken in assessing impact on setting. (see Appendix 10.7).

10.9.6 The existence of direct lines of sight between the heritage asset and a scheme is an important factor in judging the visual impact of the development. However, it is possible for changes within the setting to occur even when such a relationship does not exist. For example, views towards a listed building from a frequently visited location, such as a park or a public footpath, may be affected by the presence of a larger development, even if the development is not directly visible from the building itself.

10.9.7 Consideration has also been given to the sensitivity to change of the setting of a heritage asset. This is done through examination of the current setting with regard to identifying elements that contribute to the significance of the asset, elements that make a neutral contribution to the significance of the asset and elements that make a negative contribution (i.e. detract from) the significance of the asset.

10.9.8 Once the impact on the significance of the heritage asset was examined, this was then related to the magnitude of impact scales defined below. These are closely linked to the magnitude of impact scales used in HA208/07 (Highways Agency et al., 2007).

1. Major: Substantial change within the setting leading to considerable loss or enhancement of significance of the asset.
2. Moderate: Change within the setting leading to some loss or enhancement of significance of the asset.
3. Minor: Slight change within the setting leading to a slight loss or enhancement of significance of the asset.
4. Negligible: Very minor changes within the setting that hardly affect the significance of the asset.
5. No change: No substantive change within the setting.

10.9.9 The magnitude of impact was considered with the value/sensitivity of the asset within the overall matrix for identifying significance of effects (see Table 10.7 and 10.8).

Table 10.9: Summary of significance of assets

Significance	**No.**
Unknown	3
Moderate/Large	4
Moderate/Slight	3
Slight	3
Neutral/Slight	80
Neutral	26
Total	*119*

10.10 Limitations of the Assessment

10.10.1 All readily available data required for the assessment were acquired and examined. Remote sensing methodologies (LiDAR, satellite imaging and geophysical survey) were utilised in order to gain as much potential evidence as possible.

10.10.2 No intrusive archaeological investigation within the Scheme boundary has been undertaken to date. It is proposed that this would follow on, where indicated, following on from the results of the geophysical survey. The assessment of impact and value of any historical asset may change once additional information has been collected by evaluation trenching work. Remote sensing has identified a number of locations that potentially contain buried archaeological evidence. Some appear to be of natural or very recent origin. These would need to be examined by a programme of evaluation trenching, the details of which need to be agree with the regional curator.

10.10.3 The assessment of previously known archaeological remains, the walkover survey and the geophysical survey indicate that it might be expected to locate possible remains of earlier agricultural activity which may relate to the Medieval or Post Medieval periods. However, it is impossible to be categorical about what may, or may not, be identified.

10.10.4 As there is not a construction contractor in place for the Scheme, it has not been possible to determine additional work areas, compounds etc. outside the boundary of the Scheme. These would require additional assessment as these are identified.

Significance of effect

10.10.5 Two features of unknown significance are features identified through the geophysical survey (109, 110) and would be directly impacted by the proposed development, a further feature (97) is the possible remains of a Clergy House of Rest, a convalescent home, which was demolished as part of the works to build the roundabout at Junction 15. Features relating to this structure may still be preserved below the road development. The Llanfairfechan Town Centre Conservation Area (76), the eastern area of which comes within c 50m of the current roundabout would be directly impacted by the proposed Junction development. (See Appendix 10.7)

10.10.6 No other assets are directly impacted by the Scheme, the vast majority of assets are noted as of Neutral or Neutral/Slight significance and the impact of the proposed scheme are deemed de minimis, limited perhaps to changes in noise levels although in many cases even this would be difficult to detect and measure. Three assets are identified as of Slight significance and although not directly physically impacted by the proposals have the potential to have their setting affected. These are (48) The Church Institute which is Listed Grade II*, (79) the Stone Axe working area of Ffridd Tan y Graig and (104) the line of the Post road between Conwy and Bangor.

10.10.7 Four assets are noted as of Moderate/Slight significance, these are (1) the scheduled site of Gwern y Plas Hut Group (SAM CN072) which is just within the 1km study area, the two Registered Parks and Gardens (73, 74) of Bryn y Neuadd and Wern Isaf. Bryn y Neuadd directly butts up to the A55 to the west of Junction 15, while Wern Isaf is located above Junction 15, within a direct line of sight. Llanfairfechan Conservation Area (75) which includes The Close area of Arts and Crafts houses built by Herbert Luck North, is also included. The impact on these would largely relate to changes in noise levels brought about by proposed changes to the

Junction. Although Wern Isaf, located as it is directly above the Junction and around 500m away, the impact would be both changes to noise levels and potentially changes to views from the garden directly onto the proposed changed Junction. (see Chapter 9, Landscape, section 9.27, 9.8.79 – 9.8.83). Appendix 7.

10.10.8 Three assets are noted as of Moderate/Large significance. They are the Grade II* listed house Wern Isaf, (2) the Arts and Crafts house that Herbert Luck North designed for himself; the Grade II* listed Bryn y Neuadd Farmhouse and attached dairy (61) and the Llanfairfechan Town Centre Conservation Area (76) which in the east is within c 70m of the Junction and would be directly impacted by the proposals. (both noted as of importance and which would be affected in Chapter 9, Landscape, See section 9.8.17 – 9.8.20 and 9.8.79 – 9.8.83) (Appendix 7)

10.10.9 Three features of unknown significance have been noted as of potential high impact from the proposals, all are directly within the area of proposed development. As noted above these are two features identified through the geophysical survey and one structure which was demolished as part of the road developments in the past, but parts of which may survive. The significance of all three is derived from the potential to enhance archaeological knowledge of this area.

10.10.10 The assessment includes the entire Scheme footprint for permanent construction. Information is not available for areas of temporary land take, which would need to be assessed once they are identified once a construction contractor is appointed. Once identified this may result in a direct physical impact on further assets.

Hedgerow Regulations 1997

10.10.11 The majority of hedgerows on site formed parts of a field system shown on the Tithe maps of the mid 19th century, there are no Inclosure maps for this area. Therefore, it is considered that they meet the archaeology and history criteria of the Hedgerow Regulations 1997, as important hedgerows (Criterion 5). The exact length of hedgerows to be affected by the proposed development is unclear as sections of several, at varying lengths, would be removed as part of the proposed Junction 15 alterations, this would largely relate to current boundaries in roadside locations. No hedgerow would be totally removed, so the look of the fieldscape would largely remain intact.

Undiscovered Archaeology

10.10.12 There is always a potential that intrusive works on the Scheme may uncover previously unrecognised archaeological deposits. The potential for previously unrecorded archaeology has not been quantified at this stage but is likely to be adverse.

10.10.13 A construction contractor has not yet been appointed to the Scheme. Therefore, additional areas of temporary works that may have an impact such as construction yards, haul roads and borrow pits have not been identified. As these works would be contiguous to the Scheme, a preliminary view can be given once they are identified from the information in the 1km study area. Detailed assessment of any proposed temporary works would be conducted once they are identified.

Designated Sites

10.10.14 Designated sites with a minimum 2km distance of Junction 15 have also been examined to assess the significance of impact upon them caused by proposed alterations to Junction 15. Within 2km there are a further 7 scheduled ancient monuments and 8 listed buildings, all of which are listed Grade II.

10.10.15 Of the 7 scheduled monuments one, CN 250, Hut Circles near Wern Newydd, demonstrates a minor impact from the proposals and has moderate/slight significance. The site is located to the west of the settlement of Llanfairfechan, c 200m from the carriageway of the A55 but just under 2km to the west of Junction 15. Its setting would not be altered by proposed changes to the Junction at such a distance. The remaining scheduled monuments show a negligible impact with a slight significance. All are separated from Junction 15 by a large distance, have minimal intervisibility with the Junction and in many cases are shielded by higher land separating the Junction from the SAMs. Five of the SAMs are Prehistoric in date with one dating to the Romano British period and one to the Medieval period. Appendix 10.6

10.10.16 The further listed buildings within 2km of Junction 15 are all Grade II and are either Industrial structures linked to the quarrying or Post Medieval buildings. They demonstrate Negligible impact from proposed changes and Neutral/Slight significance. Appendix 10.4.

10.11 Mitigation

10.11.1 Mitigation and enhancement measures are proposed for a number of sites affected either resulting from direct impact or from an impact on the setting. This is based on guidance given in DMRB Section 5.11.

Scheduled Monuments

10.11.2 There is one scheduled monument within 1km of the proposals, this is Gwern y Plas hut group (CN072), located in a small copse to the north of the housing estate of Gorwel. The A55 and Junction 15 is not visible from the site however the sound of the road is very obvious. Visually the setting would not be adversely impacted by the proposals due to the tree covered nature of the site and the fact that there is no direct line of site between Gwern y Plas and Junction 15 however proposed changes to the junction layout have the potential to alter the noise generated by the road and junction. The traffic on the A55 can be heard at Gwern y Plas clearly as a constant background sound. A change in layout has the potential change sound to a different pitch which could be more intrusive. Careful design of road surfacing would help mitigate the noise pollution at this site. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.) (Appendix 7)

10.11.3 There are a number of other scheduled monuments within a 5km distance of the Junction (see Table 10.x below). None of these has a direct line of site of the Junction and noise pollution is lessened the greater the distance from the Junction, particularly in relation to those scheduled sites, such as the hut circles at Clip yr Orsedd (CN283) and Penmaenmawr Stone Circle (CN024), which are hidden from the junction by the hills which act as a buffer. The topography of the area, with steep hills rising sharply from the coastal area, in some part mitigates against both visual impact and sound impact from proposed changes at Junction 15. However, consideration should be given to the road surfacing treatment to mitigate against noise impact on the scheduled monuments in the wider area. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.)

Table 10.10: SAMs within 5km of Junction 15

SAM No.	Name	Easting	Northing	Site Type	Period
CN072	Gwern y Plas Ancient Village	268680	374830	Unenclosed hut circle	Prehistoric
CN250	Hut Circles near Wern Newydd	267335	374126	Unenclosed hut circle	Prehistoric
CN185	Garreg Fawr Hut Groups, Ancient Fields and Cairns	268520	373425	Enclosed hut circle	Prehistoric
CN330	Cae'r Haidd Deserted Rural Settlement	268072	373155	Platform house	Medieval
CN184	Pont y Teiryd Hut Group and Ancient Fields	269526	373554	Enclosed hut circle	Prehistoric
CN049	Dinas Camp	270017	373832	Hillfort	Prehistoric
CN351	Waun Llanfair barrow	270521	374126	Round barrow	Prehistoric
CN283	Hut Circles at Clip yr Orsedd	271091	375018	Hut circle settlement	Prehistoric
CN024	Penmaenmawr Stone Circle	272114	374606	Stone circle	Prehistoric
CN340	Maen Crwn standing stone	273101	374991	Standing stone	Prehistoric
CN339	Bryn Derwydd stone circle	273226	375055	Stone circle	Prehistoric
CN352	Bryniau Bugeilydd cairns	271835	374030	Ring cairn	Prehistoric
CN350	Cerrig Gwynion cairn	272257	373662	Round cairn	Prehistoric
CN349	Foel Lwyd, cairn to N of	271983	373343	Round cairn	Prehistoric
CN348	Foel Lwyd, cairn to NW of	271389	372740	Round cairn	Prehistoric
CN306	Hut Circles West of Foel Llwyd	271347	372403	Unenclosed hut circle	Prehistoric
CN129	Bwlch y Ddeufaen Standing Stones	271450	371812	Standing stone	Prehistoric
CN131	Barclodiad-y-Gawres Round Cairn	271730	371607	Round cairn	Prehistoric
CN402	Roman Road N of Llannerch Fedw	270630	372017	Road	Roman
CN341	Yr Orsedd, cairn to NNW of	269096	372119	Round cairn	Prehistoric
CN342	Foel Dduarth, cairn to NE of	268339	372029	Round cairn	Prehistoric
CN122	Foel Dduarth Enclosure	268004	371745	Enclosure	Prehistoric
CN138	Carnedd y Saeson & Neighbouring Cairns NW of Foel Dduarth	267841	371759	Cairnfield	Prehistoric
CN123	Hut Group W of Foel Dduarth	267720	371608	Enclosed hut circle	Prehistoric
CN286	Hut Circle and Rectangular Hut North of Wern Y Pandy	267550	371825	Unenclosed hut circle	Prehistoric
CN135	Hut Group 180m NW of Hafod-y-Gelyn	267469	371436	Enclosed hut circle	Prehistoric
CN308	Meuryn Isaf Cairn	267123	370908	Round cairn	Prehistoric
CN244	Hut circle East of Afon Rhaeadr Fawr	266641	371050	Unenclosed hut circle	Prehistoric

SAM No.	Name	Easting	Northing	Site Type	Period
CN137	Medieval Homestead 400m SE of Maes y Gaer	266683	372275	Rectangular hut settlement	Medieval
CN061	Bont-Newydd	266260	372007	Bridge	Post Medieval/Modern
CN038	Maes y Gaer Camp (Hillfort)	266323	372505	Hillfort	Prehistoric
CN218	Enclosure & Associated Structures at Pen-y-Bryn	265805	372779	Enclosure	Medieval
CN007	Aber Castle Mound (Pen-y-Mwd)	265668	372640	Motte	Medieval
CN136	Hut Group 750m SE of Bod Silin	267758	372276	Enclosed hut circle	Prehistoric
CN285	Enclosed Hut Circle Settlement South-East of Bod Silin	267666	372240	Enclosed hut circle settlement	

Listed Buildings

10.11.4 There are eight listed buildings in the area surrounding Junction 15, other than those in the initial 1km study area. All are listed at Grade II and evaluated as of Medium importance with negligible impact from the proposed changes to Junction 15. The significance is assessed as Neutral/Slight. None would have a direct impact from the proposals although in all cases the impact of changes in noise generated by the proposals has the potential to impact these listed structures even though it is assessed as negligible. Consideration should be given to the road surfacing treatment to mitigate against noise impact on the listed buildings in the wider area. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.)

Table 10.11: Listed Buildings within 5km of Junction 15

EIA ref	No.	Name	Grade	Easting	Northing	Community	Description
1	16521	Incline Drumhouse at Middle Bank	II	270503	375945	Penmaenmawr	Late C19 counterbalance incline drumhouse; snecked rubble construction with mid-C20 concrete slab roof. The oak drum and steel cables remain in situ between two thick gable walls and the brake mechanism survives externally, though lacking its lever.
2	3557	The Lodge	II	269554	374664	Llanfairfechan	Octagonal lodge to house now called Plas Heulog. Single storey plus attic. Steeply pitched roof with graded courses of small slates. Central chimney group (cruciform in plan with taller central stack) in brick with inclined slate rooflets, venting to sides.
3	3554	Glan-yr-Afon Farmhouse	II	269961	374452	Llanfairfechan	Two storeys, white-washed rubble with moderately-pitched slate roof. Two rectangular stone chimneys. Central doorway (boarded door) flanked by 12-pane hornless sashes. Two smaller windows on first floor, horned sashes.
4	5842	Tan yr Allt Isaf	II	268520	373956	Llanfairfechan	Range of farm buildings, formerly a bell sheaf farm of the Bryn-y-Neuadd estate. To R, house of c1870's. Two storeys, symmetrical front of 2 windows, small pane sashes. Rendered, slate roof, end chimneys, symmetrical about central entrance doorway.
5	5850	One of a pair of Cottages	II	266739	374253	Llanfairfechan	Circa 1911. By H L North, of Llanfairfechan, outstanding Arts and Crafts architect of his age in Wales.
6	22910	Gatehouse range including stabling, cowhouses and walls enclosing yard to south at Madryn Farm	II	266458	373546	Aber	Built in the 1880s as the model farm for Gorddinog, a large house nearby in severe Tudor Gothic style, built for the Platt family, industrialists from Oldham (Lancs.), who created a small country estate here, of which the farm manager's house and highly mechanised farmbuildings at Madryn formed an integral part.
7	22917	Cart shelter, barn, granary and smithy at Madryn Farm	II	266468	373498	Aber	Built in the 1880s as the model farm for Gorddinog, a large house nearby in severe Tudor Gothic style, built for the Platt family, industrialists from Oldham (Lancs
8	22916	Stable range in yard at Madryn Farm	II	266440	373520	Aber	Built in the 1880s as the model farm for Gorddinog, a large house nearby in severe Tudor Gothic style, built for the Platt family, industrialists from Oldham (Lancs.), who created a small country estate here.

Conservation Areas

10.11.5 The Llanfairfechan (The Close) Conservation Area is located in the centre of Llanfairfechan and is made up of Arts and Crafts houses designed by Herbert Luck North. The impact of proposals is assessed as Minor with the area being of Moderate/Large significance in relation to the Junction proposals. Llanfairfechan Town Centre Conservation Areas stretches eastwards along Penmaenmawr Road, towards Junction 15. The impact of proposals is assessed as High with the area being of Moderate/Large significance in relation to the Junction proposals, this Conservation Area is within less than 50 m of Junction 15. Sensitive design at Junction 15 is important to limit adverse impact on this conservation area. (See Chapter 9, Landscape, which recommends planting to replace the removed as part of the Scheme, see sections 9.7.17 – 9.7.22 and 9.8.17 – 9.8.20) In addition, alterations in noise and noise levels remain a factor which would potentially impact on both Conservation Areas. Consideration should be given to the road surfacing treatment to mitigate against noise impact on the Conservation Area. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.) (Appendix 10.7).

Historic Landscape

10.11.6 The North Arllechwedd Registered Historic Landscape stretches northwards almost to the coast in the Llanfairfechan area. It includes the upland areas of Penmaenmawr quarries and Penmaenmawr. The impact of the proposals is assessed as Minor with the Significance assessed as Moderate/Slight alterations in noise and noise levels are a factor which would impact on the Historic Landscape. Consideration should be given to the road surfacing treatment to mitigate against noise impact on the Conservation Area. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.) (Appendix 10.7).

10.11.7 As described in Section 10.4, specifically with regard to buried archaeological remains, a programme of archaeological evaluation is required. This would include proposals for the archaeological recording of buildings and parts of the field system which would be demolished as part of the Scheme as well as archaeological evaluation trenching of features identified through the geophysical survey. Depending on the results of the evaluation, there may be a requirement for further mitigation recording of archaeological deposits found at these locations.

10.11.8 The proposals involve the potential demolition of two properties at No 8 and 9 Penmaen View. These are located immediately west of the existing roundabout at Junction 15. The properties are shown on the 1st edition OS maps. The buildings are not within the Conservation Area nor noted on the HER but form part of the early 'seaside' development of Llanfairfechan. Should these buildings be demolished as part of the scheme proposals, a Level 2 record of the structures should be made in order to preserve by record.

10.11.9 The implementation of this programme of archaeological work would not result in the avoidance or reduction of the potential impacts and effects described in section 10.8. It would rather serve to 'offset' the adverse nature of the effects through the provision of information which can be disseminated through appropriate media to the widest possible audience.

10.11.10 The scale and nature of archaeological evaluation trenching in areas needs to be fully agreed with the regional curator. Following consideration of the results of the evaluation work, further detailed archaeological mitigation investigation may then be required at some of these locations.

10.11.11 Geophysical survey anomalies, 109-110, are features which lie within the Scheme boundary and are likely be impacted by construction activities, the scale of impact is assessed as major and moderate. The significance of effects have been defined as Unknown. A programme of intrusive evaluation trenching is recommended to provide additional information on this group (109-110) in order to better understand the nature of anomalies identified and their significance. Further detailed mitigation excavation may be required on some or all, of these depending on results.

10.11.12 An archaeological watching brief should be undertaken on all construction activity within the Scheme boundary. This may lead to a requirement for further archaeological investigation of any previously unknown buried archaeological remains that are identified during the watching brief. The watching brief would record surviving sections of the Clergy House of Rest (97) which was demolished as part of the original A55 dual carriageway construction. Basic recording of hedgerows and parts of the field system would be undertaken as part of the watching brief.

10.11.13 The scale and intensity of the watching brief would be determined following the results of the evaluation trenching programme. If this is a thorough characterisation of the nature of subsoil deposits resulting in the majority of archaeological features being identified, then a less intense programme of monitoring may be approved. The scale of this would be agreed in conjunction with the regional curator.

10.11.14 The Clergy House of Rest (97) was located almost directly underneath Junction 15, it is shown on the first edition and is visible on aerial photographs right through to the early 1980s. It is unclear whether any of this structure survives below ground. The archaeological watching brief should record remains of this should they survive.

10.11.15 As additional construction areas such as site compounds, are identified, archaeological assessment, evaluation or monitoring may be identified as the appropriate action to be undertaken. This would be agreed with the regional curator and implemented by the appointed construction contractor.

Summary of Mitigation

10.11.16 Proposed mitigation includes consideration of noise disturbance and visual impact of the Scheme on designated sites. Consideration should be given to noise reduction from traffic on the new road and to manage construction noise to minimise impacts to designated and non-designated sites. The strategy for mitigation of the Scheme should aim to minimise impact on the Llanfairfechan Town Centre Conservation Area. The design of Penmaenmawr Road and Shore Road East, the proposed footways and cycleways, and associated green space and verges should be sensitive to the architectural importance of the buildings and to the value of the original street setting.

10.11.17 Before construction takes place, the detailed building recording to Level 2 of all structures proposed for demolition[1]. (All the records to be deposited with the appropriate HER and NMRW/RCAHMW and Local Museum Services).

10.11.18 Archaeological evaluation trenching should take place before site clearance of a given area so that all anomalies identified through the geophysical survey to identify the nature, age and importance of features identified. All records to be deposited with the HER and Regional archive. Depending on the results of the archaeological evaluation trenching there may be a

[1] Understanding Historic Buildings: A Guide to Good Practice. Historic England May 2016 https://historicengland.org.uk/images-books/publications/understanding-historic-buildings/)

need for further detailed mitigation excavation.

10.11.19 An archaeological watching brief should take place over the full extent of the Scheme and all areas to be used on a temporary basis for construction as compound sites, borrow pits etc. The scale and intensity of the watching brief would be determined following the results of the evaluation trenching programme. If this is a thorough characterisation of the nature of the subsoil deposits resulting in the majority of archaeological features being identified, then a less intense programme of monitoring may be approved. The scale of this would be agreed in conjunction with the regional curator. All records to be deposited with the HER, the NMRW/RCAHMW and the relevant local museum service.

10.11.20 Additional construction areas have been included within the land taken on a temporary basis for construction, archaeological assessment, evaluation or monitoring may be identified as the appropriate action to be undertaken. This would be agreed with the regional curator and implemented by the appointed construction contractor. All records to be deposited with the HER, Royal Commission on Ancient and Historic Monuments Wales and the local Museum Service.

Monitoring requirements

10.11.21 The proposed mitigation would not result in the avoidance or reduction of the potential impacts and effects described above. It would rather serve to 'offset' the adverse effects through the provision of information which can be disseminated through appropriate media to the widest possible audience. The magnitude of impacts and significance of effects described in Section 10.8 would remain the same. The assessment of land take, construction and operational effects would therefore remain as reported in these sections.

10.11.22 It is possible as details of archaeological sites are identified during the evaluation trenching programme, that changes can be made to the design of the Scheme to reduce damage, or preserve in situ, identified features. If these are identified a programme of monitoring of the effectiveness of this mitigation would be required.

10.11.23 It is essential to monitor all stages of the mitigation work to ensure that standards are met and complied with, particularly all necessary CIfA standards including but not exclusively, those relating to archaeological excavation and archaeological watching briefs. The monitoring would be overseen by the Regional Curator. It is essential to monitor work to ensure:

a) the effectiveness of any noise reduction measures.
b) the effectiveness of design solutions to minimise impact on the Llanfairfechan Town centre conservation Area.
c) the standard and quality of the Level 2 building records produced and archived
d) the archaeological evaluation trenching ensures both the quality of the archaeological work and the veracity of the results.
e) possible further archaeological mitigation excavation is carried out to a high standard.
f) the potential archaeological features currently buried beneath landfill are identified and recorded potentially by complete excavation or through the watching brief.
g) the archaeological watching brief which has the potential to identify previously unknown archaeological features is conducted to a high standard and ensures more detailed further excavation takes place as necessary.
h) the archaeology potentially present within site compound areas, borrow pits etc. is thoroughly recorded.
i) all records to be deposited with the appropriate HE, NMRW/RCAHMW and local Museum

Service.

10.12 Cumulative effects

10.12.1 No proposed projects have been identified in the vicinity of the Scheme with a joint direct physical impact on historic assets identified in this study. The proposed alterations to nearby Junction 16 of the A55 are 4.5km to the east and share several designated sites within the 5km boundary study area for scheduled ancient monuments (CN049, CN351, CN283, CN024, CN340, CN339, CN352, CN350, CN349, CN348, CN306, CN402 and CN341). Similarly, there is one Listed Building within a 2km boundary common to both Junctions 15 and 16. This is 16521, a Grade II listed Incline drumhouse at Middle Bank, a feature of the Graiglwyd quarries. The Historic Landscape of North Arllechwedd (19) reaches northwards nearly to both Junction 15 and Junction 16.

10.12.2 The impact individually on these assets has been assessed as predominantly an impact on their setting coming from a change in noise levels generated by proposed changes at the junctions. All of these assets are already impacted by noise from the existing road and Junctions. There is the potential for a cumulative adverse impact brought about by changes or alterations in noise levels to these assets. Great care should be taken to limit alterations and changes to noise levels. If possible, a lessening of noise should be brought about by careful consideration of the use of noise reducing surfacing on the proposed new carriageways at both Junctions. In this way any potential cumulative impact can be lessened and the settings of these designated sites enhanced. (see Chapter 13, Noise and Vibration section13.9.1, which recommends the use of a 'low noise thin surface system' for the road surface treatment.)

10.13 Conclusions

10.13.1 There are no direct impacts on designated sites although the Llanfairfechan Town Centre Conservation Area is within c 50 metres of the proposals.

10.13.2 Assets identified through the Geophysical Survey have the potential to be impacted by the scheme proposals as do features identified through the National Monument Record and OS mapping.

10.13.3 By following the mitigation proposed any impacts would be minimised through adherence to a scheme of mitigation which includes evaluation excavation, possible further excavation and archaeological watching brief, thus ensuring preservation by record.

10.13.4 As noted, there is always the potential for previously unidentified assets to be discovered. A Watching Brief is designed to record such assets however this may result in previously unknown assets being encountered which necessitate further and more extensive archaeological excavation.

10.13.5 Mitigation suggested above and in both Chapter 9, Landscape, and Chapter 13, Noise and Vibration, to include the use of a low noise thin surface system and screening planting adjacent to the junction would in the long term manage and minimise the impact on the important heritage assets identified.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 11 COMMUNITY ASSETS

RAMBOLL Bright ideas. Sustainable change.

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11. COMMUNITY & PRIVATE ASSETS (INCLUDING AGRICULTURE AND LAND USE)

11.1 Chapter introduction

11.1.1 This chapter of the ES describes the assessment of effects on community and private assets, development land and agricultural land, resulting from the Scheme.

11.1.2 This ES assessment focuses on those facilities and assets which would be subject to direct land-take (this includes buildings), or where impacts to access during construction and / or operation are likely to be incurred and, impacts on land for development. The impact also considers and takes into account the availability of alternative facilities nearby.

11.1.3 The assessment of effects includes the following *community land and facilities*[1]:

a) Common land. This includes a Town or Village green;
b) Fuel and Field Garden Allotment;
c) Doctor surgeries;
d) Hospitals;
e) Aged people homes;
f) Schools;
g) Shops;
h) Post offices;
i) Places of worship;
j) Parks, play areas and other public open space and sports centres;
k) Tourist, Visitor Attractions; and
l) Community and village halls.

11.1.4 In relation to the assessment of effects on private assets, the following are included:

a) Private property and associated land take;
b) Land used by the community, including common land, village greens, garden allotments, war memorials and public open space;
c) Development land; and
d) Agricultural land and farm businesses.

11.2 Study Area

11.2.1 DMRB [2] does not specify a 'study area' for the assessment of effects of land-take but, refers to the need to establish local travel patterns and the identification of land used by the community and their catchment areas.

11.2.2 The ES must therefore take account of existing community facilities in a setting and identify the location, status and importance of buildings or land that may be lost to the Scheme.

11.2.3 Figure 11.1 includes the extent of the Study area for use for this ES Chapter. The extent of the Scheme includes associated improvements on the existing local authority highway, Penmaenmawr Road, as far as the junctions with Station Road and Village Road, on the westerly edge of Llanfairfechan village. These improvements include an Active Travel cycle route along the southern verge of Penmaenmawr Road.

[1] Volume 11, Section 3, Part 8, Chapter 2, Part 3, Chapter 3 DMRB
[2] DMRB Volume 11, Section 3, Part 8

11.2.4 Separate, limited improvements are also proposed for the existing A55 slip roads at Junction 14A with Aber Road, 2.6 km further west of the village.

11.2.5 This Chapter also considers the relevant effects of a proposed temporary construction site compound for the Scheme. The temporary compound area is indicated to the north of the existing Conwy County Borough Council office building, The Heath.

11.2.6 This ES Chapter considers the relationship and potential impact on the main settlement associated with Junction 15, Llanfairfechan. It also has regard to the smaller settlement of Abergwyngregyn (3.5 km south west of Junction 15).

11.2.7 The Scheme is located within the community of Llanfairfechan. ES Chapter 5 identifies Llanfairfechan as part of an 'Urban Development Strategy Area' within the adopted Conwy County Borough Local Development Plan (CCBC LDP).

11.2.8 The assessment of effects on private assets requires the numbers of properties that would be demolished or, from which land would be taken, including residential, commercial, industrial and other properties[3] to be set out. The private assets assessment for the Scheme therefore includes all properties and land which could be affected by demolition of property, or by loss of land, or by changes to the amenity of properties or land as a result of the Scheme.

11.2.9 The effects on agricultural land follows the four 'main areas' highlighted in the DMRB guidance[4]. These comprise the following:

a) Land take:
b) Type of husbandry;
c) Severance; and
d) Major accommodation works for access, water supply and drainage.

11.3 Baseline Conditions

11.3.1 Within this ES Chapter, separate methods and baseline details have been used to assess effects on:

a) Community and Private Assets and development land; and
b) Agriculture and Land Use.

Methods

11.3.2 A short description on the two separate methods used in this ES Chapter is set out in the following sections (sections 11.3.3-to 11.4.6.)

Community and Private Assets and development land

11.3.3 The assessment process includes the potential for any directly or indirectly related impact and effects, together with any related potential changes in associated journey length and travel patterns, the demolition of any properties, on any existing community facilities and private assets and development land identified.

11.3.4 The following aspects of the Scheme are considered:

a) Demolition of properties;

[3] DMRB Volume 11, Section 3, Part 6
[4] DMRB Volume 11, Section 3, Part 6, paragraph 6.3

b) Permanent land take required for the Scheme;
c) Construction of the Scheme, including temporary land take areas e.g. construction compounds, soil storage areas; as set out in ES Chapter 2; and
d) Operation of the new Scheme.

11.3.5 The assessment requires considerations of the following:
a) The potential for demolition of private property and associated land take, and the effects on residential, business, commercial properties;
b) Loss of land and buildings used by the community. This is defined as common land, town and village greens, fuel and field garden allotments and public open space;[5]
c) Loss of, or effects on, new and future, proposed land use development. This is defined by the DMRB[6] as, land of any sites covered by local planning authorities' land use planning designations and identified within the relevant local planning documents (e.g. the local plan or local development framework) and, effects on land within the planning process; and
d) Loss of agricultural land, and assessment of the quality of that land, and the effects of land loss or severance on affected farm businesses.

11.3.6 A combination of desk- based studies, questionnaire surveys and meetings with relevant parties was undertaken to confirm the existing land use and ownership for the land and buildings directly affected or adjacent to the Scheme. This included the following:
a) Searches of Land Registry for information and detail;
b) Issuing the questionnaires to affected parties; and
c) Meetings held with affected parties.

11.3.7 A detailed knowledge of the existing provision of community resources; land use pattern and private assets within the study area also included reference material from other Sections of this ES and the following data sources:
a) Walking, Cycling, Horse Riding Assessment Report (ES Chapter 14 Appendix 14.1);
b) Ordnance Survey (OS) mapping;
c) OS MasterMap Address Layer data;
d) OS Points of Interest data;
e) A study of the Predictive Agricultural Land Classification Map (2017) and the Predictive ALC Map Guidance Note (November 2017);
f) A study of the Scheme engineering layout plans and land referencing information;
g) A study of aerial photographs and over-the-hedge site survey in July 2019;
h) Conwy County Borough Council (CCBC); and
i) Wales NHS.

11.3.8 DMRB[7] sets out the relevant assessment requirements for development land considerations. This includes identifying the land use planning designations along the Scheme route and land for future development and how route options might affect these and, for the Local Planning Authority to give views on possible developments.

[5] DRMB Volume 11 Section 3 Part 6, Chapter 3
[6] DRMB Volume 11 Section 3 Part 6, Chapter 5
[7] Volume 11, Section 3, Part 6, Chapter 5

Existing community and private assets and development land

11.3.9 Table 11.1 describes the existing community facilities identified within the study area. Each site reference identity is drawn in Figure 11.2.

11.3.10 Table 11.2 describes the existing private assets within the study area. The locations of these are shown in Figure 11.2, together with the current CCLDP defined land uses.

Table 11.1: Existing community facilities

Existing community facility		Site& numbers identified
a)	Doctor surgeries/pharmacies	None.
b)	Hospital	None.
c)	Aged people homes	None.
d)	Schools	Land associated with the Primary School Ysgol Pant y Rhedyn, Penmaenmawr Road
e)	Shops	None (Boots pharmacy lies adjacent).
f)	Post offices	None.
g)	Places of worship	None (Garisim, Capel Yr Annibynwyr (SH68407528) lies adjacent).
h)	Parks, play areas and other public open space and sports centres	A temporary and limited part (118m²) of the Promenade Path area.
i)	Tourist, Visitor Attractions	No properties identified as such, but the Scheme includes part of an existing vehicular and pedestrian access route along Shore Road East towards Pennmaenmawr Promenade, a tourist destination point.
j)	Libraries	None.
k)	Community and village halls	None.
l)	Land used by the community, including common land, village greens, garden allotments, war memorials and public open space:	As h).

Table 11.2: Existing private assets.

Existing private asset		Description
a)	Residential	Gardens and land areas relating to terraced housing/flat units which include properties 1-4 St. Brenda's; 1-3 Sunny Bank; 1 & 2 Glan Meurig; 1&2 Glan Seiriol; 1-4 Fern Bank, Penmaenmawr Road.
		1&2 Bodfair
		Land associated with 6 & 7 Penmaen View
		Gardens/areas relating to new residential properties on land adjoining Fernbank, Penmaenmawr Road (Appendix 2.6 site location indicates these properties).
b)	Offices	No offices directly, but land/car parking relating to existing, former Conwy County Borough Council offices known as 'The Heath', vacant at the time of this ES being prepared.
c)	Others	Land to the south of Junction 15, currently in agricultural use.

Existing private asset		Description
		Other remaining land, non- agricultural e.g. highway and railway land and landscape. This includes land to the north east of the new development at Fernbank.
		Land owned by Conwy County Borough Council relating to education.
d)	Commercial property	No commercial premises are located **within** the study area, although Boots pharmacy and a commercial garage directly adjoins.

Development land

11.3.11 The Scheme includes the use of development land allocated within the current adopted CCBC LDP as a Housing Contingency site. ES Chapter 5 (paragraph 5.16.16) describes the site as a 2.43 ha site, land to the 'West of Penmaen Park', with a potential for forty-five (45no.) dwelling units. The site is shown in Figure 11.1.

Summary

11.3.12 Table 11.3 identifies the extent of Scheme land- take on the existing community and private assets, development land and agricultural land.

Table 11.3: Summary table of existing assets (community and private), development land and, agricultural land within the Study area.

Asset	Description
Community	a) A limited part of the open space area on the approach to the Promenade.
Private Assets & land	a) Land associated with the Primary School. b) Gardens and areas relating to the residential properties 1-4 St. Brenda's; 1-3 Sunny Bank; 1 & 2 Glan Meurig; 1&2 Glan Seiriol; 1-4 Fern Bank; c) Land to the south of Junction 15, currently in agricultural use. d) Garden areas used for the residential properties, land adjoining Fernbank e) Agricultural land f) Part of a housing allocated site g) Other land
Development land	a) Northerly part of a housing contingency allocated site, known as 'West of Penmaen Park'.

11.3.13 Figure 11.1 identifies the existing community facilities, private assets and the current adopted CCBC LDP defined land uses.

11.3.14 The community is likely to experience a temporary increase in traffic during the construction stages, as described in ES Chapter 14. The Scheme would retain all routes to and from all existing community facilities to be kept open, with traffic (which includes all travellers) management forming part of this stage, as and when required.

11.3.15 This assessment also considers the potential for benefits to occur to existing community assets.

11.3.16 As the Scheme does not include the direct loss of commercial properties then this is not considered further within this ES assessment.

11.3.17 ES Chapter 14, together with other research [8], confirms the status and routes of any existing Public Rights of Way (PROW) within and near the Scheme land- take area. The nearest public footpath to the Scheme is Llanfairfechan 02. Footpath 02 commences north west from the Scheme and continues south west, through Penmaen Park, converging with footpath number Llanfairfechan 03, before it reaches St. Winifred's Close, a short distance south. Footpath 02 does not directly connect with the existing assets identified in Table 11.4. This ES Chapter considers the potential for improvements to the existing PROW to contribute to existing community assets as part of the Scheme.

Agricultural land

11.3.18 'Agricultural land' is land which is capable of being used for agricultural purposes. The Agricultural Land Classification (ALC) sets out a method for assessing the quality of farmland in England and Wales. The ALC system classifies land into five grades, with 1 being the best and 5 being the worst and Grade 3 subdivided into Subgrades 3a and 3b.[9]

11.3.19 Agricultural land affected by the Scheme is grassland and is shown on the Predictive ALC Map (Welsh Government, 2017) as comprising mostly Subgrade 3a with the potential for a small area of Grade 1. However, consultation with the relevant Welsh Government Department[10] has confirmed that gradient plans show that the land cannot be better than Subgrade 3b and that no detailed ALC survey therefore required for this Scheme. The land is farmed as grassland for grazing of livestock.

Summary

11.3.20 Table 11.4 identifies the Scheme land – take of existing assets and land use[11]:

Table 11.4: A summary description of the extent of the proposed Scheme land – take in terms of existing assets and land use.

Asset	Description	Site area (ha)
Community	Open space areas –minor part of the promenade.	temporary use of 118m² area.
Private Assets & land, including agricultural land	Remaining land areas within the land Scheme take up area.	9.66 overall and permanent.
Development land	West of Penmaen Park	0.13 ha (or 52% of the existing site allocation area), permanent.

[8] Conway County Borough Council maps available on: map.conwy.gov.uk/gis/cmfindit/default.aspx?menuconfig=STE&filters=PRA~1%3C2&zoomtoselection=true&itemconfigid=PRAID

[9] The current ALC grading methodology is described in The Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land (MAFF 1988) The most up to date predictive ALC map for Wales can be viewed on : lle.gov.wales/map/alc?_ga=2.258395978.1920932241.1567162720-234694212.1543587638#m=-3.4,52.5,8&b=europa&l=908h;893h;1326;

[10] Email 01/07/2019 from James Cooke, Welsh Government Agricultural Land Use Policy Manager to Tony Kernon, Kernon Countryside Consultants

[11] Based on the extent of the Scheme, as defined in Appendix 2.5 drawings.

11.4 Value (Sensitivity) of Resource

11.4.1 As set out in ES Chapter 4, the approach includes a qualitative assessment to indicate the 'significance' of effects. This relies on the significance of an effect, a function of the value or sensitivity of the resource/receptor and the magnitude (or scale) of the impact (in the context of the timescale involved, as temporary or permanent). Levels of 'significance' considers both adverse and beneficial effects during the construction period and arising from the operation of the Scheme [12].

11.4.2 For this ES Chapter, the recommended approach and guidance to evaluate the significance of an effect, includes the following:

a) Community and private assets *objectives* for the Scheme – as set out in Chapter 2 of this ES;
b) *Outcomes* of consultations with relevant stakeholders;
c) Professional judgement [13] and,
d) supplementary advice [14]

11.4.3 The DMRB [15] provides separate advice on assessing impacts from the severance and/or loss of community buildings. This relies on an interpretation of the extent or degree of a new severance or a change in the location of centres of activity or, in some cases the permanent loss to a community. DRMB categorises permanent community severance as *'severe'.*

11.4.4 In the event that a road scheme entails the use of publicly used land, the DRMB sets out the categories of land where exchange land may need to be provided. It also recognises that 'community land may have conservation, landscape or other heritage value'. Where this is the case, the assessment of these aspects should be included in the schemes' wider ecological, landscape or heritage assessment.' It highlights that 'if public open space is to be taken, identify whether there is land in the vicinity which could be offered as exchange land. If so, this should be assessed to ensure that is no smaller and is equally advantageous to users as that which would be required for the preferred route' [16]

11.4.5 In line with the DMRB guidance [17], this ES Chapter focuses on identifying two main agricultural receptors; agricultural land resources and farming/land-based business(es):

a) Agricultural land resources. TAN 6 (2010) [18] sets out a threshold of a loss of 20ha or more of grades 1,2 or 3a agricultural land (either as a current or previous use), of which is less than 20 hectares but is likely to lead to further losses amounting cumulatively to 20 hectares [19] or more for consultation with the Welsh Government. The thresholds used in this assessment were agreed in consultation with the Welsh Government (as set out in the Environmental Scoping Report, March 2019); and
b) Farming/land-based business(es). The owners and users of land, whether as direct or indirect, temporary or permanent involvement, represent key receptors. The assessment considered the temporary physical effects, including land loss, severance, the potential effects on the movement of livestock, field accesses, drainage and the use of farm buildings and the potential to affect any long- term agricultural use.

[12] as defined in Table 2.3 of HA205/08 (Highways Agency et al., 2008)
[13] DMRB Volume 11, Section 2, Part 5 (HA205/08) (Highways Agency et al., 2008)
[14] TAN 06 (2010)
[15] DMRB Volume 11, Section 3, Part 8.
[16] Volume 11 Section 3 Part 6 Land use Chapter 4, paragraph 4.8
[17] HA 205/08
[18] TAN 6, Planning for Sustainable Rural Communities (2010)
[19] The ES Cumulative Assessment Effects considers the potential cumulative loss of agricultural land.

11.4.6 This ES Chapter uses the approach set out in the following tables (Tables 11.5, 11.6 and 11.7) to determine the significance of effects on community, private property, development land and agricultural land and/or farming businesses.

Table 11.5: Magnitude of impact assessment criteria assessment descriptions

Magnitude of impact	Assessment Criteria
Large adverse	Where residential properties would be demolished, become uninhabitable and inaccessible or lose more than 50% of their garden land. The viability of a commercial or community facility is threatened due to the land -take. The viability of a site allocated for development within an adopted development plan/or with an existing planning permission is threatened due to the land- take A large proportion of land used by the community would be threatened due to land-take. The loss of 20 ha or more of best and most versatile agricultural land.[20] The cessation of a full-time agricultural business.
Moderate adverse	Where a residential property would suffer a permanent, negative impact from losing between 10- 50% of their related amenity/garden land. The viability of a commercial or community facility is not threatened, but significant changes may be experienced in the day to day running and or the relative size and scale. The viability of a site allocated within an adopted development plan /or with an existing planning permission remains viable, but the developable area is reduced by 25-50%. A moderate proportion of land used by the community would be threatened due to land-take. The loss of between 5 ha and 20 ha of best and most versatile agricultural land. A significant effect on a full-time farm business, or the loss of a part-time farm business.
Slight adverse	Where a residential property would lose less than 10% of their amenity/garden land. The viability of a commercial or community facility using the land is not threatened and land -take may involve only the redundant or infrequently used land/buildings not essential to the continuation of the commercial or community facility. A site allocated within an adopted development plan or with planning permission remains viable, but the developable area is reduced by 25% or less. A minor proportion of land used by the community would be threatened due to the land–take. The loss of less than 5 ha of best and most versatile agricultural land, or the loss of any quantum of poorer quality agricultural land. A moderate or limited effect on a full-time farm business, or a significant or lesser effect on a part-time farm business.
Neutral	The Scheme would have no significant impacts on existing land use.
Beneficial	Additional areas of land which members of the community can access are made available by the Scheme.

[20] As defined

Table 11.6: Receptor sensitivity descriptions

Sensitivity	Examples of Receptors
High	Existing private residential/commercial properties with associated gardens/land which are occupied, or a community facility in use. Land allocated for development with the benefit of planning permission. Land with the benefit of public access and frequently used by the community. Land in Grades 1, 2 and 3a of the Agricultural Land Classification, being the best and most versatile agricultural land.
Moderate	Existing private residential/commercial properties/community facilities with associated gardens/land which are not permanently occupied or, is not essential to the residence/running of a business or community facility. An LDP allocated site but without the benefit of planning permission. Land with the benefit of public access which is sometimes used by the community. Land in Grades 3b, 4 and 5 of the Agricultural Land Classification. Full-time farm businesses.
Low	Existing private residential/commercial properties/community facilities with associated gardens/land which are derelict or not in current use. Land which represents a 'candidate site' as part of the local development plan. Land infrequently used by the community/or identified as being used as an unofficial open space. Part-time farm businesses.

Table 11.7: Significance of effect descriptions

MAGNITUDE	SENSITIVITY		
	High	**Moderate**	**Low**
Large adverse	Major adverse	Major – Moderate Adverse	Moderate – Minor Adverse
Moderate adverse	Major-Moderate Adverse	Moderate – Minor Adverse	Minor Adverse
Slight adverse	Moderate – Minor Adverse	Minor Adverse	Minor - Negligible
Neutral	Negligible	Negligible	Negligible

11.5 Regulatory/Policy Framework

Legislation and Policy Framework

11.5.1 ES Chapter 5 provides the relevant environmental legislative and policy context for the Scheme. The following legislation, policies and documents are of direct relevance to this ES Chapter:

a) The Highways Act 1980. This sets out the compulsory purchase powers for the acquisition of land for highway schemes;
b) The Acquisition of Land Act 1981, Section 19. This sets out the compulsory purchase of any land forming part of a common, open space or fuel or field garden allotment; and
c) The Countryside and Rights of Way Act 2000 Part 1 Sets out the public right of access to countryside.

11.5.2 Published guidance documents include the following:

a) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5, HA 205/08 (Highways Agency et al., 2008) relating to overarching assessment principles;
b) DMRB Section 11.3.6 Environmental Assessment Techniques. 'Land Use' (Highways Agency et al., 2001) for the assessment of effects on Community and Private Assets;
c) DMRB Section 11.3.8 Environmental Assessment Techniques. 'Pedestrians, Cyclists, Equestrians and Community Effects' (Highways Agency, 1993) for the assessment of effects on the Community;
d) DMRB Interim Advice Note 125/09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment' (Wales Only) (Welsh Assembly Government, 2010b.)

National Planning Policy

11.5.3 Of relevance to this ES Chapter:

Planning Policy Wales (Edition 10) (Welsh Government, 2018) and accompanying Technical Advice Notes (TAN).

PPW sets out the context for development plans and planning applications and infrastructure projects, with detailed technical guidance in TAN'S. ES Chapter 5 includes a detailed review of PPW 10.

PPW Chapters 2, 3, 4 and 6 highlights that community-based assets should be optimised and integrated; the importance of recreational space and, to conserve the best and most versatile agricultural land. Several objectives and aims are highlighted for communities and the importance of conserving the best and most versatile agricultural land, with development directed towards land of the lowest grade.

The relevant TAN's include: TAN 6: Planning for Sustainable Rural Communities (Welsh Assembly Government, 2010). This provides advice to Local Planning Authorities when preparing development plans and assessing planning applications to consider the quality of agricultural land; TAN 16: Sport, Recreation and Open Space (Welsh Assembly Government, 2009). This sets out detailed requirements for site allocation and community needs.

Local Development Plan.

11.5.4 The assessment has had regard to the current, adopted Local Development Plan (LDP) in force (as detailed in ES Chapter 5).[21]

Other relevant guidance

11.5.5 The Welsh Government 2016 Guidance for' *Traditional Allotments and Community Led Gardening Projects'*. This guidance covers all aspects of allotments and community growing projects, with guidance on managing allotment sites to developing new allotment or community growing sites.

11.5.6 Sport for Wales/ Fields in Trust Guidance 'Protecting Playing Fields in Wales' provides guidance on the long- term protection of recreational land.

[21] DMRB Volume 11 Section 3 Par 6 Land use, paragraph 5.1

11.6 Design, Mitigation and Enhancement Measures

Design

11.6.1 ES Chapter 3 sets out the Scheme alternatives and includes a description of the difficulties encountered during the design development options. This included construction and operational requirements.

11.6.2 The presence of community and residential private assets is identified as one of the main design constraints for the Scheme options. ES Chapter 3 describes how the Scheme options were assessed as part of the Weltag process. The process considered the technical objectives and environmental, social and cultural impacts. In particular, the proposed Scheme final design is considered to minimise the number of residential properties that would need to be demolished, whilst still retaining four-way movement. Additionally, it ensures that it minimises potential disruption to the school community at Ysgol Pant Y Rhedyn.

11.6.3 The extent and temporary use of land for construction compounds is limited and sited as close as possible to the Scheme. This was considered during route selection and design. The proposed temporary compounds represent central and convenient location close to the existing and proposed A55 Scheme with limited additional land take, focusing on the existing car park at The Heath.

11.6.4 This ES Chapter considers the main impact therefore of the replacement and re- configuration of the existing Junction layout. This includes an additional elevated slip road and a realignment of the existing highway route.

Residential properties and garden areas

11.6.5 The extent of demolition of residential properties and the use of garden areas has varied throughout the design process. The design process was continuously refined to identify the minimum possible of both demolition of properties and the use of, or part use of, garden areas to achieve the technical highway requirements for the Scheme. The requirements for permanent maintenance routes are integral to operation of the Scheme.

11.6.6 The Scheme identifies the demolition of two, existing, residential properties and the use and part use of existing rear gardens of other residential properties, which lie adjacent to the existing A55 southerly carriageway. 'Residential' properties are identified as private assets for this ES Chapter assessment. The DMRB guidelines highlights that the environmental impact of the demolition of properties should be included in an ES and sets out the stages in the assessment of demolition.

11.6.7 Land Registry details confirm that the residential properties and garden areas which are affected by the Scheme includes several private ownerships, a legal representative and North Wales Housing. At the time of preparing this ES, the residential properties identified for demolition are owner occupied.

11.6.8 A separate legal process considers potential compensation and 'blight' matters.

Assets and land

11.6.9 The Scheme proposes a new local highway section from Junction 15 along Penmaenmawr road. This includes the northerly section of the housing allocation development land, west of Penmaen Park. This land is currently in agricultural use and tenanted. A smaller extent of agricultural land, further to the west, would also be included.

11.6.10 The extent of the agricultural land (the majority of which is recognised as development land) is used in order to reconfigure the existing local highway route (Penmaenmawr Road) and other requirements for access arrangements to serve Shore Road East; parking and vehicular access with the existing properties located on Penmaenmawr Road, including the Primary School Pant y Rhedyn and the provision for a bus stop lay-by.

11.6.11 In assessing the effects on development land DRMB[22] confirms that '*where a proposed scheme should run close to an area reserved for housing development it should be recognised that more residences would be affected by noise, visual intrusion etc than the current assessment suggest. The impacts of planned land use changes for the Scheme should therefore be considered, in broad terms, as part of the overall assessment'.*

11.6.12 The Scheme design process has consistently considered, and remains aware, of the potential housing development land at all stages of the Scheme, including construction and operational stages.

11.6.13 The agricultural land relates to one ownership and farmed by a local farm. No agricultural buildings exist with the land.

11.6.14 The temporary site compounds proposed on land related to the Primary School will be restored to the current land use on completion of the Scheme. The Scheme's design recognises the existence of surface and coastal flood water constraints for the site compound and these are described in detail in ES Chapter 7. The Scheme's proposed drainage attenuation mitigation measures features within this site.

Community assets

11.6.15 The use of the community asset along the promenade road includes a limited extent of the existing open space are and a temporary change only. (11.3.15).

11.6.16 The Scheme includes additional and landscape enhancements, for example, on land adjoining the local highway; adjacent to no 7 Penmaen View and, to the south of the re-configured A55 Junction, adjoining the property St Brenda's.

Mitigation

11.6.17 The consideration of open spaces designed for the Scheme[23] forms part of the considerations and mitigation options.

[22] DMRB Volume 11, Section 3 Part 6, paragraph 5.2
[23] Volume 11 Section 3 Part 6 Land use Chapter 4, paragraph 4.8

Scheme stages

11.6.18 The potential extent of the impact on the assets (as identified in Table 11.4) at pre-construction, construction and operational stages includes several measures.

At pre- construction stage

11.6.19 The process of the site clearance for the Schemes would include advanced and temporary mitigation of construction effects. These are set out in ES Chapter 2 and the ES CEMP. ES Chapter 2 sets out the need to maintain good environmental protection measures for noise, dust and air pollution at pre- construction stage. A CEMP would be produced prior to the commencement of the Scheme and updated to inform members of the public of the site clearance and construction programme.

11.6.20 Buildings and land included within the Scheme, which includes existing car parking, agricultural land, open space (limited and temporary), other land and legally defined garden areas, would be secured with a temporary or permanent fence in advance of site clearance.

11.6.21 The Scheme layout would adversely affect the allocated development land to the south of Junction 15 at pre- construction and operational stages. ES Chapters 8 Nature Conservation (Table 8.17) and 9 Landscape (paragraphs 9.10.130 have considered the impacts for this development land and highlights potential mitigation measures. Chapter 8 describes the potential adverse effects for the Scheme for this development land during land take and disturbance during construction.

11.6.22 A full assessment of the potential impact of the Scheme and the development land is considered in ES Chapter 19' Cumulative Assessment'. ES Chapter 19 provides a review of predicated inter-related receptors and in combination impacts and wherever possible, suggests relevant mitigation measures incorporated as part of the Scheme CEMP.

Construction stage

11.6.23 Construction activity would take place within the proposed land taken for the Scheme and would require use of public roads and also land, for access and site compound areas.

11.6.24 To minimise disruption to traffic, the community, and the use of community facilities, temporary traffic management would be required. ES Chapter 14 details the considerations for Scheme on the accessibility on existing community facilities. This includes the open space at the Promenade path.

Completion and operational stage

11.6.25 Agricultural and open space land taken on a temporarily basis during construction would be restored on completion of the Scheme.

Enhancement

11.6.26 The potential impact on existing assets was considered during route selection and design and the potential for enhancements were examined.

11.6.27 Figure 11.1 identifies the local community assets. Overall, many of these assets lies within the central or core area of Llanfairfechan village; within the Promenade area and land to the west of Junction 15.

11.6.28 The Scheme includes additional community environmental benefits. Additional cycle routes and diversions to existing routes, are proposed as part of the Active Travel measures. These form part of the realignment of Penmaenmawr Road from which environmental benefits to the community would be derived. ES Chapter 14 provides detail of the proposed Active Travel measures. These are and detailed further in the Scheme Environmental Master plan. All areas are accessible to members of the Community.

11.6.29 ES Chapter specialists have considered the potential to enhance the existing development land and its setting. However, the time of preparation for this ES Chapter, the current the LPA commenced a review of the LDP and land allocations. This could introduce changes to the existing status of land use within or adjoining the Study area.

11.7 Monitoring Requirements

11.7.1 The ES CEMP sets out the proposed mitigation measures which would be implemented.

11.7.2 The use of temporary agricultural land and community assets would be monitored as part of the CEMP measures and land restored to their current uses.

11.7.3 Potential revisions of the Scheme which would introduce additional effects on all assets identified within this ES would be reassessed.

11.8 Magnitude of Impacts (change)

11.8.1 Table 11.8 identifies how the Scheme would impact on existing residential properties, land areas, development land and agricultural land:

Table 11.8: Description of the magnitude of the impact on the assets identified

Asset	Description of impact
Community	The temporary use of a small are of open space land on the land on the promenade would be considered as 'beneficial' in the longer term. Although not defined as a specific community asset, the Scheme includes a re-configuration of a section of the Penmaenmawr Road. This includes design considerations for Active travel routes with additional areas of land. The Scheme provides additional benefits for accessibility to members of the existing school premises, a defined community asset and provides open space areas. These are considered as 'beneficial'.
Private Assets & land	*Residential and development land* The demolition of two residential properties represents a 'large adverse' impact**,** and separately, the loss of more than 50 % of a garden area and the viability of an allocated site for development. Scheme includes the following: Reduction in the residential garden areas for St Brenda's; Sunny Bank; Glan Meurig; Glan Seiriol; Fernbank; the communal garden for properties 1-4, the separate garden for property 5, the new development adjacent to Fernbank. A gated maintenance easement route would also be provided through the rear of the garden areas and in between the properties. Part removal of existing garden areas is a permanent, negative impact. A loss of between 10- 50% of related amenity/garden land, is a 'moderate adverse' impact. The properties of 7- 17 of the new development adjacent to Fernbank would retain between 55 - % of existing garden areas.

Asset	Description of impact
	Agricultural land The Scheme will result in the permanent loss of approximately 1.7 ha of agricultural land. This land is limited by slope and does not comprise best and most versatile agricultural land. Approximately 0.4 ha is required only temporarily. Accordingly, the loss of agricultural land is a '**slight adverse'** impact. The Scheme will affect a modest amount of land forming the northern edge of a field, and a small corner of a second field. There will be no severance or access disruptions to the occupying farm business. The impact on farm businesses is therefore a' **slight adverse'** impact.
Development land	The Scheme would impact on the viability of land allocated for housing (as defined in the adopted CCBCLD Plan, currently under review stage) and is threatened due to the extent of the land – take. At the time of preparing this ES, the impact would be 'large adverse'. A consideration should be taken to re- assess this specific section of this ES Chapter assessment, in consultation with the LP, as part of the final stage of the CBCCLDP review process.

11.9 Significant Effects of receptors

11.9.1 Based on the methodology for the significance of effects[24], the sensitivity of receptors identified with the Scheme is considered as:

a) The demolition of occupied, private residential properties and the loss of more than 50% of garden areas for some of the remaining residential properties, means that the impact of the Scheme would be 'high';
b) To existing, occupied private residential with associated gardens which are not essential to the residence, means that the impact of the Scheme would be described as **'**moderate';
c) The temporary loss of open space means that the impact on Community assets would be 'neutral' and, in the longer term 'beneficial'.
d) For an allocated site, but without the benefit of planning permission, the impact of the Scheme would be 'moderate'; and
e) For agricultural land and farming business, the Scheme would be' moderate'.

Summary

11.9.2 The significance of effects for the Scheme would result in;

a) a 'major adverse' for the two residential properties Numbers 8 and 9 Penmaen View, the garden areas of the residential properties on Penmaenmawr Road and the current land allocation site, land to the West of Penmaen Park; and
b) 'major -moderate adverse' and 'moderate – minor adverse 'impacts for changes to existing gardens for several residential properties. This includes some of the recently constructed properties to the south of the existing Junction 15.

11.9.3 For agricultural land and farming business, the significance of effects would be 'minor adverse' for a temporary period during construction stage, and 'minor adverse' for the permanent loss of agricultural land.

11.9.4 For community assets, the temporary loss of and, final enhancement of the open space would be 'neutral' and 'beneficial' in the longer term. The provision of additional cycleways and enhanced connectivity represents a 'beneficial' impact**,** which has the potential for further indirect beneficial impact on the community assets located at the Promenade, further north.

[24] as set out in Table 11.6

11.10 Cumulative Effects

11.10.1 Most ES Chapter assessments indicate a relationship with private and community assets, as defined. The following potential inter – relationship effect would take place:

a) The potential for existing soil conditions and contamination related to previous structures and importation of materials connected with the construction of the existing A55 route;
b) Many of the assets and routes within the Study area (except for the existing A55 route) include the potential for flood event considerations;
c) Nature Conservation (Biodiversity) mitigation potential, the demolition of properties. The Scheme includes an important bat roost and the Penmaen Park land housing site allocation includes important biodiversity and connectivity features;
d) Landscape & Visual Change considerations for views to/from private and community assets, significantly the change in impact on/from the residential properties to the east;
e) Archaeological recording prior to demolition of properties and the potential for previous findings and additional investigations for the Scheme;
f) Air Quality impacts on existing and proposed assets, particularly the residential properties of Penmaen View and recent residential developments adjacent to Fernbank, to the east;
g) Potential benefits to non-motorised travellers gained; and
h) Materials includes reference to the demolition of the residential properties and Pendalar footbridge.

11.10.2 The cumulative impact, as either a temporary or permanent removal, of assets connected with other plans and projects [25] is considered unlikely to cause a significant impact with the Scheme.

11.11 Indication of any Difficulties Encountered

11.11.1 Baseline details for open space areas were provided directly by CCBC. Accordingly, the baseline is secondary information which should be up to date. If the baseline is out of date and/ or incorrect, then this ES Chapter assessment should be re- considered.[26]

11.11.2 DRMB highlights that the assessment of impact on the effects on development land should take 'account of any changes in preferred route alignment or in local planning authority development policies.'[27]

11.11.3 The CCBC LDP which defines the current land use designations is progressing with the final stages of a review process and is likely to contain additional and revised land use designations. This assessment has been completed with the adopted LDP version only.

11.12 Conclusions

11.12.1 This chapter of the ES describes the assessment of effects on community and private assets, development land, including agricultural land, resulting from the Scheme, and considers the existing use of routes.

11.12.2 A limited part of a community, open space 'asset' would be temporarily lost during the land take and construction of the Scheme, but the potential exists for an overall beneficial effect,

[25] As identified in ES Chapter 19
[26] At the time of preparation for this ES Chapter a CCBC review is ongoing. Email 07/02/2020 from RML to James Harland, CCBC.
[27] DRMB Volume 11 Chapter 5 Section 3 Part 6 Land use. Paragraph 5.10.

together with additional Active Travel routes cycleways and accessibility improvements.

11.12.3 There would be a loss of residential properties and, some or all associated gardens of these and, other existing residential properties to the east. The loss of the residential properties is considered as a 'major- adverse' effect.

11.12.4 There would be the use of land defined as part of development land allocated for housing in the current LDP. The Scheme attempts to minimise any viability implications for this site and enhance the opportunities for public rights of way, with ongoing opportunities for consultations with the LDP review process.

11.12.5 Based on the assessment of 'significance of effects', the Scheme would result in a 'major adverse' to 'moderate minor adverse' impact on existing private assets and development land.

11.12.6 The Scheme would result in 'minor adverse' impacts on agricultural land and farm businesses during the construction stage and permanently.

11.12.7 Where relevant, appropriate mitigation and enhancement measures are mentioned in this Chapter ES.

11.12.8 Mitigation measures would also comprise a separate process, outside the scope of this ES, with considerations for relevant and suitable compensation to be assessed and agreed with an independent valuer appointed by the Welsh Government.

11.12.9 The Scheme includes several Community benefits, such as improved Active Travel Routes; additional pedestrian road crossing places; two bus lay-by's, and enhancements for both school and existing residential properties, with the design of a separate road access and parking arrangements along Penmanemanwr Road.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 12 AIR QUALITY

RAMBOLL Bright ideas. Sustainable change.

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12. AIR QUALITY

12.1 Chapter introduction

12.1.1 This chapter considers the likely significant effects of air quality associated with the construction and operation of the J15 Scheme. The Scheme upgrades the existing roundabout junction where the A55 dual carriageway meets Penmaenmawr Rd in Llanfairfechan into a grade separated junction. A detailed description of the Scheme is provided in Chapter 2.

12.1.2 This chapter describes the existing air quality within the study area and assesses the potential impacts of construction and operation of the J15 Scheme on air quality in the surrounding area. The main air pollutants of concern related to construction are dust and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}), and for road traffic are nitrogen dioxide (NO_2) and PM_{10}. Professional experience indicates that any impacts associated with other air pollutants would be negligible.

12.1.3 The assessment of operational effects follows the guidance set out in Welsh Transport Appraisal Guidance (WelTAG) Guidance[1]. WelTAG is not prescriptive about the methods that should be used to assess impacts as this is a continually developing field, but the methods used should be appropriate for understanding the extent and severity of each impact. The methods used to assess impacts follow the advice set out by the Department of Transport in the Design Manual for Roads and Bridges (DMRB)[2] Volume 11, Section 3, Part 1 (HA 207/07) combined with up to date guidance published by the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM)[3] and the Department for Environment, Food and Rural Affairs (Defra)[4].

12.1.4 Subsequent to this assessment, Highways England published a new document on the requirements for assessing and reporting the effects of highway projects on air quality, LA105 Air Quality[5], which replaces HA 207/07. LA105 scoping methodology would results in a simple qualitative statement being required at detailed design stage as both potential for the project to impact on traffic and the sensitivity of the receiving environment are considered to be low risk. LA105 would have required a lower level of assessment than has been undertaken for the J15 Scheme and therefore would not change the conclusions of the assessment.

12.1.5 DMRB is complemented by supplementary guidance Interim Advice Notes (IAN) issued by Highways England, which are then considered for adoption on the Welsh motorway and trunk road network and issued as an IAN (W). Any IAN issued by the Highways England, but not issued as an IAN (W) is not for use on the Welsh motorway and trunk road network[6], and therefore as there are no IAN (W) issued, no IANs have been used in this assessment. The changes in air quality and significance of potential effects has been classified based upon the sensitivity of identified receptors and the magnitude of predicted impacts following the EPUK and IAQM guidance. Where significant air quality effects are determined, mitigation options are proposed and discussed.

[1] https://gov.wales/welsh-transport-appraisal-guidance-weltag
[2] http://www.standardsforhighways.co.uk/ha/standards/dmrb/
[3] https://iaqm.co.uk/guidance/
[4] https://laqm.defra.gov.uk/technical-guidance/
[5] Highways England. LA105 Air Quality. November 2019. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm
[6] https://gov.wales/highway-standards

12.1.6 During the construction period, the increase in heavy duty vehicles (HDVs) movements on the road network will be below the threshold of 100 movements per day outside an Air Quality Management Area (AQMA) for an assessment to be necessary according to the IAQM guidance[7]. The construction HGVs traffic flows assumes the trips would spread uniformly throughout the construction period with approximately 10 HDV serving the site daily. Construction traffic will primarily arrive via A55 from the east. Vehicle movements associated with construction are typically significantly lower than the number of vehicle movements associated with operation of the Scheme, which have been taken into account in this assessment, and be closely controlled in accordance with the Construction Traffic Management Plan. The construction traffic impacts in the area are considered to be insignificant and have therefore been scoped out of this assessment.

12.1.7 The assessment of the potential temporary nuisance impacts from construction dust, and recommendation of mitigation options, was undertaken in accordance with the IAQM guidance on the assessment of dust from demolition and construction[8].

12.1.8 The DMRB scoping exercise for local and regional air quality is to indicate whether there are likely to be significant impacts associated with a particular scheme. The criteria for regional impacts are presented in section 12.6.8 and if no roads meet the criteria it is not necessary to undertake any calculations. For J15 Scheme, the only link with a change of more than 10% is 'J15 off slip to Bangor Road' (Chapter 14 All Travellers). The link change is 10.5% on a total 1280 daily vehicles with the Scheme in place and therefore the total traffic flows are considered very low and the change in emissions insignificant.

12.1.9 During the operational phase, although traffic flows could change because of external factors, the Scheme itself is considered likely to result in no overall additional traffic or resulting emissions. Similarly, although the replacement of the roundabout with slip roads could result in minor fluctuations in local emissions, these are considered likely to have a negligible regional effect. In this instance, it is therefore considered that the change in operational regional emissions will be negligible, and therefore have been scoped out of this assessment, similar to the Greenhouse Gas operational emissions.

