Llywodraeth Cymru
Welsh Government

A55 Junctions 16 and 16A Improvements

Environmental Statement

Volume 3A Appendices Chapters 2-5

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A55 JUNCTION 16 ENVIRONMENTAL STATEMENT VOLUME 3 APPENDICES

RAMBOLL Bright ideas. Sustainable change.

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APPENDIX 2.1
TRAFFIC FORECASTING REPORT

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A55 JUNCTIONS 15 AND 16 IMPROVEMENTS
TRAFFIC FORECASTING REPORT

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A55 JUNCTIONS 15 AND 16 IMPROVEMENTS
TRAFFIC FORECASTING REPORT

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1. INTRODUCTION

1.1.1 The Welsh Government (WG) originally appointed Carillion in October 2017 to develop the design of the proposed A55 Junctions 15 and 16 Improvements up to publication of Draft Orders. Ramboll was the lead designer to Carillion. In January 2018, Carillion went into liquidation and WG appointed Ramboll directly.

1.1.2 Ramboll have undertaken a transport study on the A55 trunk road Junctions 15 and 16, following the Welsh Transport Planning and Appraisal Guidance 2017 (WelTAG). The study includes a Stage 2 Appraisal, building upon work already undertaken during the previous WelTAG stage 1.

1.1.3 Along with WelTAG guidance, development of the traffic model has been undertaken in accordance with Department for Transport (DfT) Transport Analysis Guidance (WebTAG).

1.1.4 The A55 Transport Model (A55TM) has been developed to understand current traffic conditions in the area, to provide evidence for the planning of changes to the transport network and to produce traffic forecasts that are used in the detailed economic, social and environmental appraisal of proposed interventions in the transport system.

1.1.5 The traffic model has been calibrated to represent the traffic conditions observed in the model's base year of 2016. Further details of the base year model are found in the Assignment Model Validation Report (AMVR) (Ref: A55J15J16-RAM-60-XX-RP-T-0003)

1.1.6 The primary purpose of this model is to appraise the impact of 13 potential junction improvement options at junctions 15 and 16 (7 options for Junction 15 and 6 options for Junction 16) on the A55 and local highway network within the study area. All 13 options are described in chapter 2 and the results of the forecasts for each option is presented in chapter 4.

1.1.7 Following comments received through Public and Stakeholder engagement, two further options were developed and added to the original 9 options for consideration. These are refinements to Option 5 at Junction 15 and refinements to Option 3 at Junction 16. These options were identified as the preferred options by the Welsh Minister for Transport in April 2019 and presented at the Public Information Exhibition (PIE). The PIE was held in Dwygyfylchi, Penmaenmawr and LLanfairfechan on the 25th, 26th and 27th June 2019 respectively.

1.1.8 Following the PIE and subsequent comments received on the two preferred options, further design changes were made. For the purpose of this appraisal and forecasting report these options are presented as the 'preferred option mitigated' for each junction.

1.2 Purpose of Report

1.2.1 The purpose of the Traffic Forecasting Report (TFR) is to demonstrate that the forecasting procedure undertaken using the SATURN model is in accordance with WelTAG and WebTAG guidance.

1.2.2 This report describes the process undertaken in preparing the model for use in the forecasting of future traffic conditions in and around Junctions 15 and 16 on the A55 'with' and 'without' the junction scheme improvements. The model forecasts will provide the data required for economic and environmental appraisal of the scheme at WelTAG stage 2.

1.2.3 This TFR presents the 13-junction improvement options and describes the development of the future year matrices for assignment onto the highway network, and the results of these assignments. The traffic assignment model has been developed using the guidance in WebTAG

Unit M3-1, 'Highway Assignment Modelling' and traffic forecasting has adopted the guidance in WebTAG Unit M4, 'Forecasting and Uncertainty'.

1.3 Report Structure

1.3.1 This TFR comprises the following Chapters:

- Chapter 2 provides a description of the future year ''Do Minimum'' and ''Do Something'' networks;
- Chapter 3 describes the committed developments that have been considered within the A55TM;
- Chapter 4 describes the approach to the traffic forecasting;
- Chapter 5 presents the ''Do Minimum'' Assignments;
- Chapter 6 presents the ''Do Something'' Assignments;
- Chapter 7 provides a comparison of the scheme options; and
- Chapter 8 provides a conclusion.