12.1.10 Particulate matter with an aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$) monitoring is not undertaken in close proximity to the Scheme but is carried out at two of the six local authorities that encompass the North Wales Combined Authority[9]. 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/m^3 in 2017. $PM_{2.5}$ therefore is not included in the assessment as there is not considered to be a risk of the annual mean air quality criteria being exceeded either with or without the Scheme and the modelling of PM_{10} can be used to demonstrate that the Scheme does not impact on $PM_{2.5}$ air quality objective[10].

12.2 Regulatory/policy framework

12.2.1 Local air quality is monitored and managed under a range of national and international legislation which sets out procedures, guidelines and standard limits for specific commonly occurring air pollutants.

[7] IAQM. Guidance on the Assessment of dust from demolition and construction. 2014. v1.1.
[8] IAQM. Guidance on the Assessment of dust from demolition and construction. 2014. v1.1.
[9] North Wales Combined Authority. 2018 Air Quality Progress Report. September 2018.
[10] Highways England. LA105 Air Quality. November 2019. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20105%20Air%20quality-web.pdf

12.3 International Legislation and Agreements

The European Air Quality Framework Directive and Daughter Directives

12.3.1 The European Air Quality Directive 2008/50/EC[11] on ambient air quality and cleaner air for Europe establishes a strategic framework for setting European-wide limit and/or target values for seven pollutants (nitrogen oxides, particulate matter, sulphur dioxide, ozone, carbon monoxide, lead and benzene). Limit values for heavy metals and polycyclic aromatic hydrocarbons are established by the Fourth-Daughter Directive 2004/107/EC[12] and are based on recommendations made by the World Health Organisation (WHO).

12.3.2 European Council Directive 92/43/EEC[13] on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) requires member states to introduce a range of measures for the protection of habitats and species.

12.4 National Planning Policy and Legislation

Environmental Protection Act 1990

12.4.1 The local authority has powers and duties to address issues arising from dust through the statutory nuisance provisions of the Environmental Protection Act 1990[14]. Regulation through the use of statutory nuisance provides a crucial level of protection in respect of problems that were not anticipated at the planning or permitting stage. Section 79(1)(d) sets out this statutory nuisance as: "Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance".

Environment Act 1995

12.4.2 Part IV of the Environment Act 1995[15], requires the local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM).

12.4.3 Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the UK's Air Quality Objectives (AQOs), it must designate these areas as Air Quality Management Areas (AQMA) and draw up an Air Quality Action Plan setting out measures to reduce pollutant concentrations with the aim of meeting the UK AQOs.

Air Quality (Wales) Regulations 2000 and the Air Quality Standards (Wales) Regulations 2010

12.4.4 The AQOs were made statutory in Wales with the Air Quality (Wales) Regulations 2000[16], as amended by the Air Quality (Wales) (Amendment) Regulations 2002[17], and the Air Quality (Wales) Regulations 2010[18], as amended by the Air Quality Standards (Wales) (Amendment)

[11] European Commission. European Air Quality Directive 2008/50/EC. 2008.
[12] European Commission. Directive 2004/107/EC. 2004.
[13] European Commission. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
[14] UK Government. Environmental Protection Act 1990 (Section 79(1)(d)). UK Government, 1990.
[15] UK Government. Part IV of the Environment Act 1995. 1995.
[16] The Air Quality (Wales) Regulations 2000 - Statutory Instrument 2000 No. 1940 (W 138).
[17] The Air Quality (Wales) Regulations 2002 - Statutory Instrument 2002 No. 3182 (W.298).
[18] The Air Quality Standards (Wales) Regulations 2010 - Statutory Instrument 2010 No 1433 (W.126).

(EU Exit) regulations 2019[19], for the purpose of LAQM. Table 12.1 presents the AQOs objectives for NO_2 and PM_{10}, which are relevant to this assessment.

Table 12.1: Human Health Air Quality Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3
	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
Fine Particulate Matter (PM_{10})	Annual mean	40 µg/m^3
	24-hour mean	50 µg/m^{3}not to be exceeded more than 35 times a year

12.4.5 The objectives apply at locations where members of the public would be exposed over the relevant exposure period. For example, the annual mean objective applies at the building façades of residential properties and public buildings. The annual mean objectives do not apply in gardens of residential properties, at the building façades of offices (or other places of work), or at kerbside locations where public exposure would be short term. The one hour mean objective would apply at any outdoor location where members of the public might reasonably be expected to spend an hour or longer.

Air Quality Strategy for England, Scotland, Wales and Northern Ireland

12.4.6 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) most recently updated in July 2007[20]. The AQS sets out a framework for reducing hazards to health from air pollution and to ensure that the European Union and International agreements are met in the UK.

12.4.7 The AQS sets standards and objectives for the ten listed pollutants. Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects on human health (including sensitive sub groups) or ecosystems. In general, these are concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects. Objectives are policy targets often expressed as maximum concentrations not to be exceeded either without exception or with a limited number of exceedances within a specified timescale.

12.4.8 For some pollutants, there is both a long-term (e.g. annual mean) standard and a short-term (e.g. one-hour mean) standard. These periods reflect the varying impacts on health of differing exposures to pollutants. Long-term standards are generally lower than short-term standards owing to the chronic health effects associated with exposure to low concentrations of pollutants for longer periods of time.

[19] The Air Quality Standards (Wales) (Amendment) (EU Exit) Regulations 2019- Statutory Instrument 2019 No. 390 (W. 95).
[20] DEFRA. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1). 2007.

Habitats

12.4.9 The Conservation of Habitats and Species Regulations 2017[21], transposes the European Council Directive 92/43/EEC into law in England and Wales. Sites as Special Areas of Conservation (SACs) are designated under these regulations, as are Special Protection Areas (SPAs); with these classified under the Council Directive 2009/147/EC on the Conservation of Wild Birds. These Sites form a network termed "Natura 2000".

12.4.10 The Regulations primarily provide measures for the protection of European Sites and European Protected Species, but also require local planning authorities to encourage the management of other features that are of major importance for wild flora and fauna.

12.4.11 The Habitats Directive (as implemented by the Regulations) requires the competent authority to firstly evaluate whether the Scheme is likely to give rise to a significant effect on the European site. Where this is the case, it has to carry out an 'appropriate assessment' in order to determine whether the Scheme will adversely affect the integrity of the site.

12.4.12 Sites of national importance may be designated as Sites of Special Scientific Interest (SSSIs). Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs have been re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs (in England and Wales) were introduced by the Countryside and Rights of Way (CROW) Act 2000. If a Scheme is "likely to damage" a SSSI, the CROW act requires that a relevant conservation body (i.e. Natural Resources Wales) is consulted. The CROW act also provides protection to local nature conservation sites, which can be particularly important in providing 'stepping stones' or 'buffers' to SSSIs and European sites. In addition, the Environment Act (1995) and the Natural Environment and Rural Communities Act (2006) both require the conservation of biodiversity.

12.4.13 The United Nations Economic Commission for Europe (UNECE) and the WHO have set a critical level for NO_x (30 µg/m^3) for the protection of vegetation. Therefore, the statutory nature conservation agency's (Natural Resources Wales) policy is to apply the 30 µg/m^3 criterion as a benchmark, on a precautionary basis, in internationally designated conservation sites and in nationally designated Sites of Special Scientific Interest (SSSIs) designated for the protection of vegetation, as per Table 12.2. The objectives only strictly apply (a) more than 20 km from an agglomeration (about 250,000 people), and (b) more than 5 km from Part A industrial sources, motorways and built up areas of more than 5,000 people. For the assessment of road Schemes, the Highways England follows this approach and requires an assessment of the impacts of roads traffic emissions on nature conservation Sites (Designated Sites) within 200 m of a road. When pollutant concentrations exceed a critical level it is considered that there is a risk of harmful effects.

Table 12.2: Designated Sites (Ecosystems) Air Quality Objectives or Critical Level

Pollutant	Time Period	Objective
Nitrogen Oxides (expressed as NO_2)	Annual Mean	30 µg/m^3

12.4.14 In addition, critical loads for nitrogen deposition onto sensitive ecosystems have been specified by UNECE. They are defined as the amount of pollutant deposited to a given area over a year, below which significant harmful effects on sensitive elements of the environment do not occur,

[21] The Conservation of Habitats and Species Regulations 2017 - Statutory Instrument 2017 No. 1012.

according to present knowledge. Exceedance of a critical load is used as an indication of the potential for harmful effects to occur. Critical Loads are determined based on habitat and therefore vary between designated sites.

Welsh Government National Strategy

12.4.15 In September 2016, Welsh Government launched its five-year Programme for Government, Taking Wales Forward[22]. The document set out how the Government intended to build a united, connected and sustainable Wales. In September 2017, Welsh Government launched Prosperity for All: The National Strategy[23], which sets out how the government will deliver those commitments within the long-term context of working within the wider Welsh public service to lay foundations towards achieving prosperity for all. The well-being Objective on building healthier communities and better environments states:

'*We will tackle inequalities between communities and deliver more services closer to home, acknowledging the importance of communities and the wider environment for good health and well-being… We will:*

… through planning, infrastructure, regulation, and health communication measures, we will reduce emissions and deliver vital improvements in air quality.'

Planning Policy Wales 2018

12.4.16 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government[24]. The PPW states regarding air quality '*Development should prevent problems from occurring or getting worse such as the generation of carbon emissions, poor air quality and waste and the depletion of our natural resources which will need to be managed for many years to come'*.

12.4.17 Section 6.7 on Air Quality and Soundscape provides the framework for addressing air quality and soundscape with objectives and key planning policy principles to consider the effects of proposed developments may have on air quality.

Conwy Local Development Plan 2007 – 2022

12.4.18 The Local Development Plan (LDP)[25] was adopted in October 2013. Strategic Policy NTE/1 on the Natural environment states:

'*In seeking to support the wider economic and social needs of the Plan Area, the Council will seek to regulate development so as to conserve and, where possible, enhance the Plan Area's natural environment, countryside and coastline. This will be achieved by:*
… Preventing, reducing or remedying all forms of pollution including air, light, noise, soil and water, in line with Policy DP/6' …

[22] Welsh Government. Taking Wales Forward 2016-2021 | September 2016. https://gov.wales/taking-wales-forward
[23] Welsh Government. Prosperity for All: the national strategy | September 2017. https://gov.wales/prosperity-all-national-strategy
[24] Welsh Government. Planning Policy Wales. Edition 10 | December 2018. https://gov.wales/planning-policy-wales.
[25] http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf

12.4.19 Strategic Policy DP/1 on sustainable development principles states:

'*… 2. Development proposals should also where appropriate:*

Protect the quality of natural resources including water, air and soil in line with Strategic Policy NTE1; *…*'

12.4.20 Policy STR/3 on mitigation travel impact states:

'*1. New developments will be required to mitigate the undesirable effects of travel such as; noise, pollution, impact on amenity and health and other environmental impacts*.'

Replacement Local Development Plan 2018-2033

12.4.21 Conwy are preparing a Replacement Local Development Plan (RLDP) to cover the period 2018 – 2033. The Preferred Strategy document outlines the Plans vision, issues and objectives, preferred level of growth and preferred spatial strategy[26]. Strategic Policy 25 (SP/25) on water, air, soundscape and light states:

'The RLDP will reduce exposure to air and noise pollution, balance the provision of development and lighting to enhance safety and security, and protect and enhance the water environment and water resources, including surface and groundwater quantity and quality.'

12.5 Relevant Guidance

Guidance on the Assessment of Dust from Demolition and Construction

12.5.1 The Institute of Air Quality Management (IAQM) Guidance[27] sets out a methodology to determine the risk factors which affect the potential for dust to be created and released from the Scheme during construction activities and to migrate to, and be deposited on surfaces, potentially causing nuisance, health and ecological effects. The guidance also sets out mitigation to ensure the appropriate control of dust risks.

LAQM Technical Guidance

12.5.2 LAQM Technical Guidance (LAQM.TG16)[28] provides local authorities with guidance, advice and methodologies to undertake their statutory duties under Part IV of the Environment Act 1995. As well as outlining the LAQM duties councils should follow, it also provides a methodology for undertaking the verification process when using dispersion models and the process of annualisation for short term monitoring studies, which has been followed for this assessment.

IAQM EPUK Land-Use Planning and Development Control: Planning for Air Quality

12.5.3 The Land-Use Planning and Development Control: Planning for Air Quality guidance[29] provides general guidance as well as criteria for the magnitude of change and significance of impacts for detailed air quality assessments. This document has been used to determine whether any air

[26] Conwy County Borough Council. Replacement Local development Plan 2018-2033. Preferred Strategy. July 2019. https://www.conwy.gov.uk/en/Resident/Planning-Building-Control-and-Conservation/Replacement-LDP/Stage-5-Preferred-Strategy/assets/documents/Preferred-Strategy-web.pdf
[27] IAQM. Guidance on the Assessment of dust from demolition and construction. 2014. v1.1.
[28] DEFRA. Local Air Quality Management Technical Guidance (TG16) DEFRA, 2018.
[29] IAQM EPUK. Land Use Planning & Development Control: Planning For Air Quality v1.2. IAQM EPUK, 2017.

quality impacts arising from the proposals are significant or not.

Welsh Transport Planning Appraisal Guidance WelTAG

12.5.4 The WelTAG[30] provides guidance on how to conduct an appraisal of a transport proposal. It states that the key local pollutants that affect local air quality are PM_{10} and NO_2. For the local pollutants the assessment of air quality impacts (i.e. considering the effects of dispersion) can be undertaken using dispersion models (which are complex and require information such as wind speed, wind direction and temperature) or, for road traffic, the empirical and more straightforward method described in the DMRB[31].

Design Manual for Roads and Bridges (DMRB)

12.5.5 The DMRB[32] is a suite of documents which contains requirements and advice relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations is highway or road authority. Volume 11 Environmental Assessment, Section 3, Part 1 HA 207/07 Air Quality[33] gives guidance on the assessment of the impact that road projects may have on local regional air quality. Where appropriate, this advice may be applied to existing roads.

12.5.6 In November 2019, subsequent to this assessment, Highways England published a new document on the requirements for assessing and reporting the effects of highway projects on air quality, LA105 Air Quality[34], which replaces HA 207/07.

12.6 Assessment Method

Consultation

12.6.1 An Environmental Impact Assessment Scoping Report was issued to the Welsh Government and the Environmental Liaison Group in February 2019. Chapter 4 of this document provide further details about the consultation process. Air Quality was recognised as an important aspect of the Scheme; however, no significant issues were raised to the scoping assessment method and approach.

12.6.2 Public consultation was carried out where noise issues were discussed. No changes to the assessment methodology were deemed required.

12.6.3 Consultation has also been carried out with the Environmental Health Officer at CCBC to agree the approach and locations of Ramboll's monitoring study.

[30] https://gov.wales/welsh-transport-appraisal-guidance-weltag
[31] The Welsh Assembly Government. Welsh Transport Planning and Appraisal Guidance. WelTAG. June 2008. https://gov.wales/sites/default/files/publications/2017-09/welsh-transport-appraisal-guidance-weltag.pdf.
[32] http://www.standardsforhighways.co.uk/ha/standards/dmrb/
[33] The Highways Agency. Volume 11 Environmental Assessment Section 3 Environmental Assessment Techniques Part 1 Ha 207/07 Air Quality. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf
[34] Highways England. LA105 Air Quality. November 2019. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20105%20Air%20quality-web.pdf

Baseline

12.6.4 Information on existing air quality has been obtained by collating the results of monitoring carried out by Conwy County Borough Council (CCBC)[35] combined with a monitoring programme undertaken by Ramboll.

12.6.5 Background concentrations for the site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[36].

12.6.6 Existing nitrogen and acid deposition rates for habitats within the study area were determined from the Air Pollution Information System website[37].

Study Area

12.6.7 For construction dust, impacts can potentially affect sensitive receptors within 350 m of associated works.

12.6.8 For local air quality impacts, DMRB (HA207/07) provides the following guideline criteria for defining the Affected Road Network (ARN) by a Scheme:

i. A change in road alignment of ≥ 5 m; or
ii. Change in daily traffic flows of ≥ 1000 Annual Average Daily Traffic (AADT); or
iii. Change in Heavy Duty Vehicle (HDV) flows of ≥ 200 AADT; or
iv. Change in daily average speed of ≥ 10 km/hr; or
v. Change in peak hour speed of ≥ 20 km/hr.

12.6.9 A regional assessment is required if affected roads are expected to have:

i. A change of more than 10% in AADT; or
ii. A change of more than 10% to the number of HDVs; or
iii. A change in daily average speed of more than 20 km/h.

12.6.10 The above change criteria are based on the difference in traffic data or highway design between the do-minimum (without Scheme) and do-something (with Scheme) scenarios.

12.6.11 The study area for local air quality impacts is proposed to encompass a 200 m corridor either side of the ARN. Only sensitive human health receptors and Designated Sites within 200 m of the ARN have been considered. The regional air quality assessment considers the change in pollutant emissions on a regional basis rather than locally therefore no receptors are assessed.

12.6.12 For local air quality impacts, the main criteria defining the ARN is a change in road alignment as some sections of the carriageway will be widened by 5 m or more. Although some roads will cease to carry traffic and new links are being proposed, there are no predicted changes in daily traffic flows or HDV flows that meet the above criteria. Further roads have been included in the assessment to account for their emissions at nearby receptors.

[35] North Wales Combined Authority. 2018 Air Quality Progress Report. September 2018.
[36] Department of the Environment, Food and Rural Affairs (Defra) (2019). '2017 Based Background Maps for NOx, NO2, PM10 and PM2.5'
[37] http://www.apis.ac.uk

12.7 Construction Dust Risk Assessment

12.7.1 During pre-construction demolition and construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source. Separation distance is also an important factor as significant dust annoyance is usually limited to within a few hundred metres of its source. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

12.7.2 The assessment of potential construction dust impacts follows the guidance published by the IAQM.[38] on the assessment of the impacts of construction on air quality. The guidance recommends that the risk of dust emission magnitude is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.

12.7.3 The IAQM assessment methodology considers three separate dust effects and defines their significance according to the sensitivity of the surrounding area, as follows:

i. Annoyance due to dust soiling;
ii. Harm to ecological receptors; and
iii. The risk of health effects due to a significant increase in exposure to PM_{10}.

12.7.4 The assessment was therefore carried out in a number of steps:

i. The need for a construction assessment was screened, based on the proximity of receptors;
ii. The risk of dust impacts was assessed taking into account the level of activity and the proximity and sensitivity of nearby sensitive receptors;
iii. Site specific mitigation integral to the Scheme proposals was reviewed and supplemented where necessary; and
iv. The significance of the dust effects, after applying the site specific mitigation, was assessed.

12.7.5 Full details of the dust risk assessment methodology which includes the assessment criteria is provided in Appendix 12.1.

12.7.6 The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations. With mitigation in place, effects are considered to be not significant.

12.8 Operational Vehicle Emission Impacts

Impact Predictions

12.8.1 The changes to air quality due to local traffic emissions have been predicted using the ADMS Roads (version 4.1.1) dispersion model. This model has been extensively validated against both field and laboratory data sets and against monitoring data in cities throughout the UK.

12.8.2 The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of HDV, road characteristics (including road width and

[38] IAQM. Guidance on the Assessment of dust from demolition and construction. 2014. v1.1.

heights, where applicable), and the vehicle speed. The road network for input to the model has been developed using GIS software ArcMap. The terrain within 250 m of ARN is relatively flat with slopes less than 10%, and therefore terrain effects have not been included within the modelling.

12.8.3 The model has been run using 2018 meteorological data from Rhyl NO2, which is considered to be the most representative meteorological monitoring station to the site (see Appendix 12.2 for further details on the model inputs).

12.8.4 AADT flows and the proportions of HDVs, for roads within 250 m of the site, existing receptors and monitoring sites have been provided in accordance with Chapter 14 All Travellers. Traffic data used in this assessment are summarised in Appendix 12.3.

12.8.5 Traffic emissions were calculated using the Emission Factor Toolkit (EFT) v9, which utilises nitrogen oxides (NO_x) and PM_{10} emission factors from the European Environment Agency COPERT 5 emission tool[39]. The traffic data were entered into the EFT, along with speed data to provide combined emission rates for each of the road links entered into the model. The emission rates have been selected for each link by classifying the road type as urban not London.

12.8.6 The predicted concentrations of roadside NO_X were converted to roadside NO_2 using the LAQM conversion calculator available from the Defra air quality website[40].

12.8.7 Concentrations were predicted at several monitoring locations using 2018 monitoring data and 2018 traffic data in order to verify the modelled results (see Appendix 12.4 for further details on the verification method).

12.8.8 The model, as set up for the assessment, does not provide reliable prediction of one-hour mean NO_2 concentrations. However, research has concluded that exceedances of the one-hour mean objective are unlikely to occur where annual mean concentrations do not exceed 60 µg/m[41]. This relationship has been used to assess whether exceedances of the hourly mean objective are likely. Similar to NO_2, a PM_{10} annual mean below 32 µg/m^3 is used to screen whether the 24-hour PM_{10} mean objective is likely to be achieved[34].

12.8.9 Daily mean PM_{10} concentrations were calculated from annual mean PM_{10} concentrations using the method described in Paragraph 7.92 of LAQM.TG(16)[42].

12.8.10 Due to an extension by 6 months in the proposed construction programme the opening year has changed from late 2022 to early/mid 2023. It should be noted that the traffic modelling has not been updated to reflect this change in opening year due to the anticipated 1% growth in traffic between 2022 and 2023. It is considered that this change in traffic flow would have a negligible impact on the operational performance of the highway network, as the network is not operating near capacity. The assessment is therefore based upon traffic data from 2022, whilst assuming an opening year of 2023.

[39] Department for Environment Food & Rural Affairs (DEFRA). *Emissions Factors Toolkit.* https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.
[40] DEFRA. LAQM Support. https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc.
[41] A, Cook. Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedances of the one-hour mean. May 2008.
[42] DEFRA. Local Air Quality Management Technical Guidance (TG16). Local Air Quality Management Technical Guidance (TG16).

12.8.11 In carrying out the assessment of operational traffic impacts the following scenarios have been considered:

a) 2018 Baseline for model verification.
b) 2022 (opening year) Future air quality in a 'Do Minimum' scenario without J15 Scheme.
c) 2022 (opening year) Future air quality in 'Do Scheme' scenario with J15 Scheme.

12.8.12 The opening year is considered to be the worst case scenario as vehicle emissions factors and background pollutant concentrations are anticipated to decrease over time due to improvements combustion technologies.

Human Health Receptors

12.8.13 Receptor locations have been selected based on changes in road alignment and in traffic as a result of the Scheme. Sensitive receptors were chosen to reflect places where members of the public would receive relevant exposure to annual mean and hourly pollutant concentrations from vehicle emissions. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links. The sensitive receptors assessed for road traffic impacts are presented in Table 12.3 below and displayed on Figure 12.1 (Appendix 12.6). Receptor locations were modelled at a height of 1.5 m representing exposure at ground floor level.

12.8.14 In addition, annual mean NO_2 and PM_{10} concentrations were also predicted for a grid of receptors (contour) across the study area in order to present the results geographically on a map (shown in Figure 12.2 and Figure 12.3). The grid resolution of 15 x 15 metres has been modelled.

Table 12.3: Sensitive Receptors Identified

ID	Location	X	Y	Height (m)
J15 1	Station Road Residential	268016	375229	1.5
J15 2	Maes-Y-Glyn Residential	268121	375286	1.5
J15 3	Maes Dolfor Residential	268223	375318	1.5
J15 4	Glanmor Road	268004	375305	1.5
J15 5	Manor House, Glanmor Road	268091	375348	1.5
J15 6	Promenade Residential	268107	375375	1.5
J15 7	Promenade Residential	268143	375389	1.5
J15 8	Promenade Residential	268219	375421	1.5
J15 9	Promenade Residential	268259	375441	1.5
J15 10	Glanmor Road Residential	268419	375502	1.5
J15 11	Shore Road Residential	268458	375517	1.5
J15 12	Penmaenmawr Road Residential	268533	375411	1.5
J15 13	Penmaenmawr Road Residential	268511	375386	1.5
J15 14	Ysgol Pant Y Rhedyn School Playground	268381	375359	1.5

ID	Location	X	Y	Height (m)
J15 15	Ysgol Pant Y Rhedyn School Front	268430	375289	1.5
J15 16	Maes Dolfor Residential	268379	375224	1.5
J15 17	Penmaenmawr Road Residential	268400	375204	1.5
J15 18	Penmaenmawr Road Residential	268570	375482	1.5
J15 19	Penmaenmawr Road Residential	268595	375507	1.5
J15 20	Penmaenmawr Road Residential	268597	375511	1.5
J15 21	Penmaenmawr Road Residential	268636	375550	1.5
J15 22	Penmaenmawr Road Residential	268647	375558	1.5
J15 23	Penmaenmawr Road Residential	268650	375478	1.5
J15 24	Penmaenmawr Road Residential	268690	375515	1.5
J15 25	Penmaenmawr Road Residential	268729	375553	1.5
J15 26	Penmaenmawr Road Residential	268724	375584	1.5
J15 27	Penmaenmawr Road Residential	268824	375679	1.5
J15 28	Penmaenmawr Road Residential	268951	375776	1.5

Human Health Significance

12.8.15 The relevant objectives for human health are set out in Table 12.1. There is no official guidance in the UK on how to assess the significance of air quality impacts of a new Scheme. The approach developed by the IAQM and EPUK guidance, which considers the change in air quality as a result of a proposed Scheme on existing receptors, has therefore been used.

12.8.16 The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective. The absolute concentration of the receptor is also taken into consideration i.e. if the receptor is close to or above the UK air quality objective level, marginal changes in magnitude may be determined to be moderate, however if the receptor is less than 75% of the UK air quality objective level marginal changes in magnitude may be determined to be negligible.

12.8.17 The impact descriptors from the guidance are shown in Table 12.4.

Table 12.4: EPUK IAQM Significance Criteria

Long Term Average Concentration at Receptor with Scheme	Percentage Change in Concentration Relative to Annual Mean Air Quality Objective (AQO)			
	<1*	**2 - 5**	**6 – 10**	**>10**
75% or less of AQO (a)	Negligible	Negligible	Slight	Moderate
76 – 94% of AQO (b)	Negligible	Slight	Moderate	Moderate
95 – 102% of AQO (c)	Slight	Moderate	Moderate	Substantial
103 – 109% of AQO (d)	Moderate	Moderate	Substantial	Substantial
110% or more of AQO (e)	Moderate	Substantial	Substantial	Substantial

Notes:
Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
*% change rounded to nearest whole number. Where the % change is less than 0.5% the impact will be Negligible.
(a) NO_2 or PM_{10}: ≤30 µg/m^3 annual mean; PM_{10} ≤24µg/m^3 annual mean (days).
(b) NO_2 or PM_{10}: >30 - ≤38µg/m^3 annual mean;
(c) NO_2 or PM_{10}: > 38 – ≤40.8µg/m^3 annual mean; PM_{10} >30.4 – ≤32.64µg/m^3 annual mean (days).30.4µg/m^3 annual mean (days).
(d) NO_2 or PM_{10}: > 40.8 – ≤ 44µg/m^3 annual mean; PM_{10} >32.64 – ≤35.2 µg/m^3 annual mean (days).
(e) NO_2 or PM_{10}: > 44µg/m^3 annual mean; PM_{10} >35.2µg/m^3 annual mean (days).

12.8.18 The guidance states that the assessment of significance should be based on professional judgement, taking into account factors including:

i. The number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance.
ii. Whether or not an exceedance of an objective or limit value is predicted to arise in the operational study area (where there are significant changes in traffic) where none existed before or an exceedance area is substantially increased.
iii. The uncertainty, comprising the extent to which worst-case assumptions have been made.
iv. The extent to which an objective or limit value is exceeded.

Ecological Receptors

12.8.19 DMRB requires ecological receptors, designated for nature conservation importance internationally, as Ramsar sites, SAC and SPA, and nationally, as SSSI, to be included where they are located within 200 metres of the ARN.

12.8.20 There are a number of statutory ecological receptors within the vicinity of the J15 Scheme. These are the Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC.

12.8.21 Effects at ecological receptors relating to NO_x concentrations and nitrogen deposition have been assessed. Road traffic is not a significant source of other pollutants that vegetation may be sensitive to, such as ammonia (NH_3) and sulphur dioxide (SO_2), and as such an assessment of these pollutants has been scoped out of this assessment.

12.8.22 Concentrations of nitrogen oxides were predicted, and deposition calculated, at a range of receptors at increasing distances from the ARN in order to indicate whether or not the critical level and critical loads are being exceeded in the habitat. These transects represent the ecological receptor described in Table 12.5 and shown in Figure 12.1. All ecological receptor locations were modelled at a height of 0 metres representative of vegetation growing at ground

level.

12.8.23 The lowest critical loads for the most sensitive habitat within each designation are presented in Table 12.5. Data have been taken from the Air Pollution Information System (APIS) website[43].

Table 12.5: Deposition and Site Relevant Critical Loads

Site	Habitat	Critical Load (2015-2017)	
		Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)
Traeth Lafan/ Lavan Sands, Conway Bay SPA/SSSI; Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	Littoral sediment/Saltmarshes; Mudflats and sandflats not covered by seawater at low tide	20-30	Not sensitive

12.8.24 Ecological receptors labelled as 'CB' cover the Traeth Lafan/ Lavan Sands, Conway Bay SPA/SSSI; Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC from 31 m up to 200 m from the J15 Scheme (displayed on Figure 12.1 (Appendix 12.6)).

12.8.25 Nitrogen deposition has been calculated from the predicted NO_2 concentrations using a deposition velocity of 1.5 mm/s for grassland habitats.

12.8.26 Where critical loads are already exceeded, an increase of more than 1% of the critical load is an indication of potentially significant effects which would trigger the need for further, more detailed assessment. It should be noted that an increase in deposition of more than 1% is not, per se, an indication that a significant effect exists, only the possibility of one. Depending on a more detailed assessment which would take account of the actual ecological conditions at the location under consideration, an increase of more than 1% may be acceptable. The same approach applies for the NO_x critical level of 30 µg/m^3 shown in Table 12.2.

12.9 Assumptions and Limitations

12.9.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

12.9.2 Calculations used to provide vehicle emission factors and to convert NO_x to NO_2 use accepted methods and are published on behalf of the Department of Transport and Defra. Diffusion tube coefficient of variation representing their precision has been determined as Good using Defra AEA's DifT Precision Accuracy Bias Spreadsheet[44]. The uncertainty of the model has been estimated using root mean square error and is presented in Appendix 12.4 Model verification.

12.9.3 Future background NO_2 and PM_{10} concentrations from Defra are based on projections from a base year of 2018 and based on ambient monitoring and meteorological data for 2018.

[43] http://www.apis.ac.uk
[44] https://laqm.defra.gov.uk/diffusion-tubes/precision.html

12.9.4 The J15 Scheme modelling has been based on 2022 emission factors, background concentrations and traffic flows. The model has been verified against 2018 monitoring data. The uncertainties regarding future vehicle emission factors have been taken account of by using the verification factor and the EFT emission factors.

12.9.5 Data for the Designated Sites have been taken from the APIS website. As APIS does not provide predictions of future year deposition, therefore 2015-2017 deposition rates are used as future background deposition rates. This is considered to be a conservative assumption as reductions in pollutant concentrations are anticipated in the future.

12.10 Baseline conditions

12.10.1 CCBC has not declared an AQMA and J15 Scheme is therefore not located within or in close proximity to an AQMA.

12.11 Defra Predicted Background Maps

12.11.1 Defra provides modelled predictions of background concentrations of air pollutants over the whole of the UK with a grid resolution of 1 km^2. Background concentrations are those levels that would be observed away from specific sources such as roads and industry.

12.11.2 Table 12.6 details the NO_X, NO_2 and PM_{10} background levels at the site for 2018 and 2022. The background concentrations are all well below the relevant objectives.

Table 12.6: DEFRA Background Mapping (µg/m³)

Year	Grid Reference (x, y)	NO_x	NO_2	PM_{10}
2018	268500, 375500	10.6	8.1	7.5
2022		8.8	6.8	7.2
Objective		**30** (ecological receptors)	**40**	**40**

12.12 Local Authority Monitoring

NO_2

12.12.1 CCBC operates continuous automatic monitors and diffusion tubes[45], the nearest of which is located approximately within J15 Scheme study area. The diffusion tube location is described in Table 12.7 and are displayed in Figure 12.1 (Appendix 15.6).

Table 12.7: Local Authority Monitoring Data – Measured NO_2 concentrations

Site ID	Type	Annual Mean (µg/m³)				
		2013	2014	2015	2016	2017
DT/CCBC021, Llanfairfechan, A55	Roadside	16.2	16.2	16.2	16.2	16.2
Objective		**40**				

[45] North Wales Combined Authority. 2018 Air Quality Progress Report. September 2018.

12.12.2 Measured concentrations at Llanfairfechan have been well below the objectives between 2013-2017.

Particulates (PM_{10})

12.12.3 There is no PM_{10} monitoring undertaken in close proximity to the J15 Scheme. However, PM_{10} monitoring is carried out at one of the six local authorities that encompass the North Wales Combined Authority[45]. 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.

12.13 Ramboll Monitoring Study

12.13.1 A six month monitoring study was organised in order to provide information on existing air quality within the area. The monitoring study was primarily designed to provide data with which to verify the air quality model. As such monitoring locations were chosen adjacent to the main roads in the vicinity of the J15 Scheme. The monitoring sites were all located on street furniture close to the road network and do not therefore represent locations of relevant public exposure (residential properties); or locations where the AQOs apply.

12.13.2 Table 12.8 presents measured annual mean NO_2 concentrations. The results have been adjusted to an annual mean and bias adjusted (see Appendix 12.5 for further details on the monitoring study and annualisation).

Table 12.8: Measured Annual Mean NO_2 Concentrations

Diffusion Tube	Location	2018 Annual Mean (µg/m^3)
4	Penmaenmawr Road	14.5
5	Penmaenmawr Road	9.7
6	Penmaenmawr Road	13.2
Objective		**40**

12.13.3 Measured concentrations are all well below the objectives. Concentrations are also well below 60 µg/m^3, indicating that the hourly mean objective is unlikely to be exceeded.

12.14 Air Quality within the Study Area

12.14.1 Measured concentrations at the monitoring point were well below the objective in 2018. Existing air quality at the J15 Scheme site would be expected to meet all relevant air quality objectives throughout the Scheme site. Some variation in concentrations would be expected across the study area with NO_2 and PM_{10} concentrations likely to be highest close to the A55, due to the emissions from traffic.

12.15 Baseline Deposition Ecological Receptors

12.15.1 The three-year average (2015 – 2017) nitrogen and acid deposition rates for each of the Designated Sites sensitive to either nitrogen or acid deposition are presented in Table 12.9; data have been taken from the APIS website. The APIS data does not include future year predictions

and therefore on a conservative basis, the APIS baseline is assumed constant for the future year assessments.

Table 12.9: Baseline Deposition Rates

Habitat(s)	Total Nitrogen Deposition (kgN/ha/yr)	Acid Deposition	
		Nitrogen (keqN/ha/yr)	Sulphur (keqS/ha/yr)
Traeth Lafan/ Lavan Sands, Conway Bay SPA; Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC - Littoral sediment/Saltmarshes; Mudflats and sandflats not covered by seawater at low tide			
Background 2015-2017	10.6	Not sensitive	
Critical Load/Level	**20 – 30**		

12.15.2 The background deposition rates do not exceed the relevant critical loads.

12.16 Assessment of Likely Effects

Construction Phase

12.16.1 The main activities with potential to cause emissions of dust construction will include:

i. Earthworks and site preparation.
ii. Demolition of existing structures.
iii. Construction of building structures, including foundations, which may include piling.
iv. Materials Handling such as storage of materials in stockpiles and spillage.
v. Construction of on and off-site highway improvements.
vi. Hard and soft landscaping and open space.

12.16.2 Dust impacts would be greatest in dry weather following long periods without rain and with the wind blowing towards sensitive receptors. Depending on wind speed and turbulence it is likely that the majority of dust will be deposited within 100 m of the source. Meteorological data for Rhyl NO2 Station, shown in Appendix 12.2, suggests that prevailing winds are typically south-westerly.

12.16.3 The risk of potential air quality impacts from demolition, earthworks, construction and trackout (the transport of dust and dirt from the Scheme onto the public road network) was assessed according to guidance developed by the IAQM in order to identify the appropriate level of mitigation.

12.16.4 The closest sensitive receptors to construction activity within 350 m of the J15 Scheme boundary will be residential properties along A55 and Penmaenmawr Road and ecological receptors within the designated sites Traeth Lafan / Lavan Sands, Conwy Bay SPA/SSSI and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC. The residential properties are considered to be a high sensitivity receptor and the designated sites are considered to be medium sensitivity receptors as designated features are not known to be affected by dust soiling.

Step 2A - Define the Potential Dust Emission Magnitude

12.16.5 Using the evaluation criteria within IAQM Guidance the potential dust emission magnitude has been identified for each activity during the construction phase shown in Table 12.10.

Table 12.10: Dust Emission Magnitude for Each Construction Phases

Activity	Dust Emission Magnitude	Justification
Demolition	Small	Two properties may be demolished. <20,000 m^3 building demolished, non-dusty material.
Earthworks	Large	Total site area is more than 10,000 m^2
Construction	Large	The Scheme would have a total estimated construction volume of more than 100,000 m^3
Trackout	Small	Up to 10 HDV (>3.5t) outward movements in any one day

Step 2B - Define the Sensitivity of the Area

12.16.6 The next stage of the process is to define the sensitivity of the assessment area to dust soiling, human health impacts and ecological receptors. This process combines the sensitivity of the receptor with the distance from the source to determine the overall sensitivity of the area.

12.16.7 The sensitivity of receptors and the area in relation to dust impacts is provided in Table 12.11.

Table 12.11: Sensitivity of Area to Dust Impacts (Taking in to Account Distance to Construction Activity)

Dust Impact	Receptor	Sensitivity
Dust soiling	>100 High sensitivity receptors located within 50 m	High
Human health	>100 High sensitivity receptors located within 50 m; Existing PM_{10} concentrations estimated to be below 24 µg/m^3.	Low
Ecological receptors	Designated sites with no dust sensitive features within 50 m.	Low

Step 2C - Define the Risk of Impacts

12.16.8 The dust emission magnitude determined in Table 12.10has been combined with the sensitivity assessment in Table 12.11 to define the risk of impacts for each phase of Scheme in the absence of mitigation as shown in Table 12.12.

Table 12.12: Risk of Dust Impacts in the Absence of Mitigation for each Construction Phase

Effect	Sensitivity of the Surrounding Area	Risk of Dust Impacts (Without Mitigation)			
		Demolition	Earthworks	Construction	Trackout
Dust soiling	High	Medium risk	High Risk	High Risk	Low risk
Human health	Low	Negligible	Low risk	Low risk	Negligible
Ecological receptors	Low	Negligible	Low risk	Low risk	Negligible

12.16.9 Overall, without mitigation, the risk of dust soiling impacts is likely to be highest for earthworks and construction activities. The risk of human health effects from PM_{10} and ecological impacts is likely to be low to negligible for all activities. In accordance with the IAQM guidance, mitigation measures associated with the highest level of risk should be applied, i.e. a high-risk site (section 12.18.1).

12.17 Operational Phase

Human Health

12.17.1 The air quality impacts from operational vehicle emissions in the opening year of 2022 on the local road network have been assessed. The assessment has compared the 'Do minimum' scenario (DM) against the 'Do something' scenario (DS), summarised in Table 12.13 and Table 12.14.

Table 12.13: Predicted Annual Mean NO_2 at Existing Receptors

Receptor	2022 DM (µg/m³)	2022 DS (µg/m³)	Scheme Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
J15 1	11.3	11.3	0.01	0.02%	Negligible
J15 2	11.6	11.6	0.00	0.00%	Negligible
J15 3	10.2	10.2	-0.01	-0.02%	Negligible
J15 4	11.8	11.9	0.01	0.02%	Negligible
J15 5	12.0	12.0	0.00	0.00%	Negligible
J15 6	10.6	10.6	0.00	0.00%	Negligible
J15 7	10.8	10.8	-0.01	-0.02%	Negligible
J15 8	10.9	10.9	-0.03	-0.07%	Negligible
J15 9	10.8	10.7	-0.09	-0.22%	Negligible
J15 10	11.9	11.5	-0.47	-1.17%	Negligible
J15 11	12.3	11.8	-0.47	-1.17%	Negligible
J15 12	10.1	10.6	0.47	1.17%	Negligible
J15 13	9.3	9.4	0.10	0.24%	Negligible
J15 14	9.1	9.2	0.12	0.29%	Negligible
J15 15	8.7	8.7	0.01	0.02%	Negligible
J15 16	8.5	8.5	0.02	0.05%	Negligible
J15 17	8.2	8.3	0.01	0.02%	Negligible
J15 18	13.5	11.3	-2.16	-5.41%	Negligible
J15 19	12.3	11.7	-0.55	-1.37%	Negligible

Receptor	2022 DM (µg/m³)	2022 DS (µg/m³)	Scheme Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
J15 20	12.5	12.1	-0.47	-1.17%	Negligible
J15 21	13.6	13.7	0.08	0.20%	Negligible
J15 22	13.7	13.8	0.09	0.22%	Negligible
J15 23	8.9	8.8	-0.10	-0.24%	Negligible
J15 24	9.0	8.9	-0.06	-0.15%	Negligible
J15 25	9.1	9.0	-0.05	-0.12%	Negligible
J15 26	10.3	10.2	-0.07	-0.17%	Negligible
J15 27	11.5	11.5	-0.05	-0.12%	Negligible
J15 28	12.7	12.7	-0.01	-0.02%	Negligible
Average Contribution/Change			**-0.13**	**-0.33%**	-

Table 12.14: Predicted Annual Mean PM_{10} at Existing Receptors

Receptor	2022 DM (µg/m³)	2022 DS (µg/m³)	Scheme Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
J15 1	8.2	8.1	-0.02	-0.06%	Negligible
J15 2	8.2	8.2	-0.02	-0.04%	Negligible
J15 3	7.9	7.9	0.00	0.00%	Negligible
J15 4	8.3	8.3	-0.03	-0.06%	Negligible
J15 5	8.3	8.3	-0.01	-0.03%	Negligible
J15 6	8.0	8.0	-0.01	-0.01%	Negligible
J15 7	8.1	8.1	0.00	-0.01%	Negligible
J15 8	8.1	8.1	0.00	-0.01%	Negligible
J15 9	8.1	8.1	-0.02	-0.05%	Negligible
J15 10	8.3	8.2	-0.11	-0.27%	Negligible
J15 11	8.4	8.3	-0.12	-0.31%	Negligible
J15 12	8.0	8.0	0.03	0.08%	Negligible
J15 13	7.8	7.8	-0.02	-0.05%	Negligible

Receptor	2022 DM (µg/m³)	2022 DS (µg/m³)	Scheme Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
J15 14	7.7	7.7	0.02	0.05%	Negligible
J15 15	7.7	7.7	0.00	0.00%	Negligible
J15 16	7.6	7.6	0.00	0.00%	Negligible
J15 17	7.6	7.6	0.00	0.00%	Negligible
J15 18	8.7	8.2	-0.51	-1.27%	Negligible
J15 19	8.4	8.3	-0.14	-0.36%	Negligible
J15 20	8.5	8.3	-0.13	-0.32%	Negligible
J15 21	8.7	8.7	0.04	0.10%	Negligible
J15 22	8.7	8.7	0.05	0.12%	Negligible
J15 23	7.7	7.7	-0.03	-0.07%	Negligible
J15 24	7.7	7.7	-0.01	-0.03%	Negligible
J15 25	7.7	7.7	-0.01	-0.02%	Negligible
J15 26	8.0	8.0	-0.01	-0.02%	Negligible
J15 27	8.2	8.2	-0.01	-0.01%	Negligible
J15 28	8.5	8.4	-0.02	-0.05%	Negligible
Average Contribution/Change			**-0.04**	**-0.10%**	

12.17.2 The predicted NO_2 and PM_{10} concentrations in 2022 without and with the J15 Scheme in place are well below the relevant objectives at all existing receptor locations. The changes in annual mean NO_2 range from a reduction of approximately 5% at receptor J15 18 to an increase of approximately 1% at receptor J15 12. The changes in annual mean PM_{10} range from a reduction of approximately 1% at receptor J15 18 to an increase of approximately 0.1% at receptor J15 21.

12.17.3 The predicted annual mean NO_2 concentrations for all receptors are predicted to be well below 60 µg/m³. This indicates that the hourly mean objective is unlikely to be exceeded at outdoor locations of these receptors where the hourly mean would apply. None of the predicted annual mean PM_{10} concentrations exceed 32 µg/m³ and therefore the 24-hour mean PM_{10} objective is not predicted to be exceeded.

12.17.4 The impact on annual mean NO_2 and PM_{10} concentrations are described as negligible at all receptors, as outlined in Table 12.13 and Table 12.14, with an overall improvement in air quality in the study area. The overall improvement in air quality is ascribed to the increase in average speed and reduction in congestion on the A55 due to the replacement of the roundabout with slip roads and an overbridge.

Net Emission Changes

12.17.5 The net changes in the emissions of the local pollutants (i.e. the changes between the 'Do Minimum' and 'Do Something' scenarios) for NOx, PM_{10} and CO_2 emissions are presented in Table 12.15. As per paragraph 5.1.4, the overall reduction in emissions is ascribed to the increase in average speed and reduction in congestion on the A55 due to the replacement of the roundabout with slip roads and an overbridge.

Table 12.15: Change in Emissions as a Result of the J15 Scheme

Pollutant	DM (tonnes/year)	DS (tonnes/year)	Change (tonnes/year)
CO_2	5518	5409	-109
NO_x	10.2	10.1	-0.1
PM_{10}	1.1	1.1	-0.02

Ecological receptors

12.17.6 Predicted concentrations, deposition rates and Scheme contribution at ecological receptors are presented in Table 12.16 and Table 12.17.

Table 12.16: Predicted Concentrations and Deposition at Ecological Receptors

Receptor and Distance in Habitat	2022 'Do Minimum'		2022 'Do something'	
	Total NO_x ($\mu g/m^3$)	Total Nitrogen Deposition (kgN/ha/yr)	Total NO_x ($\mu g/m^3$)	Total Nitrogen Deposition (kgN/ha/yr)
Traeth Lafan/ Lavan Sands, Conway Bay SPA; Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC - Littoral sediment/Saltmarshes; Mudflats and sandflats not covered by seawater at low tide				
CB 31m	20.5	11.5	19.8	11.5
CB 40m	18.9	11.4	18.3	11.3
CB 50m	17.4	11.3	16.9	11.2
CB 75m	15.1	11.1	14.8	11.1
CB 100m	13.8	11.0	13.6	11.0
CB 125m	13.0	10.9	12.8	10.9
CB 150m	12.3	10.9	12.2	10.9
CB 175m	11.9	10.9	11.8	10.8
CB 200m	11.5	10.9	11.4	10.9
Critical Level / Load	**30**	**20 - 30**	**30**	**20 - 30**

Table 12.17: Predicted Scheme Contribution

Receptor and Distance in Habitat	NO_x (µg/m³)	NO_x % of Critical Level	Nitrogen Deposition (kgN/ha/yr)	% N Deposition of Critical Load
Traeth Lafan/ Lavan Sands, Conway Bay SPA; Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC - Littoral sediment/Saltmarshes; Mudflats and sandflats not covered by seawater at low tide				
CB 31m	-0.7	-2.5	-0.06	-0.3
CB 40m	-0.6	-2.0	-0.05	-0.2
CB 50m	-0.5	-1.7	-0.04	-0.2
CB 75m	-0.3	-1.1	-0.03	-0.1
CB 100m	-0.2	-0.8	-0.02	-0.1
CB 125m	-0.2	-0.6	-0.01	-0.1
CB 150m	-0.2	-0.5	-0.01	-0.1
CB 175m	-0.1	-0.4	-0.01	0.0
CB 200m	-0.1	-0.3	-0.01	0.0

12.17.7 The NO_x critical level and critical load for nutrient nitrogen deposition is not exceeded within 200 m from the J15 Scheme for both 'Do Minimum' and 'Do Something' scenarios. There is a reduction in NO_x concentration and nutrient nitrogen due to the J15 Scheme, but the impacts are considered to be not significant.

12.18 Design Mitigation and Enhancement Measures

Construction Phase

12.18.1 The control of dust emissions from construction sites relies upon good site management and mitigation techniques to reduce emissions of dust and limit dispersion. A summary of the mitigation measures recommended in the IAQM guidance to reduce impacts from high risk sites is provided in Table 12.18. It is recommended that these measures are set out within a Dust Management Plan which would form part of the Construction Environmental Management Plan (CEMP) that would accompany the Draft Orders and ES for the J15 Scheme or be secured through an appropriately worded planning condition. The proposed mitigation provided below are tried and tested and standard measures included in CEMPs on a regular basis.

Table 12.18: Recommended Dust Mitigation Measures for High Risk Sites

Phase	Mitigation Measure
Communications	a) Develop and implement a stakeholder communications plan. b) Display the name and contact details of persons accountable on the site boundary. c) Display the head or regional office information on the site boundary
Management	a) Develop and implement a dust management plan. b) Record all dust and air quality complaints, identify causes and take measures to reduce emissions. c) Record exceptional incidents and action taken to resolve the situation. d) Carry out regular site inspections to monitor compliance with the dust management plan and record results. e) Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken. f) Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible. g) Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site. h) Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period. i) Avoid site run off of water or mud. j) Keep site fencing, barriers and scaffolding clean using wet methods. k) Remove potentially dusty materials from site as soon as possible. l) Cover, seed or fence stockpiles to prevent wind whipping. m) Ensure all vehicles switch off engines when stationary. n) Avoid the use of diesel or petrol powered generators where possible. o) Produce a Construction Logistics Plan to manage the delivery of goods and materials. p) Only use cutting, grinding and sawing equipment with dust suppression equipment. q) Ensure an adequate supply of water on site for dust suppressant. r) Use enclosed chutes and conveyors and covered skips. s) Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate. t) Ensure equipment is readily available on site to clean up spillages of dry materials. u) No on-site bonfires and burning of waste materials on site
Demolition	a) Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). b) Ensure water suppression is used during demolition operation. c) Avoid explosive blasting, using appropriate manual and mechanical alternatives. d) Bag and remove any biological debris or damp down such material before demolition.
Earthworks	a) Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable. b) Only remove the cover in small areas during work and not all at once

Construction	a) Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process. b) Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored silos with suitable emissions control systems
Trackout	a) Use water assisted dust sweepers on the site access and local roads. b) Avoid dry sweeping of large areas. c) Ensure vehicles entering and leaving the site are covered to prevent escape of materials. d) Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable. e) Install hard surfaced haul routes which are regularly damped down. f) Install a wheel wash with a hard-surfaced road to the site exit where site layout permits. g) The site access gate to be located at least 10m from receptors where possible

12.19 Operational Phase

12.19.1 The effects of the Scheme traffic on local air quality are judged to be not significant with an overall improvement in air quality concentrations. No additional traffic mitigation is therefore required to reduce the direct effects of the Scheme on local air quality.

12.19.2 However, to further reduce the impacts of traffic associated with J15 Scheme, following construction phase, improvements to walking and cycling routes and bus stops are being proposed (see Chapter 14 All Travellers). The walking and cycling infrastructure improvements are expected to reduce the number of vehicle movements associated with the J15 Scheme and subsequent emissions by encouraging sustainable transport.

12.20 Residual effects

Construction Phase

12.20.1 With appropriate mitigation in place the residual effect of construction is assessed as not significant.

Operational Phase

12.20.2 The operational residual air quality effects of the proposed Scheme are judged to be not significant.

12.21 Cumulative Effects

Construction Phase

12.21.1 Cumulative effects may include intra-project effects, when construction activities overlap in time for Junction 15 and Junction 16, or when changes in operational traffic at Junction 16 affect traffic at Junction 15.

12.21.2 Construction works at Junction 15 concurrent with construction works at Junction 16 do not have the potential to affect the identified receptors within the study area because of significant distances separating the two junctions. Significant cumulative effects are unlikely to occur as

each Scheme is anticipated to employ similar dust mitigation techniques such that the individual construction phase effect was not significant, alone or in combination.

Operational Phase

12.21.3 The J15 Scheme traffic model has taken into account committed developments as well as future predicted traffic growth when both Junctions 15 and 16 are completed in the assessment opening year. The assessment has therefore predicted the cumulative concentrations arising from committed developments in the area in 2022.

12.22 Summary

12.22.1 The assessments presented in this chapter identified the potential air quality effects due to construction and operation of the J15 Scheme upon the immediate environment.

12.22.2 The assessment of potential impacts to air quality during construction phase has identified that the activities, together with the location of nearby sensitive receptors, would result in a high risk of impacts in the absence of suitable mitigation. Mitigation would be provided through a series of measures set out in a detailed dust management plan secured as part of the wider Construction Environmental Management Plan. With mitigation in place, the effect is not significant.

12.22.3 Concentrations of NO_2 and PM_{10} have been predicted for a number of worst case locations representing existing properties adjacent to the road network. Predicted concentrations are well below the relevant objectives at all of the existing receptor locations in 2022 with the J15 Scheme in place. The effects of the Scheme traffic on local air quality are judged to be not significant with an overall slight improvement in air quality concentrations.

12.22.4 The increase in NO_x concentrations and nitrogen deposition on ecological receptors is unlikely to have a significant effect on the integrity of the receptors given the magnitude of the predicted changes and the limited areas of the habitats affected. The operational air quality effects of the J15 Scheme are judged to be not significant for both human health and ecological receptors.

12.22.5 Overall, it is concluded that there are no air quality constraints to the proposed Scheme.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 13 NOISE AND VIBRATION

RAMBOLL Bright ideas. Sustainable change.

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13. NOISE AND VIBRATION

13.1 Chapter introduction

13.1.1 This chapter considers the likely significant effects of noise and vibration associated with construction and operation of the J15 Scheme. The Scheme upgrades the existing roundabout junction where the A55 dual carriageway meets Penmaenmawr Rd in Llanfairfechan into a grade separated junction. A detailed description of the Scheme is provided in Chapter 2.

13.1.2 The significance of potential effects has been classified based upon the sensitivity of identified receptors and the magnitude of predicted impacts. Where significant noise and vibration effects are determined, mitigation options are proposed and discussed.

13.2 Scope of the Assessments

13.2.1 The assessment presented in this chapter considers the potential significant effects upon human Noise Sensitive Receptors (NSRs). The assessment considers potential significant effects associated with:

a) construction noise due to use of road construction plant and machinery such as excavators, breakers and delivery lorries,
b) construction vibration due to use of compaction rollers and piling rigs, and
c) changes of road traffic noise following the Scheme opening due to changes in road horizontal and vertical alignment, and changes in traffic speed and volume.

13.2.2 Assessment of significant vibration effects due to operational road traffic has been scoped out because the Scheme does not introduce a new source of vibration closer than existing roads in relation to the NSRs.

13.2.3 Noise due to construction traffic has been scoped out from this assessment because it is assumed all the traffic will access the construction site using the A55. Addition of construction traffic to the A55 traffic is considered negligible.

13.3 Regulatory/Policy Framework

Environmental Noise Regulations

13.3.1 Strategic noise mapping is carried out by each member state of the European Union every 4 years. The mapping is carried out under Environmental Noise Directive (END) 2002/49/EC. The 3rd round of mapping was completed for Wales in 2017. The aim of the END is to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. END is given legal force in Wales through the Environmental Noise (Wales) Regulations 2006 as amended by the Environmental Noise (Wales) (Amendment) Regulations 2009 (collectively referred to as the Environmental Noise Regulations).

13.3.2 The result of mapping under END is identification of Priority Areas, locations of noise sensitive receptors where the current road traffic noise level is above a limit of 73dB L_{DEN}, a Day-Evening-Night weighted level. Subsequent to the identification of Priority Areas, Action Plans are drawn with an aim to reduce the noise levels associated with transportation noise sources.

13.3.3 Under the END, the Welsh Ministers have an obligation to draw up action plans for places near major roads. It is expected that the noise maps will inform a range of activities carried out by public bodies in Wales including prioritised noise mitigation works, such as noise barriers and resurfacing.

Design Manual for Roads and Bridges (DMRB)

13.3.4 DMRB[1] provides advice on the assessment of noise and vibration impacts due to road traffic. The guidance provides a classification of magnitude of impacts related to changes in road traffic noise levels. As people are less sensitive to noise level changes over time, the classification of impacts is provided in the short term and in the long term.

13.3.5 The classification of impacts is used to define the significance criteria for assessing the changes in road traffic noise.

13.3.6 DMRB recommends calculation methodologies for the estimation of noise levels resulting from a road project during its construction and during its operation. The operational noise impacts are changes in road traffic noise, due to changes in traffic flow, speed, road alignment and road surface.

13.3.7 The new DMRB noise and vibration guidance was published in the latter part of 2019 which was after the scoping report was published. Ramboll have reviewed the requirements of the new DMRB document (LA111 Noise and Vibration). The new document requires construction noise thresholds to be determined using the ABC Method to E.3.2 of BS 5228-1:2009+A1:2014. The assessment contained in this chapter determines the construction noise impact using the 5dB change method to E.3.3 of BS 5228-1:2009+A1:2014. However, the resultant significance of effects remains the same. The assessment of operational noise is not deemed to be affected by the latest guidance document and therefore the assessment is deemed to be valid.

13.4 Assessment Method

Consultation

13.4.1 An Environmental Impact Assessment Scoping Report was issued to the Welsh Government and the Environmental Liaison Group (ELG) in February 2019.

13.4.2 Noise was recognised as an important aspect of the Scheme; however, no issues were raised to the scoping assessment method and approach.

13.4.3 Public consultation was carried out where noise issues were discussed. No changes to the assessment methodology were deemed required.

13.4.4 Chapter 4 of this document provide further details about the consultation process (paragraph 4.4.4).

Study Area and Noise Sensitive Receptors

13.4.5 The study area for the assessment of construction noise has been limited to within 100m of the boundary of the construction work areas. NSRs within the study area that would potentially be

[1] Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD 213/11 – Revision 1, Noise and Vibration, November 2011

affected by construction noise are considered a limiting case, meaning that no greater effects would occur at greater distances. Attenuation of noise from localised activities is greater than attenuation of noise from the distributed source of noise such as the A55 road, and therefore no significant noise effects are expected at distances beyond 100m from work areas in the context of ambient environment dominated by road traffic noise from A55. The work areas are identified graphically in Figure 13.1.

13.4.6 The calculation area for the changes in operational noise levels has been defined in accordance with DMRB as a 600m boundary from any new, bypassed or improved routes, and 600m boundary from affected routes in a one-kilometre radius, where affected routes are those where there is a possibility of a change in 1dB in the short-term and 3dB change in the long term. A change in road traffic noise of 1dB corresponds to an increase of 25% or decrease in traffic flow of 20%. The extent of the Scheme and the calculation area adopted for the assessment of operational noise is presented graphically in Figure 13.1.

13.4.7 Dwellings, hospitals, schools, community facilities, designated areas, and public rights of way were considered as NSRs to be identified inside the adopted study area. With reference to Figure 13.1, receptor locations P1-P9 have been identified as residential receptors. Receptor location S1 represents a school (Ysgol Pant Y Rhedyn).

Assessment Approach

13.4.8 Assessment of construction vibration compared the predicted levels with the absolute threshold values, at which people would be adversely affected. Prediction technique and threshold noise levels were established in accordance with British Standard 5228-2:2009+A1:2014[2].

13.4.9 Assessment of changes in road traffic noise followed the simple assessment method presented in DMRB. The assessment reports the number of receptors that would experience a change in noise level in a specific change band in the short-term (opening year) scenarios. The results are additionally supported by noise contour maps, which consist of a level difference in road traffic noise between baseline and with-Scheme scenarios.

Method of Baseline Data Collection

13.4.10 The baseline noise monitoring was carried out to determine the noise level criteria for construction noise. The baseline noise level measurements were made during daytime periods at locations representative of residential properties where construction noise is expected to result in the highest construction noise levels. Multiple measurements were carried out at each location throughout the day period, to be representative of the different times of the day and to cover majority of the proposed construction times. Ultimately, ambient noise levels at majority of the assessment receptors is dominated by a road traffic noise on A55, which does not significantly vary throughout the day.

13.4.11 Details of the baseline survey are presented in Technical Appendix 13.1

[2] British Standards Institution, 2009. BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration, BSI.

Construction Noise

13.4.12 Assessment of construction noise compared the predicted levels at the identified noise sensitive receptors with a noise level criterion that was established relative to the measured baseline levels. Prediction technique and threshold noise levels were established in accordance with British Standard 5228-1:2009+A1:2014[3]. All receptors have been identified to be high sensitivity.

13.4.13 The criterion for the assessment of construction noise affecting NSRs was established relative to the baseline noise levels and based upon the '5 dB change' method presented in BS 5228-1:2009+A1:2014. The 5 dB change method states site activities are deemed to be potentially significant if the total noise, i.e. combination of pre-construction ambient noise and site noise exceeds the pre-construction ambient noise by 5 dB or more. The '5 dB change' method provides a lower cut-off value for the predicted site noise of 65 dBA, i.e. any predicted construction noise at an NSR below 65 dBA is not considered significant.

13.4.14 The classification of magnitude of impacts is reproduced in Table 13.1. It has been adopted that a Moderate or Major impact would constitute a significant effect. Significant noise effects should be mitigated.

Table 13.1: Classification of impacts

Magnitude of Impact	Construction noise above pre-existing ambient level	Significance of effect
Negligible	< 0 dB	Not significant
Minor	0 - 5 dB	
Moderate	6 – 10 dB	Significant
Major	> 10 dB	

13.4.15 The exact working methods and plant to be employed during construction have not been fully established at this stage in the design. It is however possible to make assumptions regarding the likely construction activities for the type of development involved and based on the indicative construction programme.

13.4.16 The information provided by Ramboll Highways comprises defined construction phases. These phases outline areas in which work will take place as well as the duration of those works.

13.4.17 Assumptions have been made regarding construction activities occurring during each construction phase. These include the following:

Phase 1

- Traffic management
- Site clearance
- Excavation

Phase 2

- Substructure (construction of the bridge)
- Superstructure (construction of the bridge)
- Road works

[3] British Standards Institution, 2009. BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise, BSI.

Phase 3

- Substructure (sliproads viaduct)
- Superstructure (sliproads viaduct)
- Road works

Phase 4

- Finishing

13.4.18 The potential noise impacts upon the nearest NSRs were estimated based on the proposed development plans, including the assumed construction schedule. A selection of NSRs were identified within the study area to represent all NSRs that may be potentially impacted by construction noise Figure 13.1.

13.4.19 The predictions of construction noise levels were based upon the expected construction activities and plant sound levels contained in the source database of BS 5228-1:2009+A1:2014. The assumed noise emissions from the construction machinery/plant are detailed in Technical Appendix 13.2.

13.4.20 Summer construction working hours are understood to be:

- 07:00-19:00 Monday to Friday
- 07:00-14:30 Saturday

13.4.21 Working hours during winter periods are understood to be 07:30-17:30.

13.4.22 The working hours are subject to agreement with Conwy County Borough Council.

Construction Vibration

13.4.23 It is assumed that vibratory compaction and sheet steel piling will be utilised during the construction phase. Compaction of aggregates using rollers and sheet steel piling can result in perceptible vibration at nearby sensitive receptors. There is no established method of predicting vibration in buildings from construction activities. However, it is possible to apply prediction methods for vibration propagation in the ground, as described in BS 5228-2:2009+A1:2014. The calculation methods of vibration propagation predict the peak particle velocity (PPV) and consider the source of vibration, distance to the receptor and the ground conditions.

13.4.24 BS 5228-2:2009+A1:2014 suggests that, for the majority of people, vibration levels between 0.14 and 0.3 mm/s PPV are just perceptible. A vibration level of 1.0mm/s is sufficient to cause complaint, but tolerable with warning, while a level of 10mm/s is intolerable for anything more than a very brief exposure. Vibration levels exceeding
15 mm/s PPV are sufficient to result in minor cosmetic damage to light or unreinforced buildings. This magnitude of vibration commensurate with cosmetic building damage is not considered likely at the Scheme due to the nature of the proposed construction activities, therefore an assessment of building damage has not been undertaken.

13.4.25 The assessment of vibration is undertaken through the calculation of distance from NSR at which the vibrations are likely to reach 0.14mm/s and 1.0mm/s PPV. These distances are presented in Table 13.2.

13.4.26 The distances were calculated with a scaling factor corresponding to 33% probability of predicted value being exceeded and the worst-case values from the parameter range for the

vibratory drum roller. The exact type of the vibratory rollers, its dimensions and operational parameter, and the ground conditions will affect the propagation of vibration, therefore the adopted method presents the estimation of likely vibrations rather than a detailed calculation with a specific item of plant/machinery.

Table 13.2: Ranges of PPV for vibratory compaction

Construction activity	Distance to reach 0.14 mm/s PPV	Distance to reach 1.0 mm/s PPV
Vibratory compaction (steady state)	190m	50m
Sheet steel piling	Up to 59m	Up to 16m

13.4.27 The significance scale has been adopted from the threshold values for perceptible vibration and is presented in Table 13.3.

Table 13.3: Significant vibration effects

Vibration PPV	Effect	Significance of effect
< 0.14 mm/s	Negligible	Not significant
0.14 – 0.3 mm/s	Minor	
0.3 – 1.0 mm/s	Moderate	
> 1.0 mm/s	Major	Significant

13.4.28 Vibration levels exceeding 1 mm/s at NSRs; the operation of the vibratory rollers within 50m of the NSRs or sheet steel piling within 16m of the NSRs, are considered to result in significant vibration impacts.

Operational Noise

13.4.29 The assessment of operational noise level changes has been made by reference to guidance in DMRB and considered short-term effects. The guidance presented in DMRB provides the classification of magnitude of noise impacts, which is intended to assist in establishing significant effects. The DMRB classification of magnitude of impacts is reproduced in Table 13.4. It has been adopted that a Moderate or Major impact would constitute a significant effect. Significant noise effects should be mitigated.

Table 13.4: Classification of operational impacts

Magnitude of impacts	Noise level change in the short-term, dB	Adopted significance
Negligible	< 1	Not significant
Minor	1 – 2.9	
Moderate	3 – 4.9	Significant
Major	≥ 5	

13.4.30 The calculations of changes in road traffic noise were made based on the traffic model which predicts baseline and future with-Scheme traffic flows for the Scheme. The future with-Scheme traffic data incorporates traffic associated with committed developments.

13.4.31 The assessment of road traffic noise considered changes in the traffic noise predicted at individual NSRs within a study area that was defined in accordance with DMRB. The predictions of road traffic noise levels were made in accordance with the method presented in the Calculation of Road Traffic Noise[4] (CRTN) and facilitated by the proprietary computer software, CadnaA ®. The method takes into account parameters such as traffic flow, average speed, percentage of heavy goods vehicles, road surface texture depth and any screening afforded by buildings and barriers.

13.4.32 The comparison of road traffic changes was made for a short-term assessment, Do-Minimum (baseline) scenario in the opening year (2022) against the Do-Something scenario in the opening year (2022).

13.4.33 Due to an extension by 6 months in the proposed construction programme the opening year has changed from late 2022 to early/mid 2023. It should be noted that the traffic modelling has not been updated to reflect this change in opening year due to the anticipated 1% growth in traffic between 2022 and 2023. It is considered that this change in traffic flow would have a negligible impact on the predicted operational noise levels, as the network is not operating near capacity. The following assessment is therefore based upon traffic data from 2022, whilst assuming an opening year of 2023.