2. FUTURE YEAR NETWORKS

2.1.1 This section of the report describes how the ''Do Minimum'' and ''Do Something'' transport networks have been defined within the transport model.

2.2 ''Do Minimum'' Network

2.2.1 It has been determined through liaison with WG and Local Highway Authorities (Conwy, Gwynedd and Denbighshire) that no committed highway schemes are planned in the study area during the modelled assessment period and therefore the ''Do Minimum'' network will remain the same as the validated 2016 base year network.

2.3 ''Do Something'' Network - A55 Improvement Options

2.3.1 The ''Do Something'' network models have been developed by editing the ''Do Minimum'' network to incorporate the 13 junction improvement designs proposed for junctions 15 and 16. Each junction improvement has been modelled separately with 7 improvement options considered for junction 15 and 6 improvement options considered for junction 16.

A55 Improvement Options

Junc.	Model Ref.	Scheme Ref.	Improvement Scheme Description
15	J15 OPT1	OPTION A	2-way movement. WB off/on only. No EB on/off. Lengthening of Eastbound slips at J14.
15	J15 OPT2	OPTION B	4-way movement with bridge across A55.
15	J15 OPT3	OPTION C	2-way movement. WB off but no WB on. New under bridge under A55 for EB on but no EB off. Lengthening of westbound off slip and eastbound slips at J14.
15	J15 OPT5	OPTION D	4-way movement. WB on/off slips leading to priority junction with Penmaenmawr Road. Overbridge over A55 and T junction to allow EB on/off.
15	J15 OPT6	OPTION E	4-way movement. Similar to J15 Option 5 but with all slips meeting Penmaenmawr Road at a new r/bt to west of overbridge at the site of the Heath building.
15	J15 PREF OP	OPTION D PREF	4-way movement. Extended WB on/off slips leading to separate priority junctions with Penmaenmawr Road. Overbridge over A55 and T junction to allow EB on/off.
15	J15 PREF OP MITIGATED	OPTION D PREF MITIGATED	4-way movement. Extended WB on/off slips leading to separate signal-controlled junction with Penmaenmawr Road. Overbridge over A55 and signal controlled T junction to allow EB on/off.
16a / 16	J16 OPT3	OPTION A	4-way movement with bridge across A55 at J16a. Westbound on/off slips at J16. New Link road linking to Glan-Yr-Afon Rd and Ysguborwen Rd.
16	J16 OPT4	OPTION B	4-way movement. WB off/on via slips at existing r/bt. E/B off/on facilitated by an overbridge located to north-east of existing r/bt.
16	J16 OPT5	OPTION C	3-way movement, no EB off. EB on via a new underpass under A55. WB off/on at existing junction.
16	J16 OPT7	OPTION D	3-way movement, no EB off. EB on via an overbridge across A55. WB off/on at existing junction.
16a / 16	J16 PREF OP	OPTION A PREF	4-way movement with bridge across A55 at J16a. Westbound on/off slips at J16. Extended Link road linking to Glan-Yr-Afon Rd and Ysguborwen Rd. Traffic Calming through Dwygyfylchi.
16a / 16	J16 PREF OP MITIGATED	OPTION A PREF MITIGATED	4-way movement with bridge across A55 at J16a. Westbound on/off slips at J16. Extended Link road linking to Glan-Yr-Afon Rd and Ysguborwen Rd. Traffic Calming through Dwygyfylchi.