13.4.34 Traffic data for the assessed road links is presented in Table 13.5, and in Figure 13.5 and Figure 13.6 which identify the road links considered in the assessment. Road links 7 to 10 do not exist in the baseline scenario.

Table 13.5 Operational traffic data

Links	Baseline			Do Something		
	Flow	% HGV	Speed (km/h)	Flow	% HGV	Speed (km/h)
1	16775	8	96	16918	8	97
2	16889	11	96	16914	11	97
3	19222	10	96	19222	10	96
4	19227	7	96	19227	7	96
5	4361	4	35	4529	4	35
6	759	14	35	759	14	57
7	-	-	-	268	2	98
8	-	-	-	528	5	90
9	-	-	-	2837	3	55
10	-	-	-	2577	4	92

[4] The Department for Transport, 1988. Calculation of Road Traffic Noise.

13.5 Baseline Conditions

13.5.1 The baseline survey consisted of attended noise level measurements during daytime on 12 July 2019. The measurements were carried out at eight locations representative of the nearest NSRs, as shown in Figure 13.2.

13.5.2 All measurements were 15 minutes in duration, and multiple measurements were made at each location. Measurement samples were averaged from individual monitoring locations, to obtain a single figure representative of the daytime noise level. A summary of baseline noise levels is shown in Table 13.6, and details of the monitoring are provided in Technical Appendix 13.1. L_{Aeq} describes the ambient noise level, and its value is equivalent in time to a steady sound level. L_{A10} is an indicator used in the CRTN prediction method to represent the road traffic noise level.

Table 13.6 Summary of baseline noise levels

Monitoring location	dB L_{Aeq}	dB L_{A10}
A1	62	58
A2	54	55
A3	58	60
A4	60	61
A5	59	60
A6	72	74
A7	58	59

13.6 Assessment of Likely Effects

Construction Noise Effects

13.6.1 All demolition and construction effects are considered to be direct and temporary.

13.6.2 The results for the predicted construction noise for each NSR are reported in Table 13.7.

13.6.3 By assessing construction noise in accordance with the 5 dB change method in BS 5228-1:2009+A1:2014, the following is predicted:

- **Moderate Adverse** effects are predicted at receptor P6 during the phase 2 superstructure construction activity.
- **Major Adverse** effects are predicted 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

13.6.4 Construction works that are predicted to result in moderate or greater impacts are assessed to result in **significant effects**.

Construction Vibration Effects

Vibratory Compaction

13.6.5 It is predicted that significant vibration levels may occur during the finishing works activity of phase 2 at assessment locations S1, P3, P6, P7 and P7. Therefore, vibratory compaction is assessed to result in significant impacts at these assessment locations during the phase 2 substructure construction activity.

Sheet Piling

13.6.6 No significant vibration levels are predicted with sheet steel piling.

Operational Effects

13.6.7 The results of the assessment are summarised in Table 13.7, which show the number of dwellings which are predicted to experience a change in road traffic noise levels. The change in road traffic noise is also presented graphically in the noise level difference maps in Figure 13.3.

13.6.8 Without any mitigation the Scheme is predicted to result in a noise level increase at the majority of the 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 effect.

13.6.9 The construction activities and associated receptors predicted to be above 65 dBA are listed in Table 13.8.

Table 13.7: Predicted construction noise levels

Receptor ID	Construction activity							
	Phase 1 Traffic management	Phase 2 Site clearance	Phase 2 Excavation	Phase 2 Substructure	Phase 2 Superstructure	Phase 2 Finishing	Phase 3 Road works	Phase 4 Finishing
P1	41	45	42	38	35	40	58	16
P2	45	59	50	50	37	54	59	20
P3	45	54	51	45	44	51	58	26
P4	44	48	43	46	47	42	56	29
P5	53	54	48	54	56	46	62	39
P6	42	64	59	63	66	58	55	43
P7	55	69	62	72	73	58	59	46
P8	39	51	45	50	52	42	45	30
P9	43	60	55	53	56	51	53	27
P10	48	57	55	49	44	51	61	25
S1	36	50	47	46	46	44	52	29

Table 13.8 Assessment of construction noise impacts

Receptor ID	Construction activity	Predicted site noise (dBA)	Pre-construction ambient noise (dBA)	Total noise (dBA)	Total noise less pre-construction ambient noise (dB)	Magnitude of impact
P6	Phase 2 Superstructure	66	60	67	7	Moderate
P7	Phase 2 Site clearance	69	60	70	10	Moderate
	Phase 2 Substructure	72		73	13	Major
	Phase 2 Superstructure	73		73	13	Major

Table 13.9: Changes in road traffic noise in the short-term without mitigation

Change in noise level		Number of dwellings
Increase in noise level, $dBL_{A10,18h}$	5 +	7
	3 - 4.9	12
	1.0 - 2.9	200
	0.1 - 0.9	295
no change		9
Decrease in noise level, $dBL_{A10,18h}$	0.1 - 0.9	5
	1 - 2.9	5
	3 - 4.9	1
	5 +	0

13.6.10 Sixteen receptors are predicted to experience a significant noise effect, an increase in noise level of more than 3dB in the opening year. The receptors include:

- New Fernbank development,
- Sunnybank Terrace,
- St Seiriol's and St Elyn, and
- 21 to 26 Maes Dolfor.

13.6.11 Without additional mitigation the Scheme is assessed to result in **significant operational noise effects** in the short-term.

13.6.12 Properties at Mona Terrace, 11-14 Pendalar and 81-85 Pendalar were identified as a Priority Area under END mapping. The road traffic noise levels predicted for the above properties as part of this assessment are less than the threshold noise level limit of 73 dB L_{DEN} that would identify the Priority Area, however the predicted noise levels are higher than the level of 65 dB $L_{A10,18h}$ below which no further noise improvement action may be required. The level of 65 dB $L_{A10,18h}$ is based on the threshold of 68 dB $L_{A10,18h}$ to the Noise Insulation Regulations 1975[5], and allowance for a 3dB façade correction to the calculation methodology of CRTN.

[5] HMSO. 1975. The Noise Insulation Regulations.

13.7 Mitigation

Mitigation of Construction Noise Effects

13.7.1 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.

13.7.2 Noise levels from cutters, drills and small tools may be reduced by utilising an enclosure with a roof whilst carrying out these works in the vicinity of P6 and P7.

Figure 13.1 Localised screening for construction works - example 1

13.7.3 Localised screening may reduce noise levels from mobile plant as shown in Figure 13.2.

Figure 13.2 Localised screening for construction works - example 2

13.7.4 Enclosures/localised screening may reduce noise levels from these noise sources by 5-10dB.

13.7.5 Localised screening of minimum 2m height have a potential to reduce the predicted noise levels at receptors P7 (Sunnybank Terrace and New Fernbank) by approximately 5dB, assuming the construction machinery is just visible to the sensitive receptors over the noise barrier.

13.7.6 A CEMP would be prepared in advance of construction which would define all mitigation measures to be adopted to minimise noise and vibration emissions at surrounding sensitive receptors. This would incorporate specific measures within all phases of the works where noise and vibration may give rise to disturbance. It is expected that the CEMP would be secured by means of an appropriately worded planning condition.

13.7.7 Best Practicable Means (BPM), as defined by the Control of Pollution Act 1974, would be implemented as part of the working methodology. This would serve to minimise the noise and vibration effects at receptors in the vicinity of the construction works. The reduction in noise levels provided through the implementation of BPM would vary depending on the nature of the works.

13.7.8 Typical BPM measures would be considered, where reasonably practical, such as:

- Plan working hours to take account of the effects of noise and vibration upon persons in areas surrounding site operations and upon persons working on-site;
- Where reasonably practicable, adopt quiet working methods, using plant with lower noise emissions;
- Where reasonably practicable, adopt working methods that minimise vibration generation;
- Locate plant away from noise and vibration sensitive receptors, where feasible;
- Use silenced and well-maintained plant conforming with the relevant EU directives relating to noise and vibration;
- Avoid unnecessary revving of engines and switch off equipment when not required;
- Keep internal haul routes well maintained;
- Use rubber linings for chutes and dumpers to reduce impact noise;
- Minimise drop height of materials;
- Start-up plant and vehicles sequentially rather than all together;
- Carry out regular inspections of noise mitigation measures to ensure integrity is maintained at all times;
- Provide briefings for all site-based personnel so that noise and vibration issues are understood, and mitigation measures are adhered to; and
- Manage plant movement to take account of surrounding NSRs, as far as is reasonably practicable.

13.7.9 It is assumed a 2.4m site hoarding will be installed at the construction site boundary.

13.7.10 Community liaison and communication regarding construction works would be undertaken throughout the demolition and construction stage to provide information to people residing in properties located in the vicinity of the construction works and reduce the likelihood of adverse effects on the local community which could result in potential noise complaints. The level of engagement required would vary during the construction period, depending upon the expected effects experienced by individual receptors due to the construction works.

13.7.11 Details relating to liaison with the local community would be managed by the contractor. It is envisaged that community liaison would provide local residents with the following information in relation to the construction works:

- The nature of the works being undertaken;
- The expected duration of the works;
- The contractor’s working hours;
- Mitigation measures that have been adopted to minimise noise and vibration, as detailed in the CEMP; and
- Contact details in the event of a noise disturbance.

13.7.12 If work is required to extend into periods beyond the agreed hours, separate authorisation would be secured with the local authority via the CEMP process.

Mitigation of Operational Noise Effects

13.7.13 Reduction in road traffic noise emissions can be achieved through the following measures:

- In the noise propagation path, with the introduction of roadside barriers; a reduction in noise level emissions up to 10dB can commonly be achieved depending on the barrier height and distances to the road and to the receptor;
- At source, with the introduction of thin surface systems, which generate less rolling noise relative to hot rolled asphalt (HRA); a reduction in noise level emissions between 3dB and 5dB can be achieved relative to HRA depending on the manufacturing specification (aggregate composition and surface texture depth) and depending on the traffic speed; the noise reduction benefit of thin surfaces is observed fully at traffic speeds above 75km/h, and the benefit is reduced at lower speeds; long term performance of rolling noise characteristic with thin surfaces in currently unknown, therefore DMRB recommends to apply a maximum surface correction of -3.5dB to noise emissions in any assessment scenario for traffic speeds above 75km/h;
- DMRB recommends that, until further research is carried out, benefits of the low noise surfaces should not be applied to noise emissions from roads link with traffic speed less than 75 km/h. However, research presented by Transport Research Laboratory (TRL) and by the Imagine Project funded by the European Council show that the difference in acoustic benefit of a low-noise surface relative to a hot-rolled asphalt is less than 1dB between 75km/h and 60km/h mean traffic speeds. It would therefore be considered appropriate to apply the full surface correction at traffic speeds above 60km/h.

13.7.14 Low noise thin surface system was assumed to be present on all the A55 carriageways. The thin surfacing was also assumed to be introduced on all carriageways subject to the roadworks. A CRTN correction of -3.5dB was applied for any low-noise surface.

13.7.15 Noise barriers are proposed at locations of existing parapet walls/barriers that were removed to make space for the Scheme, and at locations where a significant noise level increase may occur. The location of existing and proposed noise barriers is shown in Figure 13.4.

Project enhancement measures

13.7.16 An additional noise barrier could be considered for Mona Terrace and properties at Pendalar that were identified Priority Area under END. Such a barrier would be an opportunity to reduce the noise level below 65 dBL_{A10}.The noise barrier would be specified either along the proposed cycle path with a height of 1.8m, or next to the retaining wall along A55.

13.8 Assessment of Residual Effects

Construction Noise Effects

13.8.1 The results of the assessment for mitigation are summarised in Table 13.9.

Table 13.10: Predicted construction noise levels with mitigation

Receptor ID	Construction activity	Predicted site noise (dBA)	Pre-construction ambient noise (dBA)	Total noise (dBA)	Total noise less pre-construction ambient noise (dB)	Magnitude of impact
P6	Phase 2 Superstructure	61	n/a	n/a	n/a	Not significant
P7	Phase 2 Site clearance	64	60	65	5	Minor
	Phase 2 Substructure	67		68	8	Moderate
	Phase 2 Superstructure	68		69	9	Moderate

13.8.2 Moderate effects are predicted at receptor P7 during the substructure and superstructure of Phase 2. The effects are considered **significant**.

13.9 Operational Noise Effects

13.9.1 The results of the assessment for the mitigated Scheme are summarised in Table 13.10. With the incorporation of low noise thin surface system and the introduction of roadside noise barriers, the Scheme is assessed to result in **no significant effects**.

Table 13.11: Changes in road traffic noise in the short-term with mitigation

Change in noise level		Number of dwellings
Increase in noise level, $dBL_{A10,18h}$	5 +	0
	3 - 4.9	0
	1.0 - 2.9	206
	0.1 - 0.9	299
no change		13
Decrease in noise level, $dBL_{A10,18h}$	0.1 - 0.9	5
	1 - 2.9	6
	3 - 4.9	1
	5 +	4

13.9.2 The change in road traffic noise including the proposed mitigation measures is presented graphically in the noise level difference maps in Figure 13.4 for an assessment height of 4m above the ground level. Noise barrier locations are identified also in Figure 13.4.

13.9.3 With the incorporation of the noise barrier above the retaining wall near Mona Terrace, the properties identified inside the Priority Area would experience a reduction in noise to a level not

exceeding 65 $dBL_{A10,18h}$, which is considered a threshold below which no further mitigation may be required. Alternatively, the provision of noise insulation measures to the properties could be investigated.

13.10 Assessment of Cumulative Effects

13.10.1 Cumulative effects may include intra-project effects, when construction activities overlap in time for Junction 15 and Junction 16, or when changes in operational traffic at Junction 16 affect traffic at Junction 15.

13.10.2 Construction works at Junction 16 concurrent with construction works at Junction 15 do not have the potential to affect the identified receptors within the study area because of significant distances separating the two junctions. Therefore, construction works are not predicted to result in significant cumulative effects.

13.10.3 Traffic data used for the assessment of operational noise effects is representative of the situations when both Junctions are completed in the assessment opening year. Therefore, the assessment of operational noise is cumulative with Junction 16.

13.10.4 Inter-development effects may occur when other committed developments such as new residential or commercial developments are forecast to be operational at the assessment opening year. The traffic data used for the assessment includes the traffic associated with committed developments, therefore the assessment of operational noise is cumulative with other developments.

13.11 Summary

13.11.1 The assessments presented in this chapter identified the potential significant effects due to construction and operation of the Scheme upon the immediate environment.

13.11.2 Methodology for the noise and vibration assessment was presented to Welsh Government and to the ELG. No objections were raised to the assessment methodology.

13.11.3 Predicted noise effects from construction have been found to result in significant noise effects. Mitigation measures in the form of temporary noise barriers are proposed to reduce the significant noise. Significant construction noise effects may remain at some assessment locations.

13.11.4 The use of compaction plant during road construction, such as vibratory rollers, has been assessed to result in significant effects. No practicable mitigation measures are available. Where the predicted noise impacts exceed the adopted noise level criteria, and where the effects cannot be controlled using BPMs, it is proposed to communicate about the proposed construction/demolition to the residents affected by the works.

13.11.5 The Scheme has been assessed to result in significant effects during its operation, due to changes in road traffic noise level in the short-term. Environmental noise barriers and thin surfacing are proposed. With the mitigation measures in place no significant effects have been identified.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 14 ALL TRAVELLERS

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CHAPTER 14
ALL TRAVELLERS

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14. ALL TRAVELLERS

14.1 Chapter introduction

14.1.1 This Chapter of the Environmental Statement (ES) addresses impacts in relation to effects on all travellers associated with the Scheme. It includes an assessment of impacts on pedestrians, cyclists, equestrians and vehicular travellers.

14.1.2 The chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development on all travellers, the mitigation measures required to prevent, reduce or offset the impacts and the residual impacts.

14.1.3 Secondary effects on noise and vibration (Chapter 13), air quality (Chapter 12), landscape and visual (Chapter 9), cultural heritage (Chapter 10) and nature conservation, including ecology (Chapter 8) are considered within other Chapters of this ES.

14.1.4 Due to an extension by 6 months in the proposed construction programme the opening year has changed from late 2022 to early/mid 2023. It should be noted that the traffic modelling has not been updated to reflect this change in opening year due to the anticipated 1% growth in traffic between 2022 and 2023. It is considered that this change in traffic flow would have a negligible impact on the operational performance of the highway network, as the network is not operating near capacity. The following assessment is therefore based upon traffic data from 2022, whilst assuming an opening year of 2023.

14.2 Relevant Guidance

Legislation and policy

National and Regional Polices and Plans

14.2.1 **Prosperity for All: The National Strategy (2017):** This strategy supports the Programme for Government up to 2021 and sets out the Welsh Government's commitment to deliver enhancements to the A55.

14.2.2 **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) A prosperous Wales;
b) A resilient Wales;
c) A healthier Wales;
d) A more equal Wales;
e) A Wales of cohesive communities;
f) A Wales of vibrant culture and thriving Welsh language; and,
g) A globally responsible Wales.

14.2.3 **The Active Travel (Wales) Act, (2013)** legislation requires '…Welsh Ministers and local authorities to take reasonable steps to enhance the provision made for, and to have regard to the needs of, walkers and cyclists; for requiring functions under the Act to be exercised so as to

promote active travel journeys and secure new and improved active travel routes and related facilities; and for connected purposes'.

14.2.4 **The Wales Transport Strategy (One Wales: Connecting the Nation (2008)):** This Strategy places high emphasis on the promotion of sustainable transport networks that safeguards the environment while strengthening the Country's economic and social life. Promotion of walking and cycling is key to reducing greenhouse gas emissions and other environmental impacts, which is one of the priorities of the Strategy. Improving access between key settlements and sites, integrating local transport, enhancing international connectivity and increasing safety and security are also priorities of the Strategy, which relate to all travellers.

14.2.5 **Transport Technical Advice Note 18 (2007)** The TAN includes advice on walking and cycling, public transport, planning for transport infrastructure, assessing impacts and managing implementation. TAN 18 should be read in conjunction with **Planning Policy Wales (2018)** sets outs the land use planning policies of the Welsh Government. Planning Policy Wales section 4.1 sets outs the objectives for 'Transport' to 'enable more sustainable travel choices', 'network management' and 'demand management'. The policy refers to The Wales Transport Strategy, the National Transport Finance Plan and the Local Transport Plans. It also refers to the Active Travel (Wales) Act 2013 and the Well-being Future Generations (Wales) Act (2015). The Policy considers a number of areas including, but not limited to, integrated planning and transport strategies, sustainable transport, active travel, traffic management and transport assessments.

Local Policy

14.2.6 **The Conwy Local Development Plan 2007-2022 (2013)** sets out a 'Vision – Conwy in 2022' which states that "by 2022, the communities of Conwy would be more sustainable, offer a higher quality of life and be supported by a more balanced age structure".

14.2.7 **Strategic Policy STR/1 Sustainable** Transport, **Development and Accessibility**: states transport Schemes which lead to improvements in accessibility would be supported in principle.

14.2.8 **Strategic Policy STR/4 Non Motorised Travel** supports increased levels of non-motorised travel, encouraging sustainable short distance trips between home, work, schools and other suitable destination and for leisure.

14.2.9 **Strategic Policy STR/5 Integrated Sustainable Transport System**, states the following scheme will be safeguarded and promoted "The Wales Coastal Path Improvement Programme and the Conwy Rights of Way Improvement Plan – To improve accessibility to the coast and countryside for local communities and visitors"

14.3 Guidance

14.3.1 The following guidance documents are considered relevant for the All Travellers assessment:

14.3.2 Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5, HA 205/08 (Highways Agency et al., 2008);

a) DMRB Volume 11, Section 3, Part 8 'Pedestrians, Cyclists, Equestrians and Community Effects' (Highways Agency, 1993a) in respect of the potential effects on pedestrians, cyclists and equestrians;

b) DMRB Volume 11, Section 3, Part 9 'Vehicle Travellers' (Highways Agency, 1993b) in respect of the potential effects on driver stress;
c) DMRB Interim Advice Note 125/09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment' (Wales Only) (Welsh Assembly Government, 2009); and
d) Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic'.

14.3.3 In October 2019 the DMRB Guidance Volume 11 parts 8 and 9 were withdrawn and have now been superseded by LA 112 Population and Human Health. However, previous guidance has been applied as this was applicable at both the time of scoping and during the authoring of this report.

14.4 Study Area

14.4.1 DMRB Volume 11, Section 2, Part 5 states the study area should be defined on a case-by-case basis. In accordance with the IEMA 'Guidelines for the Environmental Assessment of Road Traffic' (IEMA Guidelines'), the study area would be defined by identifying any link or location where it is considered that significant environmental effects may occur as a result of the proposed Scheme.

14.4.2 The IEMA Guidelines state two rules to be considered when assessing the impact of development traffic on a highway link:

a) Include highway links where traffic flows would increase by more than 30% (or the number of heavy goods vehicles (HGVs) would increase by more than 30 %); and
b) Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

14.4.3 Less than a 30% increase is considered to result in imperceptible changes in the environmental effects of traffic. The IEMA Guidelines considered that projected changes in traffic flows of less than 10 % create no discernible environmental effect. Only routes that are affected by the Scheme would be assessed.

14.4.4 The study area would be defined by the SATURN Traffic model.

14.5 Baseline Conditions

Non Motorised Users

<u>Public Rights of Way and Cycleways</u>

14.5.1 The following well-established Public-Rights of Way in the study area have been identified (Figure 14.1):

a) National Cycle Network (NCN) Route 5 which extends along the North Wales coast from Chester to Holyhead along the coastline passing Llanfairfechan.
b) Wales Coast Path from Chester extends along the coast through Penmaenmawr and Llanfairfechan with an optional inland route at Penmaenmawr.
c) Welsh Coast Path crosses the A55 using the railway bridge on Station Road, in the centre of Llanfairfechan.
d) Footbridge crosses the A55 between Junction 15 and Gerizim. This route connects Penmaenmawr Road and the NCN Route 5 with the coastline (although no cycle facilities are provided on the footbridge).

14.5.2 In addition, there are a number of informal NMU routes within the area including the Network Rail access track which provides access along the coastline between Shore Road East and Pendalar via the above footbridge.

14.5.3 No equestrian routes have been identified within the Scheme area.

NMU Flows

14.5.4 The following data sources have been used to establish the baseline conditions of the existing walking, cycling and horse riding facilities and existing travel patterns and use of these resources.

14.5.5 Surveys of the numbers of pedestrians, cyclists and equestrians within the study area were undertaken on bank holiday Monday, 28 May 2018 to inform the Walking, Cycling and Horse-Riding Assessment (WCHAR). The survey was undertaken by TRL 360 between 08:00 and 20:00. Survey data and locations are identified in Figure 14.2.

14.5.6 The count surveys have been undertaken at the following locations in proximity to J16:

- Survey 1 – The A55 overbridge;
- Survey 2 – Shore Road East/Penmaenmawr Road;
- Survey 3 – Penmaenmawr Road;
- Survey 4 – Station Road/Aber Road/Village Road – signalised crossing; and
- Survey 5 – Aber Road.

14.5.7 In addition, a site visit was undertaken on Thursday, 6 September 2018, between 11:00 and 16:00 during daylight 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. This data forms the basis of the pedestrian, cyclist and equestrian baseline conditions in the area, and is detailed in the WCHAR (Appendix 14.1).

14.5.8 PROW, cycleways and permissive paths affected by the Scheme are identified Figure 14.1. Alternative provision would be provided where the Scheme does impact on existing Rights of Way.

Traffic Flows

14.5.9 Traffic data from the SATURN Traffic Model has been used to inform the assessment and to provide baseline traffic flows. Table 14.1 presents the baseline traffic figures 2022 AADT Do Minimum and 2022 AADT Do Something.

Table 14.1: 2022 AADT Do Minimum and Do Something Traffic Flows

Road Name	**2022**		
	DM AADT	DS AADT	% CHANGE
Penmaenmawr Road (towards Pendalar)	753	753	0.0%
Penmaenmawr Road (towards Town)	4320	4487	3.9%
Shore Road East, Llanfairfechan	1248	1248	0.0%
Station Road, Llanfairfechan	1282	1283	0.0%
Caradog Place, Llanfairfechan	1283	1283	0.0%

Road Name	2022		
	DM AADT	DS AADT	% CHANGE
Promenade, Llanfairfechan	1283	1283	0.0%
Aber Road, Llanfairfechan	3722	3556	-4.5%
A55 between J14-J15	33345	33511	0.5%
A55 between J15-J15A	38084	38084	0.0%
J15 off slip link to Bangor Road	1158	1280	10.5%

14.5.10 Figures presented in green represent a reduction in traffic flows, figures presented in red indicate an increase in traffic flows when comparing the 2022 Do Minimum and the 2022 Do Something scenarios.

Trip Generators

14.5.11 Key trip generators and local amenities in the vicinity of the proposed Scheme that could be attractive to pedestrians, cyclists and equestrians are identified in the WCHAR (Appendix 14.1) and Figure 14.3. Places of employment, education, retail, recreation or community facilities that the public may travel to on foot or by bicycle as identified below:

a) Hotels and Restaurants in Llanfairfechan, Penmaenmawr and Dwygyfylchi;
b) Penmaenmawr Golf Club;
c) Conwy (Caernarvonshire) Golf Club;
d) Snowdonia National Park;
e) Retail Units in Penmaenmawr and Llanfairfechan;
f) Ysgol Pant y Rhedyn and Ysgol Babanod primary schools in Llanfairfechan;
g) Ysgol Pencae primary school in Penmaenmawr;
h) Ysgol Capelulo primary school in Dwygyfylchi;
i) Council offices;
j) Health care facilities;
k) Library;
l) Train station; and
m) Bus stops.

14.5.12 There is a pedestrian crossing facility at Station Road/Aber Road/Village Road signalised junction.

Active Travel (Wales) Act 2013 Active Travel Routes

14.5.13 Active Travel refers to walking or cycling as an alternative to motorised transport ie car, bus etc for the purpose of making everyday journeys. This includes all non-motorised users ie wheelchairs, electric wheelchair, mobility scooters and other mobility aids. [source: https://www.conwy.gov.uk/en/Resident/Parking-Roads-and-Travel/Active-Travel/Active-Travel-Wales-Act-2013.aspx 15.07.19]. An active travel is 'a journey made to or from a workplace or educational establishment or to access other services or facilities'. This covers short distance commuting, travel to school, shops or leisure facilities etc. The route has to connect to facilities and services and be suitable for utilitarian everyday journeys. It does not cover routes or sections of routes that are just used for leisure or recreational purposes.

14.5.14 The Act requires local authorities to prepare maps identifying current and potential future routes for their use as well as ensuring new road Schemes consider the needs of walkers and cyclists at

design stage.

14.5.15 The Integrated Network Maps form part of the Active Travel (Wales) Act 2013. These represent Conwy County Borough Council's (CCBC) draft 15 year Active Travel improvement vision to improve walking and cycling routes across Conwy.

14.5.16 The approved CCBC Active Travel Map for Llanfairfechan is provided in Figure 14.4.

14.6 Consultation

14.6.1 The Team has worked closely with CCBC, Sustrans and Cycling UK in relation to impacts of the Scheme on NMUs.

14.6.2 Consultation with the local Planning Authority and North and Mid Wales Trunk Road Agency (NMWTRA) in respect to the Scheme is ongoing and would continue. Consultation with non-statutory consultees including groups representing equestrians, pedestrians and cyclists is ongoing, and would continue.

14.6.3 Through this consultation the proposed active travel routes have been developed for inclusion within the proposed Scheme.

14.7 Future Baseline Conditions

14.7.1 The following baseline scenarios have been taken into consideration during the assessment of the Scheme, where appropriate.

a) Construction Phase – 2021-2023 (24 months)
b) Operational Phase – Year of Opening 2023

14.8 Assessment of Effects

Methodology

14.8.1 The All Travellers topic includes an assessment of the effects on the PROW (footpaths, bridleways and restricted byways); cycle routes; permissive Non-motorised Users (NMU)routes; public highways; public transport; overbridge and underpass crossings.

14.8.2 The assessment of effects on all travellers considers the construction and operation of the proposed new road and changes in amenity and effects on community severance and driver stress. 'Views from the Road' are also considered in Chapter 9.

14.8.3 The assessment methodology is presented below.

<u>Changes in Amenity</u>

14.8.4 Amenity is defined in DMRB Volume 11, Section 3, Part 8 (Highways Agency, 1993a) as the '*relative pleasantness of a* journey' and changes to the amenity of journeys undertaken by pedestrians, equestrians and cyclists may include exposure to and distance from traffic, noise, dirt, air quality and/or visual impact. The assessment involves a qualitative description and also considers the quality of NMU routes including street furniture, planting and signage.

Community Severance

14.8.5 Community severance is defined in DMRB Volume 11, Section 3, Part 8 (Highways Agency, 1993a) as '*the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows'* (paragraph 5.2). The assessment of community severance should be undertaken for the opening year of the Scheme and would take into account the direct effects of the Scheme and any increases in traffic levels on other roads. The following factors would be considered:

a) An estimation of the number of people whose journey would be affected, their location and the community facilities from which they would be severed;
b) The presence of particularly vulnerable groups such as children, the aged and the disabled;
c) The type of road involved; and
d) The provision of mitigation.

14.8.6 The guidelines apply specifically to pedestrians, as DMRB states that '*cyclists and equestrians are less susceptible to severance because they can travel more quickly than people on foot, although they may still be deterred from making journeys which require them to negotiate additional roads and especially junctions'.*

Driver Stress Assessment

14.8.7 Driver stress is defined in DMRB Volume 11, Section 3, Part 9 (Highways Agency, 1993b) as 'the adverse mental and physiological effects experienced by a driver traversing a road network'. Factors including road layout and geometry, surface riding characteristics, journey frequency, and speed and flow per lane can influence the level of stress. These can induce 'feelings of discomfort, annoyance, frustration or fear culminating in physical and emotional tension that detracts from the value and safety of a journey' in drivers. DMRB states that driver stress has the following three main components:

14.8.8 'Frustration is caused by a driver's inability to drive at a speed consistent with his or her own wishes in relation to the general standard of the road. It increases as speed falls in relation to expectations and may be due to high flow levels, intersections, roadworks or difficulties in overtaking slower traffic. Congestion can lead to frustration by creating a situation in which the driver does not feel in control.'

14.8.9 Fear of potential accidents results from the 'presence of other vehicles, inadequate sight distances and the likelihood of pedestrians stepping out into the road'. Additional factors such as 'inadequate lighting, roadworks, narrow roads and poorly maintained surfaces' are also contributing factors. According to the DMRB fear is highest where traffic speeds, flows and the percentage of HGVs are all high and these factors are of more importance during adverse weather conditions. A new Scheme may increase driver stress because of increased traffic speeds and flows, although the superior driving standards of a new Scheme often offset this.

14.8.10 Uncertainty is caused by 'signing that is inadequate for the individual's purposes'.

View from the Road Assessment

14.8.11 The assessment of 'View from the Road' which the DMRB defines as 'the extent to which travellers, including drivers, are exposed to different types of scenery through which a route passes' is set out in Chapter 9 of this ES.

Significance Criteria

14.8.12 The proposed approach to assessing the significance of impacts on All Travellers is identified below:

Receptors

14.8.13 Categories of receptor sensitivity have been defined from the principles set out in the IEMA Guidelines, and set out in Table 14.2, based on the following:

a) The need to identify particular groups or locations which may be sensitive to changes in traffic conditions; and
b) The identification of links or locations where it is felt that specific environmental problems may occur.

Table 14.2: Receptor Sensitivity Criteria

Receptor Sensitivity	Criteria
High	Individuals, businesses or groups that have a restricted or very limited capacity to experience the impact without incurring substantial economic loss (or gain), loss (or gain) of access to an economic resource, loss (or gain) of amenity or loss (or gain) of access to a recreational resource. PROW frequently used by pedestrians, cyclists and other Non Motorised Users (NMU) for utility journeys, such as commuting, or by vulnerable travellers (e.g. elderly, school children and people with disability). Also includes National Trails likely to be used for recreational / leisure purposes.
Medium	Individuals, businesses or groups that have a limited or average capacity to experience the impact without incurring substantial economic loss (or gain), loss (or gain) of access to an economic resource, loss (or gain) of amenity or loss (or gain) of access to a recreational resource. PROW moderately used by pedestrians, cyclists and other NMU for recreational / leisure purposes (e.g. regional trails).
Low	Individuals, businesses or groups that have an adequate capacity to experience the impact without incurring a substantial economic loss (or gain), loss (or gain) of access to an economic resource, loss (or gain) of amenity or loss (or gain) of access to a recreational resource. PROW sometimes used by pedestrians, cyclists and other NMU for recreational / leisure purposes (e.g. local routes)

Magnitude of Effects

14.8.14 The determination of the importance and sensitivity of the receptors and the magnitude of change specifically relating to road traffic would be informed by the IEMA Guidelines.

14.8.15 Where the existing baseline HGV or total traffic flows are very minor, a small increase in vehicles would produce a large change in magnitude whereas in real terms the increase in traffic may still be considered to be negligible or slight. Such an assessment requires appropriate professional and experienced judgements to be made.

14.8.16 The temporal scope of effects is described as short, medium, long-term or permanent as shown below. for the operational assessment the effects are long-term, whereas the construction and decommissioning effects are likely to be short-term:

a) Short term: <12 months;
b) Medium term: 1-10 years;
c) Long Term: +10 years; and
d) Permanent: effects that are considered to be 'irreversible' or extremely long-lasting.

14.8.17 The criteria for assessing the impact magnitude is identified in Tables 14.3 – 14.6. New severance would be described as identified in Table 14.3.

Table 14.3: Criteria for Assessing Impact magnitude – New Severance

Impact Magnitude	Criteria
Severe	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). People are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits, leading to a change in the location of centres of activity or in some cases to a permanent loss to a particular community. Alternatively, considerable hindrance would be caused to people trying to make their existing journeys (Adverse). Permanent loss / severance of an existing route used by pedestrians, cyclists or other NMU / considerable change in amenity value (Adverse). Substantial gain of resource and/or substantial increase in quality; substantial improvement to key characteristics, features or elements (Beneficial)
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips would be made longer or less attractive (Adverse). Disruption of a route used by pedestrians, cyclists or other NMU with significant increase in journey length / time, or moderate change in amenity value (Adverse). Moderate gain of resource and/or moderate increase in quality; partial gain of/improvement to key characteristics, features or elements (Beneficial).
Slight	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). In general, the current journey pattern is likely to be maintained, but there would probably be some hindrance to movement (Adverse). Alteration of a route used by pedestrians, cyclists or other NMU but with no significant increase in journey length / time, or minor change in amenity value (Adverse). Small but measurable gain of resource and/or minor improvement in key characteristics, features or elements (Beneficial).
Neutral	No loss or alteration of characteristics, features or elements; no observable impact in either direction (No Effect). No change to route used by pedestrians, cyclists or other NMU or change in amenity value (No Effect). No gain or improvement in quality to one or more characteristics, features or elements (No Effect).

14.8.18 Relief from existing severance can be identified by considering the reduction in traffic on the existing highway network in the opening year as presented in Table 14.4. This should be considered in the context of the size of the community affected, the presence of vulnerable groups and the existing road standards. Note a minimum traffic flow and a minimum reduction in traffic must be expected before any relief can be claimed, guidelines do not apply to roads with an existing AADT flow of less than 8,000 vehicles.

Table 14.4: Criteria for Assessing Impact Magnitude – Existing Severance

Impact Magnitude	Criteria
Substantial	Where traffic AADT levels are predicated to change by 60%+ (Built up Area) or 90%+ (Rural Area) from existing levels.
Moderate	Where traffic AADT levels are predicated to change by 30-60% (Built up Area) or 75-90% (Rural Area) from existing levels.
Slight	Where traffic AADT levels are predicated to change by 30% (Built up Area) or 60-75% (Rural Area) from existing levels.

14.8.19 The following tables give guidance on the appropriate category of stress; Low, Moderate or High, providing speeds and flows exist during peak hour flows for at least 1km. The assessment is based on the worst year in the first 15 years after opening.

Table 14.5: Criteria for assessing Driver Stress Dual Carriageway

Average Peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/Hr		
	Under 60	**60-80**	**Over 80**
Under 1200	High	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

Table 14.6: Criteria for assessing Drivers Stress Single Carriageway

Average Peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/Hr		
	Under 50	**50-70**	**Over 70**
Under 600	High	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

Significance of Impact

14.8.20 The significance of the environmental effects is determined by the magnitude of impact and the value/importance of the affected asset or resource. The degree of significance would be determined in accordance with DMRB guidelines HA 205/08 'Assessment and Magnitude of Environmental Effects'. This provides typical descriptors and criteria for magnitude of impact (degree of change and receptor sensitivity) but does not provide specific descriptors for the assessment of road traffic.

14.8.21 The typical significance of effect categories as detailed in Table 14.7 have been taken from the DMRB guidelines and used in this assessment.

14.8.22 In all cases a degree of professional judgement would be applied to assess whether the impact is considered significant or not significant.

Table 14.7: Significance of Impact

Impact Magnitude	Sensitivity		
	High	**Medium**	**Low**
Major	Major Adverse/Beneficial	Major-Moderate Adverse/Beneficial	Moderate-Minor Adverse/Beneficial
Moderate	Major-Moderate Adverse/Beneficial	Moderate-Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate-Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor/Negligible
Neutral	Negligible	Negligible	Negligible

14.9 Identification of Potential Effects

Construction Effects

14.9.1 As far as practicable the majority of work would be undertaken offline. Two lanes of traffic in each direction would be retained along the A55 during the construction phase which is anticipated to last 24 months.

14.9.2 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.

14.9.3 Some minor disruption to traffic and NMUs is anticipated where the new Scheme ties into the existing infrastructure. All impacts during the 24-month construction phase would be temporary and medium term.

Changes in Amenity

14.9.4 Changes in amenity during the construction phase are likely to be as a result in changes in traffic flows, noise, dust and visual impact.

14.9.5 NMU 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 Scheme is detailed in Chapters 9 and 14 respectively in this ES.

Community Severance

14.9.6 During construction of the Scheme the NMU/PROW routes listed in Table 14.8 would be temporarily affected. Some NMU journeys may be hindered, with potential increases in journey lengths during the construction phase. The magnitude and significance of impacts shown in Table 14.8 assume no mitigation is provided.

New Severance

Table 14.8: Construction impacts on NMU routes prior to mitigation – New Severance

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Significant/Not Significant	Notes
NCN5 (Penmaenmawr Road East of Junction Improvements)	Existing NCN5 would be severed during construction of J15 at junction with Penmaenmawr Road.	High	Major	Major Adverse	Significant	The loss of access to NCN5 would be a significant impact. 177 cyclists and 251 pedestrians recorded during 28th May 2018 survey.
Shore Road East	Potential temporary impact during construction of shared open space improvements at Penmaenmawr Road/Shore Road East.	High	Moderate	Major-Moderate Adverse	Significant	The loss of access on this link would be a significant impact. 57 cyclists and 205 pedestrians recorded during 28th May 2018 survey.
NCN 5 (Penmaenmawr Road West of Junction Improvements)	Potential temporary impact during construction of segregated cycleway along Penmaenmawr Road and through construction of shared open space improvements at Penmaenmawr Road/Shore Road East.	High	Major	Major Adverse	Significant	The loss of access to NCN5 would be a significant impact. 146 cyclists and 228 pedestrians recorded during 28th May 2018 survey.
Footbridge over A55 at Pendalar	Potential temporary impact during construction of replacement bridge.	Low	Major	Moderate-Minor Adverse	Significant	2 cyclists and 36 pedestrians recorded on footbridge during 28th May 2018 survey. Likely to be temporary loss of access during construction of the new bridge.
Pendalar to Shore Road East (Network Rail access track)	Potential temporary impact on route access during resurfacing works.	Low	Minor	Minor/Negligible	Not significant	No survey data available for this section. Not considered significant due to availability of an alternative route.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Significant/Not Significant	Notes
Llanfairfechan Promenade access	Temporary impact during minor improvement works to improve accessibility for all users.	High	Neutral	Negligible	Not significant	57 cyclists and 205 pedestrians recorded on Shore Road East during 28th May 2018 survey. Access would be retained throughout the works, therefore not considered significant.
Mona Terrace	Works would be offline	High	Neutral	Negligible	Not significant	No survey data available for Mona Terrace as not currently a cycle/pedestrian route. Access to NCN5 would be retained via existing route on Pendalar throughout the works, therefore not considered significant.

Relief from Existing Severance

14.9.7 Relief from existing severance does not apply to roads with an existing ADDT flow of less than 8,000 vehicles. Within the study area only flows on the A55 are in excess of 8,000 therefore no further assessment has been considered as users would be required to use dedicated facilitates such as an over bridge or underpass to cross the A55, which would not be impacted by changes in traffic flows.

Driver Stress

14.9.8 During construction of the Scheme there would be at times two narrow lanes with a reduced speed limit along the A55. This is likely to result in an increase in *drivers stress* during this period when compared to the baseline scenario. This could result in *frustration* due to the driver's inability to drive at a speed consistent with their own wishes. Again, *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/egress arrangements to/from the A55 to local road. It is considered there will be some reduction in drivers stress resulting from the removal of the roundabout and the improved flow and continuity of the route.

14.9.9 Assuming no mitigation, the works would cause considerable disruption to drivers and non-motorised users. Overall the impact of the construction phase on driver stress is considered to be adverse.

Operational Effects

14.9.10 The assessment of effects provided in this section does not take into account mitigation measures such as diversions or crossing points on NMU routes.

Changes in Amenity

14.9.11 Changes in the overall amenity of journeys made by pedestrians, equestrians and cyclists during the operational phase is in part related to changes in visual and noise elements, which are assessed in detail in Chapters 9 and 13 of the ES.

14.9.12 The bus gate between A55 and Penmaenmawr Road will be permanently closed resulting in the removal of the bus stop on Penmaenmawr Road in the Pendalar area. An existing bus stop further west on Penmaenmawr Road will be also be repositioned to accommodate the Scheme layout. It is anticipated that all existing bus services will be retained.

14.9.13 Overall the Scheme seeks to improve the quality of NMU routes through a number of mini Schemes as identified in Chapter 2. These Schemes would be designed to current standards and would seek to improve connectivity to the local area for pedestrians and cyclists through the provision of dedicated facilities.

Community Severance

14.9.14 The assessment of community severance considers the opening year of the Scheme and takes into account the direct effects of the Scheme and any increase in traffic levels on other roads.

14.9.15 A review of the 2022 Do Minimum and 2022 Do Something AADT as presented in table 14.1 suggests there would be minimal changes in traffic flow as a result of the Scheme at Junction 15 with no change greater than 10.5% predicted. A less than 30% increase is considered to result in imperceptible changes in the environmental effects of traffic.

Table 14.9: Operational impacts on NMU routes prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Significant/Not Significant	Notes
NCN5 (Penmaenmawr Road East of Junction Improvements)	Improved connectivity between Pendalar and Ysgol Pant y Rhedyn along NCN5. Improved online and offline dedicated cycle facility through J15 approach/ Penmaenmawr Road.	High	Major	Major Beneficial	Significant	177 cyclists and 251 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Shore Road East	Improved accessibility due to open space improvements at Penmaenmawr Road/Shore Road East.	High	Moderate	Major-Moderate Beneficial	Significant	57 cyclists and 205 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
NCN 5 (Penmaenmawr Road West of Junction Improvements)	Improved NMU facilities with segregated cycleway/footway along Penmaenmawr Road and shared open space improvements at Penmaenmawr Road/Shore Road East. Improved connectivity to Ysgol Pant-y-Rhedyn.	High	Moderate	Major-Moderate Beneficial	Significant	146 cyclists and 228 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Footbridge over A55 at Pendalar	Improved accessibility for pedestrians, cyclists and disabled users.	Medium	Major	Major-Moderate Beneficial	Significant	2 cyclists and 36 pedestrians recorded on footbridge during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Llanfairfechan Promenade access	Improved accessibility for cyclists.	High	Moderate	Major-Moderate Beneficial	Significant	57 cyclists and 205 pedestrians recorded on Shore Road East during 28th May 2018 survey, majority likely to have accessed promenade. Improved connectivity will be a significant benefit.
Mona Terrace	Improved routing of NCN5, with a lower gradient and more direct segregated route. Improved NCN5 route includes better vertical alignment, away from housing/parked cars, sea views and overall experience.	High	Major	Major Beneficial	Significant	No survey data available for Mona Terrace as not currently a cycle/ pedestrian route. Improved connectivity will be a significant benefit.

14.9.16 Due to the minimal change in traffic flows (below 10.5%) current journey patterns are likely to be maintained without hinderance to movement, therefore no new severance is anticipated.

Relief from Existing Severance

14.9.17 Relief from existing severance does not apply to roads with an existing ADDT flow of less than 8,000 vehicles. Within the study area only flows on the A55 are in excess of 8,000 therefore no further assessment has been considered as users would be required to use dedicated facilitates such as an over bridge or underpass to cross the A55, which would not be impacted by changes in traffic flows.

Drivers Stress

14.9.18 Removal of the J15 roundabout seeks to address existing issues with resilience, delays and safety, thereby reducing *driver stress* when compared to the baseline scenario. The improved at-grade junction would enable 4-way movements by 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 are raised locally to allow the bridge to pass over the A55. Access via Shore Road East would be retained. This option requires the realignment of Penmaenmawr Road and consequently the Sustrans National Cycle Network Route 5 (NCN5).

14.9.19 Through the removal of the roundabout the speed and flow per lane should become more consistent, therefore reducing *frustration*. In addition, the new junction would be designed in accordance with design standards. Street lighting and clear signage would also be present.

14.9.20 *Fear of potential accidents* would reduce due to the removal of the roundabout, and its associated traffic movements. *Uncertainty* should be minimised due to the presence of clear signage throughout the Scheme.

14.9.21 Predicted level of traffic for the design year 2032 are identified in table 14.10 for links over 1km in accordance with DMRB Vol 11.3.9[1].

Table 14.10: Driver Stress Assessment

Road name (Junction 15)	**Direction**			**2037**
		Peak Hourly flow per lane (PCUs)	Average speed (kph)	Stress Level
Aber Road	Westbound	204	71	Low
	Eastbound	137	88	Low
A55 between J14-J15	Westbound	1658	96	High
	Eastbound	1656	96	High
A55 between J15-J15A	Westbound	1706	95	High
	Eastbound	1647	96	High

14.9.22 Overall, it is considered that the Scheme would provide a beneficial effect on driver stress levels.

[1] DMRB Volume 11, Section 3, Part 9 (Highways Agency 1993b)

14.10 Mitigation Measures

Construction Mitigation

14.10.1 During construction of the Scheme there would be at times two narrow lanes with a reduced speed limit along the A55. Temporary road closures and changes to access/egress arrangements to/from the A55 to local road would be managed through the provision of clear and adequate signage during the construction phase. The majority of work would be undertaken offline as far a practical. Improvements to J14, as detailed in Chapter 2, will be undertaken prior to commencement of works at J15.

14.10.2 A Construction Traffic Management Plan would be produced prior to start of works. The public would be informed of proposed roadworks and would be updated throughout the construction phase programme.

14.10.3 Some temporary diversions to local NMU routes would be required during the construction phase. The Network Rail access track would be temporarily closed during part of the construction phase restricting access to the coastline, alternative access would be provided via Shore Road East and The Promenade. All other existing NMU movements would still be permitted throughout the construction phase, with no loss of access to local facilities.

Operational Mitigation

14.10.4 Following completion of the construction phase, there would be a number of improved NMU routes as identified in Chapter 2. All existing NMU movements would be permitted, with improvements to surfacing, signage and accessibility in particular for cyclists.

14.10.5 The Scheme would include repositioned bus stops on Penmaenmawr Road in close proximity to Junction 15. This would include the provision of laybys on Penmaenmawr Road, close to Ysgol Pany Y Rhedyn, to ensure that traffic is not obstructed by buses stopping to unload and load passengers.

14.10.6 The signalised junction with traffic islands at the junction between the slip roads and Penmaenmawr Road would slow traffic down on the approach to Penmaenmawr Road, and Ysgol Pant Y Rhedyn whilst also providing a provision for pedestrians crossing.

14.10.7 The Scheme layout enhances provision for cyclists traversing the National Cycle Network (NCN) Route 5 who wish to cycle on the road rather than use a shared cycleway/footway at the junction with J15/Penmaenmawr Road (west and east), as they would no longer have to cross oncoming traffic.

14.10.8 Improvements to open space facility on Penmaen View would enhance existing NMU route to access the coastline.

14.11 Significance of Residual Effects

Construction Effects

14.11.1 All construction effects would be temporary.

Changes in Amenity

14.11.2 Mitigation measures would be in place to minimise changes in amenity where feasible. However, despite these measures some temporary change in amenity is inevitable during the construction phase.

14.11.3 The assessment of visual and noise impacts of the Scheme is detailed in Chapters 9 and 13 respectively in this ES.

Community Severance

14.11.4 The residual magnitude and significance of impacts are shown in Table 14.11 assuming mitigation is provided.

New Severance

14.11.5 New severance is described in Table 14.11.

Table 14.11: Construction impacts on NMU routes following mitigation – New Severance

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Significant/ Not Significant	Notes
NCN5 (Penmaenmawr Road East of Junction Improvements)	Provision of temporary route to NCN5 during construction of J15 at junction with Penmaenmawr Road.	High	Minor	Moderate-Minor Adverse	Not significant	177 cyclists and 251 pedestrians recorded during 28th May 2018 survey. Impact considered not significant due to provision of alternative route.
Shore Road East	Access would be retained during construction of shared open space improvements at Penmaenmawr Road/Shore Road East.	High	Negligible	Negligible	Not significant	57 cyclists and 205 pedestrians recorded during 28th May 2018 survey. Impact considered not significant due to provision of alternative route.
NCN 5 (Penmaenmawr Road West of Junction Improvements)	Access to be retained during construction of segregated cycleway along Penmaenmawr Road and through construction of shared open space improvements at Penmaenmawr Road/Shore Road East.	High	Minor	Moderate-Minor Adverse	Not significant	146 cyclists and 228 pedestrians recorded during 28th May 2018 survey. Impact considered not significant due to provision of alternative route.
Footbridge over A55 at Pendalar	Potential temporary impact during construction of replacement bridge. No mitigation proposed.	Low	Major	Moderate-Minor Adverse	Significant	2 cyclists and 36 pedestrians recorded on footbridge during 28th May 2018 survey. Likely to be temporary loss of access during construction of the new bridge, therefore impact considered significant.
Pendalar to Shore Road East (Network Rail access track)	Potential temporary impact on route access during resurfacing works.	Low	Minor	Minor/Negligible	Not significant	No survey data available for this section. Impact considered not significant due to provision of alternative route.
Llanfairfechan Promenade access	Temporary impact during minor improvement works to improve accessibility for all users.	High	Neutral	Negligible	Not significant	57 cyclists and 205 pedestrians recorded on Shore Road East during 28th May 2018 survey. Impact considered not significant as access would be retained throughout the works.
Mona Terrace	Majority of works would be offline.	High	Neutral	Negligible	Not significant	No survey data available for Mona Terrace as not currently a cycle/ pedestrian route. Access to NCN5 would be retained via existing route on Pendalar throughout the works, therefore considered not significant.

Relief from Existing Severance

14.11.6 Relief from existing severance does not apply to roads with an existing AADT flow of less than 8,000 vehicles. Within the study area only flows on the A55 are in excess of 8,000 therefore no further assessment has been considered as users would be required to use dedicated facilitates such an over bridge or underpass to cross the A55, which would not be impacted by changes in traffic flows.

Driver Stress

14.11.7 The mitigation measures proposed would improve driver stress during the construction phase, however not all effects would be mitigated and therefore the overall effect would still be considered adverse.

Operational Effects

14.11.8 The assessment of effects provided in this section takes into account mitigation measures such as diversions or crossing points on NMU routes as presented in Section 14.10.

14.11.9 All impacts identified are considered to be permanent, in that the effects are considered to be extremely long lasting over 10 years.

Changes in Amenity

14.11.10 Changes in the overall amenity of journeys made by pedestrians, equestrians and cyclists during the operational phase is in part related to changes in visual and noise elements, which are assessed in detail in Chapters 9 and 13 of the ES.

14.11.11 Overall the Scheme seeks to improve the quality of NMU routes through a number of mini Schemes as identified in Chapter 2. These Schemes would be designed to current standards and would seek to improve connectivity to the local area for pedestrians and cyclists through the provision of dedicated facilities.

Community Severance

14.11.12 The proposed mitigation measures would further enhance the benefits of the Scheme.

Table 14.12: Operational impacts on NMU routes following mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Significant/Not Significant	Notes
NCN5 (Penmaenmawr Road East of Junction Improvements)	Improved connectivity between Pendalar and Ysgol Pant y Rhedyn along NCN5. Improved online and offline dedicated cycle facility through J15 approach/ Penmaenmawr Road.	High	Major	Major Beneficial	Significant	177 cyclists and 251 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Shore Road East	Improved accessibility due to open space improvements at Penmaenmawr Road/Shore Road East.	High	Moderate	Major-Moderate Beneficial	Significant	57 cyclists and 205 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
NCN 5 (Penmaenmawr Road West of Junction Improvements)	Improved NMU facilities with segregated cycleway/footway along Penmaenmawr Road and shared open space improvements at Penmaenmawr Road/Shore Road East. Improved connectivity to Ysgol Pant-y-Rhedyn.	High	Moderate	Major-Moderate Beneficial	Significant	146 cyclists and 228 pedestrians recorded during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Footbridge over A55 at Pendalar	Improved accessibility for pedestrians, cyclists and disabled users.	Medium	Major	Major-Moderate Beneficial	Significant	2 cyclists and 36 pedestrians recorded on footbridge during 28th May 2018 survey. Improved connectivity will be a significant benefit.
Llanfairfechan Promenade access	Improved accessibility for cyclists.	High	Moderate	Major-Moderate Beneficial	Significant	57 cyclists and 205 pedestrians recorded on Shore Road East during 28th May 2018 survey, majority likely to have accessed promenade. Improved connectivity will be a significant benefit.
Mona Terrace	Improved routing of NCN5, with a lower gradient and more direct segregated route. Improved NCN5 route includes better vertical alignment, away from housing/parked cars, sea views and overall experience.	High	Major	Major Beneficial	Significant	No survey data available for Mona Terrace as not currently a cycle/ pedestrian route. Improved connectivity will be a significant benefit.

14.11.13 There are no further changes to new severance resulting from the proposed mitigation.

Relief from Existing Severance

14.11.14 No change is anticipated from the proposed mitigation.

Driver Stress

14.11.15 The proposed mitigation would lead to improvements in safety, reducing fear of potential accidents. No further changes to the effect on driver stress are anticipated as a result of the proposed mitigation.

14.12 Cumulative Effects

Introduction

14.12.1 This Chapter considers the cumulative effects of Junction 15 and Junction 16. This Chapter summarises the cumulative effects that arise from both the Junction 15 and Junction 16 Schemes, which have been considered in the above assessment for the J15 Scheme only.

14.12.2 The traffic model has taken into account committed development as well as future predicted traffic growth, as detailed in the Forecasting Report. In order to provide a robust assessment of future developments within the study area, estimates of their likely trip generation were calculated for five residential sites. It was considered that traffic generated by the remaining committed development would not enter, exit or pass through the model and the remainder were included in TEMPro growth assumptions.

14.12.3 Consultation was undertaken with CCBC, and its three neighbouring councils; Denbighshire, Gwynedd and Anglesey.

14.13 Construction Phase and Operational Phase

14.13.1 Traffic flows which consider both Junction 15 Scheme and Junction 16 Scheme are unchanged from the traffic flows which considered the Schemes in isolation. Therefore, no further assessment of the cumulative effects of the construction or operational phase has been considered.

14.14 Conclusions

14.14.1 The Scheme would affect a number of Public Rights of Way surrounding Llanfairfechan. Consultation, site visits and survey data indicate that the routes are frequently used by both pedestrians and cyclists.

14.14.2 Measures have been developed through consultation to provide improved NMU access as identified in Chapter 2. Short term temporary diversions and crossing places would be provided during the construction phase, ensuring that access to local facilities is maintained. The exception being the Network Rail access track which may close during the construction phase. Access to the coastline will still be permitted via Shore Road East and The Promenade.

14.14.3 Overall, operational traffic flows on the A55 and the local highway network would remain

unchanged. There would be a beneficial change in severance as a result of the Scheme, as NMU access would be improved. There is no existing severance caused by road traffic between residential areas, community facilities and places of employment. Opportunities to increase travel by active modes within the area may be increased as a result of improved NMU routes.

14.14.4 During the construction phase, there may be an increase in driver stress due to the narrow lanes on the A55. However, there would be clear signage and two lanes would be operational throughout the contraction phase, with a reduced speed limit. In addition, the removal of the roundabout would assist in reducing drivers stress, due to the improved continuity in route and flow. A construction traffic management plan would be in place to manage construction traffic efficiently.

14.14.5 Driver stress would be improved as a result of the Scheme, due to the removal of the roundabout, associated improved consistency in speeds and reduced frustration and fear of accidents.

14.14.6 The Scheme would contribute to both the Well-being of Future Generations Act and the Active Travel (Wales) Act 2013 through the provision of a number of walking and cycling routes. This would include improvements to the NCN 5, improved facilities to cross the A55 and an off road shared cycleway/footway would be provided at the Penmaenmawr Road/J15 junction providing safer crossing facility for less confident cyclists. Sustainable access to Ysgol Pant Y Rhedyn would be improved for journeys both to the east and west of the school. Similarly, the provision of bus laybys on Penmaenmawr Road in close proximity to the school would assisting with traffic flows, and pedestrian safety.

14.14.7 The measures identified in Table 14.13 go beyond what is considered essential to mitigate any impact.

Table 14.13: Summary of proposed measures beyond mitigation

Proposed Measure	Comment
New segregated cycleway/footway along Mona Terrace	This would provide an enhanced provision to the existing NCN 5. However, this is not required as mitigation to the Scheme but has been agreed to be included following detailed consultation with various stakeholders.
Replacement footbridge at Pendalar	The Scheme would also include for the provision of cyclists when considering the design of the replacement footbridge, beyond the required mitigation for the Scheme which would need to provide for pedestrians only.
Llanfairfechan Promenade Access	The Scheme would not impact on the Promenade and therefore no mitigation is required. Proposed improvements to cycle access along this route have been identified through consultation with key stakeholders and would be included in the Scheme.
Penmaenmawr Road (west and east)	Improvements to the footway and cycleway at the Penmaenmawr Road/J15 junction will be required as a direct impact of the scheme. However, the proposed improvements extend beyond the direct impact of the proposed scheme design, and links are proposed to provide connectivity between Penmaenmawr and Pendalar.

14.14.8 The mini schemes identified in Chapter 2 have been developed in consultation with key stakeholders including CCBC, Cycling UK and Sustrans and in accordance with the requirements of Active Travel (Wales) Act and the Well-being of Future Generations (Wales) Act.

14.14.9 These mini schemes have been developed to mitigate direct impacts from the Scheme layout itself, ie where the Scheme directly conflicts with NMU routes. In addition to this, opportunities to

improve NMU routes and sustainable access between local facilities, and the coastline have also been identified which are considered to go beyond the requirement for mitigation.

14.14.10 Overall, the Scheme would contribute to the Well-being of Future Generations Act (FGA) through seeking to deliver measures that will have *a positive impact on people living in the future as well as those living today.* The five ways of working have been considered through the development of the scheme which has taken "*into account the impact that the scheme could have on people living their lives in Wales in the future as well as in the present"*.

14.14.11 The Scheme also proposes additional measures which *seek to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs* and to meet the seven well-being goals as identified in section 14.2.2. The Scheme seeks to provide healthy and active travel options alongside the development of A55 (the highways infrastructure) through the provision of improved, sustainable accessibility between local areas and the coastline.

14.14.12 The inclusion of additional walking and cycling routes seeks to improve accessibility, health and wellbeing for both existing and future generations. These seek to improve access to local facilities for all, including those without access to a vehicle. These measures contribute towards achieving a more equal, prosperous, resilient and healthier Wales. Through improving connectivity between local areas, the Scheme also seeks to deliver cohesive communities and a vibrant culture in accordance with the FGA seven well-being goals.

14.14.13 Similarly, the Scheme has considered the requirements of the Active Travel (Wales) Act 2013 to improve facilities and routes for NMUs, supporting the Welsh Governments vision of walking and cycling being the preferred choice of mode for shorter distance trips. The inclusion of additional walking and cycling routes seeks to improve accessibility, health and wellbeing for both existing and future generations.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 15 MATERIAL ASSETS AND WASTE

RAMBOLL Bright ideas. Sustainable change.

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15. MATERIAL ASSETS & WASTE

15.1 Chapter Introduction

15.1.1 This chapter considers the likely significant effects on and from Material Assets and Waste associated with the construction and operation of the proposed Scheme. The specific objectives of the chapter are to:

i. Identify the consumption of materials and products and the production and disposal of waste associated with the Scheme;
ii. Describe the baseline with regard to material and waste management capacity in the study area;
iii. Describe the assessment methodology and significance criteria used in completing the impact assessment;
iv. Describe the potential effects, including direct, indirect and cumulative effects;
v. Describe the mitigation measures proposed to address likely significant effects; and
vi. Assess the residual effects remaining following the implementation of mitigation.

15.1.2 Figure 15.1 is included in the text, other figures referenced in the text are included in Volume 2 of the ES.

15.1.3 For details of the Scheme description, reference should be made to Chapter 2.

15.1.4 This assessment assumes the use of standard construction techniques and practices commensurate for works of this nature, and full compliance with UK legislation and guidance including Pollution Prevention Guidelines. The final installation techniques and their sequencing will be determined by the construction works contractor in consultation with the relevant authorities. In addition, incorporated mitigation measures are described which have been included in the proposed Scheme design to reduce identified impacts.

15.1.5 This section does not cover impacts which arise off site and may possibly occur outside the UK, including the depletion of non-renewable resources and the production of waste at the point of extraction and during manufacture. These impacts are outside the scope of this assessment as they are considered to be subject to separate environmental assessment processes.

15.1.6 Since the preparation of the scoping report the Interim Advice Note IAN 153/11 has been withdrawn and replaced with LA 110 Materials Assets and Waste. Because the information on which this chapter is based only became available at the end of the design development it has been possible to follow the approach outlined in LA110.

15.1.7 LA110 notes that the environmental assessment should report on the construction phase and the first year of operational activities. Use of material assets and production of waste during operation after the first year are not covered in this assessment. Given the scale of the Scheme and the fact that there is a substantial element incorporating existing highways the change in activities such as repairing potholes, clearing out drains and road surface maintenance will be relatively minor in scale and are not likely to cause significant effects.

15.2 Legislation, Policy Context

15.2.1 This section outlines the legislation, policy and guidance relevant to the assessment of potential effects on and from materials assets and waste associated with the proposed Scheme based on the following:

i. International and National Legislation and Policy;
ii. Local Planning Policy; and
iii. Guidance and Industry Standards.

International Legislation

European Union Waste Framework Directive 2008 (Directive 2008/98/EC)

15.2.2 The EU revised Waste Framework Directive[1] provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste.

15.2.3 The Directive requires all member states, which includes the UK, to take all the necessary measures to ensure waste is recovered or disposed of without endangering human health or causing harm to the environment. The Directive also includes permitting, registration and inspection requirements.

15.2.4 Article 4 of the revised *Waste Framework Directive* sets out the principles of the waste hierarchy to how waste should be managed. The waste hierarchy as shown in Figure 15.1 ensures that waste is dealt with in the following order of priority:

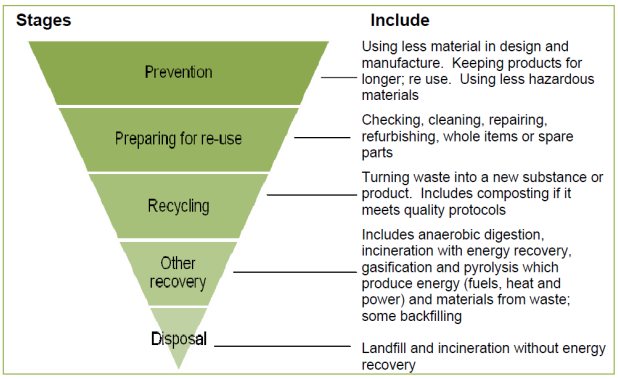

Figure 15:1: Waste Hierarchy

15.2.5 These principles are transposed into UK law by the Waste (England and Wales) Regulations 2011 (as amended)[2].

National Legislation and Policy

15.2.6 There are a number of primary legislative instruments on waste in the UK which enact a wide range of secondary legislation that governs the identification, storage, collection, treatment and disposal of waste. The key legislation and policies relevant to the Scheme include the following:

[1] European Union Waste Framework Directive 2008 (Directive 2008/98/EC)
[2] Waste (England and Wales) Regulations 2011 (as amended)

i. The Control of Pollution (Amendment) Act 1989;
ii. Environmental Protection Act (EPA)1990;
iii. Waste Minimisation Act 1998;
iv. The Environment (Wales) Act 2016;
v. The Waste and Emissions Trading Act 2003;
vi. The Clean Neighbourhoods and Environment Act 2005;
vii. The Waste (England and Wales) Regulations 2012 (as amended);
viii. Hazardous Waste (England and Wales) Regulations 2005;
ix. National Policy Statement for National Networks;
x. National Planning Policy for Waste;
xi. National Planning Policy for Hazardous Waste;
xii. Planning Policy Wales (2018);
xiii. Towards Zero Waste – The Overarching Waste Strategy for Wales (2010);
xiv. Technical Advice Note 21 Waste (2014); and
xv. Construction and Demolition Sector Plan (2012).

15.2.7 The Control of Pollution (Amendment) Act 1989 provides for the registration of carriers of wastes and powers in relation to vehicles that have been used for illegal waste disposal.

15.2.8 The Environmental Protection Act 1990 sets out the structure and authority for the management waste and control of emissions to the environment. It covers the disposal of wastes onto land including:

i. The definition of waste;
ii. Measures to be taken in the case of unauthorised or harmful disposal of waste;
iii. Duty of Care in relation to waste;
iv. Waste management licencing, now largely superseded by environmental permitting;
v. National and local government responsibilities, including development of waste strategies; and
vi. Enforcement powers.

15.2.9 The Waste Minimisation Act 1998 relates to the EPA and includes powers for local authorities to take steps to minimise the generation of wastes in their area, including household, commercial and industrial wastes.

15.2.10 The Environment (Wales) Act 2016 cover a range of environmental issues, Part 4 refers to the collection and disposal of wastes and notes the need for separation of wastes prior to collection, prohibits the disposal of food waste to sewer and provides powers to regulate or prohibit the disposal of wastes by incineration.

15.2.11 The Waste and Emissions Trading Act 2003 discusses wastes to be sent to landfill. It introduces the concept of targets and allowances for biodegradable wastes to comply with the European Landfill Directive together with a trading system for the allowances. It also included a requirement for a strategy to reduce the amount of biodegradable waste disposed of to landfill.

15.2.12 The Clean Neighbourhoods and Environment Act 2005 provides powers to tackle environmental quality and anti-social behaviour. With regard to waste it covers transport of waste, control of fly tipping, retention and provision of documentation, seizure and search of vehicles connected with fly tipping and the powers to require landowners to remove fly tipped waste.

15.2.13 The Waste (England and Wales) Regulations 2012 Act cover waste management and transpose the European Waste Directive into UK law. Key aspects include duties in relation to waste collection, confirm that the waste hierarchy has been considered and to collect waste streams separately and keep them separate. It also includes requirements on hazardous waste, in particular, that it cannot be mixed or diluted without an appropriate permit. Two tiers of registration as a waste carrier were introduced for waste carrier, broker and dealer together with additional provisions relating to hazardous wastes.

15.2.14 The Hazardous Waste Regulations 2005 make provision for the management of hazardous wastes from the point of production to disposal, or recovery. The regulations implement the Hazardous Waste Directive (91/698/EEC). The regulations provide a definition of hazardous waste and link to the European List of Wastes which defines whether or not wastes are hazardous. Hazardous wastes must be recorded and identified and must not be mixed with other hazardous, or non-hazardous wastes. If they are already mixed, then separation should be undertaken where technically and economically feasible. The regulations require notification of premises at which hazardous waste is produced and a quarterly return from those who receive the waste or dispose of it on the site of production.

15.2.15 The National Policy Statement for National Networks refers to waste management. It notes the need for sustainable waste management through the adoption of the waste hierarchy and that large infrastructure Schemes may generate wastes through their construction and operation. The statement noted that certain operational waste management requirements may require an Environmental Permit. Arrangements for managing wastes should be set out and steps should be taken to minimise the volume of waste generated, and the amounts sent for disposal. In terms of decision making the statement notes the need for the Secretary of State to be satisfied that an effective process for the management of wastes, including that it will be properly managed on and off site, the waste can be dealt with appropriately by the waste infrastructure that is likely to be available and that steps have been taken to minimise waste volumes and disposal. Where necessary planning obligations should be used to ensure that appropriate measures are applied for waste management.

15.2.16 The National Planning Policy for Waste notes the ambition to work towards a more sustainable and efficient approach to resource use and management. It focusses on local authorities and the requirements placed on them together with provision of waste management infrastructure. Key points relevant to the proposed Scheme include driving waste management up the waste hierarchy, securing the re-use, recovery or disposal of waste without endangering human health or the environment and ensuring that infrastructure including transport links complements sustainable waste management. With regard to determining planning applications the policy notes that local planning authorities should consider the likely impact of proposed Schemes on waste infrastructure and that handling of waste maximises re-use/recovery opportunities and minimises off-site disposal. The National Policy Statement for hazardous waste focusses on provision of new hazardous waste management infrastructure but does note that hazardous waste may pose a risk to human health and the environment and that it needs to be managed in a sustainable way that recovers or recycles this waste, rather than disposing of it.

Planning Policy Wales (December 2018)

15.2.17 The Planning Policy Wales (PPW)[3] sets out the land use planning policies of the Welsh Government with a view to ensuring that the planning system delivers sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

[3] Planning Policy Wales Edition 10

15.2.18 The Plan notes the need for planning decisions to consider whether the depletion of non-renewable resources will be minimised, whether waste will be prevented, and that the most appropriate and efficient use of materials will be made, including re-use and recycling.

15.2.19 Chapter 5 of the policy refers to making the best use of material resources and promoting the Circular Economy. The document provides guidance to local authorities including the following key points relating to materials and waste relevant to this Scheme:

i. Designing out waste by using materials which are, or can be re-used or recycled and through appropriate site selection and treatment;
ii. Designing in reused materials and elements;
iii. Seeking a cut and fill balance to avoid the creation of waste;
iv. Use of locally sourced, alternative or recycled materials should be encouraged in line with the Proximity Principle; and
v. Adequate space and facilities for managing waste materials should be incorporated into the design.

15.2.20 The PPW also makes reference to the Waste Hierarchy and notes that the Welsh Government's policy for waste management is contained in Towards Zero Waste and associated sector plans (see below).

15.2.21 The policy notes the need for planning authorities to encourage the recycling and re-use of construction and demolition wastes as well as mineral and industrial wastes. It also discusses the efficient use of mineral and aggregate resources, noting the need to ensure that they are not wasted and that they are used efficiently. With regard to aggregates the policy notes the need to consider the use of alternative products to primary materials but also the need to use high specification aggregates in road construction and maintenance, of which significant resources exist in Wales.

Towards Zero Waste - The Overarching Waste Strategy Document for Wales (June 2010)

15.2.22 'Towards Zero Waste' is the overarching waste strategy document for Wales.

15.2.23 The Strategy[4] is intended to meet the requirements of EU Directives, including the Waste Framework Directive, and the National waste Strategy for Wales, as required under UK legislation. The strategy notes that detailed delivery actions will be defined in sector plans. These include sector plans for:

i. Construction and Demolition (C&D) (consulted on in 2011 with responses published in September 2012);
ii. Environment and Climate Change;
iii. Transport;
iv. Collections, Infrastructure and Markets;
v. Municipal; and
vi. Industrial and Commercial.

15.2.24 The Sector Plan for Environment and Climate Change states there is currently consultation being held on increasing recycling by businesses, which is open until December 2019. The Transport sector plan makes reference to several guidance notes including the Welsh transport appraisal guidance (WelTAG).

[4] Towards Zero Waste – The Overarching Waste Strategy Document for Wales (2010)

15.2.25 The strategy notes that the documents that form the waste plan/strategy for Wales are:

i. Towards Zero Waste;
ii. Waste Strategy Progress Report 2002-2008;
iii. Wise About Waste (2002);
iv. Technical Advice Note 21 (Waste);
v. Regional Waste Plans for North, South West and South East Wales; and
vi. Local Development Plans.

15.2.26 The PPW notes that Wise About Waste (2002) was the previous waste management strategy for Wales but that a number of actions and targets in this older document are still in existence.

15.2.27 The strategy sets targets including that by 2025 waste will have been significantly reduced and that it will be managed to make the most of resources with recycling maximised, residual waste minimised and landfill disposal as close to zero as possible. By 2050 the aim is to phase out residual waste, achieving Zero Waste through enhanced waste prevention and sustainable consumption and production to ensure that all waste is re-used or recycled.

15.2.28 For construction and demolition wastes the strategy notes that the previous target of re-using or recycling at least 85% of construction and demolition wastes by 2010 was met. It refers to the need to maximise the use of alternative materials, secondary and recycled aggregates where possible in the construction industry. The strategy notes that a Sector Plan will be developed for construction and demolition wastes to cover waste produced by all types of development.

Technical Advice Note 21 (February 2014)

15.2.29 Technical Advice Note (TAN) 21[5] discusses the waste hierarchy and notes the relevant EU Directives and National legislation relating to waste. It discusses strategic planning for waste management and the need for monitoring and data collection.

Construction and Demolition Sector Plan (November 2012)

15.2.30 The C&D Sector Plan[6] plan was based on the Wales Construction and Demolition Waste Arising survey 2005-2006. The amount of C&D waste was estimated to be 12.2 million tonnes, dominated by aggregates and soils, which accounted for a combined 10.8 million tonnes and forming 89% of the arisings. The recycling rate was approximately 85% with 1.27 million tonnes disposed of to landfill.

15.2.31 The sector plan focusses on 'priority' materials that have the highest ecological footprint, the plan notes that over 75% of the ecological footprint is associated with wood (26.6%), plastic (17.5%), insulation and gypsum materials (12.5%), hazardous wastes (10%) and metals (9.5%).

15.2.32 The key actions addressed in the plan centre on:

i. Waste prevention – reducing arisings by around 1.4% each year across the sector to achieve the 2050 goal. Minimising hazardous wastes was a key action;
ii. Preparing for Re-use – items that are discarded should be prepared for re-use so that they can be used as a resource, and re-used by others;
iii. Recycling – to ensure that wastes are segregated at source as far as practicable so they can

[5] Technical Advice Note 21 Feb 2014
6 Construction and Demolition Sector Plan Nov 2012

be recycled to a high quality; and

iv. Other recovery/disposal – to ensure that wastes not suitable for re-use or recycling are segregated at source or collected in such a way that they are capable of being recovered in local applications, and to ensure that the retention of economic value in Wales from recovery operations is maximised.

15.2.33 The relevant overarching actions in the plan likely to be relevant at the Scheme level include:

i. Encouraging producers of C&D waste to take note of the Welsh Government's 'Guidance on Applying the Waste Hierarchy';
ii. Encouraging clients, designers and contractors to prevent, minimise and recycle waste on C&D Schemes through the introduction of mandatory Site Waste Management Plans;
iii. Ensure the public sector uses its influence as the largest construction client in Wales through 'greening' of public procurement; and
iv. Consider Design for Deconstruction (D4D) in the Scheme design.

15.2.34 Waste prevention measures likely to be relevant at the Scheme level identified in the plan include:

i. Minimising wastage from over-ordering, consider take back options from suppliers;
ii. Encouraging the use of value engineering for large construction Schemes;
iii. Increasing awareness of designing out waste, particularly at the start of Schemes;
iv. Encouraging greater re-use of surplus materials; and
v. Moving the use of demolition wastes up the waste hierarchy.

15.2.35 Actions to prepare wastes for re-use discussed in the plan and likely to be relevant at the Scheme level include:

i. Encouraging a reclamation led demolition approach; and
ii. Encouraging the implementation of the Institution of Civil Engineers Demolition Protocol, by raising awareness of the protocol within the C&D sector, as well as with potential clients.

15.2.36 Actions taken within the plan to implement the recycling objectives that are likely to be relevant at the Scheme level include:

i. Separate collection for paper, metal, plastic and glass;
ii. Encouraging use of alternative substitutes for aggregates, to make better use of waste as a resource; and
iii. Increasing the recycled content of products and materials used in Government funded projects.

15.2.37 Key benefits and outcomes from the plan relevant to the Scheme include:

i. Financial savings;
ii. Reduction in greenhouse gas emissions;
iii. Increased skills, employment and social justice;
iv. Replacing the need for primary aggregates;
v. Reduced disposal to landfill; and
vi. Conservation of resources through recycling.

Local Planning Policy

North Wales Regional Waste Plan (2008)

15.2.38 The North Wales Regional Waste Plan[7] is reported to have been prepared by Flintshire County Council as lead authority. However, it has not been possible to obtain a copy of the plan although the Council have been consulted on this aspect.

15.2.39 An interim progress report on waste planning monitoring was produced by Flintshire County Council (lead authority for regional waste planning monitoring) in 2016[8]. This noted that only sporadic surveys had been undertaken on construction and demolition wastes but that in 2024/2025 there may be a requirement for between 200,000 and 250,000 tonnes of capacity for residual construction and demolition waste across Wales.

Conwy Local Development Plan 2007-2022 Adopted October 2013

Minerals and Waste Management Strategy

15.2.40 The Conway Local Development Plan (LDP)[9] includes a Minerals and Waste Strategy.

15.2.41 Spatial Objective 14 notes the need to promote the prudent use of resources through the minimisation of waste and assist in providing an integrated network of waste management facilities consistent with the needs of the area and the waste hierarchy.

15.2.42 Spatial Objective 15 notes the need to contribute to regional and local mineral needs in a sustainable manner.

15.2.43 Strategic Policy DP/1 Sustainable Development principles notes the need to reduce waste production and manage waste recycling in line with Strategic Policy MWS/1 Minerals and Waste.

15.2.44 With regard to aggregates the strategy notes the need to take a long-term strategic approach to the supply of aggregates. It notes that there is no need or justification to allocate land for hard rock extraction however, the LDP does safeguard additional hard rock, sand and gravel resources. The strategy notes that the existing quarries at Penmaenmawr, Raynes (Lysfaen) and St George will provide the regional supply of hard rock. There are also permitted reserves at Llandulas Quarry and safeguarded sand and gravel resources (as identified on the Proposals Map). Policy MWS/3 safeguards these resources and notes that permission will not be granted for development within the safeguarded zones which could harm the long-term viability of working the resources. The Strategy notes that sand and gravel was not currently produced within the plan area. Policy MWS/4 Quarry Buffer Zones notes that there will be a presumption against inappropriate development in these zones.

15.2.45 The plan identifies the Llandulas Quarry landfill as one of the largest and most strategically located waste management facilities in North Wales, with good access to the A55. It notes that the main quarry has planning permission for landfilling and composting and that a number of possible future waste management facilities could be located at this site. Gofer is identified as the location of a previous landfill site that hosts a bulking station, transfer station and civic amenity site. Policy MWS/6 identifies these sites as locations for waste management facilities.

[7] North Wales Regional Waste Plan (2008)
[8] Interim Progress Report on Waste Planning Monitoring (2016)
[9] Conwy Local Development Plan 2007-2022 Adopted 2013

Background Paper 20 Waste Management (March 2011)

15.2.46 Background Paper 20 Waste Management[10] is referenced in the LDP. This refers to TAN 21, the use of the proximity principle and the waste hierarchy, Towards Zero Waste – Overarching Waste Strategy Document for Wales 2010 and the North Wales Regional Waste Plan 1st Review. The background paper identifies a number of waste management facilities within Conwy Borough and discusses forecast arisings for waste in the future, with a forecast of 223,390 tonnes of construction and demolition waste in 2013. Land requirements and locations for future waste management facilities are discussed in the paper to be included in the LDP to ensure that sufficient land is available up until 2022.

Background Paper 29 Safeguarding Aggregate Resources (March 2011)

15.2.47 Background Paper 29 Safeguarding Aggregate Resources[11] links to the LDP. This Paper defines primary aggregates as mineral resources worked directly to provide aggregates, which can include sand, gravel and crushed rock. It notes the risk that construction Schemes can sterilise aggregate resources and that national planning policies protect land that contains potentially valuable aggregate resources, a process known as safeguarding.

15.2.48 The Paper notes that mineral workings in the area have historically been concentrated along the coast and that this area still contributes significantly to regional aggregate production. It also notes that this is where the three remaining active hard rock quarries in the council area are located and that Conwy does not have permitted reserves of sand or gravel, supplies of which have been sourced from Gwynedd and North East Wales. The Paper considers aggregate production over the period 1999 to 2008 and notes that the quarries in Conwy make a significant contribution to regional and some of the national need for aggregates and that this would continue for the foreseeable future.

Key Relevant Guidance

Design Manual for Roads and Bridges (DMRB)

15.2.49 LA110 Materials Assets and Waste[12] is the key guidance provided in the DMRB. This replaces Interim Advice Note 153/11. The guidance aligns with the Waste Directive.

15.2.50 The standard notes that the construction, improvement and maintenance of motorways and all purpose trunk roads can result in environmental effects associated with the consumption and use of material assets, and the disposal or recovery of waste. It notes the need to identify, describe and assess the likely significant effects on the environment arising from material assets and the expected residues and emissions and the production of waste. The assessment is to include:

i. The consumption of materials and products from primary, recycled or secondary and renewable sources, the use of materials offering sustainability benefits, and the use of excavated and other arisings that fall within the scope of waste exemption criteria; and
ii. The production and disposal of waste.

[10] Conwy LDP Background Paper 20
[11] Conwy LDP Background Paper 29
[12] Design Manual for Roads and Bridges Standard LA110 Material Assets and Waste (2019)

15.2.51 The guidance specifically states that consideration of the effects associated with transportation of materials do not form part of the assessment. It also notes the need to consider linkages with other environmental factors, in particular geology and soils for potential sources of hazardous wastes and climate for quantifying emissions associated the use of materials.

15.2.52 The standard notes that the environmental assessment should include:

15.2.53 A description of the Scheme including the quantities and types of waste produced during the construction and operation cycles:

i. A description of the likely significant effects of the Scheme on the environment including the disposal and recovery of waste;
ii. The direct and indirect significant effects; and
iii. The interaction with other factors.

15.2.54 The assessment is required to follow the waste hierarchy to encourage options that deliver compliance with the Waste Directive and offer the best environmental outcome. Specifically, the guidance notes the need to consider:

i. The principles of precaution and sustainability;
ii. Technical feasibility and economic viability;
iii. Protection of resources; and
iv. The proximity principle, that waste is to be disposed of in one of the nearest appropriate installations.

15.2.55 Where trans-boundary impacts are predicted then the need to consult with relevant planning authorities is noted.

15.2.56 The significance criteria in LA110 include the need to consider the recycled content of aggregates against regional targets. These are defined in the Annexes to LA110 but no specific values are quoted for Wales, therefore the average value for England of 25% has been adopted.

15.3 Study Area

15.3.1 Two study areas have been considered comprising:

i. The first study area is the construction footprint including land needed for compounds and temporary land take.
ii. The second study area is that defined by the available waste infrastructure that is suitable, in terms of licensed capacity (volume and type) to accept the anticipated arisings and waste from the Scheme.

15.3.2 The first study area comprises the construction footprint including land need for compounds and temporary land take. This area also includes land needed for stockpiling and managing materials and waste. For the purposes of this assessment this has been referred to as 'land within the Scheme Boundary'.

15.3.3 The second study area is based on the available waste infrastructure. This has been based on a distance of 30 km reflecting the available facilities in the context of the anticipated arisings and wastes. For the purposes of this assessment this has been referred to as the 'Study Area'.

15.4 Methodology

15.4.1 The methodology outlined below is considered to be applicable for the assessment of Material Assets and Waste. As noted in Section 15.6.1, 15.7.7 – 15.7.9 below the assessment considers only the construction stage.

Scope of the Assessment

15.4.2 Initial considerations with regard to the scope of the assessment were made based on the points shown in Table 15.1 which are noted in LA110:

Table 15.1: Initial Review of Scope of Assessment

Question	Response
Is the Scheme likely to recover/reuse little on site material thereby requiring materials to be imported to site?	Yes - the Scheme is likely to re-use all of material cut. However, there is still a large net balance of imported material required for the Scheme
Is the Scheme likely to use little or no recycled or secondary materials thereby requiring the majority of the materials used on the Scheme to comprise primary materials?	There are opportunities to re-use road planings and aggregates arising from removal of existing pavements and to re-use excavated materials However, there is not a materials balance for the Scheme and there is a need to import materials to meet the requirement for fill. In the worst case this could require primary materials, even if all the excavated materials are reused the majority of materials (i.e. > than 50% of the material requirement) would still need to be imported
Is the Scheme likely to sterilise mineral sites or peat resources?	No
Would the Scheme generate large quantities of waste relative to regional waste capacity?	No – at this stage it is expected that requirements for landfill would be limited. The contaminated land assessment indicates that all of the materials arising from the proposed Scheme should be capable of being reused, similarly the assessment shows that all of the tarmac should also be capable of being reused
Will the Scheme have an effect on the ability of waste infrastructure within the region to continue to accommodate waste from other sources?	Unlikely - As there is a large net fill on the Scheme, it is unlikely that there will be significant volumes of material that will need to be exported to local waste management facilities.

15.4.3 On the basis of the above assessment the need for more detailed assessment was identified.

15.4.4 The scope of the assessment comprised the following:

i. Assessment of the likely material requirements and waste arisings for the proposed Scheme;
ii. A review of the extent to which materials could be re-used within the proposed Scheme, particularly in the context of the earthworks cut/fill balance and opportunities to use recovered, recycled or secondary materials;
iii. A desk-based review of the key materials available in the Study Area;
iv. A desk-based review of available waste management facilities in the Study Area including disposal, re-use and recovery facilities and, where possible, the available capacity, either at individual sites or reported across the Study Area/Region;
v. A review of historical land uses and potentially contaminative land uses (from the Geology and Soils chapter);
vi. A review of the proposed Scheme works for the construction phase against the baseline

information and an assessment of the potential impacts and mitigation measures that might be required.

Desk-based Assessment

15.4.5 Information was obtained from the following sources:

i. Natural Resources Wales website[13];
ii. North Wales Regional Technical Statement Appendix A (2019)[14];
iii. Geology and Soils Chapter for information on ground conditions; and
iv. Outline engineering design for materials quantities.

Site Walkover and Surveys

15.4.6 No site walkovers or surveys have been undertaken.

Method of Baseline Data Collection

15.4.7 Baseline data has been collected from desk-based sources as described in Paragraph 15.4.5.

Assessment Methodology

15.4.8 This section sets out the methodology by which the impacts have been assessed.
Significance Criteria

15.4.9 Significance criteria are defined in the DMRB standard and are shown in Table 15.2.

Table 15.2: Significance Criteria

Significance Criteria	Description of Effect/s
Very large	**Material Assets** No criteria – use criteria for large categories **Waste** >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from the Scheme; or Construction of new permanent waste infrastructure is required to accommodate waste from the Scheme.
Large	**Material Assets** Scheme achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute primary materials; Aggregates required to be imported to site constitute <1% reused/recycled content; and Scheme sterilises one or more mineral safeguarding site and/or peat resource.

[13] https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer26/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Permitting/viewers/Permitting/virtualdirectory/Resources/Config/Default&locale=en-GB&version=26 accessed 16.10.2019
[14] Regional Technical Statement (2nd review) Appendix A (North Wales) September 2019

Significance Criteria	Description of Effect/s
	Waste >1% reduction in the regional waste capacity of landfill as a result of accommodating the waste from the Scheme; and >50% of the waste from the Scheme disposed of outside the region.
Moderate	**Material Assets** Scheme achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute primary materials; and Aggregates required to be imported to site comprise reused/recycled content below the relevant regional target. **Waste** >1% reduction in the regional waste capacity of landfill as a result of accommodating the waste from the Scheme; and 1 to 50% of the waste from the Scheme disposed of outside the region.
Slight	**Material Assets** Scheme achieves 70% to 99% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute primary materials; and Aggregates required to be imported to site comprise reused/recycled content in line with the relevant regional target. **Waste** =<1% reduction in the regional waste capacity of landfill as a result of accommodating the waste from the Scheme; and Waste infrastructure has sufficient capacity to accommodate waste from the Scheme, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	**Material Assets** Scheme achieves greater than 99% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute primary materials; and Aggregates required to be imported to site comprise <99% reused/recycled content. **Waste** No reduction in the regional waste capacity of landfill as a result of accommodating the waste from the Scheme.

15.4.10 The following information has been considered as part of considering the significance of the effects:

i. Status of the impact (beneficial or adverse);
ii. Duration of the impact (short or long term);
iii. Permanent or Temporary;
iv. Direct or Indirect; and
v. Significance (significant or not significant).

Status of the Impact

15.4.11 The status of the impacts has been assessed by considering whether the proposed Scheme would have a beneficial or adverse effect on the receptor, and whether the proposed Scheme would lead to a change in exposure.

Timescales

15.4.12 In assessing the effect, the likely length of the effect has been considered. These have been summarised under the following timescales:

i. Short term: <12 months;
ii. Medium term: one-10 years;
iii. Long Term: +10 years; and
iv. Permanent: effects that are considered to be 'irreversible' or extremely long-lasting.

15.4.13 Short term effects would arise principally within the construction phase, which is anticipated to be 24 months.

15.4.14 Medium term effects could arise associated with environmental maintenance and after care (anticipated to be up to five years).

15.4.15 Long term and/or permanent effects could arise during the operational phase of the proposed Scheme associated with maintenance of the highway and associated infrastructure. Long term effects could also arise in terms of loss of assets or capacity that cannot be readily replaced, for example, use of primary aggregates or loss of landfill capacity which have the potential to result in a long term change within the study area that extends beyond the construction period.

Permanent or Temporary

15.4.16 In assessing whether an impact is permanent, the effect will be regarded as one which is not reversible and will last for the lifespan of the proposed Scheme and beyond.

15.4.17 A temporary effect was considered to be one that is reversible or where it ceases to be an issue at some point during the proposed Scheme.

Direct or Indirect

15.4.18 Direct effects are considered to arise from activities associated with the proposed Scheme.

15.4.19 An indirect impact is one which is not considered to arise directly from the proposed Scheme or one which is already present and may continue after it has been constructed.

Significance of Effect

15.4.20 Significance has been assessed based on the DMRB standard as shown in Table 15.3.

Table 15.3: Definition of Significance

Significance	Description
Significant (one or more criteria met)	**Material Assets** Category met for moderate or large effect

Significance	Description
	Waste Category met for moderate, large or very large effect
Not significant	**Material Assets** Category description met for slight or neutral effect **Waste** Category description met for slight or neutral effect

Limitations to Assessment

15.4.21 The assessment has been based on the design as developed at this stage. High level materials and waste quantities have been established for the design at this stage and used to develop the materials model, but the exact quantities and measures for handling materials and waste will depend on the developed design at the time of construction. At this stage the quantities are considered to represent a reasonable worst case, waste minimisation and optimisation of materials use would be considered further in the detailed design phase with a view to reducing waste and the need to import materials.

15.4.22 The assessment into Material Assets and Waste commenced prior to the issuing of the LA110 standard on the basis of a 30 km buffer around the proposed Scheme. The LA110 standard requires consideration of regional data which has been adopted where practicable, however, the use of a 30 km buffer has been retained for the purposes of defining waste management facilities. This is not considered to significantly affect the outcome of the assessment given that facilities are generally concentrated in the coastal strip along the A55 or on Anglesey.

15.4.23 As noted above in Paragraph 15.2.38, it has not been possible to obtain a copy of the North Wales Regional Waste Plan which dates from 2008. This is not considered to be a material limitation given that it would be reasonable to assume that any key requirements of the plan would have been implemented by this time. On this basis, the proposed Scheme is unlikely to either adversely affect the implementation of the plan or not comply with requirements of the plan.

15.5 Consultations

15.5.1 Table 15.4 below summarises the consultation responses received and provides information on where and/or how they have been addressed in this assessment.

Table 15.4: Consultation Responses

Consultee and Date	Type of Consultation	Issue/s Raised	Response/Action Taken
Flintshire County Council – 11/10/19	Email and telephone call	Telephone conversation and followed up via email the location of the North Wales Regional Waste Plan (2008).	No response
Denbighshire County Council 15/10/19	Email	North Wales Regional Waste Plan.	No response
Flintshire County	Email	North Wales Regional	No response

Consultee and Date	Type of Consultation	Issue/s Raised	Response/Action Taken
Council 05/11/19		Waste Plan.	
Flintshire County Council 20/12/19	Email	North Wales Regional Waste Plan.	No response.
North and Mid Wales Trunk Road Agency (NMWTRA) 17/12/19 to 10/01/20	Email	Liaison with NMWTRA regarding operational activities.	Information provided, note NMWTRA do not hold any records of the material assets used or waste generated.
North Wales Minerals and Waste Planning Services 29/01/20	Email	North Wales Regional Waste Plan.	No response at the time of issue

15.6 Potential Effects Scoped Out of Assessment

15.6.1 It is anticipated that operational phase effects will be similar to those for the existing highway and therefore these have been scoped out.

15.6.2 The decommissioning phases for the Scheme has also been scoped out of the assessment. This is because the proposed Scheme will have a design life of 60 to 120 years and it is not possible to predict the effects at the time of decommissioning.

15.7 Baseline Environment

Material Assets and Waste Statistics UK and Wales

15.7.1 Information used to inform the materials assets has been sourced from the Regional Technical Statement (2nd review) Appendix A (North Wales) September 2019[15] .

15.7.2 With regard to waste DEFRA and the Government Statistical Department, jointly published the most recent figures on waste in March 2019[16].

15.7.3 This shows that the UK generated 66.2 million tonnes of non-hazardous construction and demolition waste in 2016, of which 91.0% was recovered. The rates of recovery have been similar between 2010 and 2016.

15.7.4 In comparison in 2010, the UK generated 49.5 million tonnes of non-hazardous construction and demolition waste; 87.6% of which was recovered.

15.7.5 A survey of construction and demolition waste in Wales was undertaken in 2012. This showed that the Welsh construction and demolition sector produced 3.4 million tonnes of waste with a re-use, recycling and other recovery rate of 87%. Of these wastes 639,000 tonnes (19%) was sent to landfill. An estimated 38,000 tonnes of hazardous wastes were generated in the sector, representing around 1% of the total sector waste.

[15] Regional Technical Statement (2nd review) Appendix A (North Wales) September 2019
[16] UK Waste Statistics 2019

Types and Quantity of Material Use Associated with the Operation of the Existing Road

15.7.6 Consultation has been held with North and Mid Wales Trunk Road Agency (NMWRTA) on the operational activities and frequencies, the key activities were as shown in Table 15.5.

Table 15.5: Key Operational & Maintenance - Material Assets

Maintenance	Activity/Frequency
Winter maintenance gritting	The highway is gritted during winter in accordance with the winter maintenance decision matrix of the TRMM. The rate of spread can vary from 10 gsm upwards.
Future end of life resurfacing planning waste including road markings and studs	This depends upon the material used for surfacing e.g. thin surfacing is currently replaced approximately every eight-10 years with road markings (road markings are also refreshed (sprayed over) approximately every five years). HRA would be 20-30 years
Replacement of end of life lighting columns, LED lanterns and VMS components	Replaced at the end of the design life (LED lanterns 18 years, steel street lighting columns 30 years, aluminium street lighting columns 45 years and MS4 signs 15 years)
Replacement of end of life boundary fencing, VRS, signs	Based on DMRB design life.

15.7.7 It is anticipated that after the first year operational phase effects will be similar to those for the existing highway and therefore these have been scoped out.

Types and Quantities of Waste Associated with the Operation of the Existing Road

15.7.8 Consultation has been held with North and Mid Wales Trunk Road Agency (NMWRTA) on the operational activities and frequencies, the key activities were as shown in Table 15.6.

Table 15.6: Key Operational & Maintenance Waste Arisings

Maintenance	Activity/Frequency
Gully emptying waste	The Trunk Road Maintenance Manual (TRMM) stipulates that catch pit chambers/gullies are cleansed once a year with an additional intelligence leaf cleansing during the winter periods (in leaf fall areas). On the dual carriageway records show that chambers are generally ⅓ - ⅔ full when they are cleansed annually.
Ditch clearing	TRMM stipulates that ditches are cleansed if identified for cleansing following inspection (every five years). Generally, ditches are cleansed every 5-7 years (concrete channels are generally cleansed annually) with the material left in situ or taken off site for disposal.
Litter	The Local Authority is responsible for litter collection on this section of the A55 (litter is collected a minimum of once a year before/after cutting the grass)
Cut and collect grass cutting	Currently grass is collected and taken off site or left in piles in situ once a year if the area is identified as a wildflower plot

Maintenance	Activity/Frequency
Tree and other vegetation maintenance	Trees are checked/maintained annually for encroachment/felling/thinning
Future end of life resurfacing planning waste including road markings and studs	This depends upon the material used for surfacing e.g. thin surfacing is currently replaced approximately every eight-10 years with road markings (road markings are also refreshed (sprayed over) approximately every five years). HRA would be 20-30 years
Replacement of end of life lighting columns, LED lanterns and VMS components	Replaced at the end of the design life (LED lanterns 18 years, steel street lighting columns 30 years, aluminium street lighting columns 45 years and MS4 signs 15 years).
Replacement of end of life boundary fencing, VRS, signs	Based on DMRB design life.

15.7.9 It is anticipated that operational phase effects after the first year will be similar to those for the existing highway and therefore these have been scoped out.

Availability of Key Construction Materials required for the Scheme

15.7.10 Aggregates will be required for the construction of the Scheme, including potentially to provide general fill given the current shortfall in the materials balance. The exact sources of aggregates cannot be defined at this stage and therefore consideration has been given to available materials across the Study Area. Consideration has been given to both primary aggregates which are discussed below and secondary/recycled aggregates, which are discussed below.

15.7.11 The Regional Technical Statement Appendix A (15) states that Carboniferous limestone is currently worked at two quarries in Conwy (Raynes (20.5 km E) and Abergele (28.5 km E)) and in three quarries on Anglesey (Aber (21.5 km NW), Nant Newydd and Rhuddian Bach (located close to each other 20 km WNW).

15.7.12 Igneous rock reserves are also available including Precambrian Coedana Granite of Anglesey (worked at Gwalchmai (30 km W), Gwyndy (29 km W) and Gaerwen Quarries (20 km W). Granite of unknown age is reported to be currently worked at Trefor Quarry (location not identified) on the north coast of the Llyn Peninsula, with Ordovician diorite worked at Penmaenmawr quarry (1.5 km E) on the Conwy Coast. Ordovician dolerite is worked at two locations outside the Study Area, Minffordd in Gwynedd (37.5 km SW) with other igneous rocks at Nanhoron Quarry on the Llyn Peninsula (58.2 km SW).

15.7.13 Precambrian and Ordovician slates are currently worked as either primary aggregate or from previously discarded slate waste at numerous sites in Gwynedd and two sites within Snowdonia National Park.

15.7.14 Glaciofluvial sand and gravel deposits are primarily found in the northern Gwynedd area of the Llyn Peninsula, which are currently worked at Penygroes and Cefn Grainog Farm. Sand is

currently worked at Chwarel Bryncir. The BGS has mapped small resources of sand and gravels across the region but they are not currently worked.

15.7.15 Llandulas Quarry is discussed in the Conwy LDP Background Paper 20[17]) which notes that it was only worked briefly between 1997 and the date of the paper in March 2011 to provide engineered rock and void space for the landfill site which is located at the site. On this basis it does not form a source of materials as part of the baseline.

15.7.16 Table A6 of the Regional Technical Statement Appendix states the permitted reserves of sand and gravel in the region to be 15.2 Mt at 2016. This is mainly from the Wrexham area and therefore lies outside the Study Area. Table A7 stated that there were 175.2 Mt existing permitted reserves, at 2016, of crushed rock. This is shown to be mainly from Flintshire, Conwy and Snowdonia National Park areas.

15.7.17 The Regional Technical Statement notes that the national figure for future primary, land won aggregates provision is calculated to be 20.224 million tonnes per annum (mtpa) and that this is only marginally higher than the recorded sales of 20.11 million tonnes for 2007. This takes account of demand from all sectors, including infrastructure Schemes. The report notes that for the North West Wales sub region (Conwy, Gwynedd and Isle of Anglesey) the existing supply pattern is well balanced with the supplies sourced from primarily outside the National Park and the Area of Outstanding Natural Beauty and well distributed between Conwy and Gwynedd, with more limited supplies from Anglesey to local markets. Table A1 of the report notes that the average sales in North Wales to 2016 were 6.155 mtpa, of which 86.6% was from crushed rock sources.

Secondary and Recycled Aggregates

15.7.18 The Regional Technical Statement[18] notes that no reliable monitoring data on recycled and secondary aggregate production is currently available for any part of the UK but estimates are that these materials now comprise 30% of the overall supply and that most material suitable for aggregates use (construction, demolition and excavation waste) is already being recovered and utilised.

15.7.19 The Statement outlines that in Conwy, Flintshire and Denbighshire no substantial sources of secondary or recycled aggregates were identified, with the exception of small-scale slate waste tips which are being reworked. In these areas recycled aggregate production was considered to be small scale, associated with construction, demolition and excavation wastes from the towns along the North Wales coast although in Flintshire it was noted that dredgings from the Dee Estuary are landed at Mostyn Dock and have been used as low specification construction fill. The amounts of materials arising from construction, demolition and excavation waste were likely to be greater in Flintshire and Wrexham because of the higher level of industrial and commercial development. In Gwynedd crushed slate formed a more substantial part of the aggregates in use and this material has been used as bulk fill.

15.7.20 In August 2019, Gwynedd Council put the slate areas of North West Wales forward for UNESCO World Heritage status. The proposals could ban quarrying and revoke extant mineral working permissions. If implemented this could affect both the generation of secondary or recycled aggregates and the future demand for other sources of primary crushed rock aggregates as

[17] Conwy LDP Background Paper 20
[18] Regional Technical Statement (2nd review) Appendix A (North Wales) September 2019

slate waste and quarried slate accounted for an average 9.7% of the total crushed rock sales between 2008 and 2016.

15.7.21 It is anticipated that the Carboniferous Limestone, igneous rocks and glacio-fluvial sand and gravel deposits would be suitable for use in road construction. The Precambrian and Ordovician slates have also been used in road construction in North Wales, including slate waste.

15.7.22 Other key construction materials comprise concrete (ready mix and precast, for example kerbs), steel (reinforcement, barriers), bricks, pipes (concrete and plastic), timber (fencing, formwork and other potential uses) and tarmac for the highway pavement. Concrete plants are noted at Abergele and Rhyl, and asphalt plants at Abergele, Penmaenmawr and Bangor[19].

Presence and Capacity of Landfill Facilities to be Utilised by the Scheme

15.7.23 The exact landfill facilities to be utilised cannot be defined at this stage and therefore consideration has been given to available facilities across the Study Area.

15.7.24 A total of 10 landfills have been identified within 30 km of the proposed Scheme, as shown in Table 15.7. Locations of waste management facilities in North Wales and within the 30 km Study Area are shown in Figures 15.2 and 15.3.

Table 15.7: Landfills within the Study Area

Site Name	Town/City	Local Authority	Operator	Limit (tpa)	Category	Distance (km)
Penhesgyn Gors Landfill (area 2)	Menai Bridge	Isle of Anglesey	Cyngor Sir Ynys Mon	0	Hazardous Waste Landfill Site	15.13
Penhesgyn Gors Landfill (area 3)	Menai Bridge	Isle of Anglesey	Cyngor Sir Ynys Mon	0	Non-Hazardous Landfill Site	15.27
Nant Y Garth Landfill Site	Portdinorwic	Gwynedd	Treborth Leisure Limited	75000	Inert Landfill Site	15.73
Nant Newydd Quarry Landill Site		Isle of Anglesey	Clive Hurt (Plant Hire) Ltd	125000	Inert Landfill Site	20.72
Rhuddlan Bach Quarry Landfill Site	Brynteg	Isle of Anglesey	Clive Hurt (Plant Hire) Ltd	125000	Household, Commercial and Industrial Transfer Stations;Inert Landfill Site	20.76
Pontrug Landfill - Part Ordnance Survey 3990	Caernarfon	Gwynedd	Watkin Jones & Son Ltd	0	Inert Landfill Site	22.2

[19] https://www.agg-net.com accessed 20.10.2019

Site Name	Town/City	Local Authority	Operator	Limit (tpa)	Category	Distance (km)
Ty Mawr Farm Landfill	Abergele	Conwy	Griffiths Griffith Wyn, Edward Lloyd And Gwenfrai Rees	99000	Inert Landfill Site	25.27
Cilgwyn Landfill Site	Penygroes	Gwynedd	Gwynedd Council	0	Non-Hazardous Landfill Site	28.41
Plas Gwernoer	Caernarfon	Gwynedd	Robin Jones & Sons Limited	0	Inert Landfill Site	28.96
Ty Mawr East Quarry Landfill	Penygroes	Gwynedd	Watkin Jones & Son Ltd	0	Non-Hazardous Landfill Site	29.46

15.7.25 Of these six have no quoted capacity, this includes the only hazardous waste landfill at Menai Bridge, 15 km from the proposed Scheme. Of the remaining sites there is a total limit of 424,000 tonnes per annum, however, all of these sites are licenced for inert waste.

15.7.26 The closest non-hazardous landfills are noted to be at Caernarfon, 35 km from the proposed Scheme with a limit of 40,000 tonnes per annum and at Harlech, 42 km from the proposed Scheme with a limit of 18,000 tonnes per annum. The closest hazardous waste landfill listed on the NRW website is located 191 km from the proposed Scheme in South Wales. On this basis it is considered that hazardous waste would most likely be transferred to North West England where several suitable landfill sites are present.

Presence and Capacity of Material Recovery/Recycling Facilities to be Utilised by the Scheme

15.7.27 The exact material recovery and recycling facilities to utilised by the Scheme cannot be defined at this Stage and therefore consideration has been given to available facilities across the Study Area.

15.7.28 A total of nineteen waste management facilities have been identified within 30 km of the proposed Scheme. The licence types cover a range of waste streams, as shown in Table 15.8. Locations of waste management facilities in North Wales and within the 30 km Study Area are shown in Figures 15.2 and 15.3.

Table 15.8: Waste Management Facilities within the Study Area

Site Name	Town/City	Local Authority	Operator	Limit (tpa)	Category	Distance (km)	Available to Scheme?
Caerhun Farm	Conwy	Conwy	Sion Roberts	4,000	Open Windrow Composting	9.96	Yes
G Lock Scrap Metal Processors	Bangor	Gwynedd	Philip Lock	149,998	Metal Recycling; End of life vehicle facility	10.27	Yes
Morfa Uchaf	Conwy	Conwy	Alwyn Jones Limited	40,779	Use/treatment of inert waste for land reclamation or construction	11.31	Yes
Llandygai Transfer Station	Bangor	Gwynedd	Watkin Jones & Son Ltd	0	Household, C&I Transfer Stations (including treatment)	10.29	Yes - but no capacity noted
Worldcare Recycling	Llandudno Junction	Conwy	World Care (wales) Ltd	75,000	Use/treatment of inert waste for land reclamation or construction	11.39	Yes
Worldcare Wales Ltd	Llandudno Junction	Conwy	World Care (wales) Ltd	0	Household, C&I Transfer Stations (including treatment)	11.42	Yes – but no capacity noted
Penrhyn Quarry	Bangor	Gwynedd	Welsh Slate Ltd	0	Inert Waste Transfer Stations (including treatment)	11.82	Yes - but no capacity noted
Bron Y Nant Road Waste Transfer & Materials Reclamation Facility	Colwyn Bay	Conwy	Conwy County Borough Council	22,671	Household, C&I Transfer Stations (including treatment)	14.73	No - Council operated site
Cae Uchaf Farm	Menai Bridge	Isle of Anglesey	Glyngwyn Foulkes	35,000	Use/treatment of inert waste for land reclamation or construction	14.87	Yes
Sp Power Systems	Bangor	Gwynedd	S P Power Systems Ltd	5,000	Hazardous Waste Transfer Stations (including treatment)	14.91	No - Scottish Power site
Penhesgyn Waste Transfer & Materials Recovery Facility	Llansadwrn	Isle of Anglesey	Isle of Anglesey County Council	75,000	Household, C&I Transfer Stations (including treatment)	15.20	No - Council operated site

Site Name	Town/City	Local Authority	Operator	Limit (tpa)	Category	Distance (km)	Available to Scheme?
Penhesgyn In Vessel Composting Facility	Menai Bridge	Isle of Anglesey	Isle of Anglesey County Council	25,000	In-Vessel Composting	15.20	No - Council operated site
Plas Y Dre, Llanwrst	Llanrwst	Conwy	Conwy County Borough Council	0	Household, Commercial and Industrial Transfer Stations	17.61	No - Council operated site
Coed Bolyn Mawr	Caernarfon	Gwynedd	Robert Davies & Jennifer Ann Davies	250,000	Inert Waste Transfer Stations (including treatment)	17.94	Yes
Bwlch Gwyn Quarry	Gaerwen	Isle of Anglesey	Anglesey Aggregates Ltd	75,000	Use/treatment of inert waste for land reclamation or construction	20.62	Yes
Rhuddlan Bach Quarry Landfill Site	Brynteg	Isle of Anglesey	Clive Hurt (Plant Hire) Ltd	125,000	Household, C&I Transfer Station. Inert Landfill Site	20.76	Yes
Thomas Skip And Plant Hire Ltd	Caernarfon	Gwynedd	Thomas Skip & Plant Hire Limited	74,999	Household, C&I Transfer Stations	20.97	Yes
Phoenix Metals & Colin Davies Non-ferrous Metals	Gaerwen	Isle of Anglesey	Alwyn Davies & Colin Davies	24,999	Metal Recycling Site	21.15	Yes
Anglesey C C Highways Depot	Gaerwen	Isle of Anglesey	Dawnus Construction Holdings Limited	74,999	Inert Waste Transfer Stations (including treatment)	21.18	Yes
Llanddulas Quarry Waste Treatment Centre	Abergele	Conwy	Hogan Waste Limited	110,000	C&D MRF; further materials processing for recycling; Household, C&I Transfer Stations (including treatment)	21.26	Yes
Green Skips Environmental Ltd	Gaerwen	Isle of Anglesey	Green Skips Environmental Ltd	0	Household, C&I Transfer Stations (including treatment)	21.27	Yes - but no capacity noted

Site Name	Town/City	Local Authority	Operator	Limit (tpa)	Category	Distance (km)	Available to Scheme?
Cymru Lan	Gaerwen	Isle of Anglesey	Cymru Lan Cyfyngedig	69,000	Household, C&I Transfer Stations (including treatment)	21.33	Yes
Llanddulas Composting Facility	Abergele	Conwy	3 C Waste Ltd	20,000	Open Windrow Composting	21.82	Yes
Caergylchu Waste Management Facility	Caernarfon	Gwynedd	Gwynedd Council	40,000	I&C MRF; Household, C&I Transfer Stations; Household Waste Recycling Centres	22.29	No - Council operated site
Gwynedd Skip And Plant Hire Ltd	Caernarfon	Gwynedd	Gwynedd Skip And Plant Hire Ltd	75,000	Household, C&I Transfer Stations (including treatment)	22.6	Yes
Plot 8 A	Holyhead	Isle of Anglesey	Veolia ES (UK) Limited	74,999	Hazardous Waste Transfer Stations (including treatment)	26.65	Yes
Waste Management Ltd	Mona	Isle of Anglesey	Veolia ES (UK) Ltd	45,000	Household, C&I Transfer Stations (including treatment)	26.71	Yes
Llechwedd Quarry	Blaenau Ffestiniog	Gwynedd	Northern Welsh Recycling Ltd	75,000	Inert Waste Transfer Stations (including treatment)	28.44	Yes
Gofer Bulking Station	Abergele	Conwy	Conwy CBC	24,999	I&C MRF	28.56	No - Council operated site
Ty Mawr (East Quarry)	Talysarn	Gwynedd	Watkin Jones And Son Ltd	49,999	Use/treatment of inert waste for land reclamation or construction	29.60	Yes

15.8 Summary of Significant Effects

15.8.1 Tables 15.13. and 15.14 above contain the assessment of the potential effects of the Scheme on Material Assets and Waste respectively. With regard to material assets one potentially significant effect has been noted for the use of aggregates. No other potentially significant effects have been noted on other material assets or with regard to wastes.

15.8.2 On the basis of assessment against the criteria defined in LA110 the Scheme will have a **Large** effect and would be **significant** in terms of re-used/recycled content. This is because the Scheme has a shortfall of materials for construction of some 84,000 tonnes which will need to be imported. At this stage it is not possible to confirm where the imported materials would originate from since it will depend on what Schemes are underway in the area from which fill materials can be sourced. The review of waste management facilities indicates that there are sites within 30 km for the use and treatment of inert waste for land reclamation or construction, with a limit of 275,000 tonnes per annum, that could be a source of fill, subject to it meeting specification. However, if these materials are not available a worst-case assessment would be on the basis that all of this material has to be primary aggregates, and therefore that it may not be possible to meet targets for reused/recycled content. Notwithstanding this it is also apparent that in the overall context of primary aggregates production in North Wales, where average sales were 6,155 million tonnes per annum in 2016, that even in this situation this would only represent 1.3% of current annual sales.

15.9 Effects with Mitigation

15.9.1 The significant effects that have been identified will 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.

Materials Selection and Reuse, Recycling and Recovery and SWMP

15.9.2 It is anticipated that most of the materials arising from the construction works would be suitable either for re-use in the works, in the case of soils, or for recycling and recovery in the case of other construction materials. Re-use, recycling and recovery would be the preferred treatment routes with disposal to landfill adopted as a last resort.

15.9.3 Opportunities would be sought wherever practicable to make use of local Schemes to source fill materials for construction, for example, any surplus soils from nearby Schemes could be reused (subject to complying with legislation and meeting specifications). In addition, this would be the most cost-effective solution compared to using primary aggregates as fill.

15.9.4 A number of sites have been identified for the use/treatment of inert waste for land reclamation or construction, located between 11.31 km and 29.60 km from the proposed Scheme. These are potential sources of materials for the Scheme with a combined limit of 275,778 tonnes per annum. In addition, there may be opportunities to make use of slate as fill although this would depend on whether the World Heritage Site is designated before the proposed Scheme proceeds.

15.9.5 Based on the LA110 to mitigate the significant effect it would be necessary to incorporate recycled or re-used materials to meet the regional target. No specific targets are included in the standard and therefore an average of the English regional targets has been used. This would require a minimum of 25% recycled/re-used content. This requirement would be incorporated in the Contract requirements for the proposed Scheme subject to completion of the detailed

design and a sustainability review and would be incorporated in the Materials Management Plan (see below).

Further Best Practice Mitigation Measures

15.9.6 Further mitigation measures in addition to standard best practice measures are outlined below that would be employed at the site in order to avoid potentially significant effects arising from the construction of the proposed Scheme.

15.9.7 Life cycle principles would be applied, including reducing waste and increasing materials recovery for reuse and recycling. Embodied carbon would be reduced during the construction stage by using materials with lower carbon footprints wherever practicable. Wherever feasible materials would be selected that have low environmental impact and are sourced responsibly. In addition, opportunities would be sought to source materials locally, and use local waste management facilities, with the potential for reducing carbon emissions associated with transport.

15.9.8 Wastes arising on site would be minimised by applying best practice measures including:

i. Designing out waste, during the design phase;
ii. Just in Time deliveries to avoid the need to store materials with the risk of damage or loss;
iii. Use of off site construction techniques;
iv. Planning work sequences to minimise waste and avoid the need for re-work; and
v. Use of 'take back' schemes for surplus materials and offcuts.

15.9.9 Waste streams would be segregated into different containers for each waste stream (timber, metals, plastics etc) to enable appropriate waste management and recycling. Containers would be clearly labelled to show which wastes should be placed where. They would be promptly removed from site when full for waste processing by suitably licenced waste carrier and transported to suitably licensed waste management facilities. During transport waste containers would be covered or sheeted appropriately to prevent material becoming airborne.

15.9.10 The site compounds would have adequate space for on site storage and processing of materials to maximise opportunities for re-use and recycling.

15.9.11 Records would be kept showing the amounts of waste generated and the proportions recycled, re-used or disposed of.

15.9.12 All waste would be stored safely and securely in accordance with arrangements identified in the SWMP to prevent damage to human health or adverse effects on the environment. Consideration would be given to preventing theft, acts of vandalism or scavenging by vermin.

15.9.13 Hazardous waste would be stored separately in suitable containers. Where contaminated soils are present that are hazardous waste these would stock piled and sheeted to prevent water ingress and to prevent the materials becoming airborne. Where necessary the materials would be placed in impermeable areas to prevent pollution of the underlying soils and groundwater.

15.9.14 The waste management facilities to be used would be identified in the SWMP together with evidence that they are suitable licensed.

Targets for Materials Use and Waste Disposal

15.9.15 In preparing the SWMP the Contractor would be required to achieve specific targets with regard to waste management, as follows:

i. >70% overall recycling/recovery of non-hazardous CDW; and
ii. No greater than a 1% reduction in landfill capacity in the region/study area.

15.9.16 There would be a requirement for the Contractor to monitor performance against these targets and report on their performance through the SWMP.

Materials Management Plan & Recycled Materials under WRAP Protocols

15.9.17 As noted in Chapter 6 Geology and Soils a Materials Management Plan (MMP) in accordance with the CL:AIRE Definition of Waste: Development Industry Code of Practice will be implemented as part of the CEMP to address materials reuse on site and maximise the amount of soils that can be recovered. The plan would need to include all necessary risk assessments/design statements/remediation strategies to address the re-use of both uncontaminated and contaminated soils and materials.

15.9.18 Materials excavated from the proposed Scheme would be re-used onsite where possible, where this was not possible, they would be removed off site for recycling, disposal would only be used as a last resort if no beneficial use can be found. If any localised contamination were encountered during excavations, this material would need to be treated for re-use or removed off-site for disposal.

15.9.19 A specification will be prepared for existing site won materials or imported new fill material for use as part of the construction works to provide acceptability criteria for geotechnics and contamination. This will form part of the MMP. Within the MMP specific targets would be set with regard to imported materials, including as noted above that aggregates imported to the site would meet or exceed the regional target in terms of reused/recycled content (25% target recycled content based on the average value for England).

15.9.20 A key means of achieving the 25% recycled content is likely to be through the use of recycled aggregates. Where these are prepared under WRAP protocol they would not technically be wastes and would therefore lie outside the scope of the MMP. Nevertheless, they would need to be considered in the wider context of materials re-use and the earthworks balance for the site and their contribution to meeting the target for recycled content.

15.9.21 In considering materials use in the wider sense would need to be given to demonstrating that incorporating recycled or re-used materials is the most sustainable option at the time of construction, for example, if there are only limited materials available locally it would not be sustainable to transport recycled or re-used material over very long distances to meet a notional target when primary aggregates are available locally.

15.9.22 Compliance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites would be a requirement of the MMP. On completion of the proposed Scheme a verification report would be required under the MMP to demonstrate that the materials have been used in accordance with the Code of Practice.

15.10 Residual Significant Effects

15.10.1 Following implementation of the mitigation measures outlined above, there are considered to be no residual significant effects.

15.11 Cumulative Effects

Intra-Project Effects

15.11.1 Intra-project effects are considered as those that "occur between different environmental topics within the same proposal, as a result of that development's direct effects"[23].

15.11.2 The following potential direct and indirect intra-project cumulative effects have been considered along with mitigation:

i. Chapter 6: Geology and Soils – The proposal is to re-use excavated materials and no potentially significant soil contamination has been encountered. Unexpected contamination could be encountered during construction and this would be managed via a protocol incorporated into the CEMP. If unexpected contamination were encountered, and depending on the risks identified, this could result in additional material being removed offsite. However, based on the findings from the ground investigation and previous land uses identified within the Scheme area, along with the construction proposals, this is unlikely to be significant.
ii. Chapter 7: Water Environment - Materials and waste represent a potential risk to the water environment, for example, sediment run off from stockpiles. Mitigation measures will be required to manage these potential effects, which will be implemented through the CEMP.
iii. Chapter 12: Air Quality – There is likely to be a requirement to stockpile materials. The air quality chapter notes the need for mitigation to prevent off-site migration of dust during excavations and soil stockpiling along with the movement of soils during construction.
iv. Chapter 13: Noise and Vibrations – Importation and movement of the fill materials necessary for the Scheme will contribute to construction noise. Significant noise effects have been identified associated with construction and demolition, mitigation in the form of portable noise barriers has been proposed. Where the predicted noise impacts exceed the adopted noise level criteria, and where the effects cannot be controlled using Best Practicable Measures, it is proposed to communicate about the proposed construction and demolition works to the residents affected by the works regarding levels and duration.
v. Chapter 14: Travellers – There will be additional construction traffic on the local roads and A55 associated with the need to import materials for the Scheme. However, traffic models have shown that this is not be a significant effect.
vi. Chapter 16: Climate Change – The re-use of excavated materials on the Scheme, which would also divert waste away from landfill will reduce the embedded carbon for the project. Import of Secondary (recycled) aggregates for the project, if available and viable would reduce the need for virgin quarried aggregates and could contribute to reducing the carbon footprint. Consideration of embedded carbon in materials and selection of sustainable products would contribute towards reducing impacts on climate change.

15.11.3 Following the implementation of mitigation, no potentially significant intra-project cumulative effects have been identified.

[23] Institute of Environmental Management & Assessment (IEMA), 2011. Special Report – The State of Environmental Impact Assessment Practice in the UK

Inter-Project Effects

15.11.4 Inter-project effects have been considered as those where "cumulative effect occurs as a result of the likely impacts of the proposed development interacting with the impacts of other developments in the vicinity" (IEMA[13]).

15.11.5 Chapter 19 sets out the known schemes that could be considered to have a cumulative effect in combination with the Scheme.

15.11.6 If both Junction 15 and Junction 16 are constructed at the same time, there would be a cumulative effect in terms of material imports. The two Schemes in combination have a shortfall of materials for construction of some 213,000 tonnes which will need to be imported. If these materials were all primary aggregates then on the basis of the criteria defined in LA110 this would be a Large effect and would be significant in terms of not meeting targets for re-used/recycled content. This is because at this stage it is not possible to confirm where the imported materials would originate from since it will depend on where fill materials are sourced from. Sources for re-used or recycled materials could include surplus fill from other construction projects which are underway at the same time (that would otherwise go for disposal), waste management facilities for the use and treatment of inert waste for land reclamation or construction or materials recovered from slate waste heaps. A review of waste management facilities indicates that there are sites within 30 km for the use and treatment of inert waste for land reclamation or construction, with a limit of 234,999 tonnes per annum. If these materials are not available a worst-case assessment would be that all of the material for the two Schemes has to be primary aggregates, and therefore that it may not be possible to meet targets for reused/recycled content. Notwithstanding this it is also apparent that in the overall context of primary aggregates production in North Wales, where average sales were 6,155 million tonnes per annum in 2016, that even in this situation this would only represent 3.6% of current annual sales.

15.12 Conclusions

15.12.1 A number of potential effects have been identified and assessed. However, with the implementation of the incorporated mitigation measures and additional mitigation measures as outlined above it is considered that there will be no residual significant environmental effects as a result of the proposed Scheme.

15.12.2 The approach adopted to the management of material assets and waste offers the potential for enhancements in accordance with the Well-Being of Future Generations Act (Wales). The Conway and Denbighshire Local Well Being Plan outlines ways to develop environmental resilience, it is considered that the approach to material assets and waste can support the plan in the following ways:

i. Recycling and reuse of waste will contribute environmental resilience by diverting materials from landfill and reducing waste – contributing to goals of addressing recycling, producing less waste and reducing carbon emissions; and
ii. Seeking to reuse materials and/or obtain recycled materials to provide imported fill, rather than primary aggregates, will contribute to environmental resilience by reducing reliance on sources of primary aggregates – contributing to goals of sustainable use of resources and reducing carbon emissions.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 16 CLIMATE CHANGE

RAMBOLL Bright ideas. Sustainable change.

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16. CLIMATE CHANGE

16.1 Chapter introduction

16.1.1 This chapter reports on the likely significant effects with respect to climate change associated with the construction and operation of the Junction 15 Scheme. The specific objectives of the chapter are to:

a) describe the climate and greenhouse gas emissions baselines;
b) assess the resilience of the Scheme to climate parameters;
c) describe the assessment methodology and significance criteria used in completing the impact assessment;
d) describe the potential effects, including direct, indirect and cumulative effects;
e) assess the additive effect of climate change on residual effects of other disciplines;
f) describe the mitigation measures proposed to address likely significant effects; and
g) assess the residual effects remaining following the implementation of mitigation.

16.1.2 There are three aspects that will be considered as part of the climate assessment:

a) **In-combination Climate Change Impact (ICCI) Assessment** – evaluates the combined effect of the Scheme and potential climate change impacts on the receiving environment during construction and operation;
b) **Climate Change Resilience (CCR) Assessment** – evaluates the effectiveness and feasibility of adaptation measures integrated into the Scheme to avoid or reduce hazards and/or increase resilience of the Scheme to climate change impacts during construction and operation; and
c) **Greenhouse Gas (GHG) Emissions Assessment** – quantifies the potential GHG emissions associated with the construction of the Scheme and identifies mitigation measures to reduce these emissions.

16.1.3 This chapter is supported by the following figures and appendices:

a) Volume 3, Appendix 7.1 Greenhouse Gas Assessment

16.2 Relevant Legislation, Policy and Guidance

16.2.1 The assessment has been informed by the legislation, policy and published guidance detailed below.

International Legislation

Kyoto Protocol to the UNFCCC

16.2.2 The Kyoto Protocol[1] is an international agreement linked to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) that commits state parties to reduce greenhouse gas emissions.

[1] Kyoto Protocol to the United Nations Framework Convention on Climate Change. United Nations, 1998. Available at: https://unfccc.int/sites/default/files/kpeng.pdf [Accessed 04/06/2019]

European Legislation

EU Intended Nationally Determined Contribution

16.2.3 The EU's Intended Nationally Determined Contributions[2] (INDCs) under the UNFCCC sets out the EU's GHG emissions reduction targets.

The EIA Directive 2014/52/EU

16.2.4 European EIA directives require an EIA to be undertaken in support of an application for development consent for certain types of scheme. The legislative framework for EIA is set by *European Directive 2011/92/EU*, as amended by *Directive 2014/52/EU* (collectively referred to as the EIA Directive). From May 2017 the new EIA Directive EC2014/52/EU, is transposed into the *Harbours, Docks, Piers and Ferries Environmental Protection - The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 (EIA Regulations 2017)* 5th December 2017. The equivalent under town and country planning act is the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016.

16.2.5 The regulations introduced the need to consider climate as part of EIA.

National Legislation

Climate Change Act 2008 (2050 Target Amendment) Order 2019

16.2.6 The Climate Change Act 2008 is the basis for the UK's approach to tackling and responding to climate change. It established a requirement to undertake a climate change risk assessment every five years and develop a programme for adaptation action in response to the risks identified. The 2050 Target amendment order imposes a duty on the Secretary of State to reduce UK wide greenhouse gas emissions in 2050 to net zero (following any adjustment for trading in carbon units).

16.2.7 Parts 4 and 5 of the Act impose limited duties and confer limited powers on Welsh Ministers in terms of contributing towards meeting the UK wide carbon targets. The Environment (Wales) Act 2016, imposes specific carbon budgeting duties on Welsh Ministers like those to which the Secretary of State is subject.

16.2.8 By removing the existing roundabouts, which typically involves hard acceleration and deceleration, a benefit of the A55 Junction 15 Improvements is to minimise stop-start conditions. This will contribute to improved vehicle emissions.

Planning (Wales) Act 2015

16.2.9 The Planning (Wales) Act 2015 became law in Wales on 6 July 2015. The overall aim of the Act is to provide a modern legislative framework for the operation of the planning system in Wales thereby creating a more consistent planning system that enables development and enhances built and natural environments.

[2] Submission by Latvia and the European Commission on Behalf of the European Union and its Member States. Intended Nationally Determined Contribution of the EU and its Member States. March 2015. Available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Latvia/1/LV-03-06-EU%20INDC.pdf [Accessed 25/09/2018]

Environment (Wales) Act 2016

16.2.10 The Environment (Wales) Act 2016 delivers against Welsh Government's Programme for Government commitment to introduce new legislation for the environment. It sets out the approach for the sustainable management of natural resources in Wales, which will help to mitigate for and adapt to the impacts of climate change.

Well-being of Future Generations (Wales) Act 2015

16.2.11 The 2015 Act places a duty on public bodies in Wales and those listed in the Act to work to improve the economic, social, environmental and cultural well-being of Wales. To help do this they must set and publish well-being objectives and give greater consideration to the long term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach. The Act establishes seven well-being goals, which specifically reference acting on climate change.

Climate Change Strategy for Wales (October 2010)

16.2.12 The Climate Change Strategy for Wales (Welsh Assembly Government, 2010c) sets out the Welsh Government's plan to tackle the causes and the consequences of climate change. The Welsh Government's key target is to reduce greenhouse gas emissions by 3% per year from 2011.

16.2.13 Section 8 of the Strategy in particular refers to the transport sector, which is most relevant to the Scheme. In order to reduce transport emissions the Welsh Government sets out the following actions:

a) develop sustainable travel centres and supporting 'Smarter Choices';
b) promote eco-driving, walking and cycling;
c) invest in bus and rail services and improve traffic management; and
d) promote infrastructure of electric and hydrogen vehicles.

Active Travel (Wales) Act 2013

16.2.14 The Active Travel (Wales) Bill places a requirement on local authorities to continuously improve facilities and routes for walkers and cyclists and to prepare maps identifying current and potential future routes for their use. The Bill will also require new road schemes to consider the needs of pedestrians and cyclists at design stage.

Prosperity for all: A low carbon Wales

16.2.15 A collection of policies and proposals[3] that will aid Wales in meeting 2016 to 2020 carbon budget and 2020 emission reduction targets.

The National Adaptation Programme: Making the country resilient to a changing climate (July 2018)

16.2.16 This is the second National Adaptation Programme (NAP)[4] setting out government's response to

[3]Prosperity for all: a low carbon Wales (2019). Available at: https://gov.wales/prosperity-all-low-carbon-wales [Accessed 23/10/2019].
[4] DEFRA The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting (2018). Available at:

the second Climate Change Risk Assessment (CCRA), showing the actions government is, and will be, taking to address the risks and opportunities posed by a changing climate.

UK Climate Change Risk Assessment: Government Report (2017)

16.2.17 The UK Government is required under the 2008 Climate Change Act to publish a UK-wide Climate Change Risk Assessment[5] (CCRA) every five years. The Act stipulates that the Government must assess 'the risks for the United Kingdom from the current and predicted impacts of climate change'. A National summary for Wales[6] is available. This national summary presents the Wales-specific evidence included in the UK Climate Change Risk Assessment (CCRA2) Evidence Report.

The Climate Change (Carbon Budgets) (Wales) Regulations 2018

16.2.18 The Climate Change (Carbon Budgets) (Wales) Regulations 2018 were passed in December 2018 and set the first two carbon budgets for Wales. Following the CCC's May 2019 advice on net zero, the Welsh Minister for Environment, Energy and Rural Affairs announced that the Welsh Government will bring regulations before the Assembly in 2020 on a net zero by 2050 target for Wales.

Planning Policy Wales 2018:Edition 10

16.2.19 Planning Policy Wales (PPW) was originally published in 2002 and is the principal and authoritative source of national planning policy, under which local planning authorities prepare their Local Development Plans. It is supplemented by a series of Technical Advice Notes (TANs) including TAN 15:Development and Flood Risk which considers provision for future changes in flood risk as a result of climate change. Together with Welsh Government Circulars and policy clarification letters the with PPW provide the national planning policy framework for Wales.

Guidance and Best Practice

IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation.

16.2.20 This guidance aims to assist EIA practitioners with addressing climate assessment and mitigation. It outlines the process for incorporating climate change resilience into a project and outlines an approach to considering in combination with the impacts of the project and how it relates to the EIA stages.

IEMA Environmental Impact Assessment Guide to assessing greenhouse gas emissions and evaluating their significance

16.2.21 This guidance aims to assist EIA practitioners with addressing greenhouse gas emissions assessment and mitigation. It outlines the process for undertaking the carbon assessment as it

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf. [Accessed 28/10/2019]

[5] UK Climate Change Risk Assessment (2017). Available at https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/uk-climate-change-risk-assessment-2017/introduction-to-the-ccra/ [Accessed 28/10/2019]

[6] Committee of Climate Change (CCC) UK climate change risk assessment 2017 evidence report – summary for Wales. Available at: https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Wales-National-Summary.pdf. Accessed 14/10/2019)

relates to the EIA stages.

PAS 2080:2016 Carbon management in infrastructure

16.2.22 PAS 2080[7] provides a framework on how to manage whole life carbon when delivering infrastructure assets and programmes of work. This assessment broadly follows the principles set out in PAS 2080 for the quantification of greenhouse gas emissions.

16.3 Consultation

16.3.1 As discussed in Chapter 1: Introduction, consideration has been given in this assessment to the EIA Scoping Opinion comments provided by the Welsh Government. These are summarised below in Table 16.1.

Table 16.1: Consultation Responses

Comments Received	Response to comments
17.10 – Not sure if it is appropriate to scope out greenhouse gas emissions likely to arise during construction. Road construction projects are carbon intensive and should be properly assessed. Information from the materials chapter could be used to work out the amount of carbon required for the project.	Accepted - A carbon assessment of the scheme construction will be undertaken and has been scoped in.

16.4 Study Area

Spatial Scope

16.4.1 Three separate assessments have been undertaken as part of the climate assessment. Due to the nature of each assessment, it is necessary to define a separate study area for each. The study areas are defined as follows:

a) In-combination Climate Change Impact (ICCI) Assessment: for each discipline, the study area for the ICCI will match that of the relevant discipline. This is to take account of the fact that the ICCI assessment looks at the additive effect of climate change on each discipline;
b) Climate Change Resilience Assessment (CCR): the study area for this assessment will not go beyond the boundary of the Scheme. This is to capture only the risks to the Scheme itself from climate change; Adverse effects associated with climate change are likely to be in the medium to long term and so the focus will be on the operational stage, although extreme weather events during construction will also be considered. Proposed design measures and/or mitigation measures will be identified to address these risks.
c) Greenhouse Gas Assessment (GHG): the study area for the GHG assessment will include the Scheme as well as the transport network utilised for transport of materials, the embodied carbon associated with the relevant construction materials and the emissions arising during construction of the Scheme. Greenhouse Gas Assessment - Operational Stage has been scoped out of this assessment. IEMA guidance requires assessments to be proportional to the size of the development and avoid placing un-due responsibility on the developer or assessors. In this instance, during the operational stage, although traffic flows could change because of external factors, the Scheme itself is considered likely to result in no overall additional traffic or resulting emissions. Similarly, although the replacement of the roundabout with slip roads could result in minor fluctuations in emissions, these are

[7]Carbon Management in infrastructure (2019). Available at: https://www.lr.org/en-gb/pas-2080/[Accessed 23/10/2019].

considered likely to have a negligible effect on human and ecological receptors. In this instance, it is therefore considered that operational GHG emissions will be negligible, and therefore also scoped out.