Table 2.1: A55 Junction Improvement Schemes

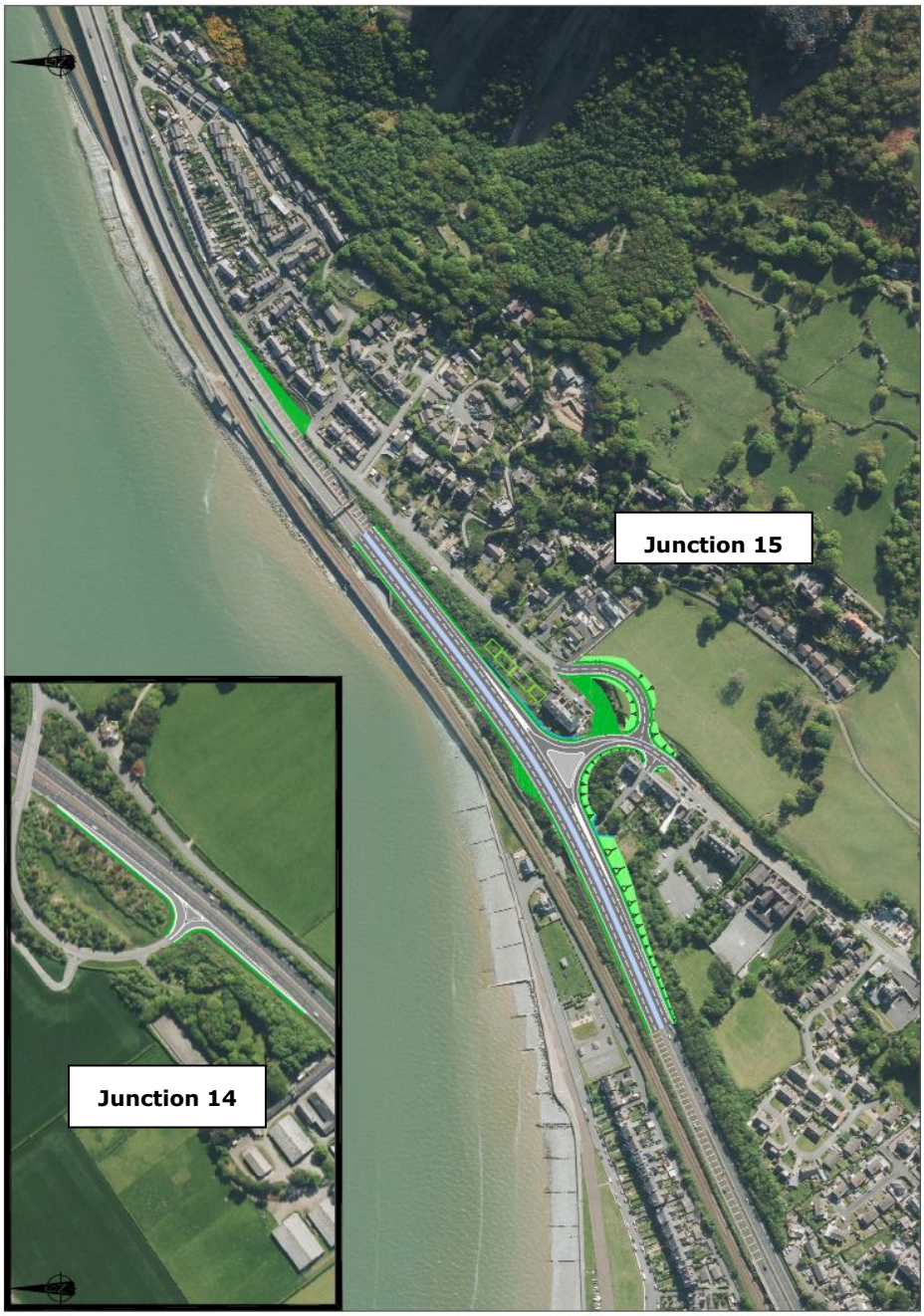
2.3.2 Table 2.1 above presents the 13 junction improvement options for junctions 15 and 16 providing the model and scheme references for each option and a brief description of each improvement scheme.

2.3.3 The following section describes the 13 junction improvement options accompanied by drawings of how the improvements will look and be incorporated into the highway network.

2.4 Junction 15 Option 1

2.4.1 Of all the options being proposed at junction 15, this option has the smallest footprint and would have the least immediate impact on the surrounding land. However, the option only allows two-way movement, providing slip roads serving westbound traffic. Eastbound traffic would need to enter and exit the A55 at junction 14. To accommodate the associated increased traffic flows, it is proposed that minor improvements will be made to junction 14.

2.4.2 It is proposed that a shared cycleway / pedestrian path would be provided to maintain continuity. It is expected that the existing bus-stops will not be affected.



Map data © 2018 Google

Figure 2.1: Junction 15 Option 1

2.5 Junction 15 Option 2

2.5.1 This option provides four-way movement by utilising an overbridge. The slip roads would be raised locally to allow the bridge to pass over the A55 and railway. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops.