Technical Scope

16.4.2 The technical scope of the assessment has been informed by information available on the Scheme, including design elements as described in Chapter 2.

16.4.3 This chapter has been undertaken in line with the methodology presented in the Scoping Report (submitted February 2019) [8]. Highways England published their first guidance on the climate topic (LA114) at the end of October 2019. The new guidance has not been followed in this climate assessment as this had been prepared prior to the publication of LA 114 using available best practice guidance such as the IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation and Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance.

16.4.4 A 'sensitivity test' against LA114 has been undertaken and can confirm that the outcomes of the CCR and ICCI assessment are not materially altered. A precautionary approach has been undertaken when assessing the significance of GHG emissions, drawing upon the conclusions of the IEMA guidance which includes three over-arching principles relating to significance. An assessment of GHGs associated with the construction phase has been undertaken and contextualised against national carbon budgets.

16.5 Baseline Conditions

16.5.1 Information sources used in the assessment/to characterise existing and/or future baseline conditions:

a) UKCP18 climate projections;
b) UK Climate Change Risk Assessment (2017) – Wales National Summary;
c) Met Office Historic Climate data;
d) Welsh Government: A Low Carbon Wales carbon dioxide emissions national statistics; and
e) UK local authority and regional carbon dioxide emissions national statistics.

Climate Change Resilience and In-combination Climate Change

16.5.2 A local climate baseline is provided by Met Office Historic Climate Data which presents a set of 30-year averages, covering the period 1981 – 2010 for a range of parameters and locations. The nearest meteorological Met Office data station is Rhyl, North Wales which is located approximately 25km to the east of the Scheme. The climate data available for Rhyl displays the influence of the maritime setting, with observed maximum and minimum temperatures both being higher than the UK average and fewer days of air frost experienced (an average of 30.9 annual air frost days in comparison to the UK annual average of 54.6 days). In addition, the annual precipitation is in Rhyl is 35% less than the UK average.

16.5.3 The Climate Change Risk Assessment for Wales (2017) details historic climate trends across Wales, which can inform and provide context for future projections. The following trends have been observed:

a) Average annual rainfall over Wales has not changed significantly since 1910; Throughout Wales, the winter months are significantly wetter than the summer ones;

[8] Ramboll, February 2019, A55 Junction 15 EIA Scoping Report

b) Annual average temperatures in Wales are similar to the UK average. Average temperatures over land have increased, from 2005 - 2014 it was 0.9°C warmer than the 1961- 1990 average; and
c) No significant recorded changes in the number of days of air frost in Wales since 1960.

16.5.4 At the UK level, daily maximum and minimum temperature extremes have increased by just over 1°C since the 1950s; and there is some evidence that heavy seasonal and annual rainfall events have also become more frequent with an increasing proportion of rainfall attributed to heavy precipitation events in winter[9].

Greenhouse Gases

16.5.5 Local and Regional CO_2 emissions data tables published by the Government contain historic emissions data covering 2007 – 2017 for all the UK's Local Authorities and Councils. The total emissions and emissions per capita in Conwy for the reported period are shown Table 16.2 below:

Table 16.2: Conway historic GHG emissions (2007 - 2017).

Year	Kt CO_2	Population ('000s)	Per capita emissions
2007	794.9	113.8	7.0
2008	758.2	114.4	6.6
2009	712.1	114.6	6.2
2010	739.5	114.7	6.4
2011	670.1	115.3	5.8
2012	694.6	115.6	6.0
2013	672.7	115.9	5.8
2014	620.1	116.4	5.3
2015	603.5	116.5	5.2
2016	592.8	116.8	5.1
2017	577.4	116.9	4.9

16.5.6 Figures 16.1 and 16.2 below shows the change in the share of emissions between industry and commercial, domestic and transport sources from 2007 to 2017. CO_2 emissions per capita in Wales is higher compared to other regions in the UK due to having the highest Industrial and Commercial sector emissions (4.4 tCO_2 per person), resulting from a greater proportion of industrial activities. The proportion of emissions from industry and commercial accounts for less of the overall total in 2017 compared to 2007, with transport taking up a larger portion.

[9] UK Climate Change Risk Assessment 2017 Evidence Report. Summary for Wales. Available at: https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Wales-National-Summary.pdf [Assessed on 04/10/2019]

Figure 16.1: Proportion of Emissions from Industry and Commercial, Domestic and Transport Sources in 2007 in Conway.

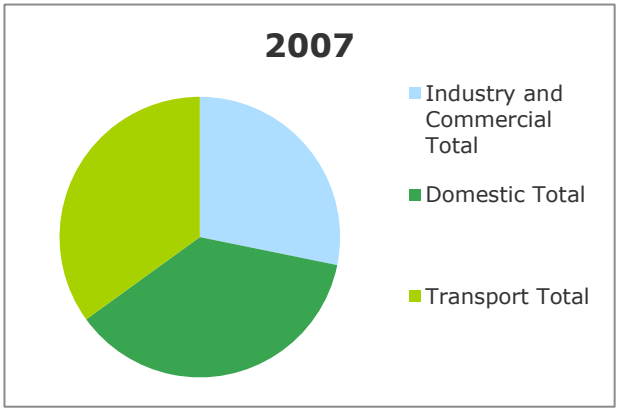
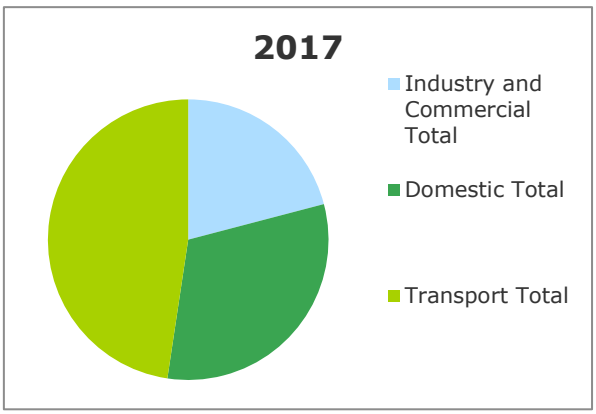


Figure 16.2: Proportion of Emissions from Industry and Commercial, Domestic and Transport Sources in 2017 in Conway.



Carbon Budgets

16.5.7 The Environment (Wales) Act 2016 and the Climate Change (Carbon Budgets) (Wales) Regulations 2018 requires the Welsh Government to reduce emissions of GHGs in Wales by at least 80% by 2050[10]. This commitment includes interim targets and carbon budgets (set against the 1990 baseline) as follows:

a) Carbon Budget 1 (2016-2020): Average of 27% reduction; and
b) Carbon Budget 2 (2021–2025): Average of 33% reduction.

16.5.8 In line with the Paris Agreement, the UK Government has set a target for reducing domestic emissions to net zero by 2050. Following the Committee on Climate Change May 2019 advice on net zero, the Welsh Minister for Environment, Energy and Rural Affairs announced that the Welsh Government will bring regulations before the Assembly in 2020 on net zero emissions by 2050 target for Wales.

16.5.9 The current Welsh Carbon Budget 1 is provided on a sector by sector basis and is shown in Table 16.3 for context however, this sector breakdown is not available for the Carbon Budget 2 which would cover the construction period and opening year of the Scheme (2023).

Table 16.3: Wales Carbon Budget 1 (2016-2020).

Sector	Carbon Budget ($MtCO_2e$)	% of Carbon Budget
Buildings	22.6	10.2%
Power sector	64.9	29.3%
Transport	31.9	14.4%
Industry	72.6	32.8%
Agriculture	27.4	12.4%
Waste	3.7	1.7%
Fluorinated Gas	2.5	1.1%

[10] Prosperity for All: A Low Carbon Wales. Welsh Government 2019. Available at: https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf Accessed on [04/10/2019]

Sector	Carbon Budget ($MtCO_2e$)	% of Carbon Budget
Land Use, Land Use Change and Forestry (SINK)	-2.53	-1.9%
TOTAL	**225.6**	**100%**

16.5.10 The UK Government has set five-yearly carbon budgets which currently run until 2032. The UK is currently in the third carbon budget period with the national budget set at 2,544 megatonnes (Mt) CO_2e covering the five-year period of 2018 to 2022 which spans the majority of the construction and opening year of the Scheme. The fourth carbon budget covers the five year period from 2023 to 2027 and is currently set at 1,950 megatonnes (Mt) CO_2e however given the recent commitment target for reducing domestic emissions to net zero by 2050 it is likely that budgets post 2020 will have to incorporate accelerated carbon reduction.

16.6 Future Baseline

Climate Change Resilience

16.6.1 Climate projections can be used to determine the likely future climate conditions in the locality of the Scheme through its lifetime. Climate projections take into account uncertainty due to natural variability and our incomplete understanding of the climate system and its imperfect representation in models. The projections do this by giving the probabilities of a range of possible outcomes, as estimated by scientific methodology. Good practice in the UK uses projections based on United Kingdom Climate Projections (UKCP18) and published literature such as UK Climate Change Risk Assessment. UCKP18 includes projections of a range of climate variables for different time slices until the end of the century.

16.6.2 The probabilistic projections in the UKCP18 provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. There are also a number of Representative Concentrations Pathways (RCPs) available for UKCP18 with each pathway resulting in a different range of global mean temperature increases over the 21st century.

16.6.3 The central estimate (50th percentile) projections for the 2060-2079 high emissions scenario (RCP8.5), following the precautionary principle, are presented below for the climate variables considered relevant to this assessment. The 2060 – 2079 scenario has been chosen as the Scheme reference lifespan has been assumed to be 50 years in line with Design Manual for Roads and Bridges (DMRB) Volume 1 Section 3: General Design.[11] (with permanent structures assumed to have a design life of 120 years). RCP8.5 represents a pathway in which global greenhouse gas emissions continue to rise. In addition, the results for the 10th and 90th percentile have been presented in supporting figures, indicating the uncertainty range. In general, the trends become more pronounced over time with more extreme trends arising by 2080.

Milder, wetter winters (Increase in mean winter rainfall; Increase in mean temperatures; Decreased frequency of cold weather events)

16.6.4 Over land, UKCP18 projections indicate increased likelihood of milder wetter winters. Figures 16.3 and 16.4 summarise the projected changes in mean winter temperature and precipitation

[11] Design Manual for Roads and Bridges (2016). Available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol1/section3/bd10016.pdf [Accessed 28/10/2019].

for the latter part of the operational period in comparison to the baseline[12]. This indicates an increase in mean temperature by up to 2ºC and mean winter precipitation by up to 20% (RCP8.5 - 50th percentile). However, due to natural variability, some cold and dry winters will still occur.

Figure 16.3: Winter mean temperature projected for Wales between 2060-2079. RCP 8.5 and 50th percentile has been selected.

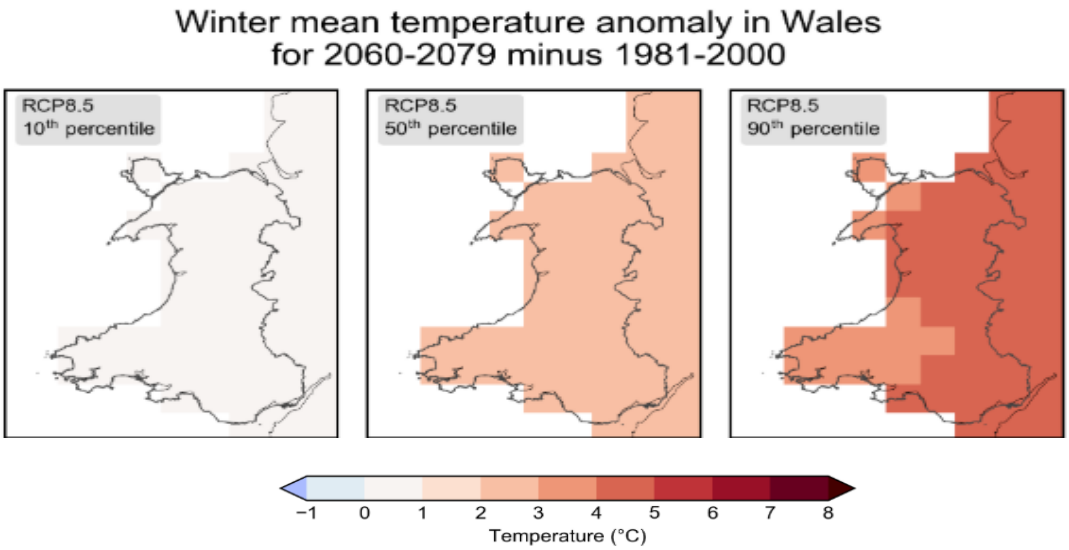
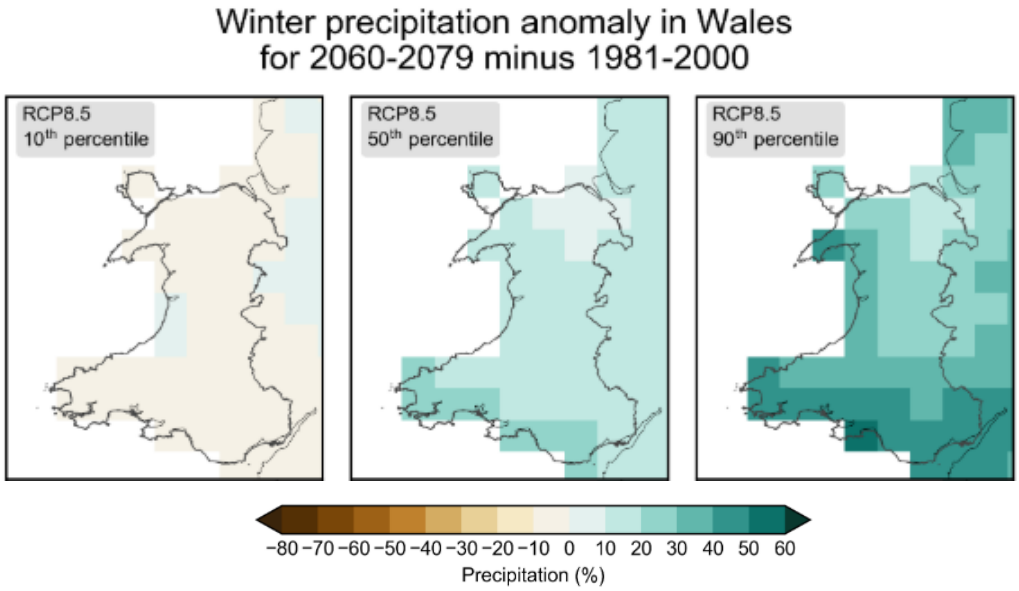


Figure 16.4: Winter precipitation projected for Wales between 2060-2079. RCP 8.5 and 50th percentile has been selected.



[12] Met Office (2018) Land Projection Maps. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/land-projection-maps [Accessed 8/10/2019].

Hotter, drier summers (Increased frequency of dry spells; Increase in mean temperatures; Decrease in mean summer rainfall)

16.6.5 Over land, UKCP18 projections indicate increased likelihood of warmer, drier summers. Figure 16.5 and 16.6 summarise the projected changes in mean summer temperature and precipitation for the latter part of the operational period in comparison to the baseline. This indicates an increase in mean temperature by up to 3ºC and a decrease in mean summer precipitation by up to 30% (RCP8.5 - 50th percentile). In addition to an increase in average temperatures, UKCP18 projects an increase in the frequency of dry spells and extreme temperature events.

Figure 16.5: Summer mean temperature projected for Wales between 2060-2079. RCP 8.5 and 50th percentile has been selected.

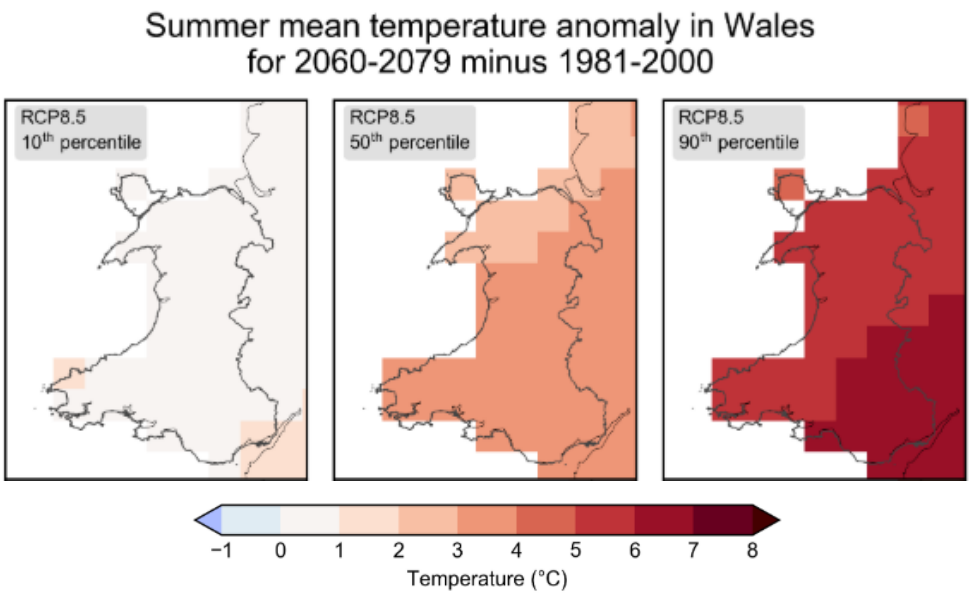
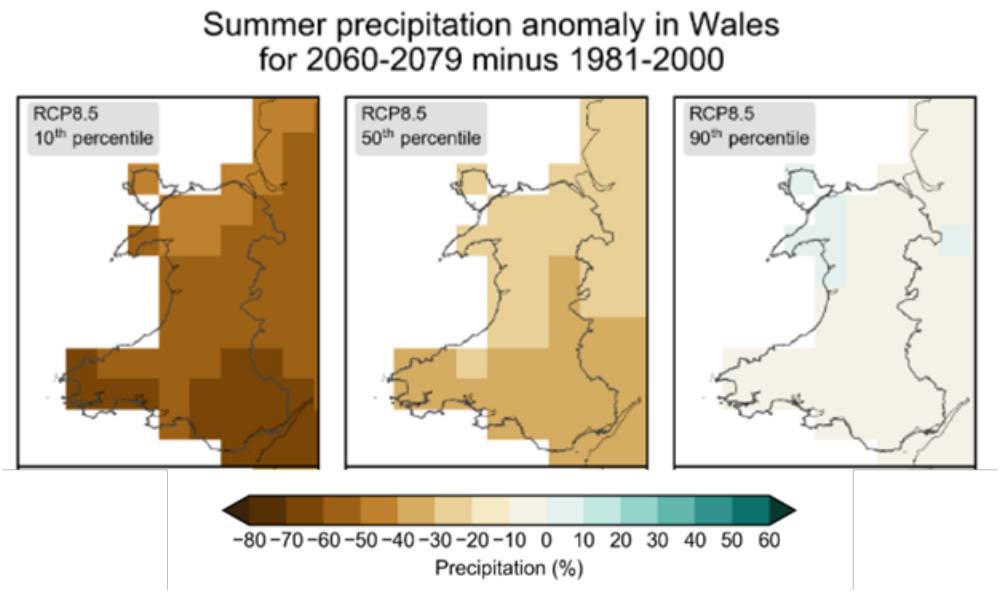


Figure 16.6: Summer precipitation projected for Wales between 2060-2079. RCP 8.5 and 50th percentile has been selected.



Increase in frequency of extreme weather (Increase in heatwaves; Increased frequency of heavy rainfall events)

16.6.6 There is uncertainty in climate modelling around extreme events[13] however UKCP18 projects that that there is likely to be an increase in the frequency and magnitude of extreme events such as heatwaves and heavy rainfall.

Wind

16.6.7 A small increase in the frequency of windstorms across the UK, especially in the winter months, is projected during the second half of the 21st century however wind speed change is more dominated by natural and complex variability with other climatic systems such as the North Atlantic oscillation[14].

Sea Level Rise

16.6.8 All emission scenarios indicate that UK coastal flood risk is expected to increase over the 21st century and beyond. The increase in future coastal flood risk will be dominated by the effects of time-mean sea level rise, rather than changes in atmospheric storminess associated with extreme coastal sea level events. There may also be changes in tidal characteristics.[15].

Greenhouse Gas Assessment

16.6.9 Local and national Greenhouse Gas (GHG) emissions have been reducing over recent years, primarily due to increasing generation of electricity from sources that produce less GHG emissions. This trend is expected to continue especially given the recent UK commitment to reduce domestic emissions to net zero by 2050. It is expected that emissions/carbon intensity will continue to decline in the region due to a combination of factors:

a) National Government carbon budget;
b) Local carbon reduction targets; and
c) Decarbonisation of industry, energy supply and transportation.

16.7 Assessment of Effects

Method of Assessment

In-Combination Climate Change Impact Assessment

16.7.1 Climate change may have an additive effect on impacts already identified within other assessments, where residual impacts identified may now become significant because of the effects of climate change. Therefore, impacts that were originally identified by the assessment but considered non-significant may have to be reconsidered and could require additional design and/or mitigation measures should there be an additive effect.

[13] Stott, P. A., Allen, M., Christidis, N., Dole, R., Hoerling, M., Huntingford, C., Pall, P., Perlwitz, J. and Stone, D. (2013). Attribution of Weather and Climate-Related Extreme Events. Climate Science for Serving Society: Research, Modeling and Prediction Priorities, 307- 337.

[14] Rockel and Woth (2007), Extremes of near-surface wind speed over Europe and their future changes as estimated from an ensemble of RCM simulations, Climatic Change, 81 (1), Available at http://prudence.dmi.dk/public/publications/PSICC/Rockel&Woth.pdf [Accessed 30/09/2019]

[15] UKCP18 factsheet (2018) Sea Level rise and storm surge. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-sea-level-rise-and-storm-surge.pdf [Accessed 16/10/2019]

16.7.2 The assessment will be qualitative using information presented in other environmental assessments carried out by applying objective professional judgement. All other topics considered as part of this ES have been considered and a review has been carried out of the topics likely to have the potential for interactions between the impacts identified and the changing climate. The in-combination assessment will consider:

a) The nature of the effect;
b) Design and mitigation measures that have been identified;
c) The implications of climate change;
d) Additional mitigation that may be required to address the effects of climate change; and
e) The residual effect taking account of climate change.

16.7.3 The conclusion of the in-combination climate change impact assessment will be to establish whether climate change is likely to alter the significance of any of the effects identified in the impact assessment.

Climate Change Resilience Assessment

16.7.4 The climate change resilience assessment for the Scheme has been informed by regional scale information based on historic and projected changes in climate variables. The UK Climate Projections 2018 (UKCP18) provide the most current data on projected change in climate variables.

16.7.5 Construction works for the Scheme are anticipated to begin in Q2 of 2021 and to be completed by Q2 of 2023. For the climate change resilience assessment, any adverse effects associated with climate change are anticipated to be more significant in the 2030s and beyond. Climate change over the construction period is anticipated to be limited. Therefore, the assessment during the construction period focuses on the potential impacts of extreme weather events on the construction programme and people on the construction site.

16.7.6 The climate change resilience assessment has been completed as a high-level overview providing:

a) An assessment of current and future climate trends in the study area using data from UKCP18 on projected changes in climate variables;
b) A review of potential future climate impacts that could affect the Scheme during operation;
c) A summary of design and mitigation measures for the Scheme that improve its resilience to future climate trends; and
d) Identification of any residual climate resilience risks.

Construction Stage Greenhouse Gas Assessment

16.7.7 The GHG assessment considers the GHG emissions associated with the construction of the Scheme.

16.7.8 GHG emissions are measured in carbon dioxide equivalent emissions (CO_2e). CO_2e is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. The sources of greenhouse gas emissions associated with the construction of the Scheme included within the scope of the assessment are summarised in Table 16.4. For each of the items, input data such as material bill of quantities has been provided by the design team, or reasonable assumptions made using professional judgement, and this has been used in calculations with standardised GHG emissions factors for determining the associated GHG emissions.

16.7.9 The construction GHG emissions are reported in annual tonnes of CO_2e. CO_2e is the standard expression of GHGs and includes all GHGs converted into the equivalent total emissions of CO_2.

Table 16.4: Construction GHG Assessment Boundaries

Item	Description	Input Data	Emissions Factors
Embodied GHG emissions	Embodied GHG emissions which are emitted during the manufacture, transport and construction of building materials used in the construction works	Volumes of construction materials	The Bath Inventory of Carbon and Energy.[16]
On-site GHG emissions	GHG emissions from the on-site construction works	Estimated usage of construction plant using Spon's Civil Engineering and Highway Works Price Book (2019).[17]	Government GHG Conversion Factors.[18]
Construction transport GHG emissions	GHG emissions associated vehicles transporting to and from the construction site	Distances travelled by demolition and construction vehicles (from traffic model)	DEFRA Emissions Factors Toolkit.[19]
Waste disposal GHG emissions	GHG emissions associated with the disposal of waste from the demolition works, excavation works and construction process	Volumes of waste arisings	Government GHG Conversion Factors

16.8 Significance Criteria

In-combination Climate Change Impact Assessment

16.8.1 The basis of this assessment is to review the identified residual effects for each discipline contained within the environmental statement. If it is considered that climate change could produce an additive effect which changes the significance of a residual effect, the residual effect taking account of climate change will be reported using the same terminology as the relevant discipline.

Climate Change Resilience Assessment

16.8.2 Potential impacts which might affect the Scheme will be identified and assessed against climate projections. A qualitative judgement will be made, relating to the consequences of any impact of climate change on the Scheme. Any design and/or mitigation measures required to address any significant adverse effects will be identified where necessary. A professional judgement will be made as to whether the consequence of any impact of climate change on the Scheme is significant or not in this context.

[16] University of Bath Inventory of Carbon and Energy (ICE) Version 2.0. Available at: http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html#.XPaGoFWWyUk [Accessed on 04/10/2019]

[17] Spon Press (2020) Spon's Civil Engineering and Highway Works Price Book. Edition 145th Published 16.09.2019. ISBN: 9780367267032

[18] UK Government emissions conversion factors for greenhouse gas company reporting 2019. Available at: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting [Accessed on 04/10/2019]

[19] DEFRA 2019 Emissions Factors Toolkit. Available at: https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [Accessed on 04/10/2019]

Greenhouse Gas Assessment

16.8.3 IEMA guidance indicates that all GHG emissions should be considered as significant, but that it is appropriate to contextualise emissions against local, national, etc. emissions. As described in Section 16.4, a breakdown of the Wales Carbon Budget is not available therefore, the total GHG emissions associated with the Scheme will be compared to the UK national carbon budget (which are provided in the Baseline section) to provide context. Additional mitigation is then identified to reduce GHG emissions where considered necessary.

16.9 Identified Sensitive Receptors

16.9.1 A summary of the receptors identified as being sensitive to the Scheme and which have been 'scoped-in' to the assessment are as follows:

Climate Change Resilience and In-Combination Climate Impacts Assessment

a) Construction workers for the Scheme
b) Construction activities, i.e. materials, programme, cost;
c) People in the immediate surroundings of the Scheme; and
d) The Scheme (e.g. road surfaces and pavement and integrity of landscape features) during the operational stage.

Greenhouse Gases Assessment

16.9.2 Construction greenhouse gases emissions associated within the Scheme will be released to the global atmosphere therefore this is considered to be the receptor. In line with standard practice, the sensitivity of human and natural receptors is not considered within this assessment.

16.10 Assumptions and Limitations

Climate Change Resilience and In-Combination Climate Change Impact Assessment:

16.10.1 Climate projections can be used to determine the likely future climate conditions in the locality of the Scheme through its lifetime. The climate trends included in this assessment are based on a range of greenhouse gas emissions scenarios which are subject to a degree of uncertainty. How the climate will react to different levels of emissions is also uncertain.

16.10.2 There are three sources of uncertainty within climate projections:

a) Natural Climate Variability: either from natural external influences on climate (e.g. change in atmospheric particulates due to volcanic activity), or changes in the energy received from the sun;
b) Incomplete understanding of Earth system processes and their imperfect representation in climate models (modelling uncertainty); and
c) Uncertainty in future man-made emissions (of greenhouse gases and other pollutants).

Greenhouse Gas Assessment

16.10.3 The following limitations are relevant to this assessment:

a) Complete data on materials for embodied carbon calculations are not available at the planning stage and therefore this assessment should be considered indicative. The full

specification of construction materials is not anticipated to be known until detailed design has been completed;

b) Emissions factors for Scheme elements are only available in CO_2 units and not CO2e. The majority of emissions factors were available in CO_2e and this is not considered likely to significantly alter the assessment. For individual assumptions made in the GHG assessment please refer to Appendix 16.1;
c) The typical emissions associated with the construction are based on the high level materials quantities provided by the design team presented in Chapter 2 of this ES. The construction materials and process will further develop through the detailed design stage and may vary from that assessed. It is considered that the assessment presents a reasonable estimation of GHG emissions;
d) Potential for double counting transport emissions from redistribution of local and regional traffic, i.e. not all vehicle journeys would be new because some would be replacements of current journeys; and
e) As set out in Section 16.4 it is expected that emissions/carbon intensity will continue to decline in the region due to a combination of factors however the baseline does not take account of any anticipated GHG emissions reductions by year of operation.

16.11 Identification of Potential Effects

In-combination Climate Impacts Assessment

Table 16.5: In-Combination Climate Change Assessment for Junction 15 Scheme.

Effect of Scheme on receptors	Construction/ Operational Stage	Existing Design and Mitigation Measures	Climate Change trend	Potential in-combination climate impact on Scheme effect or embedded/existing mitigation?	Is there a significant in-combination climate impact?	Additional Mitigation required
Geology and Soils						
Impacts on soil or groundwater from spills associated with construction activities such as use of fuels/oils.	Construction	During the construction of compounds, establishment of designated areas for fuels and materials storage and construction of pollution control measures will be undertaken following best practice guidance as outlined in the Pre-Construction Environmental Management Plan (Pre-CEMP). Following compound construction, management procedures will be identified to ensure that the risk of pollution event would be low.	Increased winter rainfall and frequency of extreme rainfall events.	Increased winter rainfall and extreme rainfall events may lead to to increased overland flows which could exacerbate this effect by causing the fuels or oils to contaminate the soil or groundwater.	Not significant due to the design and mitigation measures specified which should prevent spills. Any requirements for monitoring will be determined as part of the site investigation, which will be undertaken as part of the detailed design process.	No additional measures required.
Exposure of staff or local residents to contaminants during excavations and construction activities (uptake through direct contact, indigestion and inhalation of soil/dust/fibres/vapours)	Construction	Any hazardous waste would be stored separately in suitable containers. Where contaminated soils are present that are hazardous these would stockpiled and sheeted to prevent water ingress and to prevent the materials becoming airborne. During the construction phase, best practice in compliance with the Code of Construction Practice (CoCP) and Pre-CEMP. Health and safety measures including personal protective equipment for workers will be provided. A watching brief and protocols for dealing with unexpected contamination during excavations will be put in place.	Increased winter rainfall and frequency of extreme rainfall events.	Rainfall events are expected to become more intense, which could exacerbate this effect by causing contaminants to more readily migrate into the soil or groundwater.	Not significant due to the design and mitigation measures specified e.g. CoCP and best practice Health and Safety measures. Any requirements for monitoring will be determined as part of the site investigation, which will be undertaken as part of the detailed design process.	No additional measures required.

Impacts on ground conditions and groundwater during operational activities	Operation	Standard best practice measures would be employed for activities during the operation stage. Potential for foundations introducing preferential pathways for contaminant migration is low.	Increased winter rainfall and frequency of extreme rainfall events.	Rainfall events are expected to become more intense, which could exacerbate this effect by causing contaminants to more readily migrate into the soil or groundwater.	Not significant due to the design and mitigation measures specified e.g. CoCP and best practice Health and Safety measures.	No additional measures required
Road Drainage and Water Environment						
Loss of floodplain at Junction 15.	Operation	The Scheme encroaches on a floodplain located within Flood Zone A. A compensation floodplain storage area using an existing school playing field will be provided using would-be loss of volume. Detailed analysis of the lost storage and compensation volumes will be undertaken during the detailed design phase of the Scheme.	Increased winter rainfall and frequency of extreme rainfall events.	Increased winter rainfall and extreme rainfall events may lead to more severe flooding. The compensation floodplain storage area may not be designed to withstand additional rainfall, thereby exacerbating the impact of the Scheme on flooding.	Not significant due to the consideration of climate change allowances for the compensation floodplain proposed at Junction 15. Please see the Flood Consequences Assessment for further information (Report Ref: A55J15J16-RAM-30-15-RP-X-0026_APPENDIX_7.2).	No additional measures required.
The Scheme will result in larger area of impermeable road surface than at present.	Operation	The Scheme's surface water drainage system will be designed to control runoff rates up to 1 in 100 return period incorporating a 20% allowance to account for climate change in line with HD33 (see Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001).	Increased winter rainfall and frequency of extreme rainfall events.	Increased winter rainfall and extreme rainfall events may lead to overwhelming of drainage systems, resulting in surface water flooding on the Scheme. The drainage system may not be designed to withstand additional rainfall, thereby exacerbating the impact of the Scheme on flooding.	Not significant due to the consideration of climate change allowances in the Drainage Strategy This details that the attenuation systems will be designed to temporarily store runoff and discharge at a rate no greater than the existing rate.	No additional measures required.

Nature Conservation (Biodiversity)						
Contaminants entering nearby waterbodies or the marine environment.	Operation	The proposed surface water drainage strategy specifies that interception of drainage from road and catchment run-off would be undertaken utilising SuDs to prevent silt entering nearby waterbodies including drainage ditches and filter drains and pipes / culverts to control runoff rates up to the 1 in 100 year return period, incorporating a 20% allowance to account for climate change in line with HD33 (see Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001).	Increased winter rainfall and frequency of extreme rainfall events.	Increased frequency and intensity of rainfall events could exacerbate this effect by causing overwhelming of drainage systems.	Not significant due to the consideration of climate change allowances and SuDs specified in the Drainage Strategy.	No additional measures required.
Removal of existing planting.	Operation	An Outline Ecological Management Plan will be produced during the detailed design stage as specified in Chapter 8: Nature Conservation. This will include a planting design which allows movement of species in line with the Green Corridors Initiative to achieve a biodiversity net gain, i.e. linear habitats including shrub and tree planting.	Increase in mean temperatures and the frequency and severity of extreme heat events (i.e. heat waves).	Higher temperatures could lead to a change in species composition and or the introduction of invasive species which could compromise the ecological design.	Not significant due to the consideration of planting design in the Outline Ecological Management Plan and the Environmental Landscape and Ecology Aftercare and Management Plan.	Additional measures recommended: A wide genetic base of vegetation types and a mix of provenances is recommended to build in adaptability to an unpredictable future climate.[20].

[20]Provenance choice of native trees under climate change in England - Policy Advice Note. UK Government, Forestry Commission, 2019. Available at: https://www.gov.uk/government/publications/provenance-choice-of-native-trees-under-climate-change-in-england-policy-advice-note [Accessed on 16/10/2019].

Landscape and Visual Effects						
Loss of landscape features and fabric due to removal of hedgerows to facilitate access to the site.	Construction	Where feasible, existing vegetation will remain. Vegetation that is removed would be reinstated following construction. Mitigation planting would replace the existing roadside plantations lost as a result of the Scheme and, subject to successful establishment, screen and integrate the overbridge and westbound slip roads into the localised landscape.	Increase in the frequency and severity of extreme heat events (i.e. heat waves).	Increased frequency of heat waves and drought conditions could cause mitigation plants to deteriorate or die, reducing their screening effect. However, it should be noted that extended growing season due to warmer temperatures and greater rainfall may be beneficial for some plants, increasing their growth and screening effect.	Not significant due to the consideration of planting design in the Outline Ecological Management Plan and the Environmental Landscape and Ecology Aftercare and Management Plan.	Additional measures recommended: A wide genetic base of vegetation types and a mix of provenances is recommended to build in adaptability to an unpredictable future climate[21].
Loss of landscape features and fabric due to removal of roadside vegetation.	Operation	Vegetation that is removed would be reinstated following construction. Mitigation planting would replace the existing roadside vegetation lost as a result of the Scheme and, subject to successful establishment, screen and integrate the overbridge and westbound slip roads into the localised landscape.	Increase in the frequency and severity of extreme heat events (i.e. heat waves).	Increased frequency of heat waves and drought conditions could cause mitigation plants to deteriorate or die, reducing their screening effect. However, it should be noted that extended growing season due to warmer temperatures and greater rainfall may be beneficial for some plants, increasing their growth and screening effect.	Not significant due to the consideration of planting design in the Outline Ecological Management Plan the Environmental Landscape and Ecology Aftercare and Management Plan.	Additional measures recommended: A wide genetic base of vegetation types and a mix of provenances is recommended to build in adaptability to an unpredictable future climate[21].
Cultural Heritage						
Potential interactions of climate change with the identified effect are considered to be negligible.						
Community and Private Assets						
Potential interactions of climate change with the identified effects are considered to be negligible.						

Air Quality						
Exposure of sensitive receptors (staff/local residents/ecological receptors) to dust during excavations and construction activities (uptake through direct contact, indigestion and inhalation of soil/ dust/ fibres/ vapours).	Construction	During the construction phase, best practice in compliance with the CoCP will be undertaken. This will include measures such as developing a dust management plan which will form part of the Pre-CEMP. Health and safety measures including personal protective equipment for workers will be provided.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation may increase dust production and circulation which has the potential to affect human health.	Not significant due to the design and mitigation measures specified e.g. CoCP and Pre-CEMP Any requirements for monitoring will be determined as part of the site investigation, which will be undertaken as part of the detailed design process.	No additional measures required.
Exposure of sensitive receptors (staff/local residents/ecological receptors) to dust as a result of material storage, processing, and stockpiling.	Construction	During the construction phase, best practice in compliance with the CoCP and Pre-CEMP will be undertaken. This will include measures such as including the use of bunds; not storing of stockpiled materials within 10m of water courses and; damping down / sheeting during dry windy periods.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation.	Drought conditions may impact the availability of water for dust suppression mitigation measures, which would reduce the effectiveness of embedded mitigation measures resulting in impacts upon the receptor.	Not significant.	Additional measures recommended: Temporary storage of water should be considered during the construction stage to be used in drought conditions.
Exposure of sensitive receptors (staff/local residents/ecological receptors) to dust during operational stage (uptake through direct contact, indigestion and inhalation of soil/dust/fibres/vapours)	Operation	During the operational stage of the Scheme it is recommended that earthworks should be revegetated and to stabilise surfaces as soon as practicable.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation may result in failure vegetation on earthworks.	Not significant.	Additional measures recommended: Watering of vegetation should be considered during the construction and planting establishment stage to be used in drought conditions.

Noise and Vibration						
Potential interactions of climate change with the identified effects are considered to be negligible.						
All Travellers						
Potential interactions of climate change with the identified effects are considered to be negligible.						
Materials						
Potential interactions of climate change with the identified effects are considered to be negligible.						
Population and Human Health						
Potential interactions of climate change with the identified effects are considered to be negligible.						
Major Accidents						
Exposure of sensitive receptors (staff) to coastal flooding from the sea.	Construction	During the construction phase, advanced notice of severe weather from forecasters with advice from NRW regarding flood risk will be given. Construction works in flood vulnerable areas commenced in low-risk seasons, potential pollution-causing construction materials and plant stored away from flood risk areas.	Increase in future flood risk and coastal sea level rise. There may also be changes in tidal characteristics which could lead to more frequent or more severe flooding.	Increased risk of coastal flooding could result in increased risk to staff during construction.	Not significant.	No additional measures required.

Exposure of sensitive receptors (staff) storms and gales.	Construction	During the construction phase, potential pollution-causing construction materials and plant, or materials that could be dangerous if blown around in strong winds, would be temporarily removed. Please refer to Chapter 17, Major Accident and Disaster for more information.	Increased frequency of windstorm events in the second half of the 21st Century.	Increased frequency of windstorm events could result in higher wind loading and subsequent damage to construction materials, plant and vegetation.	Not significant.	No additional measures required.

Climate Change Resilience Assessment

Table 16.6: Climate Change Resilience Assessment for Junction 15 Scheme

Climate hazard	Construction/ Operational Stage	Climate effect	Proposed design and/or mitigation measures	Climate change implications	Significance of effect	Additional mitigation
Intense Rainfall events	Construction	Overland flows could lead to the erosion of stockpiles and silting of drainage assets which could lead to localised surface water flooding.	During the construction stage, management of stockpiles would be undertaken following best practice in line Pollution Prevention Guidelines and according the Pre-Construction Environmental Management Plan (Pre-CEMP) for the Scheme. This would include measures such as such as storing materials in a way to minimise silt laden runoff, water spraying and timely removal of stockpiled soil to prevent surface water run-off. Additionally, the Scheme's surface water drainage strategy specifies that interception of drainage from road and catchment run-off would be undertaken utilising Sustainable urban Drainage Systems (SuDs) including drainage ditches and filter drains designed to perform good water quality treatment and physical filtration to remove solids.	Increased winter rainfall and frequency of extreme rainfall events could lead to more frequent or more severe flooding.	Not significant	None required – the CoCP should prevent silt build up and the detailed drainage design takes account of existing flood risk + climate change. Current mitigation is considered appropriate to account for climate change.
	Construction and Operation	Overwhelming of drainage assets design capacity which could lead to localised surface water flooding.	The Proposed surface water drainage strategy specifies that interception of drainage from road and catchment run-off wouldl be undertaken utilising SuDS including drainage ditches and filter drains and pipes / culverts to control runoff rates up to the 1 in 100 year return period, incorporating a 20% allowance to account for climate change in line with HD33 (see Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001) Additionally, like-for-like flood compensation including a consideration of climate change, is being provided as part of the Scheme to ensure that there are no impacts upon flood risk to receptors elsewhere (see Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001).		Not significant	None required – the detailed drainage design takes account of existing flood risk + climate change. This should prevent localised surface water pooling and flooding of the carriageway. Current mitigation is considered appropriate to account for climate change.

	Operational	Damage to road surfaces and pavements due to scour from surface water flood events.	During the detailed design, best practice construction techniques and durable materials would be selected in accordance with DMRB HD26/06. This outlines the key requirements in terms of pavement design and layer thickness considering durability and suitability of materials taking into account likely climatic conditions and the vehicles anticipated to utilise the road. The Proposed surface water drainage strategy specifies that interception of drainage from road and catchment run-off would be undertaken utilising SuDS including drainage ditches and filter drains and pipes / culverts to control runoff rates up to the 1 in 100 year return period, incorporating a 20% allowance to account for climate change. See Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001.		Not significant	None required – the detailed drainage design takes account of existing flood risk + climate change and durability has been considered as part of the pavement specification and design. This should prevent localised surface water pooling and flooding of the carriageway and prevent deterioration of the pavement quality. Current mitigation is considered appropriate to account for climate change.
	Operation	Localised surface water flooding which could lead to hydroplaning and unsafe diving conditions.	The proposed surface water drainage strategy specifies that interception of drainage from road and catchment run-off would be undertaken utilising SuDS including drainage ditches and filter drains and pipes / culverts to control runoff rates up to the 1 in 100 year return period, incorporating a 20% allowance to account for climate change. See Drainage Strategy for more details Ref: A55J15J16-YGC-05-15-RP-D-0001. In addition, kerb and gullies system would be installed for the Scheme in accordance with DMRB Volume 4 Section 2: Part 3 - Drainage. This specifies the requirements for gully spacings and design, taking account of width of flow for design storms which would be incorporated into the detailed drainage design for the Scheme.		Not significant	None required - the detailed drainage design takes account of existing flood risk + climate change. This should prevent localised surface water pooling and flooding of the carriageway which can lead to a risk of unsafe conditions and hydroplaning. Current mitigation is considered appropriate to account for climate change.

Sea Level Rise	Construction	Tidal flooding which could lead to localised flooding of the Scheme.	During the construction stage it is identified that works in Shore Road East and the Promenade will be more vulnerable to flooding (Flood Zone 3). The Pre-CEMP will provide detailed mitigation measures such as ensuring the Contractors sign up to Natural Resources Wales Flood Warning System, and in the event of stormy conditions, warnings will be recieved and construction activties will be paused. Early warnings will also allow for equiptment will be moved out of the area at risk.	Increase in future flood risk and coastal sea level rise. There may also be changes in tidal characteristics which could lead to more frequent or more severe flooding.	Not significant	Current mitigation is considered appropriate to account for climate change.
	Operation		Coastal flood defences (Llanfairfechan Sea Wall) are located to the north of the Scheme, along the coastline of Llanfairfechan. It is understood from Natural Resources Wales data that the protection provided by these assets is to the 1-in-200 year annual probability event. For more information see the Flood Consequences Assessment (Report Ref: A55J15J16-RAM-30-15-RP-X0026_APPENDIX_7.2).		Not significant	None required – a flood consequences assessment (FCA) has been produced as part of the Scheme which considers the risk of tidal flooding. Existing coastal flood defences are deemed acceptable taking account of climate change. Current mitigation is considered appropriate to account for climate change.
		Tidal locking of proposed drainage network	During the detailed design, the specification of 'Flap Valves' on elements of the drainage systems vulnerable to tidal lock-in following best practice in HA107, will be considered.		Not significant	None required – the detailed draineg strategy will consider the use of Flap Valves within the design to mitgate against the potential impacts of tidal locking.
High temperatures and heatwaves	Construction	Staff welfare impacts for example, heat stress and unsafe working conditions.	The risk of heat stress to staff working outdoors would be managed through health and safety procedures. This would include the necessary Personal protective Equipment and toolbox talks to highlight risks of heatstroke.	Increase in the frequency and severity of extreme heat events (i.e. heat waves) could result in unsafe working conditions.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
	Operation	Distortion of bearings and movement joints as a result of thermal loading which may compromise the structural stability of the bridge.	During the detailed design, thermal loading would be managed through the selection of durable materials and would be informed by best practices such as DMRB Volume 2 – Section 3: Highways Structure and Eurocode design which utilise isotherms to take account of climatic conditions. Regular inspection and maintenance of the bridge structure will take place over its design life and action will be taken as required.	Increase in the frequency and severity of extreme heat events (i.e. heat waves) could result in increased thermal loading on bridges structures.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
	Operation	Change in composition of vegetation specified	An Outline Ecological Management Plan will be produced during the detailed design stage as	Increase in the frequency and severity	Not significant	None required - Current mitigation is considered

		as part of the landscaping design for example, introduction of invasive species and disease which could lead to vegetation failure.	specified in Chapter 8: Nature Conservation. This will include a planting design which allows movement of species, i.e. linear habitats including shrub and tree planting. A wide genetic base of vegetation types from different provenances following best practice is recommended as part of the ecological mitigation, for example species rich grassland. Regular inspection and checks for health of the vegetation would be required to ensure that invasive and undesired species are managed appropriately.	of extreme heat events (i.e. heat waves) could result in the introduction of undesired / invasive species, compromising the landscape design.		appropriate to account for climate change.
Cold weather events	Operation	Presence of ice and frost conditions requiring the use of de-icers e.g. grit salt which could result in corrosive action on bridge components.	During the detailed design, the selection of materials will ensure that corrosion rates are considered through best practice for example, British Standards. This includes the consideration of chloride induced corrosion of embedded steel in concrete e.g. weathering steel shall not be used in structures subject to de-icing salts. Regular inspection and maintenance of the bridge structure would occur and remedial action would be taken as required.	Cold weather and extreme cold events will still occur (just less frequently) and the use of de-icers will still be required.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
Seasonal variation in temperature (high temperatures and cold events)	Operation	Freeze-thaw during cold snaps and extreme high temperatures can cause damage to road surfaces including road and pavement cracking and deformation resulting in a reduction of road service life.	During the detailed design, best practice construction techniques and durable materials would be selected in accordance with DMRB. DMRB Vol 2 Section 2 Part 3 – HD26/06 – Pavement Design Specification. HD26/06 outlines the key requirements in terms of pavement design, layer thickness and the most suitable materials to be used, taking into account likely climatic conditions and the vehicles anticipated to utilise the road. Regular inspection and maintenance of the road would take place over its design life and action would be taken as required.	Increase in the frequency and severity of extreme heat events (i.e. heat waves) could result in more frequent pavement rutting / cracking events.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.

Drought	Construction and Operation	Dry and desiccated soils leading to soil erosion. This could cause sedimentation of drainage reducing their capacity and increasing the risk of flooding.	The Scheme surface water drainage strategy specifies that interception of drainage from road and catchment run-off would be undertaken utilising Sustainable urban Drainage Systems (SuDS) including drainage ditches and filter drains designed to perform good water quality treatment and physical filtration to remove solids.	Extended periods of drought could arise as a result of warmer summer months with limited precipitation. This could result in increased desiccation and soil erosion	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
	Operation	Shrink swell processes resulting in desiccation cracking and embankment and earthwork instability.	During the detailed design stage, robust slope design would allow for any future changes in soil moisture content and groundwater pressures as well as specifying appropriate earthworks materials. Earthworks would be designed to incorporate drainage elements which would convey surface water away from the earthworks preventing any scouring impacts. Regular inspection and maintenance of embankments and earthworks would take place over their design life and action would be taken as required.	Increased winter rainfall followed by an increase in the frequency and severity of extreme heat events or more frequent dry spells would result in greater fluctuations in soil moisture content. This could result in shrink swell impacting upon embankment and earthwork instability.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
	Operation	Bridge foundation design.	During the detailed design, ground investigations, stability analyses and design calculations would be undertaken to input into the bridge foundation design. The design of the bridge structure would be undertaken in accordance with DMRB and Eurocode design, incorporating best practice. Regular inspection and maintenance of the embankment structure would take place over its design life and action would be taken as required.	Increased winter rainfall followed by an increase in the frequency and severity of extreme heat events or more frequent dry spells would result in greater fluctuations in soil moisture content. This could result in shrink swell impacting upon structural elements of the asset e.g. foundations.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.
Windstorm events	Construction and Operation	Damage to signs/signals and minor structures (e.g. gantries) and vegetation as a result of wind loading or wind blown debris.	During the detailed design, wind loading would be considered in accordance with DMRB Volume 2: Highway Structures: Design (Substructures and Special Structures) Materials which sets out the wind loading factors considering the structure design life. Consideration of wind gusting on road side vegetation would l be undertaken and best practice such as appropriate staking of trees to reduce vulnerability to wind damage would be undertaken.	Increased frequency of windstorm events in the second half of the 21st Century could result in higher wind loading and and subsequent damage to minor structures and vegetation specified as part of the design.	Not significant	None required - Current mitigation is considered appropriate to account for climate change.

	Operation	Wind erosion for earthworks and embankments	During the detailed design, embankments and earthworks would be grass seeded which would reduce the susceptibility to wind erosion. Regular inspection and maintenance of embankments and earthworks would take place over their design life and action would be taken as required.		Not significant	None required - Current mitigation is considered appropriate to account for climate change.

Greenhouse Gas Assessment

16.11.1 The demolition and construction GHG emissions are reported in tonnes of CO_2e for the duration of the 24 month construction period. The GHG emission assessment has assumed the construction working hours detailed in Chapter 2.

16.11.2 The results of the GHG assessment are presented in Appendix 16.1 and summarised in Table 16.7.

Table 16.7: GHG Emissions (tonnes of CO_2e)

Item	Estimated GHG Emissions (tCO_2e) over 24 month demolition and construction period
Embodied GHG emissions	11,859.40
Construction onsite GHG emissions	8461.57
Construction transport GHG emissions	318.8
Waste disposal GHG emissions	0.21
Total	20,634

16.11.3 The construction and demolition associated with the Junction 15 Scheme is expected to contribute 0.0008% of the UK's 3rd carbon budget (2018-2022). IEMA best practice guidance states that all GHG emissions contribute towards climate change and are significant. Therefore, although emissions from the Scheme are considered low in comparison the UK Carbon budget, they are significant. It should be noted that by removing the existing roundabouts, which typically involves hard acceleration and deceleration, a benefit of the A55 Junction 15 Improvements is to minimise stop-start conditions. This will contribute to improved vehicle emissions.

16.11.4 The construction of Junction 15 and Junction 16 will be delivered concurrently. As a result, GHG emissions would be reduced as the transportation of construction and waste materials and the onsite emissions from machinery would be optimised. Please see Chapter 2: The Scheme for further information on the construction period and working hours associated with the Scheme.

16.11.5 It is assumed that 95% of demolition materials resulting from the removal of the footbridge located east of Junction 15 and the demolition of two properties adjacent to Shore Road would be reused or recycled. It is also assumed that 70% of waste materials arising from construction operations will be reused or recycled. The benefits resulting from reusing and recycling materials have been considered in the GHG emissions assessment.

16.12 Mitigation Measures

Construction Stage

Climate Change Resilience Assessment

16.12.1 No additional mitigation measures relating to climate resilience have been identified as being required for the construction stage.

In-combination Impact Assessment

16.12.2 No additional mitigation measures relating to ICCI have been identified as being required for the construction stage.

Greenhouse Gas Assessment

16.12.3 A Pre-CEMP would be prepared in advance of construction which would define all mitigation measures to be adopted ensure as the design progresses, consideration of construction emissions and design enhancement measures (particularly related to embodied carbon within materials) should be used as a decision-making criterion, with the aim of minimising emissions where practicable.

16.12.4 No additional mitigation measures relating to GHG emissions have been identified as being required for the Scheme construction stage. It is recommended that the following opportunities to minimise GHG emissions should be considered at the detailed design and construction stage of the Scheme to reflect the carbon reduction hierarchy as follows[21]:

Build nothing:

- Evaluate the basic need for an asset and/or programme of works and shall explore alternative approaches to achieve outcomes set by the Welsh Government.

Build less:

- Evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required
- Reuse or recycle the existing road surface planning's and demolition materials.

Build clever:

- Consider the use of low carbon solutions (including technologies materials and products) to minimise resource consumption during the construction, operation and user's use stages of the asset or programme of work.
- Substitute construction assets for lower-carbon alternatives (e.g. using low temperature asphalt)
- As far as possible, incorporating material resource efficiency and waste minimisation best practice into design, in particular improving the cut/fill balance of the Scheme.
- Selection and engagement of suppliers of materials and construction contractors taking into account their proximity to the Scheme in order to reduce transport miles, as well as

[21]Carbon Management in infrastructure (2019). Available at: https://www.lr.org/en-gb/pas-2080/ [Accessed 23/10/2019].

their inhouse policies and commitments to the ongoing reduction of GHG emissions, including embodied emission in materials.

- For example, any surplus soils from nearby projects could be reused and local waste management facilities could be used, with the potential for reducing carbon emissions associated with transport.

Build efficiently:

- Use techniques (e.g. construction, operational) that reduce resource consumption during the construction and operation phases of an asset or programme of work
- Consider the use of efficient plant, including hybrid and electric machinery and equipment as appropriate.

Compensate:

- Consider offsetting of carbon emissions.

Operational Stage

Climate Change Resilience Assessment

16.12.5 No additional mitigation measures relating to climate resilience have been identified as being required for the completed Scheme. However, it is recommended that the design process includes a more detailed assessment of climate risks and that this be reported on at each stage of the detailed design process

In-combination Impact Assessment

16.12.6 No additional mitigation measures relating to ICCI have been identified as being required for the operational stage.

16.13 Significance of Effects

16.13.1 The assessment included in Section 16.11 of this chapter concludes that the Scheme will not result in any significant effects with regards to climate change resilience or in-combination climate impacts. Following IEMA guidance, although emissions from the Scheme are considered low in comparison the UK Carbon budget, they are significant.

16.14 Cumulative Effects

Construction Stage

Climate Change Resilience Assessment

16.14.1 The climate resilience risks identified are limited in their spatial extent to the Scheme and therefore no cumulative effect with other developments is considered.

Greenhouse Gas Assessment

16.14.2 This assessment has considered GHG emissions in the context of local and national GHG emissions and no further consideration of the Scheme's GHG emissions with other sources of

GHGs is considered necessary.

Operational Stage

Climate Change Resilience Assessment

16.14.3 The climate resilience risks identified are limited in their spatial extent to the Scheme and therefore no cumulative effect with other developments is considered.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 17 RISK OF MAJOR ACCIDENT & DISASTER

RAMBOLL Bright ideas. Sustainable change.

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17. RISK OF MAJOR ACCIDENT OR DIASTER

17.1 Chapter introduction

17.1.1 This chapter reports on an assessment of risks of major accidents and disasters. The assessment is carried out in compliance with the EIA Directive 2014/52/EU, published in the EU Journal on the 16th May 2017, which states the need to assess '*the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project during construction and operation to risks of major accidents and/or disasters which are relevant to the project concerned.'* This definition implies a focus on low-likelihood risks (those that occur so infrequently that they cannot be foreseen, or are so unlikely that the cost or adverse effects of avoidance cannot be justified) which are:

- Not properly addressed through the design of the Scheme;
- Not considered elsewhere in other assessments within the ES.

17.1.2 The UK published The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways, and Transport) Regulations on the 5th December 2017. This Statutory Instrument requires an assessment of the risks of major accident and disasters to be completed.

17.1.3 The underlying objective of this assessment is to identify appropriate precautionary actions (mitigation) to be considered because of the project's vulnerability to major accidents and/or natural disasters set against the baseline situation, which in this case is an existing highway. This chapter seeks to identify:

- Relevant major accidents and natural disasters to which the proposed development could be vulnerable;
- The potential for these to have significant adverse environmental effects;
- Measures that should be in place to prevent or mitigate the likely significant adverse effects of such events on the environment.
- To be proportionate and to avoid crossing over into the scope of other environmental assessments aspects.

17.2 Regulatory and policy framework published guidance

International regulation and policy

17.2.1 Paragraph 18 of Directive 2014/52/EU[1] states: '*In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those major accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment. In order to avoid duplications, it should be possible to use any relevant information available and obtained through risk assessments carried out pursuant to Union legislation, such as Directive 2012/18/EU of the European Parliament and the Council3 and Council Directive 2009/71/Euratom4, or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met.'*

[1] EU Directive 2014/52EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

National regulation and policy

17.2.2 The Directive has been transposed into UK law in Schedule 4 (8) of the 2017 EIA Regulations[2] which require: *'A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned'.*

17.2.3 UK law has removed the word 'natural'. An article written by a registrant of the EIA Quality Mark Registrant Scheme of the Institute of Environmental Management and Assessment (IEMA) suggests that given the intention underlying this aspect of the 2017 Directive, both man-made [major accidents] and natural disasters [disasters] should be considered[3].

Published guidance

17.2.4 As this is a new topic within the realms of EIA, the approach will evolve over time in the absence of any published guidelines. Examples of other assessments and papers published by experienced EIA practitioners have been examined and lessons learned from these.

17.2.5 Neither the Regulations nor the EU Directive define the scope or method to be used in the assessment. However, the Institute of Environmental Management and Assessment (IEMA) provides useful outline guidance in an EIA Quality Mark Article[4]. The article provides useful definitions of:

Major Accident: *uncontrolled occurrence in the course of the construction or operation of a development, leading to serious danger to the environment, which may be either immediate or delayed.*
Examples: large-scale fire, structural collapse, explosion, or transport accident.
Disaster: *This is an external event (i.e. not directly caused by the development) leading to serious danger to the environment, which may be either immediate or delayed.*
Examples: natural sources such as coastal flooding, adverse weather, ground movement; natural disasters arising from man-made sources such as escalation of a fire from an adjacent facility, dam collapse etc.

17.2.6 Emerging EIA practice is to consult the following documents to identify potential major accidents and disasters:

- *The International Federation of Red Cross & Red Crescent Societies Early Warning, Early Action* (2008). This guidance looks to other countries including those in warmer climates, thereby identifying risks that the UK may encounter in the future considering climate change and global warming.
- *The International Disaster Database.* This online source contains data covering over 22,000 mass disasters in the world from 1900 to the present day and aims to *'rationalise decision making for disaster preparedness, as well as provide an objective base for vulnerability assessment and priority setting.'*
- T*he National Risk Register of Civil Emergencies* (2017)[5]. This document is the unclassified version of the National Risk Register and it identifies the main types of civil emergencies that could affect the UK in the next five years. It is recognised, however, that this document does

[2] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.
[3] IEMA (2016) EIA Quality Mark Article: Assessing Risks Of Major Accidents / Disasters In EIA. Available at: https://www.iema.net/assets/uploads/EIA%20Articles/wsp_assessing_risks_of_major_accidents_disasters_in_eia__revised.pdf
[4] https://www.iema.net/assets/uploads/EIA%20Articles/AMEC%20What%20is%20this%20MADness.pdf | Amec Foster Wheeler. 2018
[5] National Risk Register Of Civil Emergencies 2017 edition, Cabinet Office

not provide an all-encompassing list of all potential major accidents and disasters and its timescales are short-term.

- *The North Wales Community Risk Register* produced by the North Wales Resilience Forum, which is made up of representatives from all the main agencies involved in responding to emergencies: fire, police, ambulance, local authorities, the health service, environmental organisations and utilities. The purpose of the forum is to ensure representatives work together to achieve an appropriate level of preparedness to respond to emergencies that may have a significant impact on the communities of North Wales.

17.2.7 There is a lack of clarity over exactly what situations should be included in this assessment. The considered view of Andrew Mahon[6] an EIA practitioner, is that the assessment should include a '*systematic identification and assessment where the vulnerability of a development to an existing low-likelihood environmental hazard introduces or increases the risk of sensitive receptors being adversely affected following realisation of that hazard. This could result from the development introducing or enhancing a pathway between an environmental hazard and one or more sensitive receptors, increasing the likelihood of a pre-existing risk, or from the development being vulnerable to a pre-existing low-likelihood hazard, such that it releases secondary, triggered effects that impact one or more sensitive receptors'*. The assessment of low-likelihood hazards with significant consequences for sensitive receptors is the core of this assessment.

17.3 Methodology

17.3.1 The assessment is required to identify the significant adverse effects on receptors, which could arise from the vulnerability of the Scheme to relevant major accidents or disasters. The occurrence of a major accident or disaster is described as an 'event' in this chapter. The significance of the effect is assessed against a baseline of the existing situation.

17.3.2 For such event to pose a risk to the environment, there must be a:

Source: a major accident or disaster; and

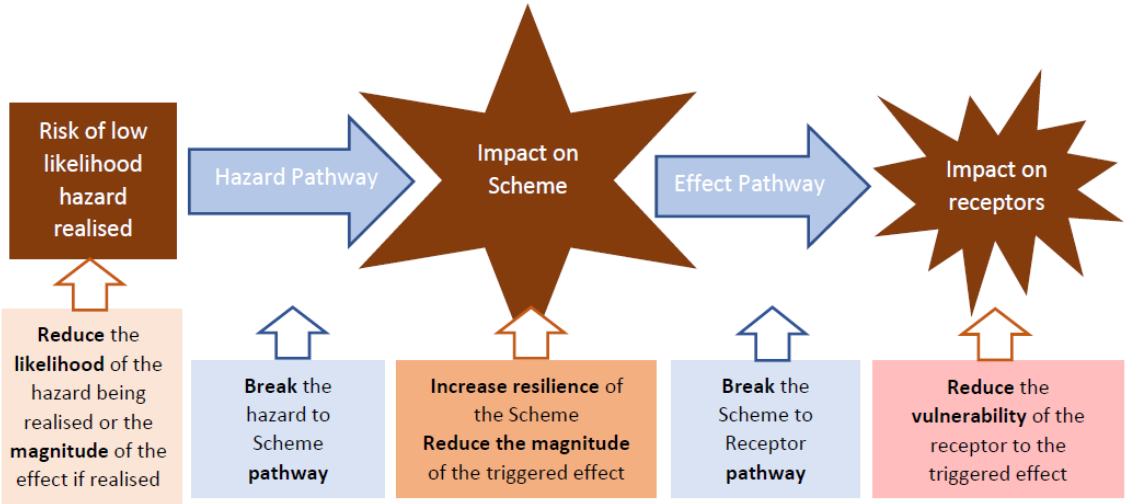
Pathway: the mechanism by which a receptor could be affected by the event; and

Receptor: population, human health, biodiversity (with particular attention to species and habitats protected under Directive 92/43/EEC(1) and Directive 2009/147/EC(2)), land, soil, water, air and climate; material assets, cultural heritage and the landscape; the interaction between the factors.

17.3.3 During Key Stage 1 of this project (considering a long list of options) and Key Stage 2 (examining a short list to identify a preferred option) the high-likelihood hazards have been identified and then eliminated or avoided. In Key Stage 3 the Low Likelihood Hazards are considered. This chapter is concerned with Key Stage 3, which involves the development of a preferred option and proposed mitigation. The assessment of the preferred option has identified avoidance and mitigation measures for the low likelihood hazards. Figure 17.1 shows how there are various means to achieve avoidance or mitigation.

[6] Disasters in EIA, by Andrew Mahon, TRANSFORM, For Environmental Professionals 2nd March 2018.

Figure 17:1: Approach to avoidance and mitigation



Identifying threats

17.3.4 A two-stage screening is used:

1. Firstly, to rule out matters that are more properly addressed by compliance with detailed legislation, for example, health and safety matters;
2. Secondly, to rule out any potential major accidents and disasters (threats) that are impossible or of negligible likelihood in the context of this project. For example, in North Wales there is no volcanic activity, but there is a recognised likelihood of tidal surges.

17.3.5 Major accidents and disasters on the list are subject to further consideration in the following sequence:

1 **Adopting the suitable long list of threats** such as those in the sources identified in paragraph 17.2.6. The most appropriate sources for this project include the *National Risk Register of Civil Emergencies (2017)* and *The North Wales Community Risk Register.*

2 **Screening of relevant threats**: based on the risk registers listed in item 1 above. This is expected to give rise to a short list of low likelihood/severe consequence threats as set out in Figure 17.2.

3 **Consideration of vulnerability:** how site location and adjacent landuse makes the project vulnerable to the risk of the threats remaining on the list following screening;

4 **Scoping of threats to the Scheme**: using source-pathway-receptor risk matrix approach where the project becomes a pathway that increases risk as a result of the changes brought about by the Scheme;

5 **Consideration of threats:** based on risk factors, avoidance, prevention and mitigation;

6 **Cross referencing** of identified risks relevant to other ES topics, as appropriate;

7 **Examination of remaining threats**.