2.5.2 In addition to providing access to the Parade for larger vehicles, it is proposed that access would be retained for Non-Motorised Users via Shore Road East. It is also proposed that there will be a shared cycleway / pedestrian path to maintain continuity.

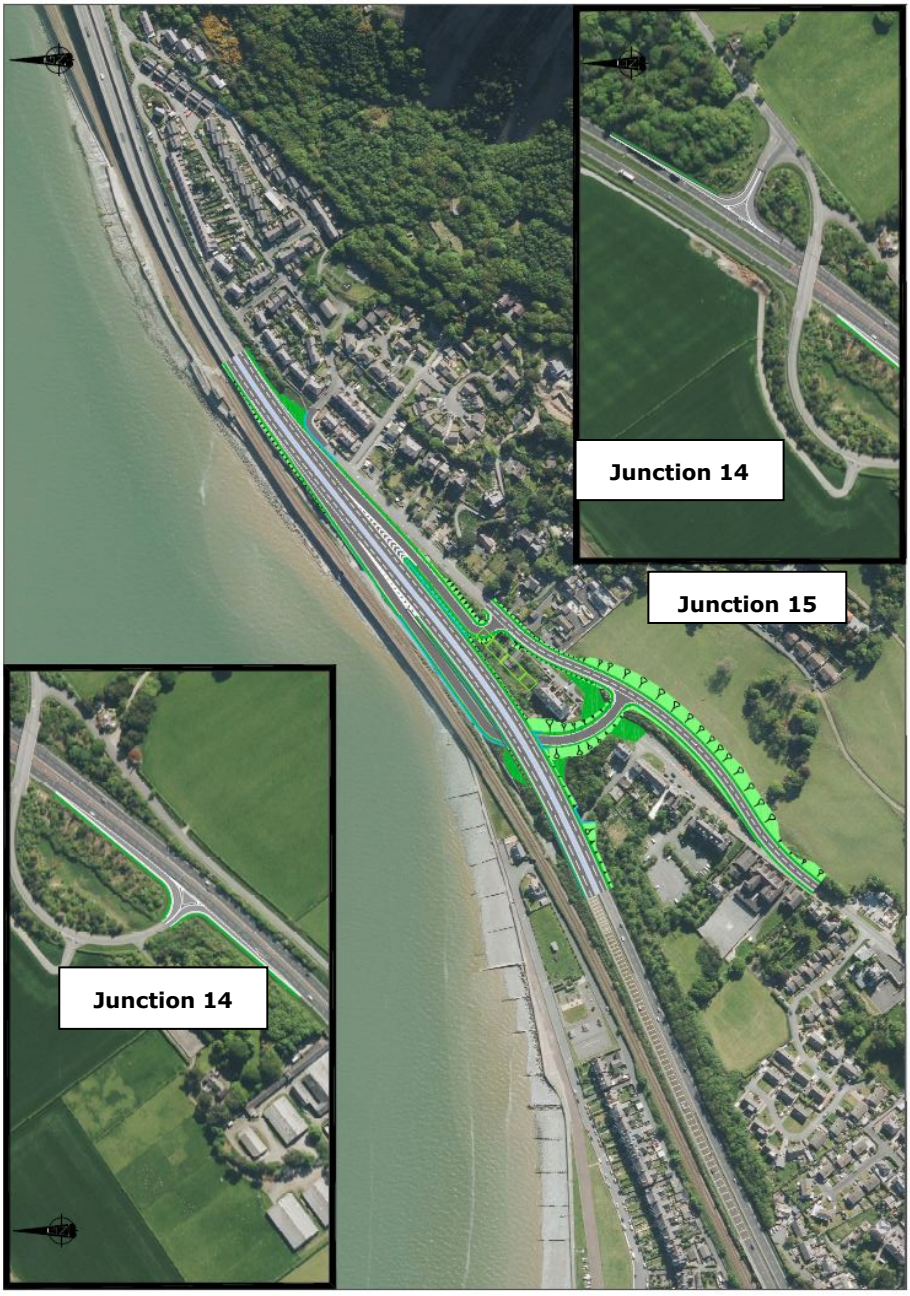
Map data © 2018 Google

Figure 2.2: Junction 15 Option 2

2.6 Junction 15 Option 3

2.6.1 This option provides two-way movement, with slip roads on and off the A55 for traffic travelling towards and from the east. Traffic travelling to and from the west would need to be diverted to junction 14. To accommodate the associated increased traffic flows, it is proposed that improvements will be made to junction 14. Access to the Parade via Shore Road East would be retained for local traffic. This option would take the longest to construct and cause the greatest disruption during construction.

2.6.2 This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path to maintain continuity.



Map data © 2018 Google

Figure 2.3: Junction 15 Option 3Junction 15 Option 5

2.7 Junction 15 Option 5

2.7.1 This option provides four-way movement 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 would be raised locally to allow the bridge to pass over the A55. Access to the Parade via Shore Road East would be retained. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path to maintain continuity.

Map data © 2018 Google

Figure 2.4: Junction 15 Option 5

2.8 Junction 15 Preferred Option

2.8.1 This option provides four-way movement by utilising an overbridge with a T-junction to the north of the A55 and priority junctions to the south of the A55 to access the westbound on and off slips. The slip roads would be raised locally to allow the bridge to pass over the A55. Access to the Parade via Shore Road East would be retained. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path to maintain continuity.

Map data © 2018 Google

Figure 2.5: Junction 15 Preferred Option

2.9 Junction 15 Preferred Option (Mitigated)

This option provides four-way movement by utilising an overbridge with a signal-controlled T-junction to the north of the A55 and priority junctions to the south of the A55 to access the westbound on and off slips. The slip roads would be raised locally to allow the bridge to pass over the A55. Access to the Promenade via Shore Road East would be retained. The connecting link road leads to a signalised junction with Penmaenmawr Road. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops with new bus laybys. The option incorporates additional active travel route improvements and associated pedestrian crossings, including a shared cycleway / pedestrian path which maintains continuity of the Sustrans National Cycle Network Route 5 at the junction with Penmaenmawr Road.