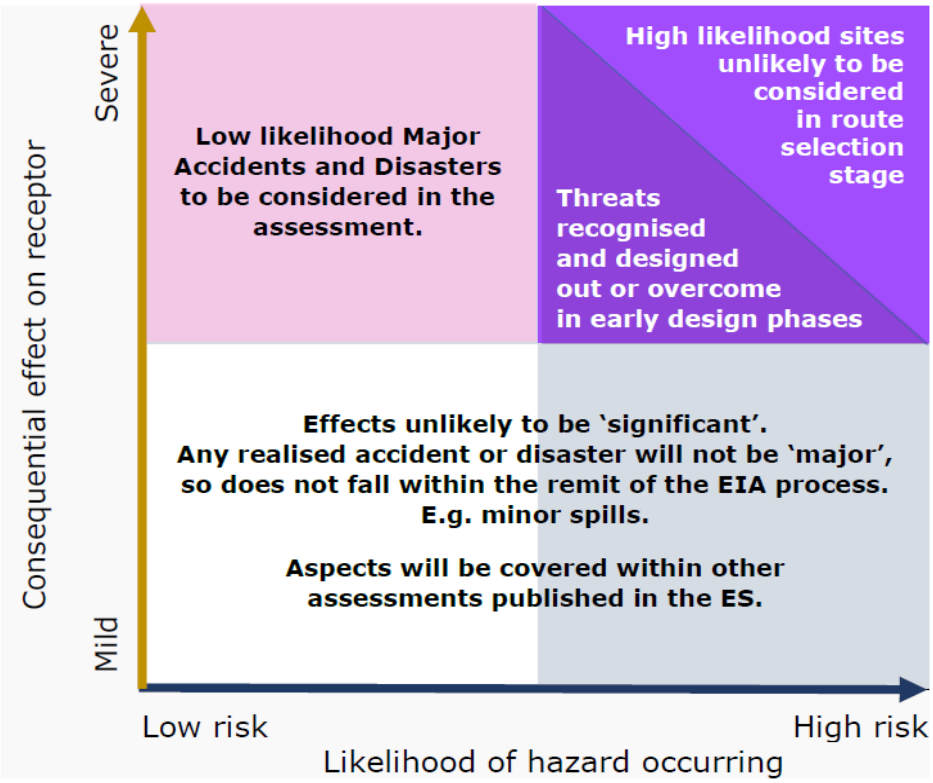
17.3.6 The assessment will evaluate the exposure and vulnerability of the development to each of the threats on the short list and identify the major accidents or disasters associated with each that could potentially give rise to adverse effects on the environment. Then the risk of likely significant environmental effects that would be caused is evaluated. Figure 17.2 shows how these potential impacts are considered, and how they are likely to be those of low likelihood and moderate to severe consequences. An explanation of the matrix is provided below:

Low Likelihood - Mild Consequence *(bottom left, no colour):* these threats are considered unlikely to have moderate or severe consequences and are therefore outside

the scope of this assessment. Although some of these threats might affect other parts of the A55, there are likely to be well-established procedures in place to address the consequences with no significant effects on the environment.

High Likelihood - Mild Consequence *(bottom right, grey square):* these threats are considered unlikely to have moderate or severe consequences and are therefore outside the scope of this assessment. Although some of these threats might affect other parts of the A55, there are likely to be well-practised procedures in place to address the consequences of these more frequent events with no significant effects on the environment.

Figure 17:2: Consideration of risk for major accidents and disasters



High Likelihood - Severe Consequence *(top right, purple square):* This square is divided into two triangles by the diagonal line to differentiate between:

(Upper triangle): Threats of such magnitude and severe consequence that they would influence the choice of route.

(Lower triangle): Threats of sufficient magnitude and severity of consequence that they will be considered in design of the preferred option and any necessary mitigation incorporated.

Low Likelihood - Severe Consequence *(top left)*: This is the square containing the threats that pose consequences severe enough to be considered in option selection and Scheme design, but where the risk of occurrence is so low that the risks to the Scheme and the environment, due to the vulnerability of the Scheme, are considered acceptable.

17.4 Study area

17.4.1 The study area is definable only after any potential major accidents or disasters that could arise have been identified as relevant to the project and which could result in serious danger to the environment. In each case the project is either the source of, or is subjected to, the major accident or disaster resulting in potentially significant adverse effects on the environment.

17.4.2 Figures in Volume 3 of this ES will provide an understanding of the Scheme and the setting. Figure 1.1 is the Scheme location; 2.2 shows the Scheme setting and Figure 2.3 is photographs of the existing situation. The general arrangement of the Scheme is shown in Appendix 2.5.

17.5 Baseline conditions

17.5.1 A desk-based study has been undertaken to establish the baseline environment on which the assessment of risk is to be carried out, as this will influence both the likelihood and the impact of a major accident and/or natural disaster.

17.5.2 North Wales' geographical location means that it 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 which have affected North Wales, particularly those that lead to flooding.

17.5.3 The A55 dual carriageway was designed in the 1980s, following the North Wales coast to provide improved access to the port of Holyhead and to the communities that live along the coast. The route responds to some extreme topography from rocky coastline and cliffs to low-lying river flood plains and coastal foreshore. This is reflected in the landform that the dual carriageway crosses on either side of junctions 15. 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.

17.5.4 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. Examples of major accidents and disasters that could affect the Scheme and have consequences for Llanfairfechan and other sensitive receptors include:

A. Sea and tide: tidal ranges vary from neap to spring tides, and tidal extremes can occur when exacerbated by weather conditions, leading to flooding above the normal high tide line. The effects of climate change are predicted to include an increase in sea level which would exacerbate high tidal extremes. At Llanfairfechan there are coastal areas of the town that are at risk of flooding from the sea in Flood Zone 2 and 3[7]. Zone 2 (1% to 0.1% probability) is a reduced area that includes much of the Promenade and low land to the south of the railway and linked to the Promenade by Shore Road East. Zone 3 (0.5% to 0.1% probability) covers a greater extent than Zone 2 and includes areas to the south of the railway linked to the Promenade by Station Road. Flood defences protect the area and so flooding from the sea would occur only when these defence structures were

[7] https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/

overwhelmed. The West Wales Shoreline Management Plan provides information on potential sea flooding and sets out the features that could be affected[8].

B. Rivers and surface water: the local catchments are small but mountainous with short, steep routes down to the coastal plain and sea. The watercourses are 'flashy', which means that periods of precipitation can result in a rapid increase in the volume and velocity of water descending the steeper upland channel. In these spate conditions fast flowing water is then slowed as the river channel gradient eases on the coastal plain. As a consequence the slower-moving water backs 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 as a consequence of heavy precipitation. Climate change is predicted to lead to an increase in sea level which would exacerbate high tidal extremes;

C. 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. Severe weather, possibly influenced by climate change effects, could influence the behaviour of the material forming the slopes;

D. Industrial premises and manufacturing: quarrying in the Penmaenmawr headland is the largest industry in the proximity of the Scheme with the potential to influence Llanfairfechan and the A55 and railway corridor, but the existing presence of industrial hazards associated with the quarries or other industries in the proximity would not change as a consequence of the Scheme;

E. Road tunnels: through the headlands could be closed by major traffic accidents or other events with the consequence that travellers and goods would unable to travel east or west on this international route. However, the risk of tunnel closures following the Scheme would be no greater than for the existing A55;

F. Rail and road traffic: major accident could occur within or adjacent to the 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;

G. Climate change effects: as explained above could increase the above risks or influence the consequences of the risk being realised. However, the risk is no greater for the Scheme than for the existing A55;

H. From all of the above there is potential for the consequences of a low risk hazard being realised and as a consequence affecting environmental receptors.

17.6 Potential effects

17.6.1 Tables 17.1 and 17.2 provide a checklist of the low likelihood / high (severe) consequence hazards based broadly on the list provided in the Risk Registers[9]. Those that are likely to be relevant to the Junction Improvements Scheme are identified and scoped-in for further assessment.

[8] West Wales Shoreline Management Plan http://www.westofwalessmp.org/content.asp. Relevant area: PDZ20 Conwy - Gerazim to Great Orme.

[9] National Risk Register Of Civil Emergencies 2017 edition, Cabinet Office and The North Wales Community Risk Register

Table 17.1: Potential Effects: initial threat list: Natural Hazards

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Geophysical	Earthquake	**NO**	**NO**	**NO**	Geological conditions allowing the transmission of shockwaves	√		√			√	√	√	**NO**	**OUT**	Earthquakes of a magnitude to be a threat rarely occur in the UK. Minor earthquakes have not endangered lives or caused extensive damage. National Risk Register of Civil Emergencies 2017 (NRRCE) states: '*Earthquakes in the UK are moderately frequent but rarely result in large amounts of damage. An earthquake of sufficient intensity (determined based on the earthquake's local effect on people and the environment) to inflict severe damage is unlikely'*. There is a negligible risk of an earthquake of enough magnitude to adversely affect the A55 carriageway, structures and drainage network. Earthquakes or earth tremors of lower magnitude are taken into consideration in design, with the result that there is a negligible risk of significant adverse effects on the Scheme, or on the environment as a result of the Scheme.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Volcanic activity	**NO**	**NO**	**NO**	Geological conditions are not present	√	√	√	√	√	√	√	√	**NO**	**OUT**	Volcanic activity in the UK does not occur. The wider effects of ash clouds from Iceland, the closest location of volcanoes, spread to North Wales as experienced in 2010, but did not affect the operation of the road network. There is a negligible risk that a remote volcanic eruption would affect the existing A55 or the Scheme or affect the environment as a consequence.
	Landslides	**YES**	**NO**	**NO**	Loose rock and soil on steep slopes are present and could affect the A55	√	√	√	√		√	√	√	**YES**	**OUT**	There is a low risk of landslides occurring on the steep rocky slopes of Penmaenmawr headland. The areas at risk are outside the footprint of the proposed junction improvements. Risks of scree material falling onto the A55 outside the footprint are a recognised threat to the road and to traffic, but measures have been installed at Penmaenmawr headland to reduce the hazards associated with material falling from the slopes. While the A55 corridor might be vulnerable to landslides, the consequences of a landslide on the Scheme is unlikely to have an adverse effect on the environment.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Tsunami	**NO**	**NO**	**NO**	The sea lies very close to the site	√	√	√	√		√	√	√	**NO**	**OUT**	There is a negligible risk of Tsunami. European Spatial Planning Observation Network (ESPON) have no records of these threats occurring along the North Wales coast and there are no tectonically-active zones in the vicinity to affect the existing A55 or the Scheme, nor to affect the environment as a consequence.
Hydrological	Coastal flooding from the sea	**YES**	**YES**	**NO**	The sea lies very close to the site	√		√	√		√	√		**NO**	**IN**	The A55 lies on the coast, elevated a few metres above the high tide line but protected by coastal flood defences and the railway. NRW Flood Maps show that 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 (Flood Zone 2 and 3). Flood Zone 3 is the 0.5% or greater risk of flooding each year. Flood Zone 2 is 0.5% - 0.1% risk of flooding each year. The consequences of coastal flooding risk from the sea would not be affected by changes resulting from the Scheme and so would not result in significant adverse effects on the environment as a result of the Scheme. During construction, flooding from the sea could have a significant effect on construction activity associated with Shore Road East and the Promenade. Refer to Chapter 7 Road Drainage and the Water Environment.
	Fluvial flooding	**YES**	**YES**	**NO**	Water flows in watercourses towards the sea	√			√		√	√		**NO**	**IN**	The NRW Flood Maps show that fluvial flooding (Flood Zone 2 and 3) can occur over areas of Llanfairfechan associated with the Afon Ddu along Station Road and associated low-lying land south of the A55. Flood Zone 3 is the 1% - 0.1% chance of flooding each year. Flood Zone 2 is up to 0.1% chance of flooding each year. The risk would not be changed by the Scheme would not result in significant adverse effects on the environment as a result of the Scheme. Fluvial flooding could affect construction activity associated with Shore Road East. Refer Chapter 7 Road Drainage and the Water Environment.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Surface water flooding	**YES**	**YES**	**NO**	Water not infiltrating due to paved surfaces. Surface water flows obstructed downslope.	√		√	√		√	√		**YES**	**IN**	NRW Flood Maps show that surface water flooding can occur over areas of Llanfairfechan on low-lying land and some streets on the inland (south) and coastal (north) sides of the A55. The most extensive flooding, which is classified as low risk, could affect residential properties. The risk of surface water flooding would not be adversely affected by changes resulting from the Scheme and so would not result in significant adverse effects on the environment as a result of the Scheme. Surface water flooding could affect construction activity associated with Shore Road East. Refer Chapter 7 Road Drainage and the Water Environment, which sets out proposed mitigation. The assessment includes a Flood Consequences report.
	Avalanches	**NO**	**NO**	**NO**	Heavy snowfall on steep slopes	√		√			√	√	√	**NO**	**OUT**	No avalanches have occurred in the area in the recent past and are considered to be a negligible risk due to the shallow depths of snow accumulation and the short duration before thawing. This circumstance is not considered likely to change because of climate change. The risks of avalanche are not increased by the Scheme.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Climatological/meteorological	Hurricanes storms and gales	**YES**	**YES**	**YES**	Atmosphere	√	√	√	√	√	√	√	√	**YES**	**IN**	Areas that are more exposed towards the northern Atlantic experience the highest threat of winter storms. Most of the British Isles lie within the ESPON mapping *'Very High Probability'* category, but severe hurricanes, storms and gales occur infrequently. A severe event could cause flooding of the carriageway, severe gusting winds affecting vehicles, poor visibility due to rain or blown debris, falling trees or structures blocking roads. These results are likely to cause traffic congestion, speed reductions, vehicle collisions, injuries and fatalities and road or tunnel closures. Coastal locations suffer these extreme weather events more frequently than inland areas and the consequences can be more severe. Royal Metrological Society research has found that these events tend to affect critical 'single points of failure' that can sever important social and economic links[10]. Design of the Scheme to take account of severe weather would reduce the likelihood of these effects. Extreme events could still cause temporary road closure. These effects are already a risk associated with the baseline situation and so there would be no significant adverse effects on the environment as a result of the Scheme. Refer to Chapter 17 Climate Change

[10] The impacts of the 28 June 2012 storms on UK road and rail transport, David Jaroszweski, et al, published 2014; Royal Meteorological Society

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Wave/ storm surges	**YES**	**YES**	**YES**	The sea overwhelming existing defences	√	√	√	√		√	√	√	**NO**	**IN**	ESPON mapping shows that the Scheme lies on a coastline that is prone to storm surges. Storm surges are often closely linked to winter storms (see hurricanes, storms and gales). Although North Wales is within the 'Very High Probability' category, the coastline morphology of cliffs and maintained coastal protection reduces the threat of storm surges. The presence of the existing sea defences, embankments for the railway and the A55 could influence the impacts of a wave surge, but the effects of this is unlikely to be worsened as a result of the Scheme, nor are the effects on the environment likely to be worsened. Refer to Chapter 17 Climate Change and Chapter 7 Road Drainage and the Water Environment
	Extreme high temperatures	**NO**	**YES**	**YES**	Atmosphere	√	√	√	√	√	√	√	√	**NO**	**IN**	High temperatures in this maritime context are a low risk hazard for the Scheme, but these events have become more frequent in recent decades with temperatures reaching record highs in the Summer of 2019. In the UK there is a wide annual temperature range from as low as -16°C to over 30 °C. 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.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Extreme low temperatures and heavy snow	**NO**	**YES**	**YES**	Atmosphere	√	√		√		√	√	√	**NO**	**OUT**	In the UK there is a wide annual temperature range from as low as -16°C to over 30 °C. Extreme low temperatures in this maritime context are a low risk hazard for the Scheme. Some of the highest winter temperatures in the UK have been recorded on the North Wales coast. Low temperatures and deep snow can occur in North Wales, but with an average of less than 5 days in a year when snow will lie and the mild maritime setting, the risk of blockage of the A55 at Junction 15 for more than a few hours is extremely low. Extreme low temperatures could result in freezing conditions with iced surfaces, while freezing fog could result in very poor visibility, major accidents, fatalities and injuries. Traffic Wales and the maintaining agent apply long-established measures to deal with severe cold, including gritting and snow clearance on the A55. The Scheme will not result in changes to the current situation and snow, frost and severe low temperatures would not have an adverse effect on the environment as a result of the Scheme.
	Droughts	**NO**	**NO**	**NO**	Atmosphere	√	√	√	√				√	**NO**	**OUT**	Drought is not considered to constitute a risk to the A55, so the Scheme would not cause significant adverse effects on the environment.

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Severe space weather	**NO**	**NO**	**YES**	Atmosphere					√	√			**NO**	**OUT**	The NRRCE suggests that an extreme space weather event is likely to occur in a five-year period and this would have a moderate severity of impact, but with little effect on the functioning of the road network. Consequently, there would be no adverse effect on the A55. Interference with the function of electronic equipment such as signs and cameras in the nearby tunnels alone would not be a disaster but could result in blockages and congestion on the A55 for a period. The failure of electronic systems would be addressed by the deployment of Traffic Officers when conditions require their intervention. The Scheme would not result in any change to the existing circumstances on the A55 and would not have a significant impact on the environment as a consequence.
	Poor air quality	**NO**	**YES**	**YES**	Construction activity and heavy traffic congestion	√	√			√				**NO**	**OUT**	Poor air quality can occur in circumstances when airborne pollutants cannot disperse because of still air, temperature inversion or severe traffic congestion. Air pollution from petrol and diesel engine exhausts can also react, in still, hot and sunlit conditions, to produce smog. The A55 is located close to the coast with a background of high air quality dominated by maritime air carrying low concentrations of pollution. The maritime setting means that on-shore and off-shore winds and the absence of obstructions to air movement disperse air pollution rapidly. The likelihood of congestion and slow-moving queues of traffic producing high concentrations of air pollution on the A55 is mitigated by removing the roundabout and encouraging free-flowing traffic. Air quality is addressed in Chapter 12

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
	Fog	**YES**	**YES**	**YES**	Local atmospheric conditions	√								**NO**	**IN**	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 Scheme. Improving the junction will not result in increased risk of fog occurring. 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 major accidents, but the higher speeds of vehicles on the 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. Refer to Table 17.2 Major transport accidents (roads) Measures to protect the water environment are set out in Chapter 7

Disaster Group: Natural Hazards		**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Disaster subgroup	Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human health	Biodiversity (including designations)	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability of Scheme	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Biological	Wildfire	**NO**	**NO**	**NO**	Local atmospheric conditions flammable vegetation	√	√	√		√	√	√	√	**NO**	**OUT**	The Scheme does not lie within an area prone to wildfire and there is little or no dry flammable vegetation of the kind that supports wildfire. If fires did affect the existing A55 or the Scheme, the consequences are considered unlikely to cause significant adverse effects on the environment.
	Diseases and epidemics	**NO**	**NO**	**NO**	Geographical spread on transport or in atmosphere	√								**NO**	**OUT**	NRRCE explains that a pandemic among human beings would arise unexpectedly and spread quickly. The risk matrix indicates that there is a high (4) likelihood and a very high (5) impact severity of this occurring in the five-year period. If a disease or pandemic were to occur, it is unlikely to result in significant adverse effects on the existing A55, the Scheme, or on environment because of the Scheme.

Table 17.2: Potential Effects: initial threat list: Man-made Hazards

Disaster Group: Man-made Hazards	**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human	Biodiversity (including	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Extensive violence resulting in loss of life	**NO**	**NO**	**NO**	Social discord among resident or visiting population	√					√			**NO**	**OUT**	National Risk Register of Civil Emergencies (NRRCE) determines the risk of public disorder in the UK as being a high likelihood but moderate impact severity. Public disorder can escalate into violence in some circumstances. Terrorism can also result in violence and loss of life. Events of this kind occur when large numbers of people are a target of terrorism or gathering to protest and these circumstances are highly unlikely to occur in a small town with a small population and few targets for protests. If extensive violence and loss of life were to occur, the impact on the existing A55 or the Scheme would not result in significant adverse effects on the environment because of the Scheme.
Act of terrorism (on infrastructure)	**NO**	**NO**	**NO**	Social discord in a high-profile location									**NO**	**OUT**	NRRCE rates malicious attacks on infrastructure as a medium to low plausibility (risk) in a five-year period but indicates that there is a medium impact severity. The register lists only railways, air and maritime targets and does not mention attacks on roads. For this assessment, the effectiveness of an attack on the A55, possibly by damaging bridge structures, is considered of low risk and implausible, although a hoax could result in temporary road closure at time of heightened threat. The consequences are unlikely to have a significant adverse effect on the road or the environment as a consequence.

Disaster Group: Man-made Hazards	**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human	Biodiversity (including	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Widespread damage to the economy	**NO**	**NO**	**NO**	Political change, financial collapse, loss of workforce	√					√			**NO**	**OUT**	If widespread damage to the economy were to occur, the impact on the A55 or the Scheme would not result in adverse effects on the road or the environment because of the Scheme.
Famine	**NO**	**NO**	**NO**	Loss of food supply	√								**NO**	**OUT**	If widespread famine were to occur, the impact on the A55 or the Scheme would not result in adverse effects on the road or the environment because of the Scheme.

Disaster Group: Man-made Hazards	**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human	Biodiversity (including	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Major road transport accidents	**YES**	**YES**	**YES**	Traffic on the A55 or on the local road network.	√	√	√	√	√	√			**YES**	**IN**	NRRCE states that road major traffic accidents occur daily on Britain's roads. Major or severe accidents involving numerous fatalities or serious injuries are less frequent. Design of the Scheme to modern standards would avoid or mitigate some major accidents by comparison with the existing road. This assessment is concerned with the major accidents that could occur despite these avoidance and mitigation measures. While major 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. 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 major 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 Scheme. During construction of the 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.

Disaster Group: Man-made Hazards	**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human	Biodiversity (including	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Major railway transport accident	**YES**	**NO**	**NO**	Derailing or damage to trains on the Chester – Holyhead line	√	√	√	√	√	√			**NO**	**OUT**	NRRCE indicates that major rail accidents are infrequent in the UK and the risk of major accident in the vicinity of the Scheme is negligible. Continuing improvements to mainline rail safety have meant that there is a reducing risk of major accident and fatalities. Railway accidents that include major spillages of highly-polluting materials such as fuels or chemicals to air, water or land are rare and with few such trains on the North Wales mainline the risk is negligible. While the railway runs parallel to the A55 through the area, the Scheme will not increase the risk of rail accidents or the risk of adverse effects on the environment.
Utility failure	**NO**	**YES**	**NO**	Damage to existing networks	√			√		√			**NO**	**OUT**	The A55 and vehicles using it are unlikely to be affected by the loss of utilities in such a manner as to cause significant adverse effects on the environment. Utilities failure could result from construction activity during junction improvement works. Local loss of power and communications might result in closure of the A55 tunnels, or loss of traffic management capability. Traffic Wales have established procedures to mitigate these effects and road or tunnel closures are likely to last for only a short duration.

Disaster Group: Man-made Hazards	**Type of risk** Will it occur?			**Pathway**	**Potential Receptor**								**Result**		**Reasons**
Major accident or disaster type	Particular location risk	Construction risk	Operational risk	Process by which receptor could be affected	Population and human	Biodiversity (including	Land and soil	Water	Air and climate	Material assets	Cultural heritage	Landscape & townscape	Effect on environment as due to vulnerability	Scoped in or out?	Why there is, or is not, a significant effect on the environment as a result of event
Major Industrial accidents	**NO**	**NO**	**NO**	Failure of control systems and human supervision, collapse of structures	√	√	√	√	√	√	√	√	**NO**	**OUT**	NRRCE explains that industrial accidents take many forms of varying scale and can cause a range of potential impacts, including health problems, loss of life, destruction of property, economic and environmental damage. Some have limited local impacts, while others have cascading effects with wider impact. This broad category of risk in the local context includes: • fires and explosions (e.g. residential buildings, fuel storage, damage to utilities); infrequent, but minor local impact with low to moderate potential to cause loss of life and damage to property; • chemical and biological contamination (e.g. oil spills or food contamination); very infrequent, minor low impact and low to moderate potential to cause loss of life. There are no major industries or hazardous industrial facilities close to the Scheme. The changes to the A55 are sufficiently minor that the effects of major industrial accidents in the wider region are unlikely to cause significant adverse effects on the Scheme, or on the environment as a result of the Scheme.

17.7 Potential Construction and Operational Effects

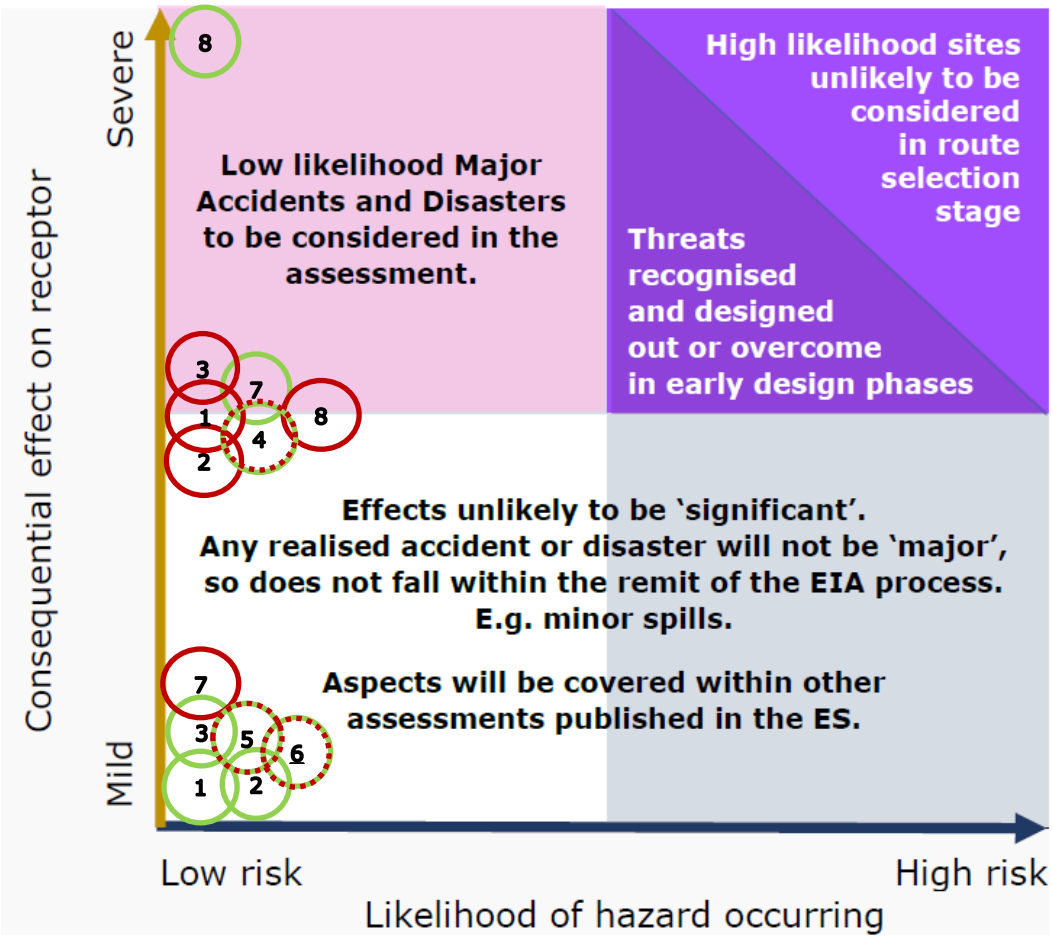
17.7.1 The discussion in Table 17.1 and 17.2 provides the basis for determining those potential events that can be scoped out because they pose a negligible risk. Those that need further consideration are summarised in Table 17.3.

17.7.2 Those threats identified in Table 17.3 are shown on the Risks and Consequences Matrix in Figure 17.2. An explanation of what the matrix shows is set out in paragraph 17.3.6. The red and green circles at the head of the table columns in Table 17 3 are also used in Figure 17.2 to differentiate between effects on the Scheme and effects on the environment.

Table 17.3: Risk and consequence assessments for the identified threats

Threats not scoped out	**Effect on Junction Improvement Scheme** (A)		**Does this change from the existing A55?**	**Potential effect on receptors because of the Scheme** (B)	
	Likelihood	**Consequence**		**Likelihood**	**Consequence**
1. Coastal flooding from the sea	Low	Mild during Construction	No change	Low	**Moderate** during Construction
2. Fluvial flooding	Low	Mild during Construction	No change	Low	Low
3. Surface water flooding	**Moderate**	Mild during Construction	Positive	Low	**Moderate** during Construction
4. Hurricanes, storms and gales	Low	**Moderate**	No change	Low	**Moderate**
5. Wave / storm surges	Low	Mild	No change	Low	Mild
6. Extreme high temperatures	Low	Mild	Change	Low	Mild
7. Fog	Low	Mild	No change	Low	Mild
8. Major Road transport accidents	Low	**Moderate**	Change	Low	**Moderate**

Figure 17.3: Risk and Consequences Matrix



17.8 Potential mitigation

17.8.1 The need for mitigation applies to the 'Low Likelihood / Moderate or Severe Consequence' threats, which are considered significant. The risk matrix in Figure 17.3 shows the events that require further mitigation to break the pathways outlined in Figure 17.1. There are also five types of mitigation were outlined in Figure 17.1:

- Type (1) Reduce the likelihood of the hazard being realised or the magnitude of the effect if realised;
- Type (2) Break the hazard to Scheme pathway,
- Type (3) Increase resilience of the Scheme or Reduce the magnitude of the triggered effect;
- Type (4) Break the Scheme to Receptor pathway,
- Type (5) Reduce the vulnerability of the receptor to the triggered effect.

17.8.2 Table 17.4 sets out the threats and proposed avoidance measures or mitigation. All the reasonable and proportionate physical measures that can be applied are included within the Scheme either as avoidance or as mitigation that takes the form of physical changes to the design or are achieved by management of the trunk road. Further measures to address the threats would be based on the established systems of trunk road network management.

Table 17.4: Threats and avoidance or mitigation measures

Potential threat	Threat to:		Potential mitigation (mitigation type)
	Scheme	Environment because of Scheme	
Coastal Flooding from the sea	No	Yes	**Construction:** advanced notice of severe weather from forecasters with advice from NRW regarding flood risk. Construction works in flood vulnerable areas commenced in low-risk seasons, potential pollution-causing construction materials and plant stored away from flood risk areas (Type 2 and Type 4). **Operation:** drainage for the Scheme will be designed in accordance with the Flood Consequences Assessment to ensure that flood risk and vulnerability of the setting is not increased by the Scheme, and the Scheme is not endangered by flood water (Type 3).
Fluvial Flooding	No	No	
Surface water flooding	No	Yes	**Construction and operation:** surface water drainage enhanced along south side of A55 and west of Shore Road East to reduce or avoid flooding on land (Type 1).
Hurricanes, storms and gales	Yes	No	**Design:** the application of highway and structural design standards would avoid the physical damage to A55 infrastructure (Type 3) **Operation:** advanced notice of severe weather from forecasters with advice from NRW regarding flood risk. Traffic management actions taken on advice from Traffic Wales and NMWTRA to advise drivers, impose temporary vehicle speeds or close the road or the junctions (Type 2) **Construction:** as for operation, but with construction works removed from vulnerable locations, potential pollution-causing construction materials and plant, or materials that could be dangerous if blown around in strong winds, are removed from the vulnerable works. Open excavations backfilled and sealed or adequately covered over (Type 2 and Type 4)
Major road transport accidents	Yes	Yes	**Design:** the application of current highway design standards would reduce risks of major accidents occurring (Type 3). **Operation:** advanced planning of emergency response developed in liaison with emergency services and civil emergency planners to ensure good access and egress from site for police, fire brigade and ambulance to recover vehicles, casualties and reopen road efficiently (Type 5). **Construction:** appropriate speed limits through all traffic management works and liaison with Traffic Wales/Traffic Officers to ensure advance warnings given to motorists of works area. Construction personnel briefed to avoid trafficked areas to minimise risk of collision (Type 3 and 4). Advanced plans developed in liaison with emergency services and civil emergency planners to ensure good access and egress from construction site for police, fire brigade and ambulance (Type 5).

17.8.3 The Trunk Road Agents are the organisations responsible for managing strategic routes in Wales, including the A55 from Holyhead to the English border. In North Wales trunk road management is based in the North Wales Traffic Management Centre in Conwy. Traffic Wales is the Welsh Government's traffic information service for motorways and trunk roads in Wales (here delivered by the North and Mid Wales Trunk Road Agent (NMWTRA)), and they operate a system of CCTV cameras to observe traffic and electronic message signs along the A55. In the area of Junction 15 Traffic Wales operate six CCTV cameras between Junction 14A (Madryn) and the Pen-y-Clip Tunnel western portal. These, or replacements, would be maintained during construction and operation of the Scheme.

17.8.4 NMWTRA has a team of Traffic Officers who patrol the route and attend incidents. Traffic Wales maintain a website providing up to date traffic information and road traffic 'alerts' on social media, news updates and on roadside information signs to inform the public of congestion, maintenance works, emergencies and road closures.

17.8.5 On the A55 NMWTRA is responsible for coordinating any works that could affect the trunk road network. During construction of the Scheme the contractor responsible for the works would liaise with NMWTRA to agree the management of traffic through the works area to ensure the safest driving conditions and to avoid congestion, where possible. In special circumstances, such as the passage of an abnormal load through the works, the contractor would responsible for providing a route through the works at a suitable time that would be agreed with NMWTRA and Traffic Wales.

17.9 Cumulative Effects

17.9.1 It is possible that some of the threats identified could realistically occur together, and one threat could occur as the result of another. The threats included are those set out in Table 17.4. Those highlighted in Table 17.5 are those that could occur simultaneously or as a consequence of another event occurring.

Table 17.5 Potential cumulative effects

*Cumulative effects, where two or more threat could combine are indicated by the letter '**C**'.*	Landslides	Coastal flooding from the sea	Fluvial flooding	Surface water flooding	Hurricanes, storms and gales	Wave surges	Major Traffic Accident	Fog
Coastal flooding from the sea								
Fluvial flooding		C						
Surface water flooding		C	C					
Hurricanes, storms and gales	C	C	C	C				
Wave surges		C	C	C	C			
Major Traffic accidents	C	C	C	C	C	C		
Fog							C	
Extremely high temperatures							C	

17.10 Conclusions

17.10.1 The assessment has demonstrated that there are potential risks to the Scheme and to the environment as a result of the Scheme. 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 major 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.

17.10.2 Some events will cause damage to elements of the 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.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 18 POPULATION AND HEALTH

RAMBOLL Bright ideas. Sustainable change.

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18. CHAPTER INTRODUCTION

18.1 Chapter introduction

18.1.1 This chapter considers the likely significant effects on Population and Health from the construction and operation of the Scheme. The chapter considers health through a Health Impact Assessment, but it should be noted that the scope of the chapter is wider than solely health aspects and therefore consideration has been given to wider well-being, in particular of future generations under Welsh legislation. On this basis the assessment is broad enough to cover potential determinants of good health and well-being, as well as environmental effects.

18.1.2 The specific objectives of the chapter are to:

a) Describe the baseline with regard to the health and well-being status of the local community in the study area;
b) Describe the assessment methodology and significance criteria used in completing the impact assessment;
c) Describe the potential effects, including direct, indirect and cumulative effects;
d) Describe the mitigation measures proposed to address likely significant effects; and
e) Assess the residual effects remaining following the implementation of mitigation.

18.1.3 This chapter is supported by:

a) Technical Appendix 18.1 Health Impact Assessment.

18.1.4 For details of the Scheme description, reference should be made to Chapter 2.

18.1.5 This assessment assumes the use of standard construction techniques and practices commensurate for works of this nature, and full compliance with UK legislation and guidance. The final installation techniques and their sequencing will be determined by the construction works contractor in consultation with the relevant authorities. In addition, incorporated mitigation measures are described which have been included in the Scheme design to reduce identified impacts.

18.2 Legislation, Policy Context

18.2.1 This section outlines the legislation, policy and guidance relevant to the assessment of potential effects on and from materials assets and waste associated with the proposed development based on the following:

a) International and National Legislation and Policy;
b) Local Planning Policy; and
c) Guidance and Industry Standards.

International Legislation

2014 Environmental Impact Assessment Directive

18.2.2 The need to consider population and health in Environmental Impact Assessment is identified in EU Directive 2014/52/EU which was transposed into UK law through the Environmental Impact Assessment Regulations 2017.

18.2.3 The Directive harmonises the principles for EIA and introduces minimum requirements to ensure a high level of protection of the environment and, by extension, human health. The Directive

replaces Article 3 with a new version which notes the need to identify, describe and assess in an appropriate manner the direct and indirect significant effects on a range of factors, the first of which is 'population and health'. It notes that any project should be considered with regard to the risks to human health, for example, from water contamination or air pollution.

National Legislation and Policy

Environmental Impact Assessment (Miscellaneous) Amendments Relating to Harbours, Highways and Transport Regulations 2017

18.2.4 Schedule 2 of the Regulations reflects the 2014 Directive and identifies a wider range of topics to be considered which includes the addition of 'Population and Health'. It notes that each topic needs to be considered in the light of the nature of the proposed development, the site and any interactions with other systems, processes or sites.

Public Health (Wales) Act 2017

18.2.5 The Public Health (Wales) Act 2017 includes a prospective provision within Part 6 for Regulations to be made, requiring health impact assessments 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.

Well-Being of Future Generations (Wales) Act 2015

18.2.6 The Well-Being of Future Generations (Wales) Act 2015 (FGA) puts in place the legislation needed to make the public bodies listed in the Act consider the long-term impact of their decisions, work better with people and communities and with each other with the goal of preventing problems such as poverty, health inequalities and climate change. The objective of the act is to ensure 'sustainable development' thereby improving the social, economic, environmental and cultural well-being of Wales. A series of seven well-being goals are set out in the legislation, namely:

a) A prosperous Wales;
b) A resilient Wales;
c) A healthier Wales;
d) A more equal Wales;
e) A Wales of cohesive communities;
f) A Wales of vibrant culture and thriving Welsh language; and
g) A globally responsible Wales.

18.2.7 The act refers to public bodies acting in accordance with sustainable development principles, meaning that the body must act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs. The act notes that a public body must take account of:

a) The importance of balancing short-term needs with the need to safeguard the ability to meet long term needs;
b) The need to take an integrated approach;
c) The importance of involving other persons with an interest in achieving the well-being goals and of ensuring those persons reflect the diversity of the population;
d) How collaboration could assist the body to meet its well-being objectives, or assist another body to meet its objectives; and
e) How deploying resources to prevent problems occurring or getting worse may contribute to meeting the body's well-being objectives, or another body's objectives.

18.2.8 The act establishes the role of the Future Generation Commissioner for Wales to promote sustainable development and monitor and assess the extent to which well-being objectives set by pubic bodies are met.

18.2.9 The most recent report on progress to meet the goals set out in the act dates from 2019 and is shown in Table 18.1, this is the third annual report. Key points from the report are:

Table 18.1: Key Points from the 2019 Report on Future Well-being Objectives

2019 Report on Future Well-being Objectives	Life expectancy had changed little, most lives were spent in good health, but that time is less for those living in more deprived areas; Little change in healthy lifestyle behaviours - diets continue to be low in fruit and vegetable consumption and too high in salt, sugar and red meat (despite improvements over the decade); Percentage of babies born with a low birth weight had increased a little over the past few years, after a gradual decline over the previous 7 years; Housing conditions improved over the last 10 years, reducing the potential risk to the health of occupants, with improvements across all tenures; The Welsh labour market continued to perform strongly, with the gap between Wales and the UK narrow in historical terms. However, the percentage of people in low paid work seemed to be increasing; Young people's participation in education and the labour market had grown since the recession, although this fell slightly in the most recent year for 16-18 year olds; Latest data showed the gender pay gap had increased although at 7.3 per cent, it was still one of the lowest on record. New data on the ethnicity pay gap showed, on average, employees from ethnic minority groups earned around 7.5 per cent less per hour than white British employees; There still remained a significant gap in employment outcomes for disabled people, although the gap had reduced in the last year; Qualification levels amongst the population continued to increase, although there remained large differences in attainment at school for different population groups; There had been little change in relative income poverty levels for a number of years, though changes had been seen for some groups. Relative income poverty remained highest amongst children. Fewer households were living in fuel poverty compared with 10 years ago as homes became more energy efficient; In the latest year there had been a slight increase in community cohesion but a slight decrease in feeling safe. However, it was considered too early to tell if this was the beginning of a trend; Recorded race hate crime incidents had been increasing; Levels of regular sports participation for adults and children remained unchanged in the latest year; Latest survey data suggested that there were increases in the percentage of people who say they speak Welsh, but not fluently. Use of the language remained steady; There had been a large fall in greenhouse gas emissions in the latest year, and over the longer term, emissions had fallen by over a quarter since the 1990s; Air pollution continued to be a significant health issue, although there had been improvements in the levels of three of the main air pollutants in the last year; The capacity of renewable energy generation installations had risen in the last decade and almost half of electricity consumed came from renewable sources. Although a few years old, assessment of ecological footprint suggested that key natural resources were being depleted faster than they could be replenished; and There had been improvements in the populations of some species, but the latest comprehensive assessment of Welsh natural resources showed that overall, biological diversity was declining.

Equality Act 2010

18.2.10 The public sector equality duty created by the Equality Act 2010 came into force in April 2011. It requires the public sector 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.

Equality Act 2010 (Statutory Duties) (Wales) Regulations 2011

18.2.11 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. The Equality Act 2010 and the associated regulations place a duty on the public sector to consider potential effects on different people.

The Children's Act 1989

18.2.12 The Children Act 1989 allocates duties to ensure children are safeguarded and their welfare is promoted.

18.2.13 In terms of the Scheme it is considered that this most directly relates to aspects around broad welfare issues with the potential for:

a) Effects on health, for example, due to reductions in air quality;
b) Increase in road accidents; and
c) Community severance, for example, where children cannot readily access their local school.

18.2.14 This has been considered in the chapter as part of the Health Impact Assessment and through the Community Assets and Effects on All Travellers chapters.

Planning Policy Wales (December 2018)

18.2.15 The Planning Policy Wales (PPW) notes that the primary objective of the PPW is to ensure that the planning system contributes to the delivery of sustainable development. It notes that this should improve the social, economic, environmental and cultural well-being of Wales and links this back to the Planning (Wales) Act 2015 and the FGA. The PPW notes that the intention to promote actions at all levels to encourage a wide, sustainable and problem-solving outlook focussed on integrating and addressing multiple issues.

18.2.16 The PPW, together with the National Development Framework, sets out how the planning system delivers these requirements through Strategic Development Plans (SDP) and Local Development Plans (LDP). It also notes the requirement for planning authorities to produce Well-being Plans, a duty of the local Public Services Boards.

18.2.17 The PPW discusses 'Sustainable Development' in similar terms to the FGA, including the need to deliver on all four aspects of well-being: social, economic, environmental and cultural and references the seven well-being goals of the Act. It notes the need for public bodies to recognise the five ways of working discussed in the Act; namely: involvement, collaboration, integration, prevention and long-term factors.

18.2.18 The PPW identifies key factors to be taken into account in assessing whether a development proposal meets sustainable development proposals, and the FGA. Key factors are identified in Table 18.2.

Table 18.2 Assessing the Sustainable Benefits of Development

Aspect	Key Factors
Social	Who are the interested and affected people and communities;
	How does the proposal change a persons way of life, which can include: How people live, for example how they get around and access services; How people work, for example access to adequate employment; How people socialise, for example access to recreation activities; and How people interact with one another on a daily basis
	Who will benefit and suffer any impacts from the proposal
	What are the short and long-term consequences of the proposal on a community, including its composition, cohesion, character, how it functions and its sense of place
	How does the proposal support development of more equal and more cohesive communities
Economic	The numbers and types of long term jobs expected to be created or retained
	Whether, and how far, the development will help redress economic disadvantage or support regeneration priorities, for example by enhancing local employment opportunities or upgrading the environment
	The contribution the development would make to achieving wider strategies, e.g. the growth or regeneration of certain areas
	The contribution this economic activity will have to wider policy goals
	How the proposal would support the achievement of a more prosperous, low carbon, innovative and resource efficient Wales
Cultural	How far the proposal supports the conditions that allow for the use of the Welsh language
	Whether or not the development protects areas and assets of cultural and historic significance
	Have cultural considerations and their relationships with the tourism industry been appropriately maximised
	If the proposal protects areas known for their cultural value in terms of music, literature, sport and the arts and vibrant cultural experiences
Environmental	Will important features of the natural and built environment be protected and enhanced
	Are the environmental impacts of development on health and amenity limited to acceptable levels and the resilience of ecosystems improved
	Is environmental protection for people and natural resources, property and infrastructure maximised and environmental risks prevented or appropriately managed

Aspect	Key Factors
	Will high standards of restoration, remediation, decommissioning and beneficial after uses be achieved
	Will the depletion of non-renewable resources be minimised, waste prevented and the efficient and most appropriate use of materials made and re-use and recycling promoted
	Will the causes and impacts of climate change be fully taken into account through location, design, build, operation, decommissioning and restoration
	Does it support decarbonisation and the transition to a low carbon economy
Transport	Does it enable more sustainable travel choices
	Does the network management make use of available capacity
	Does the application reduce travel demand, specifically that of single-occupancy private vehicles

18.2.19 The PPW also states: *"The provision of sustainable transport infrastructure is essential in order to build prosperity, tackle climate change, reduce airborne pollution and to improve the social, economic, environmental and cultural well-being of Wales. The planning system should facilitate the delivery, decarbonisation and improvement of transport infrastructure in a way which reduces the need to travel, particularly by private vehicles, and facilitates and increases the use of active and sustainable transport"*.

National Clean Air Strategy 2019

18.2.20 The Clean Air Strategy was produced by the UK Government in 2019. It discusses how all sources of air pollution will be addressed and sets out the actions required to meet the goals of the strategy. The strategy notes that public exposure to particulate matter pollution will be progressively cut with new targets to reduce exposure to $PM_{2.5}$, including identifying what action is needed to meet the WHO annual mean guideline of 10µg/m^3 and ensuring that the number of people living in locations above the guideline is reduced by 50% by 2025. The strategy also emphasises the need to improve air quality messaging and access to air quality forecasts and to help individuals and organisations understand how they can reduce their contributions to air pollution.

18.2.21 The strategy specifically refers to reducing the emissions from transport, key points relevant to road transport are as follows:

a) A commitment to cutting air pollution from all forms of transport;
b) Publication of 'Road to Zero' which sets out the Governments plans to end the sale of new conventional petrol and diesel cars and vans by 2040;
c) New legislation to enable the Transport Secretary to compel manufacturers to recall vehicles for failures in their emissions control systems;
d) New legislation to take effective action against tampering with vehicle emissions control systems;
e) Research and develop new standards for tyres and brakes to address toxic non-exhaust particulate emissions;
f) Encouraging the use of the cleanest modes of transport for freight and passengers, including active travel; and
g) Review current uses of red diesel and ensure its lower cost is not discouraging the transition to cleaner alternatives.

18.2.22 Given the proximity of the Scheme to the North Wales coastal railway line it is notable that the strategy also discusses rail transport, in particular that the rail industry will produce recommendations on how to phase out diesel-only trains by 2040.

Local Policy and Plans

18.2.23 At a local level, the Scheme has links to a number of policies contained in the Conwy Local Development Plan 2007-2022, which was adopted in 2013. Key policies include:

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[1];
c) Strategic Policy STR/1: Sustainable transport, development and accessibility to support healthy lifestyles; and
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.'

Local Well Being Plan (2018)

18.2.24 The Conwy and Denbighshire Local Well-being Plan was approved in April 2018. It sets out the local objectives of the Conwy and Denbighshire Public Services Board (PSB) to improve the economic, social, cultural and environmental well-being of the area[2].

18.2.25 The priorities of the board are noted to be good mental well-being for all ages, supporting community empowerment and supporting environmental resilience. Four additional principles are identified to support these priorities comprising addressing inequalities and treating everyone equally, supporting and promoting the Welsh language, supporting access to appropriate accommodation and avoiding duplication.

18.2.26 The plan includes a summary of well-being facts for Conwy and Denbighshire and then discusses the baseline conditions for each of the priorities together with 'Next Steps' in each case. The latter comprise the actions that the PSB will 'explore' to progress the plan although no formal targets are discussed.

Key Relevant Guidance

18.2.27 The amended EIA Directive[3] requires that population and health factors should be considered as part of the EIA process but the Directive itself (as well as the transposed UK legislation) does not define how it should be carried out.

[1] Conwy Health, Social Care and Well-Being Strategy, Draft Version 3, Healthy Conwy Strategy 2008-2011 http://spp.conwy.gov.uk/upload/public/attachments/310/Healthy_Conwy_Strategy_200811_draft.pdf [accessed 04.02.2019]
[2] https://conwyanddenbighshirelsb.org.uk/wp-content/uploads/2018/04/Conwy-Denbighshire-PSB-Well-being-Plan.pdf accessed 03.11.19
[3] Environmental Impact Assessment (EIA) Directive 2011/02/EU as amended by 2014/52/EU

18.2.28 The following guidance as outlined in the Scoping Report has been considered when completing the assessment of potential impacts to population and human health:

a) DMRB Volume 11, including Section 2 Part 5 HA 205/08: Determining significance of Environmental Effects (superseded by DMRB Volume 11 Section 2 LA 104 Sustainability and Environment. Appraisal. Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10);
b) Material provided by the Wales Health Impact Assessment Support Unit (WHIASU)[4]. 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;
c) IEMA Health in Environmental Impact Assessment, A Primer for a Proportionate Approach, 2017[5];
d) Guidance provided by the World Health Organization (WHO)[6];
e) Guidance provided by the World Bank International Finance Corporation (IFC) Introduction to Health Impact Assessment[7]; and
f) Guidance provided by the Society of Practitioners of Health Impact Assessment (SOPHIA)[8].

18.2.29 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); and
b) The Welsh Transport Appraisal Guidance (WelTAG) which 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.

18.2.30 With regard to highway projects environmental assessments will describe impacts on population and human health in line with the wider requirements and standards provided in the following DMRB standards:

a) LA 101 Introduction to environmental assessment[9];
b) LA 102 Screening projects for Environmental Impact Assessment (EIA)[10];
c) LA 103 Scoping projects for environmental assessment[11]; and
d) LA 104 Environmental assessment and monitoring[12].

[4] https://whiasu.publichealthnetwork.cymru/en/ accessed February 19
[5] https://www.iema.net/assets/newbuild/documents/IEMA%20Primer%20on%20Health%20in%20UK%20EIA%20Doc%20V11.pdf accessed February 19
[6] https://www.who.int/hia/en/ accessed February 19
[7] http://documents.worldbank.org/curated/en/437491468331191255/pdf/522150WP0Healt10Box345555B01PUBLIC1.pdf accessed February 19
[8] https://hiasociety.org/ accessed February 19
[9] DMRB Volume 11 Section 1 LA 101 Sustainability and environment. Appraisal. Introduction to environmental assessment. https://www.thenbs.com/PublicationIndex/documents/details?DocID=327074
[10] DMRB Volume 11 Section 2 LA 102 Sustainability and environment. Appraisal. Screening projects for environmental impact assessment. https://www.thenbs.com/PublicationIndex/documents/details?DocID=327077
[11] DMRB Volume 11 Section 2 LA 103 Sustainability and environment. Appraisal. Scoping projects for environmental assessment. https://www.thenbs.com/PublicationIndex/documents/details?DocID=327085
[12] DMRB Volume 11 Section 2 LA 104 Sustainability and Environment. Appraisal. Environmental assessment and monitoring. https://www.thenbs.com/PublicationIndex/documents/details?DocID=327091

DMRB LA112 Population and Health

18.2.31 The DMRB standard for assessing Population and Health, DMRB LA112 was issued in October 2019. This was not available at the time that the scoping report was prepared but has been taken into account in preparing this Chapter.

18.2.32 LA112 notes that the elements outlined in Table 18.3 should be included, however, because this ES is based on previous approaches to this topic these elements are already covered in other chapters, notably Chapter 11 Community Assets and Chapter 14 Effects on All Travellers. Therefore, whilst LA112 has been reviewed and any additional elements to those already covered across the wider ES have been addressed it has not been followed for this chapter and instead reference has been made to other relevant information in the ES.

18.2.33 LA112 notes an indicative list of consultees although not all of these parties have been approached.

18.2.34 The standard sets out a Study Area generally extending 500m from the Scheme, the assessment area used for the Chapters that inform this section of the ES are consistent with this criterion.

18.2.35 The standard provides indicative types of data to be collected as shown in Table 18.3.

18.2.36 An indication has been provided of where this information has been collected as part of the environmental impact assessment.

Table 18.3. Elements of DMRB LA112, information to be collected and status within the ES

Element	Indicative Information to be Collected	Status
Private property and housing	Location and number of properties at risk of demolition, or from which land will be required/access affected by a project	Considered in Chapter 11 Community Assets
	Location of residential development land and number of units that will be affected by a project	
Community land and assets	Location of community land (e.g. common land, village greens, open green space, allotments, sports pitches etc) and amount of land which will be required/access affected by a project	Considered in Chapter 11 Community Assets
	Location of community assets (e.g. village halls, healthcare facilities, education facilities, religious facilities etc) and number of assets from which land will be required/access affected by a project	
	Level of existing accessibility restrictions / severance to community land and assets within the study area	
	Frequency of use of community land and assets within the study area	

Element	Indicative Information to be Collected	Status
Development land and businesses	Location and number of businesses (and associated jobs) at risk or from which land will be required/access affected by a project	Considered in Chapter 11 Community Assets
	Location of land allocated for development by local authorities and the number of future jobs that will be affected by a project	
	Land not allocated by local authorities which is subject to planning application(s) supporting future jobs	
	Level of existing accessibility restrictions/severance to development land and businesses within the study area	
Agricultural land holdings	Type, location and number of agricultural holdings at risk of demolition or from which land will be required/access affected by a project	Considered in Chapter 11 Community Assets
	Level of existing severance/accessibility restrictions to agricultural land holdings within the study area	
	Frequency of use of the agricultural holdings/assets within the study area	
Walkers, Cyclists and Horse riders	Type, location and extent of WCH provision (e.g. public rights of way) within the study area	Considered in Chapter 14 All Travellers
	Frequency of use of the WCH provision within the study area	
Human health	Health profiles of affected communities Health determinants (e.g noise or air pollution) Likely health outcomes	Health Impact Assessment considered in Chapter 19

18.2.37 LA112 does not specifically discuss key elements such as the FGA that are specific to Wales, however, consideration has also been given to the extent to which the Scheme meets the requirements of wider well-being goals. Again, no specific guidance exists on this issue and therefore consideration will be given to the extent to which the Scheme meets the requirements of the FGA based on professional judgement.

Other Sources

18.2.38 The population and health chapter draws information from the ES chapters shown in Table 18.4.

Table 18.4 Links to Other ES Chapters

Chapter	Key Aspects Relevant to Population and Health
Chapter 6 Geology and Soils	Contaminated soils and water
Chapter 7 Road Drainage and Environment	Flooding
Chapter 9 Landscape, Townscape and Visual Effects	Landscape design, loss of views

Chapter	Key Aspects Relevant to Population and Health
Chapter 11 Community Assets	Severance
Chapter 12 Air Quality	Reduced, or improved air quality
Chapter 13 Noise and Vibration	Reduced, or increased noise levels
Chapter 14 All Travellers	Severance, relief from existing severance, driver stress
Chapter 16 Climate Change	Exposure to contaminants and dust, high temperatures, heatwaves
Chapter 17 Major Accident and Disaster	Major accidents and hazards and road traffic accidents
Chapter 20 Management of Environmental Effects	Summary of mitigation measures

18.3 Study Area

18.3.1 DMRB LA112 defines the Study Area as extending for 500m from the Scheme and as noted above this is consistent the approach adopted for this Chapter. The broader study area for the Scheme 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. Where likely effects are identified outside the 500m area surrounding the Scheme boundary, the study area is extended accordingly. Where effects are unlikely to occur within the 500m area surrounding the Scheme boundary, the study area is reduced accordingly.

18.3.2 The geographical scope of the assessment varies between different population and health factors being assessed, for example, hospitals with accident and emergency facilities comprise Ysbwty Gwynedd in Bangor and Ysbwty Glan Clywd at Bodelwyddan which lie some distance from the Scheme and outside the immediate Study Area. Notwithstanding this the data will generally be assessed at a ward level and on this basis the following wards have been considered:

a) Bryn, Lafan and Pandy; and
b) Penmaenan, Pant-yr-Afon and Capelulo.

18.3.3 With regard to the consideration of wider population and health factors beyond the scope of the HIA it is considered that the above wards also represent a suitable Study Area. 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.

18.4 Scope of the Assessment

18.4.1 The scope of the assessment has comprised of the following:

a) Baseline data gathering;
b) Review of Health Impact Assessment that draws on information from a number of chapters in the ES;
c) Review of other Chapters with the potential to affect population and health, based on the recently issued LA112 standard; and

d) Consideration of wider well-being goals in the context of the Well Being of Future Generations, on the basis of the Conwy and Denbighshire Public Services Board Well Being Plan 2018-2023.

18.4.2 Where elements of the LA112 standard have not been covered in either the HIA or in the other chapters in the ES they have been included within this Chapter.

18.4.3 With regard to the Equalities Act, overall, it is considered that the Scheme is unlikely to result in significantly different effects on different groups of people and therefore no Equality Impact assessment has been carried out.

18.5 Baseline Data Collection

Method

18.5.1 Baseline conditions were established through a preliminary scoping review, 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) and findings from the Welsh Transport Appraisal Guidance (WelTAG) and the associated distributional impact assessment. Other relevant activities, including the air quality and noise review and consideration of effects on all travellers were also considered. Baseline conditions from the other ES chapters is discussed in Section 18.7.

18.5.2 Feedback from the initial WelTAG Stage Two Public Consultation process has also been reviewed.

Desk-based Assessment

18.5.3 Information was obtained from the following sources:

a) The 2011 Census;
b) Population Profiles for wards published by Conwy CBC;
c) Welsh Index of Multiple Deprivation (WIMD); and
d) Welsh Transport Appraisal Guidance (WeITAG).

Site Walkover and Surveys

18.5.4 No site walkovers or surveys have been undertaken for this Chapter specifically, however other topics, such as All Travellers, have undertaken their own site visits.

Assessment Methodology

18.5.5 This section sets out the methodology by which the impacts have been assessed.

18.5.6 As per the scope of the assessment, the Health Impact Assessment, and other ES Chapters have been reviewed for aspects with the potential to affect population and health, based on the recently issued LA112 standard.

18.5.7 DMRB guidance LA 112 provides guidance on environmental sensitivity, scale of effect and magnitude of impact, however, as noted in Table 18.4 most elements have already been assessed in other chapters. On this basis it was not considered appropriate to re-assess these elements. These elements have been assessed for potential effects and significance as based on the submitted Scoping Report, which is outlined below.

18.5.8 Other elements, including drawing in on wider well-being goals, have been assessed using professional judgement.

Assessment of Potential Effects

18.5.9 There are two relevant time periods to consider impacts on human health: during the construction period and after completion during the operational period (including use and any maintenance activities).

18.5.10 During the construction period, 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.

18.5.11 After construction and during operation, the impacts can potentially affect nearby communities, either through direct or indirect effects of the new highway configuration. The impact of the operational period will be assessed up to 15 years after opening.

18.5.12 When considering the population and health impacts, both during construction and the operational period, the buffer applied will depend on the impact being considered. For example, as described in Chapter 12 the health impacts associated with construction dust will be considered within 350m of the associated works, whereas the air quality during the operational phase will considered in the immediate vicinity of the scheme and adjoining road (up to 200metres). Reference will be made to the relevant chapters for the appropriate buffers that will be applied.

Assessment of Significance

18.5.13 The following information outlines the basis to which the effects have been assesses within other relevant ES chapters:

a) **Nature** - The status of the effects has been assessed by considering whether the proposed development would have a positive or negative effect on the receptor;
b) **Likelihood** - Assessing if the likelihood of the impact of the proposal is definite, probable or speculative;
c) **Scale and Significance** - it will consider what proportion of the population is likely to be affected, and how severe or beneficial the impact would be;
d) **Timing and duration** - it will seek to assess whether short-term risks to health may be worth the long-term benefits; and
e) Distribution - Assessing whether the proposal would affect different groups of people in different ways. A proposal that is likely to benefit one section of the population may not benefit others. In some cases, the assessment will identify ways in which members of the least healthy or most disadvantaged populations could be helped. This can be an important contribution to reducing the health inequalities that exist between some communities.

Assumptions and Limitations

18.5.14 Based on the guidance that has been followed, the Environmental Impact Assessment only examined NO_x and PM_{10}, with data on the latter quite limited. 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. 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.

18.6 Consultations

18.6.1 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.

18.6.2 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 but other parties were identified and contacted to provide comment, including:

a) University Health Board;
b) Conwy and Denbighshire Public Services Board (Councillors);
c) Dewis Cymru (general email address for Care Inspectorate Wales);
d) People's Partnership (general email address); and
e) Community and Voluntary Support Conwy (North Wales Citizens' Panel).

18.6.3 No responses were received from this outreach.

<u>Scope of Potential Effects</u>

18.6.4 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. They have therefore not been examined;
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. They have therefore not been examined;
c) Workplace conditions should not differ between do-minimum and preferred options. They have therefore not been examined;
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. They have therefore not been examined;
e) Although living conditions such as smell, odour and waste management are unlikely to differ between do-minimum and preferred options from the perspective of health, these issues will be considered in other Chapters (such as Chapter 15 Materials); and
f) The decommissioning phases for the Scheme.

18.6.5 Based on the Scoping Report, the following effects were scoped in. To avoid duplication, reference will be made to the relevant chapters throughout this chapter as appropriate:

a) Impacts on individuals, including lifestyle factors such as physical activity, risk-taking activities, and impact on access to health care services;
b) Impacts on access to skills and knowledge, including access to training and education;

c) 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;
d) Impacts on accessibility and active travel, including the encouragement of walking/cycling, and traffic management and calming measures;
e) Impacts on the community, including social support mechanisms, social networks and neighbourliness;
f) Impacts on Community divisions and degree of isolation. This criterion can apply to either groups or individuals. The Scheme 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 Scheme;
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;
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 Scheme has the potential to impact during both its construction and operational phases;
i) Impacts on employment, occupation, and income; and
j) Impacts on socio-economic, cultural and environmental and sustainability factors, including biological diversity, efficient use of resources, pollution, diversity / local distinctiveness and climate. This criterion overlaps with a number of ES chapters, to which reference will be made as appropriate. It should be noted that it is not envisaged it would be considered proportionate to carry out a socio-economic study as part of this work.

18.7 Baseline Conditions

18.7.1 Full details of baseline conditions are considered in Chapter 11 – Community Assets, Chapter 14 – All Travellers and Appendix 18.1: Health Impact Assessment. To avoid duplication, information in this Section has been grouped according to relevant items within the DMRB LA112 guidance (shown previously in Table 18.3).

Private Property and Housing

18.7.2 The following private assets are located within the study area:

a) Residential:
   - A row of Victorian, terraced housing/flat units which include properties 1-4 St. Brendas; 1-3 Sunny Bank; 1 & 2 Glan Meurig; 1&2 Glan Seiriol; 1-4 Fern Bank
   - A detached property, Earlfield;
   - A row of Victorian terraced housing at Penmaen View;
   - Heath Cottage and outbuilding;
   - Voelas;
   - 1&2 Bodfair;
   - New residential properties on land adjoining Fernbank;
   - The former Victoria Inn, converted into a residential property; and
   - No 85 Penmaenmawr Road;
b) Offices:
   - The existing, former Conwy County Borough Council offices and parking area known as 'The Heath', vacant at the time of this ES being prepared;

c) Others.
   - Land to the south of Junction 15, currently in agricultural use;
   - Outbuilding at The Heath;
   - Garisim Chapel; and
   - Other remaining land, non- agricultural;

d) Commercial Property
   - No commercial premises located within the study area, although Boots pharmacy and a commercial garage directly adjoins.

Community land and assets

18.7.3 There are a number of community assets within the study area:

a) Ysgol Pant y Rhedyn – Penmaenmawr Road (Primary School);
b) Garisim, Capel Yr Annibynwyr (SH68407528) adjacent to the Primary School (Place of Worship);
c) Part of the Promenade Path and Pant y Rhedyn playing pitches; and
d) Existing vehicular access point along Shore Road East towards Penmaenmawr Promenade, a tourist destination point.

Development Land and Business

18.7.4 The Scheme includes the use of development land allocated within the current adopted CCBCLDP as a Housing Contingency site. ES Chapter 5 (paragraph 5.16.16) describes the site as a 2.43 ha site, land to the 'West of Penmaen Park', with a potential for forty-five (45no.) dwelling units.

18.7.5 The Scheme would affect a modest amount of land forming the northern edge of a field, and a small corner of a second field which is used by a farm business.

Agricultural land holdings

18.7.6 The Scheme proposes a new local highway section from Junction 15 along Penmaenmawr road. This includes the northerly section of the housing allocation development land, west of Penmaen Park. This land is currently in agricultural use and tenanted. A smaller extent of agricultural land, further to the west, would also be included.

18.7.7 The agricultural land relates to one ownership, farmed by a local farm. No agricultural buildings exist with the land.

Walkers, Cyclists and Horse Riders

18.7.8 Chapter 14 sets out the impacts on all travellers: pedestrians, cyclists, equestrians and vehicular travellers. The area contains several Public Rights-of-Ways and cycling areas.

18.7.9 The following well-established Public-Rights of Way in the study area have been identified (A55J15J16-RAM-XX-15-DR-J-1001 Volume 2 Figure 14.1):

a) National Cycle Network (NCN) Route 5 which extends along the North Wales coast from Chester to Holyhead along the coastline passing Llanfairfechan;
b) Wales Coast Path from Chester extends along the coast through Penmaenmawr and Llanfairfechan with an optional inland route at Penmaenmawr;
c) Public Footpath crosses the A55 using the railway bridge on Station Road, in the centre of Llanfairfechan; and

d) Footbridge crosses the A55 between Junction 15 and Gerizim. This route connects Penmaenmawr Road and the NCN Route 5 with the coastline (although no cycle facilities are provided on the footbridge).

18.7.10 In addition, there are a number of informal NMU routes within the area including the Network Rail access track which provides access along the coastline between Shore Road East and Pendalar via the above footbridge.

18.7.11 No equestrian routes have been identified within the Scheme area.

18.7.12 Alternative provision would be provided where the Scheme does impact on existing Rights of Way.

Human Health

18.7.13 The 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.

18.7.14 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.[13.]

Health Profiles

18.7.15 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.

18.7.16 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.

18.7.17 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.

Health Determinants

18.7.18 According to the National Clean Air Strategy 2019, NOx exacerbates symptoms of those already suffering from lung or heart conditions shortening lives and reducing quality of life and short-term exposure to high concentrations of NO_2 can cause inflammation of the airways.

18.7.19 Oxides of nitrogen (NO_x) concentrations are modelled at concentrations of 10.6 µg/m^3 in 2018, and 8.8 µg/m^3 in 2022.

[13] https://citypopulation.de/en/uk/wales/

18.7.20 Nitrogen dioxide (NO_2) concentrations are modelled at concentrations of 8.1 µg/m^3 in 2018, and 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. The annualization concentration of NO_2 from a Ramboll monitoring program conducted 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.

18.7.21 Particulate matter with an aerodynamic diameter of 10µm or less (PM_{10}) are modelled at concentrations of 7.5 µg/m^3 in 2018, and 7.2 µg/m^3 in 2022. There is no PM_{10} monitoring available in close proximity to J15.

18.7.22 Noise was reported as ambient noise level (LAeq) 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 us estimated using the LA10 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 LAeq and LA10 is located at same monitoring station, at 72 dB (LAeq) and 74 dN (LA10).

Public Services Board Well-being Plan 2018 - 2023

18.7.23 The Public Services Board (PSB) Well-being Plan 2018 – 2023 defines baseline conditions for a wide range of factors, and areas where under the PSB ways to improve will be explored as 'Next Steps'.

18.7.24 A review of the 'Next Steps' has been undertaken to identify which elements the Scheme could affect; the outcomes are identified in Table 18.5 below.