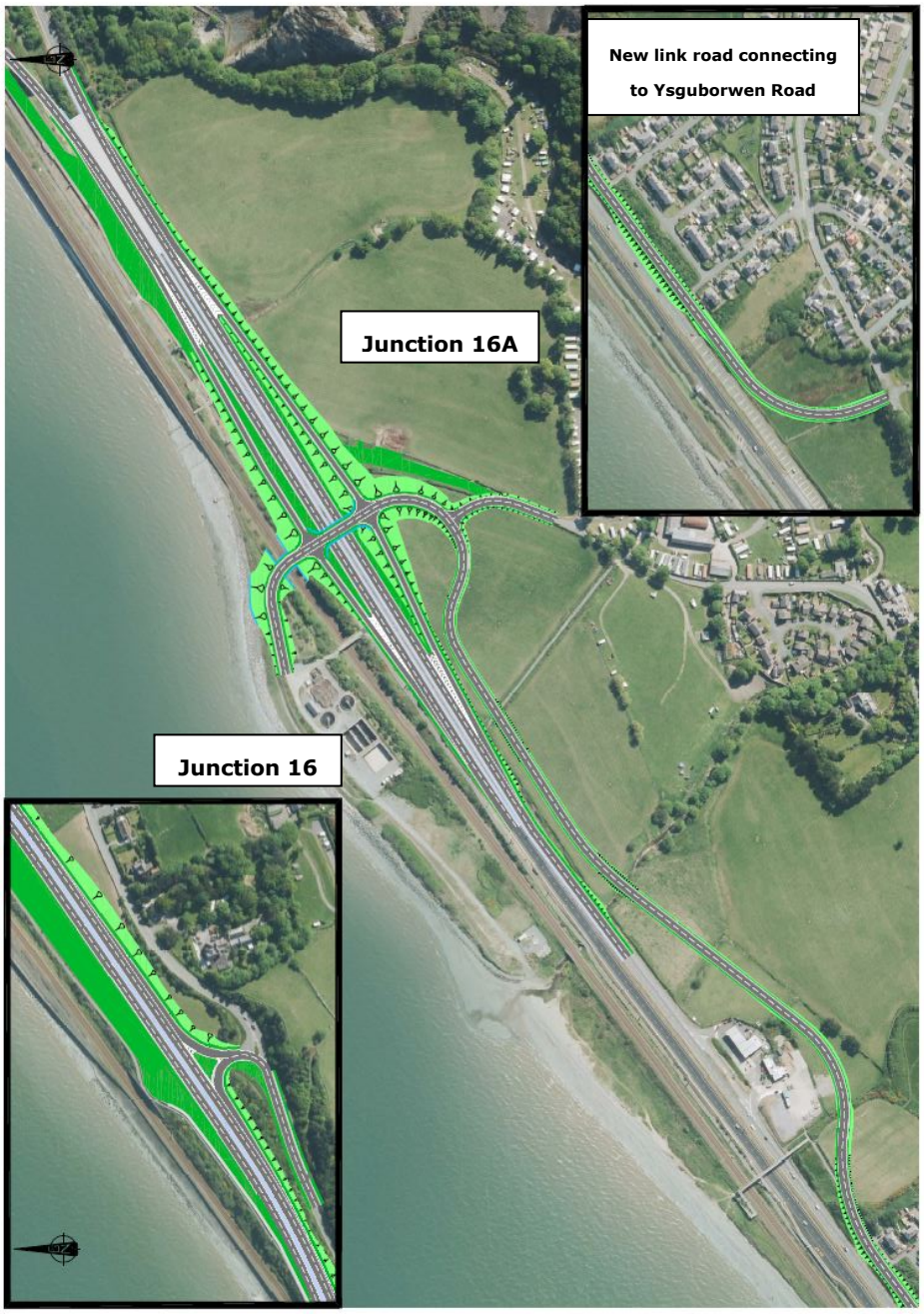
Map data © 2018 Google

Figure 2.6: Junction 15 Preferred Option

2.10 Junction 16 Option 3

2.10.1 The option comprises of a four-way movement junction, replacing junction 16A. The roundabout at junction 16 would be removed and replaced by westbound on and off slip roads. The junction 16A arrangement would consist of an overbridge, located to the north-east of the existing roundabout. The slip roads would be constructed on raised embankments. A new link road would be constructed, running roughly parallel to the A55, behind the Puffin Café linking back into Ysguborwen Road near the Gladstone Hotel.

2.10.2 Provision would be made to retain the existing SUSTRANS Route 5, which runs parallel to the north of the A55.



Map data © 2018 Google

Figure 2.7: Junction 16 Option 3

2.11 Junction 16 Option 4

2.11.1 The proposed junction arrangement provides four-way movement. Movement on and off the A55 eastbound carriageway is facilitated by an overbridge located to the north-east of the existing roundabout, with slip roads constructed on raised embankments. Movement on and off the A55 westbound carriageway would be via slip roads replacing the existing roundabout.