Table 18.5 Review of PSB Well-being Plan 2018

PSB Well-being Plan 'Next Steps'	Relevant to Scheme?	Potential effects
1 People – Supporting Good Mental Well-being for All Ages		
Work together to support parents so children have the best start in life	✓	Temporary increase in noise Temporary severance from amenity and leisure facilities Loss of views Improved connectivity Scheme contribution to active travel Provision of high quality landscaping and green space Potential opportunities for community project
Work together to support unpaid carers	×	
Help young people learn life skills and behaviours that support health and well-being	✓	
Encourage partner organisations to give mental well-being training to their workforce	×	
Have more activities that bring generations together	✓	
Make the most of volunteer services	×	
Use the environment to encourage mental well-being	✓	
Make the most of social prescribing, supporting people in their communities to improve well-being	✓	
Develop new ways of working to promote health and well-being	×	
Help people be less reliant on health and social care services	✓	
2. Community – Supporting Community Empowerment		
Have communities that can meet the needs of all ages	✓	Improved connectivity

PSB Well-being Plan 'Next Steps'	Relevant to Scheme?	Potential effects
Help older people to do what matters to them	✓	Apprenticeship schemes Site visits by schools and colleges during construction Give vulnerable people to access services
Help services and communities work together better	✓	
Find affordable ways to support people to stay in their own home	×	
Help people adapt their homes to meet their needs	×	
Encourage people to plan and shape their communities	×	
Help people travel to work, education and services	✓	
Make superfast broadband and mobile networks available to everyone	×	
Get support to the people who need training to use digital services	×	
Give young people better career advice and mentoring	✓	
Offer young people the opportunity to develop skills through volunteering and work experience	✓	
Deliver extra homes across Conwy and Denbighshire	×	
Connect people to accommodation they can afford	✓	
Support people to prepare for their later years	×	
3. Place – Supporting Environmental Resilience		
Improve how we manage against flood risk and other weather extremes	✓	Flood risk assessment and mitigation measures Biodiversity surveys and assessment Ecological mitigation Provision of high quality landscaping and green space Locally sourced materials Use of recycled materials where practicable Recycling and re-use of materials to divert waste from landfill Site visits by schools and colleges during construction
Help communities understand the value of the natural environment and how they can positively add to it	✓	
Be leaders in sustainability and supporting communities to develop renewable energy schemes	×	
Have a natural environment that is thriving and resilient, and where wildlife flourishes	✓	
Work with communities on their place plans and help them consider green infrastructure	✓	
Buy in resources that are sustainable and locally produced	✓	
Explain how important it is that we address environmental issues like recycling, energy efficiency and carbon emissions	✓	
Improve energy efficiency of our buildings	×	
Produce less waste	✓	

18.8 Assessment of Effects

18.8.1 A full description of the proposed works has been provided in Chapter 2: Proposed Development. Those features and assumptions relevant to this chapter are summarised as follows, including best practice methods.

Health Impact Assessment

18.8.2 The HIA considered the same Study Area used for this chapter and noted that the closest sensitive receptors were residential properties along Penmaenmawr Road, and in particular 'Sunnybank' Terrace, the new Fernbank development and Penmaen View.

18.8.3 Consultation was undertaken with the organisations noted in Section 19.6 but as noted no response was received.

18.8.4 The HIA considered the population, ethnicity and socio-economic baseline and summarised the information available in the following ES 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; and
g) Chapter 17 Risks of Accidents and Disasters.

18.8.5 The assessment comprised a review of the available data including information from the feedback in the WelTAG Stage Two Public Consultation and a critical review of possible health impacts to assess where significant effects could arise. The assessment considered the construction and operational periods with receptors comprising both construction workers and the local community.

18.8.6 The assessment identified the following potential effects (greater detail provided in Appendix 18.1: Health Impact Assessment):

Geology and Soils

18.8.7 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 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.

Landscape

18.8.8 Impacts on the landscape character were identified during construction and operation, with the largest effects generally during construction or in Year 1 of operation. After that the impacts would reduce as mitigation in the form of landscape planting matured. Large adverse impacts were noted on Llanfairfechan Town Centre with moderate adverse impacts on Traeth Lafan and Dutchman Bank, Trunk Road and Railway and Penmaen Park. Slight adverse impacts on Llanfairfechan Promenade were identified but only neutral impacts were noted on Penmaenmawr Beach, Llanfairfechan Drycin and Penmaenmawr quarries (disused).

18.8.9 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). 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 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.

Community Assets

18.8.10 Although the Scheme would result in temporary loss of a small area of open space land on the Promenade during construction for the purpose of working space, this would be replaced and possibly improved upon during completion as the Scheme would provide additional cycleways and enhanced connectivity. This would be a beneficial impact for both the immediate area and the community assets located at the Promenade, further north. This impact is considered as beneficial. Although steps have been taken to minimize the impact, two residential properties would need to be demolished due to the Scheme. This loss would lead to a large adverse impact. In addition, the Scheme would result in the loss of residential garden space. However, the Scheme specifically ensures that residential property demolition does not adversely affect Ysgol Pant Y Rhedyn, reducing the potential impact on the school community. The Scheme results in the loss of agricultural grass land relating to one ownership and farmed by a local farm, the majority of which is allocated for housing development. For agricultural land and farming businesses the impacts are considered to be minor adverse. Temporary site compounds on land related to the primary school would we restored to current land use on completion of the Scheme. Overall, the Scheme's impact on Community Assets ranges between beneficial and minor to major adverse.

Air Quality

18.8.11 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.

18.8.12 The closest sensitive receptors to construction activity would be residential properties along A55 and Penmaenmawr Road.

18.8.13 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 PM_{10} 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.

18.8.14 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.

18.8.15 NO_2 impacts from the Scheme are projected to be negligible, with concentrations at all receptors modelled decreasing slightly, remaining the same, or increasing by no more than 1%.

18.8.16 PM_{10} impacts are also projected to be negligible, with concentrations at all receptors modelled decreasing slightly or remaining the same.

18.8.17 Based on these two pollutants, the health implications of air quality changes from the Scheme are judged to be minimal, and no health effects are anticipated from these minimal air quality changes resulting from the Scheme.

Noise and Vibration

18.8.18 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.

18.8.19 Noise and vibration from the Scheme are anticipated to be temporary, and greatest during the Construction Phase. Of the 11 noise-sensitive receptors evaluated, only two were expected to have noise levels above 65 dBA. Even with mitigation measures, there is anticipated to be noise impacts at one 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 Operations Phase, noise is anticipated to increase without mitigation. However, planned mitigation measures should reduce these impacts with the incorporation of low noise thin surface system and the introduction of roadside noise barriers.

18.8.20 Overall, the Scheme's impact on Nosie and Vibration are expected to be neutral, with only mild impacts on limited areas during the Construction Phase and no significant impacts during the Operations Phase.

All Travellers

18.8.21 Proposed mitigation during the Construction Phase should reduce the impact of the Scheme during this phase.

18.8.22 While there are several major to minor adverse impacts anticipated during construction, the benefits during the operational phase include improvements to cycleways, improved facilities to cross the A55 and an off road shared cycleway/footway at the Penmaenmawr Road/J15 junction (providing safer crossing facilities for less confident cyclists), access to Ysgol Pant Y Rhedyn would be improved for journeys both to the east and west of the school whilst the provision of bus laybys on Penmaenmawr Road in close proximity to the school would assisting with traffic flows and pedestrian safety. These benefits are expected to outweigh the anticipated impacts, with a net result of a beneficial impact during the Operational Phase are anticipated to outweigh these anticipated impacts.

Risk of Accidents and Disasters

18.8.23 During construction of the Scheme the contractor would be responsible for managing traffic through the works. They would also be responsible for liaison with the emergency services to ensure that they have free access into and through the works.

18.8.24 There are potential risks to the Scheme 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.

18.8.25 Some events would cause damage to elements of the 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.

18.8.26 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 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.

Well Being of Future Generations Act (FGA)

18.8.27 The transport and technical project objectives for the Scheme have been developed during previous development work and engagement, aiming to address identified problems. During the early stages of Key Stage 3 the problems and objectives were refreshed during a focused workshop event with key stakeholders, considering the WelTAG 2017 guidance and Wellbeing of Future Generations (Wales) Act wellbeing goals.

18.8.28 A vision has emerged from the Scheme objectives, as outlined in Chapter 2, which takes into consideration the problems and challenges that have been noted. The vision would be implemented initially through the construction and aftercare of the A55 Junction 15 Improvements project, but also through longer term projects, implemented by others to achieve 'sustainable development', which is the *'process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals'.*

18.8.29 Fundamental to the identification of problems and opportunities has the involvement of the local communities through key stakeholder and public engagement events. A programme of these has been held since December 2017. The community of Llanfairfechan have raised many of the concerns addressed in the Scheme. Some of the principle environmental concerns have related to traffic noise, retaining views of the sea and access to the shore across the road.

18.8.30 Enhancements from the Scheme that would support the purposes of the Well-Being of Future Generations Act are:

a) Support community life and economic viability through enhanced cohesion and connectivity, support for education, learning and community involvement;
b) Enhanced quality and quantity of public spaces associated with the road corridor;
c) Improve access and enjoyment of the coastal setting, the townscape and the seafront, while enhancing opportunities for walking, cycling (active travel) and healthy lifestyles; and
d) Enhance biodiversity through habitat creation, habitat connectivity and improvements within the road corridor in a manner that reflects and supports the coastal setting.

18.8.31 The inclusion of additional walking and cycling routes seeks to improve accessibility, health and wellbeing for both existing and future generations. These seek to improve access to local facilities for all, including those without access to a vehicle. These measures contribute towards achieving a more equal, prosperous, resilient and healthier Wales. Through improving connectivity between local areas, the Scheme also seeks to deliver cohesive communities and a vibrant culture in accordance with the FGA seven well-being goals.

18.8.32 As shown in Table 18.5, the Scheme would contribute to achieving the 'Next Steps' within the PSB Well-being Plan. This includes supporting good mental well-being for all ages, supporting community empowerment and supporting environmental resilience. Although not all steps are relevant to the Scheme, the scheme does not prevent other 'Next Steps' from being undertaken. On this basis, the Scheme provides beneficial outcomes as assessed by the FGA.

18.8.33 The enhancements listed above also contribute to compliance with the policies related to wellbeing in the Conwy Local Development Plan 2007-2022, and the Local Well Being Plan 2018.

18.9 Incorporated Mitigation

18.9.1 The design for the Scheme has been developed iteratively by the design team to ensure that the most appropriate solutions have been identified and developed. Numerous minor adjustments were made to improve the design or to avoid or minimise impacts. The Scheme is complex because it must satisfy wide ranging project objectives as well as complying with legislation and the requirements of safety and of highways design standards.

18.9.2 The following list presents the assumptions that have been made for the purposes of this ES in terms of incorporated mitigation, with the proviso that the list is not exhaustive:

a) A Construction Environmental Management Plan would be prepared which would be compliant with all relevant construction best practice and codes of practice. This would include impacts associated with compound establishment and activities such as materials storage and waste management. A pre-construction CEMP is included in Chapter 21;
b) Measures would be adopted during the construction works to mitigate environmental effects of ground works including the stockpiling of soils;
c) Relevant pollution control measures would be observed during construction in line with current legislation and best practice, this is also discussed in the pre-construction management plans in Chapter 21; and
d) Construction would be compliant with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, in order to protect soil quality during excavation right through to reinstatement;
e) Proposed mitigation for the likely changes to traffic noise and visual impact would include acoustic barriers and the planting of trees and shrubs to screen views of traffic and mitigate for traffic noise. The new junction, in combination with open land for visibility splays, sustainable drainage measures, landscape planting and Active Travel routes will create a corridor of urban public space along Penmaenmawr Road.

18.9.3 Further mitigation measures in addition to standard best practice measures are outlined below that would be employed at the site in order to avoid potentially significant effects arising from the construction of the Scheme.

CEMP

18.9.4 An overarching mitigation measure which would contribute towards addressing the construction phase impacts is the development of a project specific CEMP. This would need to incorporate specific measures to address the significant impacts identified for the construction phase.

18.9.5 It would be necessary to ensure that mitigation measures are implemented to prevent off-site migration of contaminants as dust/vapours or run-off during excavations and soil stockpiling. Sheeting of lorries would be undertaken for material importing and exporting materials offsite to mitigate risks from dust. No specific mitigation is considered to be required for asbestos,

although the implementation of mitigation measures for dust would also ensure the risks from asbestos remain low.

18.9.6 A protocol would be prepared to address unexpected contamination, should this be encountered, during excavations for the construction works and this would need to be incorporated into the CEMP.

18.9.7 As noted above a Materials Management Plan (MMP) would be put in place and this would include details of how excavated soils would be managed on site including, where appropriate their re-use on site.

18.9.8 The following table 18.6 provides signposts to where the effects assessments have taken place and also an overall summary of residual significant effect.

Table 18.6: Assessment of Effects

Element from LA112	Impact related to Population and Human Health	Residual Significant Effect during Construction	Residual Significant Effect during Operation	Status
Land use and Accessibility				
Private property and housing	Flooding	None	None	Considered in Chapter 7 Road Drainage and Environment
	Demolition of occupied private residential properties	Adverse	Adverse	Considered in Chapter 11 Community Assets
	Changes to existing gardens	Adverse	Adverse	Considered in Chapter 11 Community Assets
Community land and assets	Severance	None	Beneficial	Considered in Chapter 11 Community Assets and Chapter 14 All Travellers
	Loss of open space	Adverse	Beneficial	Considered in Chapter 11 Community Assets
	Provision of additional cycleways and enhanced connectivity	Beneficial	Beneficial	Considered in Chapter 11 Community Assets
Development land and businesses	Demolition of an allocated site	Adverse	Adverse	Considered in Chapter 11 Community Assets
Agricultural land holdings	Loss of agricultural land	Adverse	Adverse	Considered in Chapter 11 Community Assets
Walkers, Cyclists and Horse riders	Severance/enhanced connectivity	Adverse	Beneficial	Considered in Chapter 14 All Travellers
	Relief from severance	N/A	N/A	Considered in Chapter 14 All Travellers
	Change in Amenity	Adverse	Beneficial	Considered in Chapter 14 All Travellers
Human Health				
Human health	Contaminated soils and water	None	None	Considered in Chapter 6 Geology and Soils

Element from LA112	Impact related to Population and Human Health	Residual Significant Effect during Construction	Residual Significant Effect during Operation	Status
	Air Quality	None	None	Considered in Chapter 12 Air Quality
	Noise levels	Adverse	None	Considered in Chapter 13 Noise and Vibration
	Driver Stress	Adverse	Beneficial	Considered in Chapter 14 All Travellers
	Climate Change	None	None	Considered in Chapter 15 Climate Change
	Major Accidents and Disasters	Potential	Potential	Considered in Chapter 17 Accident and Disaster
	Risk of Road Traffic Accidents	None	Beneficial	Considered in Economic Assessment Report
Landscape	Landscape design, loss of views	Adverse	None	Considered in Chapter 9 Landscape
Policy/Guidance				
Well-Being of Future Generations (Wales) Act (FGA)		None	Beneficial	Considered in this Chapter
Active Travel (Wales) Act 2013		None	Beneficial	Considered in Chapter 14 All Travellers

18.10 Effects with Mitigation

18.10.1 In some cases, the effects that have been identified within Table 18.6 have required mitigation in order to reduce the potential effect. This process is outlined in the relevant Chapters signposted.

18.10.2 As described above, a number of standard best practice measures would be adopted during construction and operation of the site in order to ensure that the Scheme does not result in any significant environmental effects.

18.11 Summary of Residual Significant Effects

18.11.1 Table 18.6 above contains an assessment of the potential significant effects of the Scheme on population and health. As outlined already, the assessment of significance of effect for the majority of impacts have been undertaken in other relevant Chapters.

18.11.2 Residual adverse effects for the Scheme are in relation to Land use and Accessibility, notably the demolition of existing residential properties, change to existing gardens, loss of allocated site for development and loss of agricultural land.

18.11.3 The Schemes final design is considered to minimise the number of residential properties that would need to be demolished, whilst still retaining four-way movement. A separate legal process considers potential compensation and 'blight' matters.

18.11.4 There are considered to be no residual significant adverse effects related to Human Health, however there are a range of beneficial effects. The Scheme is considered beneficial by reducing the severance of members the community from the coast, enhancing active travel provisions for walkers and cyclists and reducing driver stress.

18.11.5 There are potential impacts as a result from accidents and disasters. Most of these events arise from natural sources and would occur whether or not the junction improvements are carried out. There is also the potential for 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. Overall, according to the Economic Assessment Report, it is considered that the Scheme would be beneficial in reducing the number of road traffic accidents. The predicted number of road traffic accidents in the 60-year period for the study area under the 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.

18.12 Cumulative Effects

Intra-Project Effects

18.12.1 Intra-project effects are considered as those that "occur between different environmental topics within the same proposal, as a result of that development's direct effects"[14].

18.12.2 Intra-cumulative effects have been referenced within other Chapters; Table 18.7 outlines the

[14] Institute of Environmental Management & Assessment (IEMA), 2011. Special Report – The State of Environmental Impact Assessment Practice in the UK

potential direct and indirect intra-project cumulative effects that have been considered.

Table 18.7: Intra-Cumulative Effects

Topic Area	Cumulative Effects
Geology and Soils	Following the implementation of mitigation no potentially significant intra-project cumulative effects have been identified.
Road Drainage and Environment	Following the implementation of mitigation no potentially significant intra-project cumulative effects have been identified.
Landscape	The Scheme would result in significant noise effects, particularly during the short-term construction period and also increased noise levels during the operational phase. During construction, noise would affect the perceptual qualities of tranquillity above Llanfairfechan and along Promenade and beach areas. General amenity would be diminished by increased noise levels for local residential properties and users of Public Rights of Way such as the National Cycle Network and long-distance footpaths. During the operational phase, noise mitigation would effectively reduce the noise levels to within 1-3 dB and therefore represent no residual significant effects.
Community Assets	Most ES chapters indicate intra-project effects in relation to community and private assets comprising existing soils conditions and contamination related to previous developments and material importation, flood event considerations, nature conservation (biodiversity) relating to demolition, landscape and visual changes for views significantly the change in impact to and from residential properties to the east, archaeological recording prior to the demolition of properties, air quality impacts on existing and proposed assets (though as noted below, no significant effects have been identified), potential benefits to non-motorised travellers and materials relating to demolition of residential properties and the Pendalar Footbridge. Cumulative impacts were considered unlikely to be significant.
Air Quality	There are no significant effects, therefore no significant intra-project cumulative effects have been identified.
Noise and Vibration	Cumulative effects may include intra-project effects, when construction activities overlap in time for Junction 15 and Junction 16, or when changes in operational traffic at Junction 16 affect traffic at Junction 15.
All Travellers	No significant intra-project cumulative effects have been identified.
Climate Change	There are no significant effects, therefore no significant intra-project cumulative effects have been identified.
Major Accidents and Disasters	There is potential that threats identified could occur, which would therefore create cumulative effects between topics.
Health Impact Assessment	The Scheme has minimal potential to result in significant effects on human health.

18.12.3 Overall, following the implementation of mitigation no potentially significant intra-project cumulative effects have been identified.

Inter-project Effects

18.12.4 Inter-project effects have been considered as those where "cumulative effect occurs as a result of the likely impacts of the proposed development interacting with the impacts of other developments in the vicinity" (IEMA)[15].

18.12.5 Intra-cumulative effects have been referenced within other Chapters; therefore Table 18.8 outlines the potential inter-project cumulative effects that have been considered.

Table 18.8: Inter-Cumulative Effects

Topic Area	Cumulative Effects
Geology and Soils	The potential for significant cumulative effects in combination with the Scheme, including the proposals for Junction 16, is considered low.
Road Drainage and Environment	The potential for significant cumulative effects in combination with the Scheme, including the proposals for Junction 16, is considered low.
Landscape	There is no potential for significant cumulative effects in combination with the Scheme. The Scheme proposals for Junction 16 have also been considered in combination with Junction 15. The two Schemes, although geographically not distant from each other, are considered to have no cumulative landscape or visual effects. Effects are very localised and visually not connected due to the intervening landform of Penmaenmawr Mountain.
Community Assets	The potential for significant cumulative effects in combination with the Scheme, including the proposals for Junction 16, is considered unlikely.
Air Quality	Construction works at Junction 15 concurrent with construction works at Junction 16 do not have the potential to affect the identified receptors within the study area because of significant distances separating the two junctions. Significant cumulative effects are unlikely to occur as each Scheme is anticipated to employ similar dust mitigation techniques such that the individual construction phase effect was not significant, alone or in combination. The J15 Scheme traffic model has taken into account committed developments as well as future predicted traffic growth when both Junctions 15 and 16 are completed in the assessment opening year. The assessment has therefore predicted the cumulative concentrations arising from committed developments in the area in 2022.

[15] Institute of Environmental Management & Assessment (IEMA), 2011. Special Report – The State of Environmental Impact Assessment Practice in the UK

Noise and Vibration	Construction works at Junction 16 concurrent with construction works at Junction 15 do not have the potential to affect the identified receptors within the study area because of significant distances separating the two junctions. Therefore, construction works are not predicted to result in significant cumulative effects. The traffic data used for the assessment includes the traffic associated with committed developments, therefore the assessment of operational noise is cumulative with other developments.
All Travellers	Traffic flows which consider both Junction 15 Scheme and Junction 16 Scheme are unchanged from the traffic flows which considered the Schemes in isolation. Therefore, no further assessment of the cumulative effects of the construction or operational phase has been considered.
Climate Change	There are no significant effects, therefore no significant intra-project cumulative effects have been identified.
Major Accidents and Disasters	There is potential that threats identified could occur, which would therefore create cumulative effects between schemes.
Population and Health	The Scheme has minimal potential to result in significant effects on human health. There are no significant consented developments in the nearby vicinity, and nearby existing developments which could have the potential to cause significant effects have been included within the baseline.

18.12.6 Overall, following the implementation of mitigation no potentially significant inter-project cumulative effects have been identified.

18.13 Conclusions

18.13.1 On the basis of the significance of effects, the Scheme would result in a 'major adverse' to 'moderate minor adverse' impact on existing private assets and development land.

18.13.2 The Scheme would result in 'minor adverse' impacts on agricultural land and farm businesses during the construction stage and permanently.

18.13.3 The Scheme includes Land use and Accessibility and Human Health benefits.

18.13.4 Overall, the Scheme would contribute to the FGA through seeking to deliver measures that would have a positive impact on people living in the future as well as those living today. The five ways of working have been considered through the development of the scheme which has taken "into account the impact that the scheme could have on people living their lives in Wales in the future as well as in the present".

18.13.5 The Scheme also enables some of the 'Next Steps' within the PSB Well-being Plan 2018-2023, without preventing or hindering other 'Next Steps' to be undertaken, as all 'Next Steps' are not related to the Scheme. The Scheme enables 'Next Steps' related to people – supporting good mental well-being for all ages, community – supporting community empowerment and place – supporting environmental resilience by:

a) People – Supporting Good Mental Well-being for All Ages: Improved connectivity, contribution to active travel and provision of high quality landscaping and green space;
b) Community – Supporting Community Empowerment: Improved connectivity, Apprenticeship schemes, Site visits by schools and colleges during construction and provision of access for new homes; and
c) Place – Supporting Environmental Resilience: Flood risk assessment and mitigation measures, biodiversity surveys and assessment, ecological mitigation, provision of high quality landscaping and green space, locally sourced materials, use of recycled materials where practicable; recycling and re-use of materials to divert waste from landfill and site visits by schools and colleges during construction.

18.13.6 The Scheme also proposes additional measures which seek to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs and to meet the seven well-being goals as identified in Section 19.2.6.

18.13.7 The Scheme seeks to provide healthy and active travel options alongside the development of A55 (the highways infrastructure) through the provision of improved, sustainable accessibility between local areas and the coastline.

18.13.8 The inclusion of additional walking and cycling routes seeks to improve accessibility, health and wellbeing for both existing and future generations. These seek to improve access to local facilities for all, including those without access to a vehicle. These measures contribute towards achieving a more equal, prosperous, resilient and healthier Wales. Through improving connectivity between local areas, the Scheme also seeks to deliver cohesive communities and a vibrant culture in accordance with the FGA seven well-being goals.

18.13.9 Similarly, the Scheme has considered the requirements of the Active Travel (Wales) Act 2013 to improve facilities and routes for NMUs, supporting the Welsh Governments vision of walking and cycling being the preferred choice of mode for shorter distance trips. The inclusion of additional walking and cycling routes seeks to improve accessibility, health and wellbeing for both existing and future generations.

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 19 CUMULATIVE IMPACT ASSESSMENT

RAMBOLL Bright ideas. Sustainable change.

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19. CUMULATIVE IMPACT ASSESSMENT

19.1 Chapter introduction

19.1.1 This chapter of the ES explains the potential impact of cumulative effects within this Scheme.

19.1.2 'Cumulative effects' result from multiple actions on receptors or resources occurring in combination over a period.

19.1.3 The ES Scoping Report identifies the need for a cumulative effects assessment (CEA), due to the potential for separate effects of more than one project to incur a significant effect on receptors. This was primarily based on the potential effects associated with the construction and operation of this Scheme could correspond with construction and operation of the Junction 15 Improvements. These two separate Schemes could both be constructed over a similar period time, or with a staggered commencement and completion.

19.1.4 In addition, cumulative effects associated with 'other developments', for example, proposed housing developments, could also represent another potential effect on receptors. These are also considered within this ES CEA Chapter.

19.1.5 The CEA approach recognises that it should *'not be any longer than is necessary to identify and assess any likely significant cumulative effects that are material to the decision-making process, rather than cataloguing every conceivable effect that might occur*.' [1] This Scheme CEA reflects a *"proportionate and pragmatic process'*

Inter-relationships and in-combination effects

19.1.6 Two principal types of cumulative effects are considered: *interrelationships* between effects generated by the Scheme, and the addition or *interaction* of effects generated by one or more other schemes *in combination* with the project being assessed. For example, a small area of habitat loss coupled with increased noise disturbance in remaining habitat could together reduce the foraging available to a species sufficiently to reduce the local population (interrelationship). A short period of construction noise added to periods of construction noise from a series of other projects could combine to produce a significant impact on one group of residents (cumulative).

19.1.7 At the time of the drafting of this ES Chapter IAN 125/09(W) (Welsh Assembly Government, 2010) acknowledges that *'yet there is no industry standardised approach'* to the assessment of cumulative effects. As several different methods and techniques can be used for the assessment of cumulative effects, the emphasis is for an integrated and holistic approach to demonstrate the potential environmental complexity and relationships involved.

19.1.8 As such, for this ES chapter, reliance is made on the following principles:

a) Developing existing good practices, methods and techniques
b) Professional judgement and expert opinion;
c) Knowledge of the Scheme and,
d) To present the outcome of the methods and conclusions in a sequential and logical format.

[1] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf

19.1.9 A cumulative assessment relies on the interpretation of several terms[2]. These include the interpretation of *'direct'*; *'indirect, 'secondary'* effects and *'short/medium/long'* term and *'permanent'* and/or *'temporary'* effects. These are described with ES Chapter 22 Glossary.

19.1.10 This Chapter therefore presents two separate CEA elements:

a) The 'interrelationship' assessments reported as part of each ES topic chapter.
b) Systematic review of 'other developments' and their potential *'interaction'* impacts.

19.2 Study area and methods

19.2.1 Available guidance does not define a specific study area but recommends a proportionate and systematic CEA process.

Inter-relationships

19.2.2 For the review of *'inter-relationships'*, the Scheme CEA process initially identifies the 'study areas' set for each topic. This is based on the information provided in each of the ES Chapters.

19.2.3 As the Scheme design developed a more defined *'zone of influence'* (ZOI) for each environmental topic was identified, within the limits of the initial ES topic study areas.

19.2.4 The ES topic study areas and ZOI's for each Chapter topic are identified and these are drawn in Figure.19.1

19.2.5 Each of the ES topic chapters establishes and considers the inter-relationship between impacts on receptors or receptor groups as part of their Chapter assessment. For instance, effects on ecological receptors arising from any combination of land take, noise/visual disturbance, air quality impacts, water quality impacts and potential traffic collision are considered within the ecology chapter.

19.2.6 The ES Chapter assessments are then reviewed and the relevant interrelationships 'scoped' for the Scheme. The inter-relationships assessed for each topic chapter were then collated together and reviewed against the Scheme. The process is summarised in Table 19.1.

Table 19.1: Method of Assessment for the consideration of CEA inter-relationships

Stage	Description
1 **Which** receptor/resources are affected by the Scheme	Scoping exercise of receptor/resource types not affected or where these receptor/resource types are assessed wholly in a single EIA topic.
2 **How** will the receptor/resource be affected?	Review receptor(s)/resource affected by more than one effect through analysis of the assessment of effects sections undertaken for individual EIA topics
3 **Wha**t is the **probability** of these effects occurring?	Identification of potential inter- relationship effects on these receptor groups through review of the topic specific assessments in the EIA chapters and present findings

[2] As detailed in *'The Environmental Impact assessment handbook A practical guide for planners, developers and communities'* 2009, page 115. ES Chapter 22 Glossary includes a full description.

Stage	Description
4 **What ability** does the receptor/resource have to absorb further effects before changes become irreversible?	Assessment undertaken on how individual effects may combine to create interrelated effects on each receptor for: 'Project lifetime effects', i.e., during construction, operational and decommissioning phases; and 'Receptor-led effects', i.e., multiple simultaneous effects on a single receptor/resource

Source: DMRB Volume II Section 2 Part 5 HA 205/08 Part IV paragraph 2.14

In-combination

19.2.7 The assessment of in-combination effects with 'other development' was identified through a systematic approach. This consisted of searching and identifying 'reasonably foreseeable' projects and proposals which could have 'in-combination' effects.

19.2.8 'Other developments' are described within the ZOI's identified for the Scheme. Development sites at the margins of the ZOI's could be included and then excluded at a later stage, as the likely effects of the proposed Scheme and projects were more clearly defined.

Collation of details for in-combination effects

19.2.9 As described in paragraph 19.2.7, the CEA considers and uses the most relevant available guidance and advice[3] (as set out in Section 19.5) and similar CEA comparable Schemes and projects. This is to ensure consistency of a robust CEA approach and importantly, in defining *'other developments'*[4].

19.2.10 *'Other developments'* were identified through a systematic approach consisting of searching out *'reasonably foreseeable'* projects and proposals and then 'screening' to select those which could have in-combination effects. A four-stage approach was used to identify and screen other proposed developments within a 'zone of influence 'of the Scheme.

19.2.11 Briefly, the activities within each of the four stages are:

Stage 1: Using the established Zone of Influence (ZOI) of the Scheme, identify Long List of 'Other Developments'.

Stage 2: Identify Shortlist of 'Other Development' for Cumulative Effects Assessment, by applying inclusion/exclusion criteria to the Long List of 'other development';

Stage 3: Gathering information on projects listed in Stage 2;

Stage 4: Detailed assessment of each 'other development' and assess overlap in effects between the Scheme and other developments. Assess whether contributions to effect come equally, or predominantly from one development.

[3] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf
[4] As examples: M4 Road Transport Infrastructure Scheme; Wylfa Newydd Development Infrastructure; A40 Llanddewi Velfrey Road Scheme

19.2.12 Matrices are used to present the process and findings in a clear format.

19.2.13 A review of the following sources was undertaken to identify proposed developments:

a) The local planning authority websites for Conwy County Borough Council and Gwynedd County Council, with particular emphasis on proposed developments (including transport or minerals-related developments) in closest proximity to the site;
b) Annual reports and updates relating to adopted and emerging Local Plan (LP) previews for these two counties;
c) Planning Inspectorate website, in order to identify any Nationally Significant Infrastructure Projects, planning appeals or 'call in' proposals in the vicinity of the Scheme;
d) Details of all Environmental Impact Assessment (EIA) category developments within the Scheme study areas.

19.2.14 The identification of relevant town planning permissions and Local Development Plan (LDP) allocations included a review of the existing LDP maps and indexes, planning update reports and planning permissions, LPA annual monitoring records and other related information available at the end of February 2019.

Long list

19.2.15 Using the relevant sources, a 'long list' of other developments[5], both within and bordering the CEA boundary, was identified. The 'long list 'a total of 22 separate 'other developments', which are subsequently categorised[6] into the following:

a) Development under construction;
b) Application(s) permitted but which are not yet implemented;
c) Submitted applications not yet determined, and which, if permitted, would affect the proposed development in the scoping request;
d) Development identified in the adopted and emerging development plan (with appropriate weight being given as they move closer to adoption), recognising that information on any relevant proposals will be limited.

19.2.16 Long list projects were further categorised as either 'major' developments; EIA developments and/or those with sensitive receptors or unique matters relevant to the Scheme.

19.2.17 Detailed information and development descriptions were taken from publicly available planning application documents, and from developer websites or similar sources for projects not yet at planning application stage.

19.2.18 Figure 19.2 shows the location of the 22 sites and Appendix 19.1 provides a detailed a review of the long list of all 22 'other developments'.

19.2.19 The review included a systematic description of the type of development and the relationship with the Scheme, leading to the identification of a 'short list' of development sites/projects which could have an interaction with the Scheme.

[5] These include planning applications submitted and determined within a five – year period up to the end of February 2019. Further updates may be necessary.
[6] See details included in para. 19.5

Short- list' of 'other development' sites

19.2.20 In consultation with the Local Planning Authorities[7], a 'short-list 'of these sites was subsequently agreed. The 'short listed' sites includes the following:

a) Land to the West of Penmaen Park
b) New build residential units at Fernbank, Llanfairfechan
c) Mineral permission Penmaenmawr Quarry
d) A55 Junction 16 improvements
e) Abergwyngregyn to Tair Meibion A55 improvements[8]

19.3 Value (sensitivity) of resource

19.3.1 As set out in ES Chapter 4, the CEA includes a qualitative assessment to indicate the 'significance' of effects. This relies on the significance of an effect on the function of the value or sensitivity of the resource/receptor and the magnitude (or scale) of the impact (in the context of the timescale involved, as temporary or permanent). Levels of 'significance' considers both adverse and beneficial effects during the construction period and arising from the operation of the Scheme [9].

19.3.2 The recommended approach and guidance to evaluate the significance of a CEA effect [10]highlights *'The focus in assigning significance to cumulative effects should be determined by the extent to which the impacts can be accommodated by the receptor/resources. Thresholds (limits beyond which cumulative change becomes a concern) and indicative levels of acceptable performance of a receptor/resources may also aid the assessments process'*.

19.3.3 In determining the 'significance' of cumulative effects, DRMB[11] suggests the following approach*:*

Table 19.2: Determining the significance of cumulative effects

1 Which receptor/resources are affected
2 **How** will the activity or activities affect the condition of the receptor/resource?
3 **Wha**t are the probabilities of such effects occurring?
4 **What ability** does the receptor/resource have to absorb further effects before changes become irreversible?

19.3.4 DMRB also suggests that '*it is useful to standardise significance criteria for cumulative effects'* using the framework in Table19.3

Table 19.3: Assigning significance to cumulative effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised

[7] Email sent from RML on the 05/06/2019 to Cara Owen, Planning Services, Gwynedd Council; David Watson and James Harland, Conwy County Borough Council, Planning Services; Aled Lloyd, Snowdonia National Park, Planning Services.

[8] No firm commencement date was established for this scheme project/plan at the time of the preparation of the CEA Chapter. In late March 2020, as this ES was completed, the award of a construction contract to build the A55 (T) Abergwyngregyn to Tai'r Meibion Improvement was announced, with a completion date before construction of the Junction 15 Scheme would be likely to commence. The level of 'significance ' initially attributed for this CEA project is no longer relevant for this CEA and is not considered further. See: https://gov.wales/contract-awarded-29m-a55-tair-meibion-scheme-north-wales-transport-improvements-

[9] as defined in Table 2.3 of HA205/08 (Highways Agency et al., 2008)

[10] DMRB Volume II Section 2 Part 5 HA 205/08 Part IV paragraph 2.13

[11] DMRB Volume II Section 2 Part 5 HA 205/08 Part IV paragraph 2.14

Significance	Effect
Major	Effects that may become key decision-making issue
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where the future work may be needed to improve current performance
Minor	Effects that are locally significant
Not significant	Effects that are beyond the current forecasting ability or are within the ability of the resources to absorb such change.

Source: DMRB Volume II Section 2 Part 5 HA 205/08 Part IV paragraph 2.15

19.4 Regulatory and policy framework

Legislation and Policy Framework

19.4.1 ES Chapter 5 provides the relevant environmental legislative and general policy context for the Scheme.

Legislation

19.4.2 The following legislation is of direct relevance to this ES Chapter:

> ***The EIA Directive* 2011/92/EU**, as amended. This requires the consideration of interrelationships and cumulative effects. The information required includes the assessment *of 'the direct effects and any indirect, secondary, cumulative, short, medium and long term permanent or temporary, positive and negative effects of the project'.*
> ***Planning (Wales) Act 2015***. This strengthens the established plan- led approach to land use planning in Wales and sets out the preparation of a national land use and infrastructure requirements plan, the National Development Framework.

Policy

<u>National Planning Policy Wales</u>

19.4.3 The national Planning Policy Wales (PPW) is the principal and authoritative source of national planning policy, under which local planning authorities prepare their Local Development Plans (LDP's). PPW 10 (December 2018) is the latest edition of Planning Policy Wales and takes account of the Well-being of Future Generations (Wales) Act 2015. It outlines policies on all the key land use matters and is supplemented by Technical Advice Notes, Circulars and Policy Clarification Letters.

19.4.4 PPW and the Wales Transport Strategy both aim to secure the provision of transport infrastructure and services, which improve accessibility, build a stronger economy, improve road safety and foster more sustainable communities[12].

> *'Integration of land use planning and development of transport infrastructure has a key role to play in addressing the environmental aspects of sustainable development, climate change and the outcomes identified in the Assembly Government's Environment Strategy.'*[13]

[12] https://gov.wales/sites/default/files/publications/2018-09/tan18-transport.pdf, page 2.
[13] https://gov.wales/sites/default/files/publications/2018-09/tan18-transport.pdf, page 2.

Local Plans

19.4.5 Local Plans identify site specific land use, infrastructure and other developments. The relevant Local Plan is the adopted Conwy County Borough Council local development plan (CCBC LDP) 2000- 2015, supported by accompanying planning guidance notes.

Relevant Guidance[14]

19.4.6 At the time of drafting this ES CEA IAN 125/09(W) (Welsh Assembly Government, 2010) acknowledges that '*yet there is no industry standardised approach'* to the assessment of cumulative effects. The cumulative assessment should nevertheless 'differentiate between permanent, temporary, direct, indirect and secondary effects, positive and negative'.

19.4.7 *HA205/08. Principles of Environmental Assessment – Assessment and Management of Environmental Effects (Highways Agency et al, 2008).* The guidance set out in HA 205/08 (Highways Agency et al., 2008) forming Design Manual for Roads and Bridges (DMRB) Volume 11 Section 2 Part 5 states that there are two types of cumulative effects to be considered in environmental assessment: (i) cumulative effects from a single scheme (referred to as 'interrelationships') and (ii) cumulative effects from different schemes. The resulting cumulative effect or effects may be significant even where individually these effects are not. Good coordination and sharing of results between topic areas to ensure a comprehensive identification and understanding of the interaction between effects is therefore important.

19.4.8 The DMRB guidance defines '*reasonably foreseeable'* for 'other developments' to mean other proposed developments that are committed, including (but not limited to) trunk road and road schemes which have been confirmed through the statutory process, and development projects with valid planning permissions granted by the local planning authority. Projects for which formal EIA is a requirement or for which a non-statutory environmental impact assessment was undertaken should then be selected

Further guidance

19.4.9 Further guidance for is taken from:

a) *Environmental impact assessment handbook*. A practical guide for planners, developers and communities. Second Edition, 2009;
b) *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions* European Communities 1999. EC DG XI Environment, Nuclear Safety & Civil Protection NE80328/D1/3;
c) *Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects* (Planning Inspectorate, 2015) which gives a systematic approach to 'other development' assessments for cumulative impacts, identifying tasks and suggesting templates.
d) *Advice Note 9 version 3: Using the Rochdale Envelope (Planning Inspectorate, 2018).* Although not specifically designed for highway schemes, the Planning Inspectorate guidance note provides more recent guidance on good practice for the assessment of cumulative effects for major infrastructure schemes, particularly where there is uncertainty or a need for flexibility within the proposal.

[14] November 2019 saw the publication of a new series of Design Manual for Roads and Bridges. This included LA04 'Environmental assessment and monitoring'. This provides additional advice for all specialist and 'Cumulative effects' [14]. This ES Chapter pre- dates the publication of the new guidance but is considered to reflect the approach offered in the new guidance.

19.4.10 The Planning Inspectorate Advice Note (PINS) 9 Version 3 (2018) states that '*The potential cumulative impacts with other developments will also need to be carefully identified such that the likely significant effects can be shown to have been identified and assessed against the baseline position (which would include built and operational development). In assessing cumulative impacts, other development should be identified through consultation with the local planning authorities and other relevant authorities. Applicants should have regard to the staged approach to cumulative effects assessment set out in Planning Inspectorate's Advice Note Seventeen: Cumulative Effects Assessment'.*

19.4.11 The PINS Note 17 identifies a wider range of proposed developments to be considered in this part of the CEA, noting that the certainty of implementation and the level of information available is likely to decrease from a) to g):

a) Developments under construction.
b) Permitted applications not yet implemented.
c) Submitted applications not yet determined.
d) Planning applications where a scoping report was submitted.
e) Projects on the planning register where a scoping report was submitted.
f) Sites identified in the relevant LDPs (and emerging LDPs – with appropriate weight being given as they move closer to adoption).
g) Other plans and programmes (as appropriate) which set the framework for future development consent/approval, where such development is reasonably likely to come forward.

19.5 Design, mitigation and enhancement measures

Design

19.5.1 The development of the design options for the Scheme included matters that are integral to both construction and operation, and to the consideration of potential inter-relationships and in-combination effects.

19.5.2 ES Chapter 3 sets out the context for the Scheme alternatives and includes a description of the difficulties encountered. In particular, the potential effect on residential occupiers and designated sites and habitats have been significant considerations. These were identified as major design constraints in all five potential Scheme options. The assessment and consideration of the inter-relationships and in–combination effects of the options was influential in selection and design of the preferred Scheme.

19.5.3 The topic specialists carrying out the ES assessments have implications of inter-relationships, to identify potential impacts and design changes.

19.5.4 The Scheme design process has consistently considered, and remains aware, of the potential construction and operational stages.

Mitigation and enhancement

19.5.5 The potential impact of the Scheme, in pre-construction, construction and operation is described in the ES Chapters, and any relevant avoidance and mitigation and enhancement measures assessed as part of the individual ES Chapter specialist cumulative assessment.

19.5.6 Continued dialogue and communication is identified as an ongoing measure as is the need to be aware of further, new developments which coincide with the Scheme.

Monitoring requirements

19.5.7 The ES Construction Environmental Management Plan (CEMP) sets out monitoring to be conducted during the construction and management of the final Scheme. This would ensure that if any potential revisions of the Scheme design would arise then additional positive and/or negative effects on all receptors are identified and re- assessed and this would include a CEA.

19.5.8 No additional mitigation or monitoring specifically for cumulative effects would be necessary.

19.6 Magnitude of impacts (change)

Inter-relationships assessment

19.6.1 Table 19.4 sets out the ES topic study areas and ZOI'S for each Chapter topic and these are drawn in Figure.19.1

Table 19.4: Topic study areas and ZOI's

Topic receptor/ resource	Study area limits (in Kms)	Zone of influence (in Kms)
Geology and soils	0.5km	
Road drainage and water environment	0. 5 from Junction alignment	Extent of environment
Nature Conservation (Biodiversity)	2km for protected and notable species, set out in Figure 8.2	Up to 30 km for SAC site features
Landscape and visual	0.5 km	2 km, set out in Figure 9.1
Archaeology and Cultural Heritage	1 km corridor, set out in Figure 10.2	5km
Community and Private assets	Extent of Scheme land take, set out in Figure 11.1	
Air Quality	200 either side of the affected road network	
Noise and Vibration	As set out in figure 13.1	
All travellers	The study area defined by the SATURN Traffic model.[15]	
Materials	ES Chapter methods utilises two separate study areas; Scheme boundary; 30 km for available waste infrastructure.	
Climate Change	ES Chapter method utilises three separate study areas.[16]: 1.In-combination Climate Change Impact (ICCI) Assessment: for each discipline, the study area for the ICCI will match that of the relevant discipline. 2.Climate Change Resilience Assessment (CCR): the study area for this assessment will not go beyond the boundary of the Scheme. This is to capture only the risks to the Scheme itself from climate change. 3.Greenhouse Gas Assessment (GHG): the study area for the GHG assessment will include the Scheme as well as the transport network utilised for transport of materials, the embodied carbon associated with the relevant construction materials and the emissions arising during construction of the Scheme. Greenhouse Gas Assessment - Operational Stage has been scoped out of this assessment.	

[15] Paragraph 14.4.4 of ES Chapter 14.
[16] Paragraph 16.4.1 of ES Chapter 16.

Topic receptor/ resource	Study area limits (in Kms)	Zone of influence (in Kms)
Risks of accidents or disasters	Due to the nature of the topic, there is no 'defined' zone identified within this specialist ES chapter	
Population and Human Health	Chapter 18 defines the following: DMRB LA112 defines the Study Area as extending for 500m from the Proposed Scheme and as noted above this is consistent the approach adopted for this Chapter. The broader study area for the Proposed Scheme 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. Where likely effects are identified outside the 500m area surrounding the project boundary, the study area is extended accordingly. Where effects are unlikely to occur within the 500m area surrounding the project boundary, the study area is reduced accordingly. Health factors assessed at a ward level and on this basis the following wards considered: a. Bryn, Lafan and Pandy; and b. Penmaenan, Pant-yr-Afon and Capelulo. With regard to the consideration of wider population and health factors beyond the scope of the HIA it is considered that the above wards also represent a suitable Study Area. 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.	

19.6.2 The identification of possible inter – relationship ES topics are listed in Table 19.5 Many of the ES specialist chapters have considered the full range of potential effects of the Scheme on a single receptor, or group of receptors, and include the possibility of inter- relationship effects. None are 'scoped out' of this CEA.

19.6.3 Some of the ES topic chapters have limited 'inter – relationships', for example, archaeology, with other topics identifying a more complex array, for example, the topics of climate change, nature conservation and material assets and waste.

19.6.4 The Scheme includes several potential receptor inter- relationships, with impacts on several ES receptors (for example, climate change, nature conservation or agricultural land) identified with the potential to cause indirect or secondary effects on several receptors.

Table 19.5: ES topics which include inter-relationship effects

Topic receptor/ resource	Coverage of inter-relationship effects
Geology and soils	All of the potential impacts on geological soil receptors were assessed and reported within Chapter 6:Geology and Soils. The assessment includes the consideration of the inter- relationship effects with the following receptors/topics: Road drainage and Water; Nature Conservation; Air Quality; Materials.
Road drainage and water environment	All of the potential impacts on road drainage and water were assessed and reported within Chapter 7:Road Drainage and Water Environment. The assessment sets out the consideration of the effects with geology and soils, nature conservation.
Nature Conservation (Biodiversity)	The assessment of in- combination effects is central to the assessment of potential impacts on ecological receptors and the integrity of the biodiversity network of sites and species. As such, Chapter 8 Nature Conservation (Biodiversity) has considered and assessed the impact of in combination effects in detail. ES Chapter 8 relies on the coordination with several other ES topics to understand the potential range and

Topic receptor/ resource	Coverage of inter-relationship effects
	complexity of impacts on ecological receptors. No additional effects are therefore considered likely to occur beyond the conclusions assessed in Chapter 8. Chapter 8 sets out the consideration on the inter- relationship effects of the following receptors/topics: Geology and Soils; Road drainage and water environment; Landscape & Visual; Air Quality; Noise and vibration; Materials.
Landscape and visual	All of the potential impacts on landscape receptors were assessed and reported within Chapter 9: Landscape and Visual. The chapter assessment identifies considerations on the inter- relationship effects of Noise: The impact of noise could affect existing perceptual tranquil qualities within the Scheme study area. The addition of noise mitigation noise barrier fencing would not represent a significant cumulative effect.
Archaeology and Cultural Heritage	All the potential impacts on archaeological and cultural heritage receptors were assessed and reported within Chapter 10: Archaeology and Cultural Heritage. The chapter assessment sets out the considerations on the inter- relationship effects with: Noise and Geology and Soils The conclusions indicate, with the additional potential for further archaeological investigations, an inter-relationship with noise and geological soil (landfill) receptors.
Community and Private assets and agricultural land.	The potential impacts on community and private assets and agricultural (includes farm businesses) were assessed and reported within Chapter 11: Community and Private assets and agricultural land. Chapter 11 relies on the coordination with several other ES topics to understand the potential range and complexity of impacts on community and private assets and agricultural land. Chapter 11 sets out the consideration of the following inter- relationship receptors/topics: Geology and Soils; Road drainage and water environment; Nature conservation (Biodiversity); Landscape & Visual; Archaeology and Cultural Heritage; Air Quality; Noise and vibration; All Travellers; Materials. No additional effects are therefore considered likely to occur beyond the conclusions assessed in Chapter 11.
Air Quality	All of the potential impacts on Air Quality were assessed and reported within Chapter 12: Air Quality and both human health and ecological receptors considered.
Noise and Vibration	The potential impacts on Noise and Vibration were assessed and reported within Chapter 13: Noise and Vibration. The assessment included the residential receptors.
All travellers	All of the potential impacts on All Travellers were assessed and reported within Chapter 14 All Travellers. The assessment mentions inter- relationship with: visual and noise impacts and community and private assets.
Material assets and waste	All the potential impacts on material assets and waste were assessed in Chapter 15: Material assets and waste. Considerations include the following inter- relationship receptors/topics: Geology and Soils; Road drainage and water environment; Air Quality; Noise and vibration; All Travellers; Climate Change. No additional effects are therefore considered likely to occur beyond the conclusions assessed in Chapter 15.
Climate Change	All the potential impacts from Climate Change is provided in detail in Chapter 16. No separate inter- relationships were identified within Chapter 16.

Topic receptor/ resource	Coverage of inter-relationship effects
Risks of accidents or disasters	All the potential impacts relating to the risks of accidents or disasters were assessed in Chapter 17: Risks of accidents or disasters. Chapter 17 relies on the appreciation of several potential natural and man made events or 'threats' and, as such, relates to other ES topics to understand the potential range and complexity of impacts from the risks of accidents or disasters. Chapter 17 sets out specific considerations of the potential cumulative effects of several combination of 'threats' arising. No additional effects are therefore considered likely to occur beyond the conclusions assessed in Chapter 17.
Population and Human Health	All the potential impacts on Population and Human Health is provided in Chapter 18 and relies on the information and co- ordination of other topic details.

19.6.5 Details for the provision of a construction site compound would need further consideration and assessment.

In-combination

19.6.6 Two of the 'short-listed 'sites': site a) development land allocation, West of Penmaen Park and site b), part of the new build residential units at Fernbank, Llanfairfechan includes land within the Scheme land take area. Site a) is as an 'allocated' site within the current adopted LDP.

19.6.7 An extant minerals permission at Penmaenmawr Quarry lies within 500 metres further east of the Scheme. Significantly, the existing minerals consent relies on securing additional consents.

19.6.8 The proposed A55 improvements for Junction16 represents a potential for the most significant impact on the Scheme, either alone or, in – combination.

19.6.9 All ES chapter specialists have considered the potential implications for an in- combination effect of any, or all, of these five plans or developments to take place at the same time as the Scheme time frame.

19.6.10 Within the limits of information available, each of the short-listed site was reviewed to assess whether likely effects would:

a) Extend to overlap with effects of the Scheme, affecting the same receptors
b) Arise or apply at the same time as effects of the Scheme (temporary effects)
c) Add together to generate significant effects.

19.6.11 Details within Appendix 19.3 shows the consideration of cumulative effects of these five 'short listed' sites against each ES topic considered in this ES.

19.6.12 Three of the five 'short listed' sites would generate effects which, cumulatively with the effects of the Scheme, would be significant within the area influenced by the Scheme: Development land allocation at West of Penmaen Park, Llanfairfechan; Residential land associated with land adjacent to Fernbank, Llanfairfechan, A55 Junction 16 improvements - transport scheme.

19.6.13 This is likely to arise because these three projects in particular are sufficiently close for their effects to overlap; affect the same receptors within adjoining areas, and they would potentially occur at the same time and sufficiently large in scale to be significant.

19.6.14 As the potential for cumulative effects with developments and plans also forms part of the Scheme's HRA assessment process ('Assessment of Implications for European Sites') then a more extensive and broader report is covered in the Statement to Inform an Appropriate Assessment.[17] It is also summarised in this ES Chapter 8.

19.7 Significant effects

19.7.1 Based on the methodology set out earlier in this ES Chapter, the Scheme is considered to include the following potential CEA impacts:

Inter – relationships review

19.7.2 Table 19.5 identifies several receptor 'inter- relationships' for the Scheme. The inter-relationships for the ES topics for climate change, nature conservation or agricultural land represent the potential to cause the most effects on several receptors, either temporarily or permanently. This means that an unplanned potential impact on either of these receptors can give rise to additional CEA effects.

19.7.3 Some ES topic chapters have limited 'inter – relationships', for example, archaeology.

19.7.4 Nature conservation, as one of the key environmental 'receptors', is central to the Habitat Regulations Assessment [18] and is reported separately in a 'Statement to Inform an Appropriate Assessment'.

19.7.5 The Schemes REAC and CEMP sets out several commitments and measures. These would mean that the potential for the 'inter- relationship' effects, at all stages of the Scheme, are '*unlikely to become issues on whether the project design should be selected and* current work would improve the inter-relationship performance. As such the level of 'significance' is considered to reflect a 'moderate' effect for this CEA assessment of 'inter- relationships'.

In combination

19.7.6 Paragraph 19.6.12 highlights that at least three out of five short listed sites projects(Development land allocation at West of Penmaen Park, Llanfairfechan; Residential land associated with land adjacent to Fernbank, Llanfairfechan, A55 Junction 16 improvements - transport scheme) would generate effects which, cumulatively with the potential effects of the Scheme, would be considered as 'significant' within the' zone of influence' of the Scheme.

19.7.7 The assessment identifies occurrence of the potential for an 'in-combination' effect with several receptors, significantly water and drainage; climate change, risks of accidents, use of agricultural land and, separately, materials and waste. No mitigation measures are identified as part of this assessment stage.[19]

[17] Section10 of the SIAA includes detailed mitigation measures and the conclusions reached makes reference for PEU mitigation
[18] The Habitat Regulations for the 'Assessment of Implications for European Sites'
[19] and no direct reference to the levels of significance described in table 19.2.

19.7.8 Overall, the cumulative impact is assessed as 'modest' and 'major'. 'Modest' as the effects mentioned *'are unlikely to* become *issues on whether the project design should be selected, but where the future work may be needed to improve current performance'* and 'major; as '*Effects that may become key decision-making issue*.' This includes the consideration of potential mitigation measures. [20]

19.7.9 Essentially, further future work is needed to improve current resilience and performance. This could include for example, further communication and details of programming of the 'other developments' identified, significantly the concurrent A55 J16 Scheme of Improvements.

Residual Effects

19.7.10 Subject to programme constraints on the separate A55 J16 Improvement Scheme and the outcome of the Conwy Borough Council Local Development Plan Review, the potential residual effects are primarily an increase in construction traffic associated with different projects coinciding. To add to this, all projects could include separate construction contracts, with different and separate site compounds and mitigation measures.

19.7.11 All Schemes could share good practice environmental methods and management and measures [21] and work towards alignment with the process and outcome for example, assisting with nearby drainage design for the existing new development near Fernbank and also, the CCLDP Review.

19.7.12 If the separate A55 J16 Improvement Scheme could be managed to limit or avoid the potential for cumulative effects, then the potential for these effects to occur is reduced. This process should consist of a collaborative approach, significantly for the Scheme and the concurrent but, separate J16 Scheme.

19.7.13 The A55(T) Abergwyngregyn to Tai'r Meibion Improvement Scheme (see paragraph 19.2.20) is expected to be completed by the autumn of 2021. If the completion date were to change then the potential for residual effects for this Scheme CEA could include an additional review process.

19.7.14 Separately, the Scheme includes a statement to inform the 'Habitat Regulations' which describes how the Scheme, either alone, or in – combination with' *other plans or projects',* avoids having a significant effect on nearby designated habitats, as is any mitigation and/or residual effects. The conclusions reached as part of this separate statement will provide a key to control any effects and impact on nearby designated habitats and species.

19.8 Indication of any difficulties encountered

19.8.1 The characterisation of 'inter- relationships' and 'other developments' is dependent on information available for the Scheme and published documents for 'other developments at the time of preparing this ES. Additionally, the ES Chapter Climate Change is included as a relatively new ES topic for transport Schemes.

19.8.2 For developments at earlier stages, and for applications for which EIA has not been undertaken, professional judgement and knowledge of the wider study area is employed to consider the receptors or resources that could be affected by the Scheme and the 'other development' in question.

[20] As described in highlighted in Appendix 19.2
[21] As highlighted in Appendix 19.2

19.8.3 Although the proposed timescale for the construction of the Scheme is known, the timescale over which the potential impacts from 'other developments' cannot be determined with certainty. The information given in Appendix 19.1 (Matrices 1 and 2) sets out indicative timescales[22] but the potential for overlapping of effects, or changes to developments approved, particularly those arising from construction activity, is therefore unpredictable.

19.8.4 Paragraph 19.2.20 confirms that the A55(T) Abergwyngregyn to Tai'r Meibion Improvement Scheme was initially 'short listed' as a potential for cumulative effects. This was primarily based on that Scheme commencing within a defined timescale, at the time. As this timescale subsequently changed from this ES Chapter's initial baseline of a 'short list' of sites, this meant that the Scheme's description as one of the CEA's 'short listed' sites also changed. The A55(T) Abergwyngregyn to Tai'r Meibion is now programmed for completion by the autumn of 2021, before the commencement of this Scheme. The final CEA 'short list' within this ES chapter was revised and does not include that Scheme.

19.8.5 It is noted that the CCBC LDP is currently in the later stages of a review process and is likely to contain additional and revised land use designations. There is the potential for further development proposals and LDP revisions between that date and the implementation of this Scheme and so the relevant local plan(s) documents and 'other developments' should be reviewed at each stage of the Scheme.

19.8.6 Details for the provision of a construction site compound would need further considerations and assessments.

19.8.7 This ES Chapter includes the use of a simplified 'standardised' approach for assigning 'significance'. This is different to the main ES topic assessments and includes five descriptions, (as in Table 19.3), focusing on those which are 'moderate' and above. This means that, for the assessment of a 'significant effect' for this Chapter, this relies on the ES topic specialists' understanding of the assessment process for cumulative effects and also, when the use of secondary information or details (for separate assessments/consents required for the Scheme) is not necessarily applicable to this Chapter.

19.9 Summary and Conclusions

19.9.1 The ES Scheme Scoping Opinion identified the need for a CEA. This was primarily based on the basis that the construction and operation of the Scheme and the corresponding, but separate, Junction 16 Scheme, could both be constructed over a similar period time. In addition, cumulative effects associated with proposed multiple projects taking place represented another potential effect on receptors are also considered.

19.9.2 The CEA process for the Scheme is considered to reflect a *"proportionate and pragmatic process'*. In line with current guidance, advice and similar Schemes, Chapter 19 attempts to present a systematic review and holistic approach for the CEA. Two types of cumulative effects are considered: *interrelationships* between effects generated by the Scheme, and the addition or *interaction* of effects generated by one or more other schemes *in combination* with the Scheme. So that the Chapter maintains focus, all detailed information is presented within three linked matrix data sets and these are referenced in Chapter Appendices 19.1-3. The layout and function of these matrix follows the guidance and good practice referenced with the ES Chapter

[22] The timescales are, in the main, derived in consultation with the LPA and published documents.

and is similar to other CEA transport and infrastructure Schemes.[23]

19.9.3 The impacts of inter- relationships are considered by ES topic Chapters and are reviewed within this ES Chapter CEA. Based on the complexity of the impact of receptor i*nter- relationships*, the assessment identifies a 'modest' effect. The assessment considers several 'inter- relationship' receptors for the Scheme.

19.9.4 In the' *in combination assessment'* the CEA identifies several projects, but the separate A55 J16 Improvement Scheme has the most potential to generate effects which, cumulatively with the potential effects of the Scheme, could affect several environmental receptors. With additional refinements, dialogue and communication identified as part of the Schemes' overall mitigation measures, any potential cumulative effects can be either minimised and/or avoided.

[23] For example, the M20 Junction 10a Scheme. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010006/TR010006-000188-M20_J10a_6.1_ES_Chapter_15.pdf

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A55 JUNCTION 15 ENVIRONMENTAL STATEMENT CHAPTER 20 MANAGEMENT OF ENVIRONMENTAL EFFECTS

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20. MANAGEMENT OF ENVIRONMENTAL EFFECTS

20.1 Chapter introduction

20.1.1 The Environmental Impact Assessment (EIA) carried out for this Scheme and reported in the topic chapters of this Environmental Statement (ES), identified the following matters that need to be addressed in detailed design, construction and aftercare:

a) Potentially significant effects associated with the Scheme;
b) Strategies to avoid, reduce or remedy (mitigate) these adverse environmental effects.

20.1.2 Ensuring that commitments to comply with the law and to provide mitigation are fulfilled during design, construction and operation of this Scheme, is a binding requirement on Welsh Government. A contractor will be appointed who will be responsible for design and construction of the Scheme. Welsh Government will require the contractor to:

a) Conform with relevant legislation;
b) Satisfy national policy and standards;
c) Fulfil Scheme-specific commitments;
d) Provide mitigation as it is set out in the ES and associated documents and appendices.

20.2 Environmental Management

20.2.1 Ensuring compliance with environmental commitments is a process known as Environmental Management which is delivered by the project team working within a framework set out in an Environmental Management System (EMS). The EMS is a procedure run by an organisation to ensure that its activities are complaint with legislation and with its own environmental policies and commitments.

20.2.2 The requirements of the EMS are applied to a specific construction Scheme through a Construction Environmental Management Plan (CEMP). Of key importance in a CEMP are specific Scheme objectives that will have been set out at the commencement.

20.2.3 The contractor will be expected to ensure that the Scheme is effectively managed and that the environmental impacts realised during construction are minimised. Contractors will have an environmental policy and will be required to maintain an Environmental Management System (EMS) in compliance with ISO 14001 and ISO 14004.

The Construction Environmental Management Plan

20.2.4 The EMS provides the framework within which a Scheme specific plan will be prepared. For a construction Scheme the plan is known as the Construction Environmental Management Plan (CEMP). The CEMP develops through the stages of the Scheme and is used to assist the Scheme team in implementation while maintaining high environmental standards. The sequential development of the CEMP is set out in Table 20.1.

20.2.5 A Pre-Construction Environmental Management Plan (Pre-CEMP) is provided as an appendix to this ES. Once a construction contract is awarded the contractor will be responsible for environmental management and will adopt and update the Pre-CEMP to set out a plan of work. Table 20.1 sets out the stages of development of the Construction Environmental Management Plan (CEMP).

Table 20.1 Sequential development of the CEMP

Key Stage of Scheme	Description	Status	Responsibility
Key Stage 0	Shaping of strategy	None	Welsh Government
Key Stage 1	Identification and selection of options		
Key Stage 2			
Key Stage 3	Preliminary design	(Pre-CEMP) Pre-construction environmental management plan (refer to Section 22.3 below)	Designer
Key Stage 4	Statutory procedures and powers		
Key Stage 5	Preparation for construction	Construction Environmental Management Plan (CEMP)	Contractor (to be appointed)
Key Stage 5/6	Construction and aftercare	Environmental Landscape and Ecology Aftercare and Management Plan (ELEMAMP)	
Key Stage 6	Handover	(Handover Environmental Management Plan (HEMP)	
Key Stage 7	Operation and maintenance		Maintaining Agent

20.2.6 As knowledge about the Scheme continues to grow through the Key Stages set out in Table 20.1, the CEMP goes through a development sequence which is shown diagrammatically in Figure 20.1.

20.2.7 The Key Stage 3 pre-construction draft of the CEMP (Pre-CEMP) has been compiled and a copy is provided in Volume 3 Appendix 2.2. Understanding the approach to construction of the Scheme and the sequence of activities is important when preparing the Pre-CEMP. For this Scheme the approach to construction is set out in Chapter 2. The construction activities and the effects on the environment have also been considered in each of the environmental topic chapters of this ES. Any new matters that emerge in Key Stage 4 are added to the Pre-CEMP before a contractor is engaged.

20.2.8 In Key Stage 5 the appointed contractor will adopt, refine and expand the Pre-CEMP into a 'live' Construction Environmental Management Plan (CEMP) so that it contains all current environmental management plans, method statements, permits, relevant licences, certificates, health & safety plans, the register of environmental commitments, quality assurance procedures, and any other relevant documentation the site environmental team require in order to manage the site effectively. The CEMP would also set out plans for procurement, energy use, and waste management and minimisation activities. The Scheme specific plans to be included in the CEMP would include the following which are described in more detail in Section 20.5:

a) Site Waste Management Plan (SWMP);
b) Materials Management Plan (MMP);
c) Pollution Control and Contingency Plan (PCCP);
d) Environmental Landscape and Ecology Aftercare and Management Plan (ELEAMP);
e) Cultural Heritage Management Plan (CHMP);
f) Noise and Vibration Management Plan (NVMP), if appropriate;

g) Maintenance Environmental Management Plan (MEMP).

20.2.9 In the CEMP the contractor will set out the key staff in the team and their respective responsibilities in environmental control, communication, training requirements and delivering the Scheme. The contractor's team will use the CEMP as the main reference document for environmental matters so that continuity of knowledge is maintained between each stage of the Scheme, as set out in Figure 20.1 and this knowledge about the site and the completed Scheme is handed on to the future maintenance organisation.

20.2.10 The Contractor's site personnel, sub-contractors and suppliers, have the CEMP so that they can be fully aware of the following:

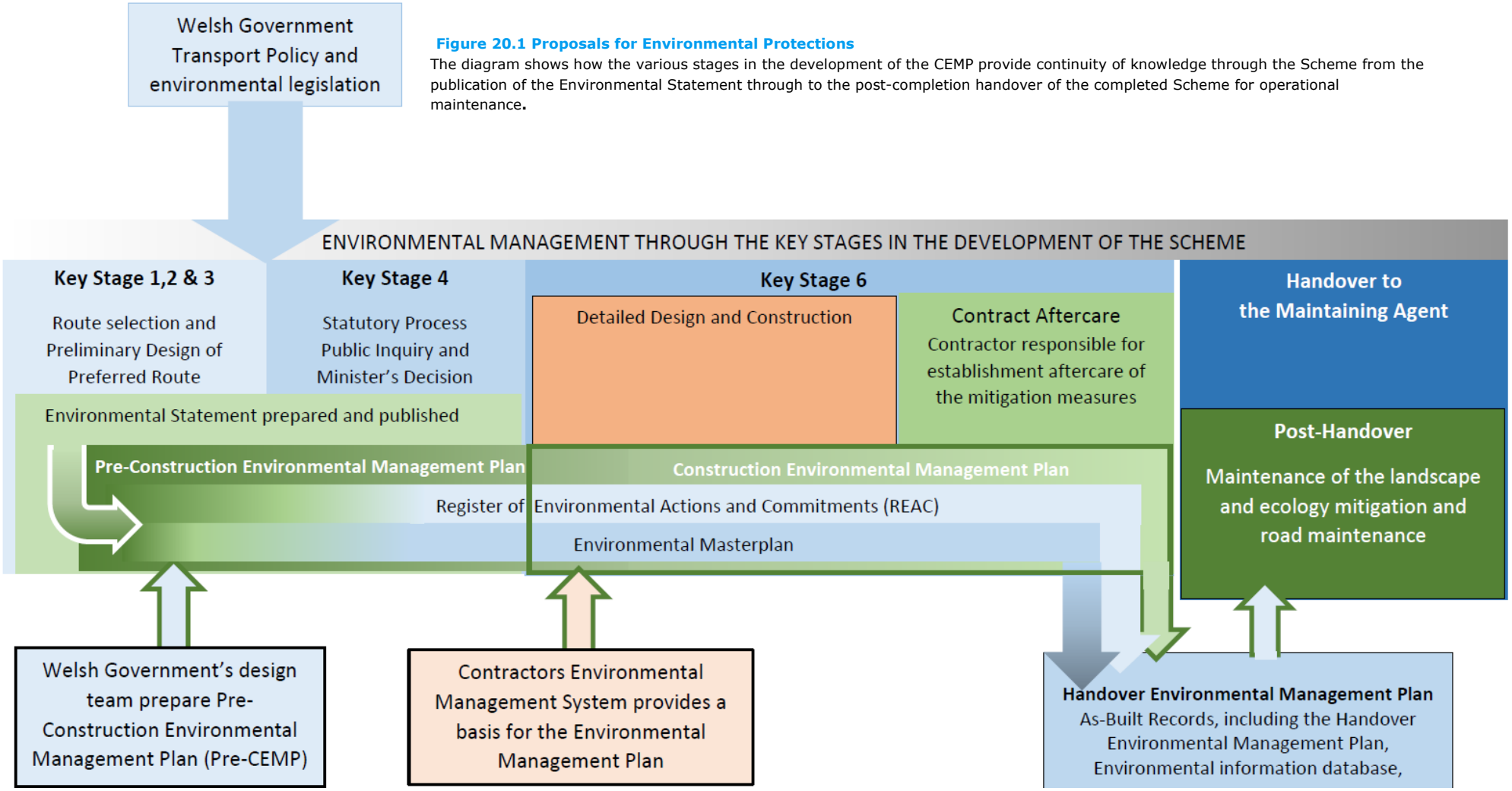
a) Compliance with legislation,
b) Good and best practice to prevent environmental damage, prevent pollution, minimise waste and achieving continuous improvement;
c) Scheme and environmental objectives and sustainable construction objectives;
d) Statutory consultees advice and their requirements;
e) Roles and responsibilities in meeting the requirements of the CEMP including performance benefits of raised environmental awareness of personnel, remedial and emergency procedures and the potential consequences of departure from operating procedures;
f) Measures required to avoid and mitigate actual or potential environmental effects during construction activity;
g) Scheme-specific mitigation (commitments), set out in the ES and mapped out in the Environmental masterplan, that the contractor and the maintaining agent are required to implement during construction and operation;
h) Environmental hold points at which construction work must cease until the Environmental Coordinator ECO agrees that work can proceed;
i) The basis for the future operation and maintenance of the completed Scheme.

20.2.11 The contractor will use the CEMP to assist in:

a) Identifying and managing construction environmental risks, including the preparation of risk assessments and method statements;
b) Liaison with regulatory authorities and third parties and recording what is agreed and implemented;
c) Recording how the requirements of environmental legislation, policy, good practice, and Scheme objectives are met or not;
d) Recording how mitigation measures and the environmental design are implemented with evidence of completion in the Register of Environmental Actions and Commitments (REAC) – described in Section 20.3.3;
e) Provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action takes place.

Figure 20.1 Proposals for Environmental Protections

The diagram shows how the various stages in the development of the CEMP provide continuity of knowledge through the Scheme from the publication of the Environmental Statement through to the post-completion handover of the completed Scheme for operational maintenance.



20.3 The Pre-CEMP for this Scheme

20.3.1 A Pre-CEMP has already been prepared as part of this ES to form the framework that the contractor would adopt throughout the construction and aftercare stage. Subsequently the maintenance organisation will make use of the information in operational maintenance of the Scheme. The Pre-CEMP is set out in Volume 3 Appendix 2.2.

20.3.2 A list of the documents which are included in Appendix 2.2 and which will be adopted and developed by the appointed contractor, are listed in Table 20.2. It is anticipated that there will be further management plans and method statements required as the design of the Scheme progresses. A list of the further management plans and method statements is set out in Table 20.3. All of these documents will be issued to the relevant statutory environmental bodies for agreement.

Table 20.2 Annexes within ES Volume 3 Appendix 2.2 Pre-CEMP

Proposed title	Description
A Regulatory Framework	A list of the legal statutory requirements for construction staff working on this Scheme.
B Preliminary List of Permits/Consents	A list of the statutory consents and permits required before construction can proceed. Some items will be subject to seasonal requirements.
C Invasive Species Management Plan	Identifies which invasive species have been identified on site and the procedure for construction works on how to deal with invasive species.
D Outline Pollution Control and Prevention Plan	Identifies the main risks of pollution during construction and the prevention measures which should be implemented to prevent or reduce the effects.
E Outline Site Waste Management	Plan Site Waste Management Plan ("SWMP"), used to plan, implement, monitor and review waste minimisation and management on construction sites. The plan can be based on the Waste and Resources Action Programme's ("WRAP") SWMP template;
F Outline Ground and Surface Water Management Plan	Developed in consultation with Natural Resources Wales (NRW). It describes the design of each element of surface water management system required to manage surface water runoff during construction and potential risks to surface waters. It would include, consideration of temporary storage and settlement requirements to manage waterborne sediment, water quality criteria to ensure any discharge to receiving watercourses meets regulatory requirements.
G Outline Materials Management Plan (MMP)	The Scheme's Materials Management Plan ("MMP") would detail how all construction phase materials (material resources and waste) would be managed, developed and implemented by the appointed contractor and provides a framework which will be used as a basis from which to develop the Scheme's MMP.
H Outline Cultural Heritage Management Plan (CHMP)	Informed by the outcome of the EIA, the CHMP should contains detailed method statements for the Scheme construction (from survey, machine excavation, hand-excavation, environmental sampling etc. to office-based activities such as finds processing, database use, reporting etc.).
I Outline Ecological Management Plan	This outline plan sets out the measures and procedures for reducing impacts on ecological receptors. It outlines the procedures for preconstruction surveys,

Proposed title	Description
	vegetation clearance, draining of ponds, translocating of hedges or trees, temporary or permanent measures for protected species.

Table 20.3 Further documents to be included in the CEMP.

Title
Register of Environmental Actions and Commitments (more detail provided from paragraphs 20.3.3)
Design Mitigation requirements
Ghost licences and Consent applications
Timing of the Works
Environmental Masterplans (more detail provided below from paragraphs 20.3.7)
Additional survey requirements
Site supervision requirements and implementation of the CEMP (more detail set out in Section 20.4.3 to 20.4.10)
Proposals for environmental protection
Proposals for special measures for translocation or habitat creation
Appropriate Assessment Compensatory Measures, if appropriate
Monitoring and reporting procedures (paragraph 20.5.5 to 20.5.13).
Consultation and liaison measures
Review and update procedures
Arrangements for consultations
Environmental Hold Points at which construction work shall cease until the Environmental coordinator agrees work can proceed.

Register of Environmental Actions and Commitments (REAC)

20.3.3 A draft Register of Environmental Actions and Commitments (REAC) has been created and a copy included in ES Volume 3, Appendix 2.3. The REAC is a record of the specific environmental actions and commitments to be implemented and managed through all stages of the Scheme. The draft REAC lists commitments made within the ES (principally taken from the mitigation sections of each chapter).

20.3.4 The draft REAC is critical to the success of an EMP and subsequently the environmental performance of the Scheme. The REAC would be implemented through the CEMP and the Environmental, Landscape and Ecology, Monitoring, Aftercare and Management Plan.

20.3.5 The draft REAC is provided in table format with each column of the table containing an element of the information required as detailed below:

Column A & B: Identification and referencing of the environmental aspect in question (*a reference letter and number*);

Column C & D: The primary and secondary environmental topic that benefits (*e.g. Landscape and Visual & Nature Conservation*);

Column E: Brief description of the environmental action or commitment (*e.g. to plant a linear belt of trees*);

Column F: The objective or desired outcome of the mitigation/action (*e.g. to screen a view of the road*);

Column G to M: The main and secondary source of the commitment and a document reference (*e.g. Environmental Statement/ Chapter X, Section or Table Y, chainage 0.0034*);

Column N & O: The organisation responsibility for the commitment and the stage of the Scheme when it would be completed (*e.g. contractor, during construction*);

Column P: Is the commitment to avoid, mitigate, enhance or a combination of these;

Column Q: How is the outcome to be achieved (*the physical work required*);

Column R: Sets out the current state of taking the action or fulfilling the commitment, to indicate the status of the necessary actions. This will be updated as the Scheme progresses

Column S: Is the location for notes on completion to be added and updated until fulfilment;

Column T: Space to provide a cross reference to where evidence is provided of completion of a commitment or action. The evidence could be in meeting minutes, photographs, drawings, site notes or monitoring reports.

20.3.6 The details of monitoring, success criteria, reporting requirements and trigger level for remedial works would be clearly defined. Where it is deemed necessary, the mitigation/action must be monitored to determine success.

Environment Masterplan

20.3.7 The environmental mitigation measures incorporated within the design of the Scheme are illustrated on the Environmental Masterplan (see drawings in Appendix 2.5 A to F, Volume 3). The masterplan drawings have been prepared in accordance with DMRB Volume 10. The landscape and environmental design proposals for the proposed new section of highway are described in Chapter 9 Landscape and Visual Effects.

20.3.8 Symbols are used on these plans to represent existing or proposed landscape and environmental features. Each feature is ascribed both an Element and a 'Function' to indicate the physical attributes and the purpose. Sometimes, when appropriate, highway and structural elements are given an environmental function that will guide design and maintenance. In addition to a range of proposed features, the masterplan shows existing features, for example retained vegetation, watercourses, cultural heritage assets and culverts.

20.3.9 Elements and Function are described in Tables 20.4 and 20.5.

Table 20.4 Masterplan Elements

Term used	Definition
Landscape Element	Landscape features found within the highway estate, which can encompass both hard landscape features (i.e. retaining walls, hard surfacing) and elements of the soft estate (i.e. grasslands and woodlands);
Environmental Element	Non-landscape features of the highway estate that have environmental functions, i.e. noise attenuation measures, water quality controls, protected species, and legislated elements such as injurious weeds and pests
Planning Policy Feature	Features pertaining to, or situated in close proximity to, the highway estate that have a specific designation or land use, i.e. Special Area of Conservation (SAC), Scheduled Ancient Monuments (SAM), Snowdonia National Park (SNP) or Listed Building.

Table 20.5 Masterplan Functions

Definition: The intended environmental purpose of features within the highway estate			
Visual Screening	EFA	Heritage	EFF
Landscape Integration	EFB	Auditory amenity	EFG
Enhancing Built Environment	EFC	Water quality	EFH
Nature conservation & biodiversity	EFD	Highway/land boundary	EFJ
Visual amenity	EFE	Access	EFK

20.4 Roles and responsibilities of those implementing the CEMP

20.4.1 For the environmental team to be effective in the implementation of a Welsh Trunk Road Scheme, some key roles require experienced staff who will need to work across organisational boundaries to ensure continuity of knowledge and a cooperative and productive approach.

Contractor's Project Manager and Environmental Manager

20.4.2 The contractor's Project Manager would be responsible for developing the Construction Environmental Management Plan (CEMP) for the Scheme. The contractor's Environmental Manager would oversee and audit the internal systems and plans to ensure compliance with the environmental management system.

20.4.3 To ensure that there is adequate liaison between the Project Manager, Environmental Manager and the Environmental Coordinator and Environmental Clerk of Works, there would be regular meetings. These would include Monthly Progress Meetings and weekly site inspections.

Environmental Coordinator (ECO)

20.4.4 The ECO would have a prominent role in Scheme delivery, required to be a full time member of the contractors team, spending at least a full day on site every week, with the authority to direct members of the contractors site staff on environmental matters. He would work alongside the Project Manager to ensure that environmental commitments, and quality standards are set out in that document are fulfilled. The Environmental Clerk of Works (ECoW) would support the ECO during pre-construction and construction. The ECO would coordinate the activities of the environmental specialists during detailed design, construction and contract aftercare.

20.4.5 The ECO would be an experienced Chartered Member of an appropriate environmental profession. Their role would be to ensure that the key environmental documents are properly considered during the development of the detailed design and during construction. The ECO would oversee the Environmental Compliance Process.

20.4.6 The ECO would identify works that are likely to have a significant environmental impact and advise the contractor how to avoid the impacts. If necessary, the ECO would identify activities that should only proceed once he/she has agreed that adequate measures are in place for environmental protection. As works progress the ECO would review the contractor's environmental performance against the commitments, objectives and targets/key performance indicators in the CEMP.

20.4.7 The CEMP and all the documents it contains would be developed to contain procedures for checking, auditing and corrective action. These procedures would continue through the construction and aftercare period.

20.4.8 The role and responsibilities of the ECO would be set out in the contract documents.

Environmental Clerk of Works (ECoW)

20.4.9 The ECoW would be an experienced professional with a broad-based competency in environmental management, construction and environmental surveys. The ECoW would assist the ECO by overseeing the implementation of environmental mitigation and compliance with environmental management systems and plans. A broad base of skills and experience would best suited to a construction contract with wide ranging environmental challenges. The ECoW would be assisted by ecologists, landscape architects and other specialists as required. The ECoW would liaise with the archaeologist responsible for archaeological recording and investigations to ensure that archaeological sites are protected from damage until the necessary archaeological works are completed.

20.4.10 Both the ECO and ECoW would work with the contractor's Environmental Manager to apply the CEMP through the company's Environmental Management System.

20.4.11 The ECoW would be expected to carry out training for the contractor's site management team and for other site personnel. The role and responsibilities of the ECO would be set out in the contract documents.

20.5 The next steps

20.5.1 Following the publication of this ES, the public can scrutinise the Scheme. If required, an independent Inspector will hold a Public Inquiry to allow a detailed examination. It is possible

that during this stage (Key Stage 4 shown in Table 20.1) further requirements, or mitigation will be introduced. These will be added to the REAC in preparation for the construction contract to commence.

20.5.2 Pre-construction surveys will be required early in Key Stage 6, and there could be modifications to the design. These would be updates to the Pre-CEMP.

20.5.3 During construction, the CEMP would be modified as necessary to take account of changes arising during construction works. These modifications could include changes to the design to reflect site conditions, but also to reflect any:

a) New legislation or standards;
b) Unforeseen site conditions, for example the discovery of ground contamination, a previously unknown protected species, or archaeological discoveries;
c) Failings in the environmental performance of the contractor that require improved procedures, or changes in the design.

20.5.4 Towards the end of the construction phase, the CEMP would be refined to provide the essential environmental information needed by the body responsible for contract aftercare and the future maintenance and operation of the road and the associated land. Prepared before the end of the construction period, this document would be issued under the title of Environmental Landscape and Ecology, Monitoring Aftercare and Management Plan (ELEMAMP), this document would set out the requirements for monitoring and maintenance during the aftercare period.

Aftercare, monitoring and management

20.5.5 Proposed mitigation is provided for a purpose and is a commitment made in the ES on behalf of Welsh Government to address an environmental impact. For example, tree planting might be proposed to reduce the visual impact of a view of traffic. When they are planted, trees will not be an effective screen and will need to grow over several years to perform their function properly. Normally, the planting is expected to fully perform as mitigation by the Design Year, 15 years following completion. The contractor will have to maintain the completed Scheme for the full duration of Contract Aftercare during which he will be expected to manage the proposed mitigation to ensure it will meet performance requirements. During aftercare, the ECO, ECoW and other members of the designer's environmental team will be carrying out a programme of monitoring. The Environmental Landscape and Ecology, Monitoring Aftercare and Management Plan (ELEMAMP) would cover the activities described in the following paragraphs.

20.5.6 **Aftercare:** will be carried out by the contractor, for three years as set out in the contract. During that time, the contractor will carry out tasks such as grass cutting, weed control, replacement of dead plants, watering, repair of fences, cleaning out ditches, and repair or replacement of bat boxes or other environmental measures. These tasks will be performed to ensure that the seeding and planting survive and successfully establish as new vegetation. At the end of the aftercare period the contractor will hand over the established landscape and environmental mitigation to the Welsh Government's maintenance organisation called North and Mid Wales Trunk Road Agent (NMWTRA).

20.5.7 **Management:** once established, the Scheme of mitigation will continue to perform its function and satisfy commitments made in the ES until circumstances change. Changing conditions can be predictable or unexpected and they can occur slowly or catastrophically. For example, a hedge will continue to grow but will need trimming regularly to ensure it remains stock proof. In the case of a plantation, it will grow for 15 to 20 years before it will need to be thinned,

coppiced or underplanted to ensure it remains an effective visual screen. A fire could destroy a coniferous plantation within hours, while a plant disease could kill only one species in a plantation over an extended period. Completing both routine maintenance, guiding long term change, or dealing with occasional unexpected incidents, is the process of management.

20.5.8 **Monitoring**: the developing environmental mitigation will be undertaken regularly throughout the aftercare period. Monitoring of various kinds, ranging from day-to-day observation to sophisticated sampling and analysis, is essential to assist managers in making management decisions. The main tasks will be to:

a) To check that maintenance work is being properly carried out;
b) Ensure that mitigation continues to develop properly to meet commitments and functions (e.g. trees should grow as planned);
c) Review and predict if the mitigation can achieve the commitment and function in the required time period (e.g. will an area of planting and seeding develop fast enough to satisfy the requirements of a Protected Species Licence);
d) Identify successes, failures and weaknesses in the application of proposed mitigation and monitoring;
e) Check for adverse or changing conditions that might compromise the effectiveness of mitigation (e.g. has a drain blocked, or has a utility company or neighbouring landowner damaged a fence or trees);
f) Meet the monitoring requirements of the National Transport Plan;
g) To provide data needed by the contractor to compile and submit environmental progress and performance reports which would be required under the contract.
h) Advise on management interventions that might be required as remedial measures, if a failure to meet commitments is identified.

20.5.9 The contractor would monitor the environmental performance of the Scheme:

a) Against the commitments, objectives and targets identified in the Construction Environmental Management Plan (CEMP);
b) At a frequency set out in the specific monitoring proposed in the specialist chapters of the ES and any licenses and consents.
c) With a minimum monitoring frequency of 3 times a year for landscape and ecological mitigation in early Spring, Summer and late autumn.

20.5.10 Typically monitoring, (detailed scope will be set out in the contract), would include:

a) Botanical measures to record establishment, gain and loss of species in key areas;
b) Landscape/soft estate establishment and maintenance;
c) Retained vegetation, especially mature trees close to the route;
d) Protected species mitigation: species crossings and underpasses, mammal fencing, habitat creation and management;
e) The condition of noise attenuation, highway boundary fence,
f) Water quality monitoring;
g) Performance of attenuation measures and Sustainable Urban Drainage measures.

20.5.11 Environmental Performance Reports would be prepared annually during aftercare to provide the Project Manager with:

a) The results of each visit;
b) The requirements for additional maintenance work or repairs; and
c) Indications of how the Scheme of mitigation is performing against agreed indicators.
d) Predictions on the likely performance of mitigation over the remaining years of aftercare and at 15 years after completion.

20.5.12 Periodic aftercare progress meetings and site walkover will be held with a representative of the Welsh Government Soft Estates Manager and NMWTRA to review monitoring results to determine whether the implemented mitigation measures are likely to meet their mitigation objectives of the design and the commitments set out in the REAC by the end of aftercare. The contractor will carry out remedial work to mitigation measures if necessary.

20.5.13 Annual, or twice annually, the ECoW will organise Environmental Liaison Meetings on site with the Statutory Environmental Bodies. The meetings will involve a site visit if required. Where monitoring is demonstrating that proposed mitigation is not likely to be effective the SEBs will be consulted about remedial measures.

20.5.14 Following completion of contract aftercare, monitoring will be reduced in frequency to an annual check by the Maintaining Agent to ensure that the effective mitigation continues to perform its proposed function (see Table 20.5).

20.5.15 **Handover:** at the end of the aftercare period, a Handover Environmental Design Performance Report (HEDPR) will be prepared. The HEDPR will accompany the Handover Environmental Management Plan (HEMP) to assist NMWTRA in taking on the long-term maintenance. The HEMP will include the as-built information.

20.6 Summary

20.6.1 Environmental Management of the Scheme is a continuous process during design, construction, operation and maintenance which is in line with the requirements of the DMRB and IS0 14001. The contractor will implement a Scheme specific EMS and a CEMP.

20.6.2 Management plans identified within this chapter and set out within the Pre-CEMP will be treated as 'live' documents. These live documents will ensure that design and mitigation measures from the EIA will be implemented on-site by the contractor. The CEMP will identify those responsible for implementing the various management plans. These management plans will compliment and inform one another as well as require regular updates and revisions. Outline versions of these management plans have been prepared at Key Stage 3 and are provided as Annexes to the Pre-CEMP in ES Volume 3 Appendix 2.2.

20.6.3 The objective of the EMS and the CEMP is to mitigate environmental impacts and have a comprehensive management plan in place to reduce any unforeseen environmental impacts.

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21. CONCLUSIONS

21.1 Chapter introduction

21.1.1 This Environmental Statement (ES) is a document that provides a description of the Scheme and the environment in which it lies, details of the assessments that have been undertaken and the main environmental effects of the Scheme. Proposals to avoid, remedy or reduce any adverse effects and to provide enhancements to the existing circumstances are described. This conclusion chapter draws out the main points.

21.1.2 In 2018 and 2019 an exercise was undertaken to establish if the Scheme should be subject to an Environmental Impact Assessment (EIA). This formal process, known as screening, is required under the EIA Directive and is used to determine whether the Scheme falls within thresholds that classified as a Relevant Project as set out in Table 4.1 above. The conclusion was that a Statutory Environmental Impact Assessment is required for the Scheme. The Screening process is described in the Screening Report and the relevant details set out in the Record of Determination (RoD). These documents were completed in June 2019.

21.1.3 The primary reasons for determining that and EIA is required are that:

A. The project lies adjacent to sensitive sites in the form of a Special Protection Area (SPA) and a Special Area of Conservation (SAC). These are known as Natura 2000 sites and are visible from Snowdonia National Park.
B. There is the potential for the project to have significant effects on several aspects of the environmental including ecology, cultural heritage, landscape and townscape, motorised and non-motorised users and the local population.

21.1.4 Subsequently, a Scoping exercise was completed, taking account of changing legislation, to identify the aspects of the environment that should be considered in the EIA and reported in the ES. Statutory Environmental Bodies, including Natural Resources Wales (NRW), Conwy County Borough Council (CCBC), Cadw were consulted and a Scoping Report was completed in July 2019.

21.1.5 During the Screening exercise it was identified that because the schemes were geographically separate with no connecting Line Order, a separate statutory process would be required for each junction improvement. For this reason, to maintain the separation of legal procedures, a separate ES has been prepared for each junction. Consequently, there are two separate Schemes with their own sets of Draft Orders, Environmental Statements and Statements to Inform and Appropriate Assessment.

21.1.6 The Screening and Scoping reports are in Appendix 4.2 and 4.3. The Notice of Determination is in Appendix 4.4.

21.2 Consultation

21.2.1 Stakeholder organisations, including Cadw, Gwynedd Archaeological Trust (GAT), Natural Resources Wales (NRW), Conwy County Borough Council (CCBC), Snowdonia National Park Authority (SNPA), Design Commission for Wales (DCfW) and Welsh Government departments, were consulted or have provided information. Their views were taken into consideration as the Scheme was developed. The statutory organisations were invited to attend periodic

Environmental Liaison Meetings and have been consulted throughout the development of the Scheme.

21.2.2 Town Councils, Community Councils, Local residents, business owners, and stakeholder groups attended public exhibitions in Llanfairfechan and met with the project team. Commercial, industrial, business operators, landowners and stakeholder groups were also consulted.

21.3 Description of the Scheme

21.3.1 With the purpose of removing the roundabout, the Scheme 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. The eastbound slip roads would rise on embankment to meet with a signal-controlled T-junction to the north of the overbridge. The westbound traffic off the A55 would meet with a priority junction with the link road, at the south side of the overbridge.

21.3.2 To accommodate the junction and the necessary highway alignments and slip roads, the A55 dual-carriageway centreline would be moved slightly south. To the south of the bridge over the dual carriageway slip road, a link road would descend towards Penmaenmawr Road and a signal-controlled junction.

21.3.3 The Scheme layout is shown in the General Arrangement Drawings included in Appendix 2.5, while the proposed Scheme with environmental mitigation is shown in Appendix 2.6. Visualisations of the completed Scheme are included in Appendix 2.7. The Scheme involves a number of measures intended to improve the corridor associated with the A55 around Junction 15:

a) The removal of Junction 15 roundabout and replacement with a new grade separated junction providing on and off slip roads in both directions;
b) A range of Active Travel measures to enhance the provision made for walkers and cyclists that would promote active travel journeys. These measures would improve connections such as with Pendalar and the Promenade to the local network within Llanfairfechan town enabling improved access to local facilities, as well as to established long-distance routes including the National Cycle Network Route 5;
c) Enhancement of public green space with more generous verges and new tree and shrub planting and a gateway design for Llanfairfechan;
d) Street improvements to Penmaenmawr Road and Shore Road East; and
e) Minor junction improvement works at Junction 14, prior to the commencement of construction works at Junction 15.

21.3.4 Further information with respect to the Scheme description, the design approach and the construction strategy, can be found in ES Chapter 2, The Scheme. The design proposals include mitigation measures to limit the adverse effect of the improvements on the environment.

21.3.5 The design proposals include mitigation measures to limit the adverse effect of the improved junction on the environment. Tree and shrub planting would be provided around the junction and along the A55 to screen views from residential properties and to replace those that would be cleared for construction. On the north side of Penmaenmawr Road there would be space to create a quiet paved area with street trees, ornamental shrubs, and an improved route down Shore Road East to the Promenade for pedestrians and cyclists. On the south side of Penmaenmawr Road Active Travel routes are proposed which would extend west into the town centre and east to Pendalar. These are also measures intended to reduce the overall adverse

effects of traffic noise on residential properties.

21.4 Environmental effects of construction

21.4.1 If the Welsh Ministers confirm the Orders for Junction 15, construction could start in early/mid 2022 and the Scheme could open at the end of 2023. Construction work will be carried out in accordance with best practice to minimise the effects of noise, dust and construction traffic and the inconvenience of road closures. Following the construction phase, there would be three years of landscape maintenance and aftercare.

21.4.2 Typically, construction working hours would be 0700 to 1900 hours (Monday to Friday), and 0700 to 1700 hours on Saturdays. In certain circumstances, specific works may have to be undertaken outside these hours with night working required in accordance with Welsh Minister's instructions.

21.4.3 During the 24 months of construction, two lanes will be kept open in each direction on the A55. Temporary traffic management would be necessary to maintain steady flows of traffic through the works. It is expected that the slips roads at Junction 15 would be closed for a period of 12 months with alternative access arrangements made at Junction 14A. The EIA has concluded that there would be some minor disruption to vehicle traffic as well as to cyclists and pedestrians.

21.4.4 Construction works would also affect travellers on local routes close to the A55. The National Cycle Network Route 5 which follows the coast would be disrupted and this would have an adverse effect on users, while the effects of construction on established pedestrian and cycle routes to the Promenade would be negligible.

21.4.5 There would also be a temporary increase in noise levels due to construction machinery, which could affect local receptors. Modern construction equipment is designed to minimise engine noise, but some activities can still be noisy.

21.4.6 Construction would typically commence with temporary fencing of the works corridor, setting up of temporary compounds, followed by site clearance, demolition and the diversion or protection of utilities. The Scheme would require the demolition of two residential properties beside Shore Road East and the loss of areas of garden for several properties on the north side of Penmaenmawr Road. Following these preparations, cuttings and drainage attenuation basins would be excavated and embankments formed. Construction of structures such as the bridge, retaining walls and culverts would require a long period and so would commence as soon as possible in the construction period. The ES shows that during construction vibratory compaction, which would be required for piling for some structures site would affect receptors close to the Scheme. With the bridge, retaining walls, cuttings and embankments in place, the new carriageway would be completed, followed by the installation of lighting columns, road signs, safety barriers and further fencing. Finally, the landscape planting and accommodation works would be completed.

21.4.7 The approach to construction planning is to aim for the best balance between the amount of soil and rock excavated and the amount used in construction. For Junction 15 there is a substantial shortfall in fill material, which will be brought to site from elsewhere. Part of the shortfall would arise because a predicted volume of contaminated materials and construction waste would have to be removed. The management of materials will ensure that waste is minimised and that suitable recycled materials will be available for use. All material for construction and waste

would need to be carried by road vehicles.

21.4.8 Ground investigations and historical records have shown that there is the potential for construction to affect made ground and buried materials associated with historical land uses, including railway sidings, garages and petrol stations. There is a risk that contaminated materials could be excavated and so mitigation includes measures to protect the general public and construction workers from any adverse effects of these materials. With these mitigation measures it is considered that there would be no residual significant environmental effects, nor would there be any long-term significant effect on groundwater, which is near the surface. During construction there would also be measures in place to protect watercourses and the sea from construction silt, spilled chemicals, such as cement, and fuels.

21.4.9 The control of dust emissions from construction sites relies upon good site management and the application of readily applicable techniques to reduce emissions of dust and limit dispersion, including damping down sources of dust, cleaning of soiled road surfaces, limiting the speed of construction vehicles that could otherwise raise dust, and covering vehicles laden with dusty materials. With these measures in place, construction dust would be limited and the effects on receptors would not be significant.

21.4.10 The Scheme would bring about changes that could affect climate. Aspects that are considered are the release of greenhouse gases into the atmosphere by construction activity, the resilience of the Scheme to the effects of climate change, and the possibility of in-combination effects arising from different aspects of the environment. The greenhouse gas assessment shows that construction of the Scheme would produce a total emission of 18,000 tonnes (tCO2e). These emissions are considered significant but are low in terms of the overall UK Carbon Budget.

21.4.11 The Scheme is designed to resist the normal adverse effects of natural and man-made events that might be expected to affect the area in which it is sited, for example, flooding, high winds or vehicle collisions. Some extreme and very unlikely natural and man-made events could occur during construction, for which the Scheme cannot be designed. If they did occur the impact of failure might be closure of the road or harm to the environment in which it is set. The assessment considered a wide range of events including those identified in The National Register of Civil Emergencies (2017) and The International Disaster Database. Most of these events were scoped out because the consequences were not significant. Those that were considered further were associated with flooding from the sea, rivers and surface water, hurricanes, storms, fog and major road or rail accidents.

21.4.12 The assessment demonstrated that the Scheme would not worsen the consequences for the environment but could result in temporary disruption and closure of the A55 construction site. Mitigation for these events would include advanced warnings from the Met Office and NRW, and advanced planning to dealing with emergencies and training of site personnel to react when warnings are given or when disruption occurs.

21.4.13 Much of the existing roadside vegetation close to the junction would be lost and as a result previously screened views of the road would be revealed to residents that overlook the road from Penmaenmawr Road. Measures to limit construction activities to a defined construction corridor would be required to protect retained vegetation, private property, sensitive habitats and watercourses. Some construction activities would be seasonally constrained to avoid harm and disturbance to nesting birds and bats for example.

21.4.14 Measures are proposed to protect designated nature conservation sites of national and international importance which are in close proximity to the Scheme. These encompass the coastal waters directly north of the junction (Menai Strait and Conwy Bay SAC, the Liverpool Bay Special Protection Area (SPA) and Traeth Lafan SPA and Site of Special Scientific Interest (SSSI)). These could be adversely affected by the Scheme during construction as a consequence of airborne dust, silt and construction noise adversely affecting habitats and species. The future contractor would be expected to implement measures to effectively control airborne dust and silt and to limit construction noise.

21.4.15 The Scheme will directly affect cultural heritage features identified by the geophysical survey, including a former convalescent home which was demolished to construct the existing roundabout. Archaeological evaluation of these sites is likely to be required during construction. Mitigation for the direct impact on a building or site cannot be mitigated, but the consequences can be minimised by an appropriate form of recording. An Archaeological Watching brief would be implemented on all areas during construction and a programme of recording and investigation would be carried out by the contractor and the results archived.

21.4.16 All mitigation, and the requirements for monitoring the effectiveness of mitigation, would be detailed in the Construction Environmental Management Plan (CEMP) to be prepared prior to the construction works commencing. The future contractor will be required to develop the CEMP and to ensure that all construction activities are carried out in full compliance with relevant and current policy, guidelines and best practice. To assist in proper environmental management all construction personnel would be given training in avoidance of harm to biodiversity, removal and eradication of invasive non-native species, dust and silt control, protection of vegetation and community liaison.

21.4.17 There have been regular public information exhibitions before the publication of Draft Orders and this ES. Welsh Government would require the future contractor responsible for building the Scheme, to inform the public before and during construction with Public Information Exhibitions, regular updates using the local press and radio, a Scheme website and newsletters if required. A member of the contractor's management team will be responsible for stakeholder liaison so that the public and public bodies will be kept informed of how construction is progressing. Liaison with the emergency services and police will be maintained to ensure that construction works do not interfere with the movement of emergency vehicles such as ambulances. Statutory Environmental Bodies (SEB), including NRW, Cadw and CCBC will be able to attend regular ELG meetings to discuss the scheme and to ensure adequate protection for the environment and local population.

21.5 Environmental effects of operation

Geology and soils

21.5.1 The underlying geology and soils have a strong influence on the appearance of the local landform and how the use of land has evolved. Historical mapping and results of a detailed ground investigation show that there are areas of made ground and potentially there are buried materials associated with past activities that include stockpiled quarry material, railway sidings, garages and fuel stations.

21.5.2 The assessment considered likely effects of the scheme on the underlying geology, ground conditions, groundwater and any areas of contamination. There are no significant effects on the

geology or underlying soils as a result of the Scheme during the construction or operational phases of the Scheme. Some areas of ground gas were discovered, but there are no significant risks to the general public of being exposed to contamination.

Drainage and water

21.5.3 The Scheme has been designed to protect water quality from the effects of the completed junction. The Afon Ddu, which discharges into the sea 700m to the west of the Scheme, is classified under the Water Framework Directive (WFD) as having 'Good' status, while the sea along the coast is classified as 'Moderate to Good'. Protecting the water quality in these waterbodies from the adverse effects of drainage discharges from the road would require effective sustainable drainage measures, including flow attenuation measures, pollution control and containment in case there are spillages on the A55. The mitigation measures, in the form of balancing ponds/basins and penstocks to contain pollution within the ponds would be monitored and maintained to ensure they are working effectively. With these measures in place there would be a negligible impact on water quality from routine road runoff, and from the risk of spillage. The assessment concluded that there would be no net deterioration in water quality.

21.5.4 The overall discharge of surface water runoff from the Scheme into the Menai Strait would result in a negligible magnitude of effect with respect to changes to chemical quality, effects on aquatic ecosystems and bathing water quality. The Scheme would comply with the Water Framework Directive.

21.5.5 There are some low-lying areas of Llanfairfechan in the vicinity of the Scheme that are considered at risk of flooding from rivers, surface water or the sea. Existing sea defences reduce the risk of flooding from the sea. Surface water flowing from higher ground can cause localised flooding. Proposed flood compensation measures would be provided at the school playing fields to address the surface water flooding associated with the area south of Junction 15. The flood compensation measures would ensure that there will be no adverse impacts on downstream receptors and no net change in peak flood levels.

Nature conservation

21.5.6 There are designated sites of national and international importance that have been considered as potentially being adversely affected by the Scheme. These include the Menai Strait and Conwy Bay SAC, the Liverpool Bay Special Protection Area (SPA) and Traeth Lafan SPA and Site of Special Scientific Interest (SSSI). These are located within close proximity to the Scheme and encompass the coastal waters directly north of the junction. The nearest terrestrial designated site is Coedydd Aber SAC and SSSI located approximately 2 km south west of Junction 15. There are also Two Local Nature Reserves (LNR) present within 5km, these are Nant-y-Coed LNR, and Traeth Lafan LNR (a component of the SPA and SSSI. In the immediate vicinity of the Scheme there are habitats that are considered of value to biodiversity, including the Afon Ddu, the shoreline, roadside plantations, some field hedges and mature parkland trees in Penmaen Park.

21.5.7 Surveys and historical records of fauna have shown that brown long-eared, lesser horseshoe, soprano pipistrelle and pipistrelle, noctule, whiskered/ Brandts, natterers and Daubentons bats are found near the Scheme. A single Pipistrelle bat was found in a roost beside the junction.

21.5.8 Otter use the Afon Ddu, and hedgehogs have been recorded. A wide range of bird species, including those normally associated with coastal habitats have been found. A survey of

overwintering birds identified that large numbers of oystercatchers forage in the intertidal zone and take refuge during high tide on local grasslands. A number of other over wintering species were noted, including mute swan, greater scaup, mallard, goosander, great crested grebe, bar-tailed godwit, ringed plover, redshank and turnstone.

21.5.9 A range of mitigation measures are proposed to reduce any potential adverse effects. These include extensive tree and shrub planting to provide cover, shelter and flightlines for fauna by replacing established linear belts that would be cleared for construction. Grass areas would be seeded with locally indigenous wildflower species to encourage pollinators. To protect marine and aquatic habitats, drainage measures will be provided to control pollution and reduce the rate of run-off into watercourses. Bat roosting boxes would be provided to replace the roost lost to building demolition. Highway lighting will be designed to minimise light spread. During the 3 years of aftercare the proposed measures will be monitored to ensure that the mitigation objectives are achieved.

21.5.10 With mitigation many of the impacts will be short term, but once replacement habitat becomes established the impact would be neutral to slightly beneficial. Establishment would occur over a period of 1 to 15 years, with biodiversity gain increasing over the period. Overall there will be a Biodiverisity Net Gain (BNG) of 141% with an increase in vegetated habitats, including species rich grassland and native trees and shrubs. There would be a minor adverse impact on bat species as a result of the loss of a roost, fragmentation of habitat and construction phase disturbance.

Landscape

21.5.11 The existing A55 road corridor traverses the scenic North Wales coastal plain at the foot of the Snowdonia mountain range. Extensive roadside planting, dating from the 1980s, integrates the road into the landscape and screens it from nearby properties.

21.5.12 The proposed overbridge and slip roads would be raised significantly above the existing A55 and the new junction arrangement would extend changes north across Penmaenmawr Road. These changes would have a significant and long-lasting landscape and visual impact on the eastern areas of Llanfairfechan either side of the existing Junction 15 roundabout. Land would be taken to build the Scheme, including two residential properties close to the edge of Llanfairfechan Conservation Area, which would be demolished. Much of the existing roadside vegetation close to the junction would be lost and as a result reveal previously screened views of the road to local residents on Penmaenmawr Road. There would be a large adverse visual effect on the properties east of the existing Junction 15 and at Fernbank. This impact would be difficult to mitigate due to the proximity and height of the structures required to form the new junction.

21.5.13 Mitigation planting would reduce the visual impact of the new structures and integrate the new landform into the local landscape. The proposed tree and shrub planting would take time to establish grow to replace the original roadside vegetation but would reduce the visual impact from certain locations.

21.5.14 The new overbridge would be visible to some properties, particularly those close to the junction, and to properties elevated above the Scheme in areas such as Penmaen Park. The proposed planting would not lessen the impact from some nearby properties and public areas such as Llanfairfechan Promenade.

21.5.15 Overall, the Scheme would cause further urbanisation of the road corridor with additional man-made features such as the overbridge, retaining walls, lighting, gantries and signage detracting from the existing view.

21.5.16 The landscape and visual impact of the Scheme on the wider area would not be significant. The highly scenic qualities of the surrounding area and Snowdonia National Park would remain intact and there would be no significant change to the wider landscape character or perceptual qualities such as the tranquillity of the surrounding area.

Cultural heritage

21.5.17 Surveys and archival research have shown there are many sites in the vicinity of the Scheme that are listed on the Historic Environment Register (HER). Those that would be directly or indirectly affected include seven prehistoric and one Medieval Scheduled Ancient Monument (SAM) within 2km and there are 66 Grade 2 Listed Buildings and three Grade 2* within 1km. There are two Conservation Areas within Llanfairfechan which protect mainly 19th century buildings. Wern Isaf (Rosebriar), on the Register of Parks and Gardens, lies close to the Junction 15, while Bryn y Nueadd Park and Garden lies to the west. There are thirty-one non-designated sites on the HER ranging in date from the Neolithic (Graig Lwyd axe factory) to the Modern period.

21.5.18 There would be indirect effects brought about by the Scheme on the Wern Isaf Grade 2* Listed house and registered garden and Bryn y Neuadd Historic Parks and gardens, on Gwern y Plas Hut Circles SAM. Several other sites would be affected to a lesser degree. The two houses to be demolished are not within the Conservation Area but form part of the seaside development of the town.

21.5.19 The indirect impact on the Town Centre Conservation Area would be mitigated by the design of public spaces and the realigned Penmaenmawr Road. Proposed landscape planting around the junction and along the south side of Penmaenmawr Road would mitigate that adverse effects on the setting of Wern Isaf and Bryn y Neuadd and the associated Historic gardens.

Community assets

21.5.20 The assessment examines the effects on community facilities such as surgeries, post offices, shops, parks, play areas, village halls, development land and farmland. The Scheme would require the demolition of two residential properties beside Shore Road East, the loss of areas of garden for several properties on the north side of Penmaenmawr Road and the loss of 1.7 hectares of agricultural land. However, there would be no farm severance or restrictions on access to farmland. Areas of land allocated under the Conwy CBC Local Development Plan for housing would be taken and this would threaten the viability of these allocations.

21.5.21 Mitigation includes additional public open space land would be designated and new, safer Active Travel Routes provided to enhance connectivity and access to community facilities. There would be no adverse effects on community facilities such as shops and village halls. The Scheme is considered likely to have an overall adverse effect on existing private assets and development land, but with a minor adverse effect on farmland.

Air quality

21.5.22 Surveys of existing air quality (the baseline) were undertaken in 2018. These results were then compared with calculations of air quality in the opening year of the proposed Scheme (2022). The comparison is based on calculations using predicted vehicle numbers for two scenarios: one that assumes the Scheme is not implemented by 2022 and the second assumes it will be. The comparison shows whether the proposals will improve or worsen air quality for local people and nature. Air quality assessments take account of construction dust and airborne pollutants such as N02, and tiny particulate matter known as PM10.

21.5.23 Existing airborne pollution is assessed by comparing pollutant concentrations to the UK Air Quality Objectives (AQOs). If concentrations are above the AQOs then the local authority must designate an Air Quality Management Area (AQMA) and set out measures to reduce the pollutant concentrations. Monitoring of airborne pollutants close to Junction 15 shows that concentrations are well below the levels that would require reduction measures.

21.5.24 The assessment of air quality considers the impact of changes that would be brought about by traffic on the completed Scheme on local residential receptors and on important nature conservation sites (for example Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay Special Area of Conservation(SAC)).

21.5.25 The assessment of the operational effects of the Scheme show that there would be a reduction in C02, Nox and PM10 as a result of the proposed junction improvements. This would be an overall slight improvement in vehicle emissions.

Noise and vibration

21.5.26 This assessment examines how the Scheme will change noise and vibration associated with construction and operation of the proposed Scheme. Surveys of existing noise (the baseline) were undertaken in 2018. These results are then compared with calculations of noise in the opening year of the proposed Scheme (2022).

21.5.27 The assessment uses predicted vehicle numbers for two scenarios: one that assumes the Scheme is not implemented by 2022 and the second assumes it will be. The comparison shows whether the proposals will improve or worsen noise and vibration for local people.

21.5.28 Surveys of baseline were carried out in July 2019 at 7 representative locations around the area of the proposed improvements. There is a Noise Action Plan Priority Area (NAPPA) identified for Mona Terrace and Pendalar, where traffic noise exceeds 65dBLA10.

21.5.29 Mitigation for the effects of noise from traffic on the A55 would include a low-noise surfacing system for the carriageway. In addition, existing noise barriers would be retained or replaced and additional barriers installed for Mona Terrace and properties in Pendalar. The assessment has concluded that 206 properties would experience a 1 to 3dB increase as a consequence of the Scheme, while 308 would experience a 0 to 1dB increase. A total of 20 properties would experience no change or a slight reduction in noise. The mitigation for Mona Terrace would reduce noise from the current situation.

All travellers

21.5.30 Travellers in vehicles, walkers, cyclists and horse riders will experience changes as a result of the Scheme. Surveys of roads, footways and public rights of way have established the numbers of people and vehicles using routes within the vicinity of the Scheme to move around the area and access employment, recreation, retail areas and public services.

21.5.31 Following consultations with Conwy County Borough Council, Sustrans and Cycling UK a number of Active Travel proposals have been included within the Scheme. These contribute to the purposes of the Active Travel Act and the Well Being of Future Generations Act, by improving safety and access for non-motorised users and by providing bus laybys close to Ysgol Pant Y Rhedyn.

21.5.32 Whilst there is predicted to be a minimal change in traffic flows on the A55 and local roads as a result of the Scheme, it would result in a moderate to major beneficial effect on cycle users of the National Network Route 5 and cycle and pedestrian access routes to the Promenade at Mona Terrace. Overall there would be a reduction in community severance.

Material Assets and Waste

21.5.33 The assessment has considered the effects of the Scheme on the use of materials and waste generated during the construction stage, there would be no significant change in the use of materials or generation of waste when the road is completed and in use. During construction the Scheme would require a large amount of fill material to be imported from elsewhere for construction of the new junction and slip roads. At this stage it is not known where the material will come from.

21.5.34 Opportunities would be sought wherever possible to make use of local projects to source suitable fill materials for construction, for example, any surplus soils or fill material from nearby projects could be reused. Waste would be minimised by recycling and suitable recycled materials would be used in construction wherever possible and feasible.

Climate Change

21.5.35 During the 24 months of Construction Greenhouse Gases (GHG) emissions would be the equivalent of around 20,634 tonnes of Carbon dioxide (CO_2). This would contribute 0.0008% of the UK's 3rd carbon budget (2018 to 2022). It should be noted that by removing the existing roundabouts, which typically involves hard deceleration and acceleration, there would be improved vehicle emissions as a result of minimising stop-start conditions.

21.5.36 Operational aspects that are considered in this assessment are the resilience of the Scheme to the effects of climate change and the possibility of in-combination effects arising from different aspects of the environment. The climate change resilience assessment demonstrated that the Scheme is not vulnerable to the effects of Climate Change and so no mitigation measures would be required. The climate risks will be monitored during the period of detailed design and construction.

Risk of Major Accident and Disaster

21.5.37 The Scheme is designed to resist the normal adverse effects of natural and man-made events that might be expected to affect the area in which it is sited, for example, flooding, high winds or vehicle collisions. Some extreme and very unlikely natural and man-made events, for which the Scheme cannot be designed, could occur. If they did occur the consequences of failure might be closure of the road or harm to the environment in which it is set.

21.5.38 The assessment considered a wide range of events including those identified in The National Register of Civil Emergencies (2017) and The International Disaster Database. Most of these events were scoped out because the consequences of occurrence were not significant. Those that were considered further were associated with landslides, coastal, fluvial and surface water flooding, wave/ storm surges, extreme high temperatures flooding from the sea, rivers and surface water, hurricanes, storms, fog and major road or rail accidents.

21.5.39 The assessment demonstrated that the Scheme would not worsen the consequences for the environment but could result in closure of the A55 for a short period while damage is repaired. Mitigation for these events would include advanced warning signs, digital information systems, and advanced planning for the consequences of collisions and repair of damage.

Population and Health

21.5.40 The assessment of population and health has drawn upon the work reported in other chapters of the ES in considered the potential effects of the Scheme. These effects relate to private property and housing, community land assets, development land and businesses, agricultural land holdings and walkers, cyclists and horse riders. The Health Impact Assessment has considered potential effects relating to geology and soils, landscape, community assets, air quality, noise and vibration, all travellers and the risks of accidents and disasters.

21.5.41 Significant residual effects were noted in several areas although these are not additional effects as they have been identified in other chapters. Demolition of private residential properties, changes to existing gardens, demolition on an allocated site and loss of agricultural land are considered to be adverse during both construction and operation. Severance and change in amenity were adverse during construction, but during operation these effects become beneficial as mitigation measures are implemented. Further beneficial effects were identified in terms of open space, reduction in severance, provision of additional cycleways and enhanced connectivity and amenity in the operation stage. In terms of the Health Impact Assessment this concluded that whilst there were potential adverse effects during construction with regard to noise, driver stress and landscape in operation there were no adverse effects, beneficial effects were expected in terms of reduced driver stress and a reduction in road accidents.

21.5.42 With regard to the Well Being of Future Generations Act and the Active Travel Act no adverse effects were identified during construction. During the operational period it was considered that there would be beneficial effects.

Cumulative effects

21.5.43 Because the construction and operation of this Scheme and the corresponding, but separate Junction 16 Scheme could occur over the same time frame, it has been recognised that cumulative effects could arise. Cumulative effects with consequences for the same receptors

could also arise with other proposed projects in the surrounding area. Two types of cumulative effects are considered:

A. Interrelationships between effects generated by the Scheme;
B. The interaction of effects generated by one or more other schemes in combination with this Scheme.

21.5.44 The inter-relationships between ES topics for climate change, nature conservation and agricultural land, in particular, could potentially cause temporary or permanent effects on several receptors. This means that an unplanned potential impact on any of these receptors could give rise to additional cumulative effects.

21.5.45 The assessment of in-combination effects identifies developments with the potential to generate effects that could affect several environmental receptors cumulatively with the Junction 16 Improvements. The potential for cumulative effects can be either minimised and or avoided either through dialogue between the different developers to manage the construction effects, or by scheduling works to occur at different times. At least three out of five development projects in the area have potential to generate cumulatively effects with the Scheme. The assessment identifies potential 'in-combination' effects for several receptors, particularly water, climate change, risks of accidents, use of agricultural land and, materials and waste.

21.5.46 Subject to programme constraints on the two other separate junction improvement schemes identified and the outcome of the Conwy Borough Council Local Development Plan Review, the potential residual effects are primarily an increase in construction traffic associated with different projects coinciding. To add to this, all projects could include separate construction contracts, with different and separate site compounds and mitigation measures. If the separate junction improvement schemes could be managed to limit or avoid the potential for cumulative effects, then the potential for these effects to occur is reduced. All Schemes could share good practice environmental management methods.

21.5.47 An entirely separate Statement to Inform an Appropriate Assessment (SIAA) which describes how the Scheme, alone or in–combination with other plans or projects, avoids having a significant effect on nearby designated habitats. The conclusions reached as part of the SIAA is important in addressing effects and impact on nearby designated habitats and species.

Enhancements and benefits

21.5.48 The Scheme is an opportunity to bring about the following enhancements and beneficial works to the environment that could support the purposes of the Environment (Wales) Act 2016, the Well Being of Future Generations Act 2015 and the Active Travel (Wales) Act 2013.

21.5.49 **Active Travel measures:** several Schemes are proposed that would provide new shared use cycleway/footways from Pendalar in the east, the centre of Llanfairfechan to the west and down to the Promenade via Shore Road East. On the north side of the realigned Penmaenmawr Road the shared use route would be set within an improved urban public space with tree planting and generous paved areas. New bus laybys would be provided as part of measures to improve access and safety to the school.

21.5.50 **New Public Open Space:** would be created around the junction and beside Shore Road East. An area associated with the active travel route is identified as a location where the town council can mount a town gateway feature close to the junction.

21.5.51 **Biodiversity enhancements:** The lack of space round the junction limits the potential for biodiversity enhancements, but opportunities arise on the new cutting slope to the south of Penmaenmawr Road where extensive new plantations of trees and shrubs will be planted to replace a much narrower roadside strip that would be cleared for construction. This new plantation would contain a range of plant species including native species and some non-native ornamental species along the roadside.

21.6 Summary

21.6.1 The ES chapters demonstrate the effects of the Scheme on the environment. The most significant effects can be summarised as:

a) Temporary disturbance to local residents and travellers during construction of which traffic and construction noise and closure of the junction 15 for 24 month would represent the most significant effect.
b) The permanent loss of views to the sea for some properties and public spaces on Penmaenmawr Road. These same properties would suffer a large adverse impact as a result of the raised slip roads, overbridge and viaduct. For those properties on the north side of Penmaenmawr Road, to the east of the junction, the impacts would include the slip roads passing much closer that the existing situations.
c) The loss of roadside plantations would open up views of the road from a larger number of residential properties.
d) A small increase in traffic noise for a large number of properties, with only a small number benefitting from a slight reduction.
e) Biodiversity would be adversely affected by the Scheme but would recover with the growth of replacement trees and shrub planting.
f) The improvements to public open space and active travel routes would have a beneficial effect of travellers, including local residents, and would improve the existing community severance caused by the existing junction.
g) Vehicle travellers on the A55 and local roads would benefit from the junction improvements.

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A55 JUNCTIONS 15 & 16 ENVIRONMENTAL STATEMENT CHAPTER 22 GLOSSARY & ABBREVIATIONS

RAMBOLL Bright ideas. Sustainable change.

CONTENTS

22. GLOSSARY OF TERMS AND ABBREVIATIONS 22-1

22. GLOSSARY OF TERMS AND ABBREVIATIONS

Term or Abbreviation	Definition
AADT	Annual Average Daily Traffic
AONB	Area of Outstanding Natural Beauty
Active Travel	Active Travel (Wales) Act 2013 Welsh Government wants to increase levels of walking and cycling in Wales to realise the many benefits that travelling actively brings for individuals and for society. The Active Travel Act focuses on walking and cycling as a mode of transport, i.e. for purposeful journeys.
Additional Effects	The cumulative effects of a proposed development assuming past, present and future proposals are already present within the existing baseline.
ADMS	Air Dispersion Modelling System
Adverse impacts	The effect is regarded as damaging for a receptor
AIES	Assessment of impacts on European Sites
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AQMA	Air Quality Management Area
AQOs	Air Quality Objective
AQS	Air Quality Strategy
ARN	Affected Road Network
Base Year	The year (normally the year when surveys are carried out, or the ES is published) against which other years are compared.
Baseline	The situation before the proposed scheme is implemented
Baseline Studies	Work done to determine and describe the environmental conditions against which any future changes can be measured or predicted and assessed.
BPM	Best Practicable Means
BRP	Bat Roost Potential
BTC	Bat Conservation Trust
Beneficial impacts	The effect is considered to be positive for a receptor
bgl	Below ground level
BGS	British Geological Society

Term or Abbreviation	Definition
BH	Borehole
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
BNG	Biodiversity Net Gain
BCC	Birds of Conservation Concern
CCBC	Conwy County Borough Council
CCR	Climate Change Risk (Assessment), or Climate Change Resilience
CCRA	Climate Change Risk Assessment
CCS	Current Conservation Status
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
Chainage	A measure of distance along the scheme from a given point.
Characteristics	Elements (or combinations of elements) which contribute to distinctive landscape character.
CHMP	Cultural Heritage Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CLVIA	Cumulative Landscape and Visual Impact Assessment
CM	Conceptual Model
CMP	Contract Management Plan
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide emissions
CoCP	Code of Construction Practice
COFNOD	North Wales Environmental Information Service
Combined Effects	Effects of more than one scheme are combined, for example, where an observer is able to see two or more developments from one viewpoint.
Compensation measures	Measures devised to offset or compensate for residual adverse effects which cannot be prevented/avoided or further reduced.
Competent Authority	The authority which determines the application…
Consultation Bodies	Bodies specified in the relevant EIA Regulations which the competent authority must consult in respect of an EIA, and which also has a duty to provide scoping opinion and information.

Term or Abbreviation	Definition
CLR	Contaminated Land Report
CROW Act	Countryside and Rights of Way Act 2000
CPO	Compulsory Purchase Order
CTRN	Calculation of Road Traffic Noise
Cumulative effects	Cumulative / in-combination effects can be defined as changes to the environment caused by the combined impact of the proposed Scheme and other developments in the area.
C4SL	The Development of Category 4 Screening Levels
dB	Decibel: a unit of measure of noise
DCfW	Design Commission for Wales
DEFRA	Department for Environment, Food and Rural Affairs
DEFRA	Department for Environment and Rural Affairs
Design Year	The year for which the scheme has been designed, which is normally 15 years after the Opening Year.
Designated	Identified as being of importance at international, national or local levels, either defined by statute or identified in development plans or other local documents.
Desirable mitigation	Measure considered to be environmentally beneficial but that cannot usually be achieved using statutory powers. For example, third party agreement may be required.
Development	Any proposal that results in a change to the landscape and / or visual environment.
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO2 in the air
Direct effect	Effect arise from activities associated with the Scheme.
DMRB	Design Manual for Roads and Bridges
Do Minimum	Without the J15 Scheme proposals in place
Do Something	With the J15 Scheme proposals in place
DQRA	Detailed Quantitative Risk Assessment
DTM	Digital Terrain Model
Duration	How long an effect it will last;
EA	Environment Agency
EC	European Commission
ECI	Early Contractor Involvement

Term or Abbreviation	Definition
ECO	Environmental Coordinator
ECoW	Environmental Clerk of Works / Ecological Clerk of Works
Effect	The results of an environmental impact on a receptor
EFT	Emission Factor Toolkit
EIA	Environmental Impact Assessment
ELEAMP	Environmental Landscape and Ecology Aftercare and Management Plan
ELG	Environmental Liaison Group
EMP	Environmental Masterplan
EMS	Environmental Management Systems
Enhancement	A measure that is over and above what is required to mitigate the adverse effects of a project. This could also be interpreted as desirable mitigation. The recent Environment (Wales) Act encourages enhancements for the benefit of biodiversity.
Environmental Manager (EM)	E.g. contractor's Environmental Manager A professional person responsible for overseeing the environmental performance of the contractor's organisation. On site the EM would run an Environmental Management Plan setting out how the contractor's personnel should implement the construction project in a sustainable manner, that is in accordance with legislation, best practice and the environmental actions and commitments set out in the REAC , Method Statements, Permits and Licenses as well as this Environmental Statement
EPA	Environmental Protection Act 1990
Episodic	Occurring with a frequency that can be predicted
EPR	Environmental Permitting Regulations 2010
EPUK	Environmental Protection UK
EqIA	Equality Impact Assessment
EQS	Environmental Quality Standards
ES	Environmental Statement
ESPON	European Spatial Planning Observation Network
Essential mitigation	Mitigation which the Overseeing Organisation (Welsh Government) has the statutory power to achieve.
EU	European Union
Extent	The area and/or distance over which in effect might be experienced;

Term or Abbreviation	Definition
FCS	Favourable Conservation Status
FGA	Well-Being of Future Generations (Wales) Act 2015
Frequency	How often will the effect occur;
GA	General Arrangement: a title for a set of drawings that show the engineering layout of the proposals.
GHG	Greenhouse Gas(es)
GLVIA	Guidelines for Landscape and Visual Impact Assessment, Third Edition
GQRA	Generic Quantitative Risk Assessment
GWDTE	Groundwater dependent terrestrial ecosystem
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
HRA	Hot Rolled Asphalt
HSE	Health and Safety Executive
HEMP	Handover Environmental Management Plan
HER	Historic Environmental Records
Heritage	The historic environment and especially valued assets and qualities such as historic buildings and cultural traditions.
HEWRAT	Highways England's Water Risk Assessment Tool
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HRA	Habitats regulations Assessment
I&TP	Inspection & Test Plan
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
ICCI	In-Combination Climate Change Impact (Assessment)
IEMA	Institute of Environmental Management and Assessment
Impact	Change that is caused by an action
IMS	Integrated Management System
INNS	Invasive Non-Native Species

Term or Abbreviation	Definition
IROPI	Imperative reasons of overriding public interest
Indirect effects	Effects that result indirectly from the proposed project as a consequence of the direct effects, often occurring away from the site, or because of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects and can occur as a result of a complex pathway.
ITS	Intelligent Transport System
JNCC	Joint Nature Conservation Committee
Land Cover	The surface cover of the land, usually expressed in terms of vegetation cover or lack of it.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical process.
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction of natural and / or human factors.
Landscape Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another.
LB	Listed Building
LCA	Landscape Character Area
LI	Landscape Institute
Landuse	What the land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
LCA	Landscape Character Area: a single unique areas which are the discrete geographical areas of particular landscape type.
LAQM	Local Air Quality Management
LDP	Local Development Plan
LED	Light Emitting Diode
LNR	Local Nature Reserve
LPA	Land with Public Access
LRN	Local Road Network
Long term	A period of greater than nine years.

Term or Abbreviation	Definition
LVIA	Landscape and Visual Impact Assessment: used to identify and assess the likely significance of the effects of change resulting from development both on the landscape as an environmental resource in its own right and on people's views and visual amenity.
Magnitude	Size /scale of an impact or effect
Magnitude (of effect)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Materials	Materials required in construction of the Scheme or are generated by demolition and earthworks and thus can be defined as waste.
mb	Millibars
MCA	Marine Character Areas
Medium-term	A period of four to nine years;
MEMP	Maintenance Environmental Management Plan
MMP	Materials Management Plan
Monitoring	Observing and measuring the progress of development of the Scheme and it's mitigation measures over a period of years so that it is kept under systematic review by comparison with objectives and functions.
Mitigation	Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects
NCLA	National Landscape Character Areas
Natural Capital	The world's stocks of natural assets which include geology, soil, air, water and all living things. It is from this natural capital that humans derive a wide range of services, often called ecosystem services, which make human life possible.
NCN 5	National Cycle Network (Route 10)
NCR	Non-Conformance Report
NDF	National Development Framework
NERC	Natural Environment and Rural Communities Act 2006
NNR	National Nature Reserve
NMWTRA	North and Mid Wales Trunk Road Agent
NO_2	Nitrogen Dioxide
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles

Term or Abbreviation	Definition
NPPF	National Planning Policy Framework
NRRCE	National Risk Register of Civil Emergencies
NRW	Natural Resources Wales
NSR	Noise Sensitive Receptor
NTFP	National Transport Finance Plan
NTS	Non Technical Summary
NVMP	Noise and Vibration Management Plan
Opening Year	The year when a proposed scheme will be open for traffic
OS	Ordnance Survey
PAH	Polyaromatic Hydrocarbons
Parameters	A limit or boundary which defines the scope of a particular process or activity
PAS2080	Publicly Available Specification 2080
Pathway	Pathway is the route that a hazard takes to reach a Receptors. Source is the origin of a hazard (for example, heavy rainfall, strong winds, contaminated land, point from which noise is emitted). This is often associated with the source - 'pathway' - 'receptor' model for assessing environmental impacts. Source and Receptor are defined separately are defined separately.
PCCP	Pollution Control Contingency Plan
Permanent effect	An effect of the Scheme that will remain for ever.
PIE	Public Information Exhibition
PINS	Planning Inspectorate
PLO	Public Liaison Officer
PM_{10}	Small airborne particles less than 10 µm in diameter
PPG	Planning Policy Guidance
ppm	Parts per million
PPW	Planning Policy Wales (currently Edition 10)
PRA	Preliminary Risk Assessment

Term or Abbreviation	Definition
Primary mitigation	Measures incorporated within the Scheme design sometimes referred to as embedded mitigation. These are often intended to avoid or minimise adverse effects considered in the design process and that may not readily be recognisable as mitigation. fundamental part of the design and incorporated within the scheme shown on the Environmental Masterplans (EMP).
Project Manager	E.g. Contractor's Project Manager: The contractor's project manager is a professional person responsible for day-to-day management of the construction contract to build the Scheme. He manages the, scope, programme, finance, risk, quality, personnel and other resources to achieve completion of construction to time and budget.
PROW	Public Right of Way
RBMP	River Basin Management Plan
RCPs	Representative Concentrations Pathways
REAC	Register of Environmental Actions and Commitments
Receptor	Individual environmental features or locations that have the potential to be affected by a scheme. This term is also often associated with the 'source' - 'pathway' - 'receptor' model for assessing environmental impacts. Source and Pathway are defined separately are defined separately
Reversibility	Whether the effect can be undone or repaired;
Pathway	Pathway - Route that a hazard takes to reach a Receptors. Source is the origin of a hazard (for example, heavy rainfall, strong winds, contaminated land, point from which noise is emitted). .
RML	Richards, Moorehead & Laing Ltd (landscape, planning and environmental consultants
RoD	Record of Determination
SAC	Special Area Conservation
SAM	Scheduled Ancient Monument
Scoping	A step on the EIA process that is used to identify the aspects of the environment that might be affected by development as o should be subject to an impact assessment
Screening	A step in the EIA process that is used to demonstrate the need, or otherwise of a formal IEA and the need to publish an ES.
Scheme	This is the term used to describe the physical arrangements required for the proposed junction improvements
SDR	Strategic Diversion Routes

Term or Abbreviation	Definition
SEB	Statutory Environmental Bodies
Secondary Mitigation	Additional measures identified during the EIA process to further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are supplementary to those measures in (1) above and are also shown on the EMP and best managed through the environmental management plan and is recorded in the REAC.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Short-term	A period of one to three years;
SIA	Social Impact Assessment
Site or Scheme Boundary	This is the area affected by changes brought about by the Scheme. This Scheme is not subject to a planning application and so the term does not refer to the red line boundary, or planning application boundary that would be shown on a planning application plans.
Significance	A term used in EIA to indicate a particular degree of effect / impact that should be considered when making an informed decision about whether or not to proceed with a proposed development. A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
SIAA	Statement to Inform Appropriate Assessment
SINC	Site of Importance for Nature Conservation
SNPA	Snowdonia National Park Authority
Source	Source is the origin of a hazard (for example, heavy rainfall, strong winds, contaminated land, point from which noise is emitted). This is often associated with the source - 'pathway' - 'receptor' model for assessing environmental impacts. Pathway and Receptor are defined separately are defined separately Pathway - Route that a hazard takes to reach Receptors. A pathway must exist for a Hazard to be realised. Receptor - Receptor refers to the entity that may be harmed (a person, property, habitat etc
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SPOSH	Significant Possibility of Significant Harm
SSSI	Site of Special Scientific Interest
SPA	Special Protection Area
SPZ	Source Protection Zone

Term or Abbreviation	Definition
SuDS	Sustainable Urban Drainage Systems
Susceptibility to Change:	The ability of a receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies.
SVOC	Semi-Volatile Organic Compounds
SWMP	Site Waste Management Plan
TAG	Transport Analysis Guidance
TAN	Technical Advice Note
TDR	Tactical Diversion Routes
Temporary effect	An effect of the Scheme that will last for a shorter duration than a permanent effect. This might arise from a change that will be reversed at the end of construction, for example.
TEMPRO	Trip End Model Presentation Programme
TEN-T	Trans-European Transport Network
Tertiary mitigation	Good practice measures to be adopted during construction to avoid and minimise environmental effects, such as pollution control measures identified in a CEMP and monitoring to ensure that is effective (HEMP).
Townscape	The character and composition of the built environment including the buildings and the relationships between them, the different types of urban open space (including green spaces) and the relationship between buildings and open spaces.
TLSE	Test of Likely Significance Effect
TPO	Transport Planning Objectives
TRL	Transport Research Laboratory
TR111	A 1:10,000 scale map and notification issued to indicate the line of a named proposed route that should be protected for planning purposes.
Tranquillity	A state of calm and quietude associated with peace, considered to be a significant asset of landscape.
TTTC	Through the Tide Counts
TW	Traffic Wales
UKCP18	United Kingdom Climate Projections 2018
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change

Term or Abbreviation	Definition
UXO	Unexploded Ordnance
Value	Rarity or sensitivity of a receptor to an action normally defined on a scale from 'Negligible' to 'Very High'
VER	Valuable Ecological Receptors
VES	Visual Effects Schedule
VOC	Volatile Organic Compounds
WCA	Wildlife and Countryside Act 1981
WelTAG	Welsh Transport Appraisal Guidance
WFD	Water Framework Directive
WG	Welsh Government
WHO	World Health Organization
WS	Window Sample
YGC	Ymgynghoriaeth Gwynedd Consultancy
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility: a map, usually digitally produced, showing the areas of land within which, a development is theoretically visible.