2.11.2 The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.

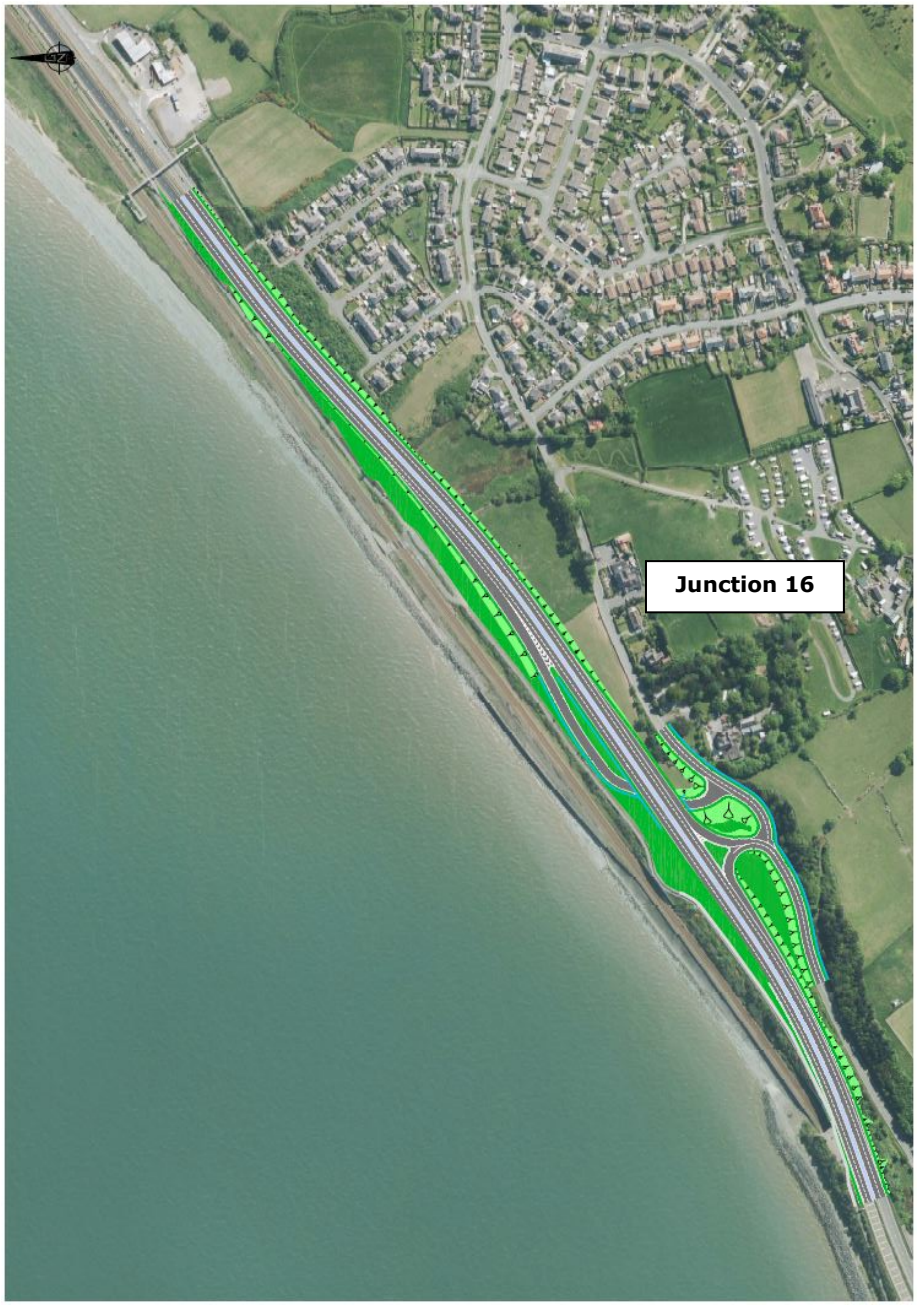
Map data © 2018 Google

Figure 2.8: Junction 16 Option 4

2.12 Junction 16 Option 5

2.12.1 This option would provide a three-way movement junction. Movement on and off the A55 westbound carriageway would be via slip roads located at the existing roundabout. Traffic joining the A55 in an eastbound direction would pass under the A55 via an underbridge. To facilitate this, the A55 would need to be raised on a substantial embankment. Traffic travelling in an eastbound direction, wishing to leave the A55 would need to leave the A55 earlier at junction 15A; resulting in increased traffic through Penmaenmawr.

2.12.2 The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.



Map data © 2018 Google

Figure 2.9: Junction 16 Option 5

2.13 Junction 15 Option 6

2.13.1 This option is similar to junction 15 Option 5, in that it provides four-way movement by utilising an overbridge with a T-junction to the north of the A55. However, for this option a compact roundabout and slip roads for west-bound traffic would be located at the site of the Heath building.

2.13.2 The slip roads would be raised locally to allow the bridge to pass over the A55. Due to headroom restrictions, access to the Parade along Shore Road East may need to be limited to Non-Motorised Users.

2.13.3 This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path.

Map data © 2018 Google

Figure 2.10: Junction 15 Option 6

2.14 Junction 16 Option 7

2.14.1 This option is similar to junction 16 Option 5 in that it provides three-way movement. Movement on and off the A55 westbound carriageway would be via slip roads located at the existing roundabout. Traffic joining the A55 in an eastbound direction would pass over an overbridge. Traffic travelling in an eastbound direction, wishing to leave the A55 would need to leave the A55 earlier at junction 15A; resulting in increased traffic through Penmaenmawr.

2.14.2 The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.

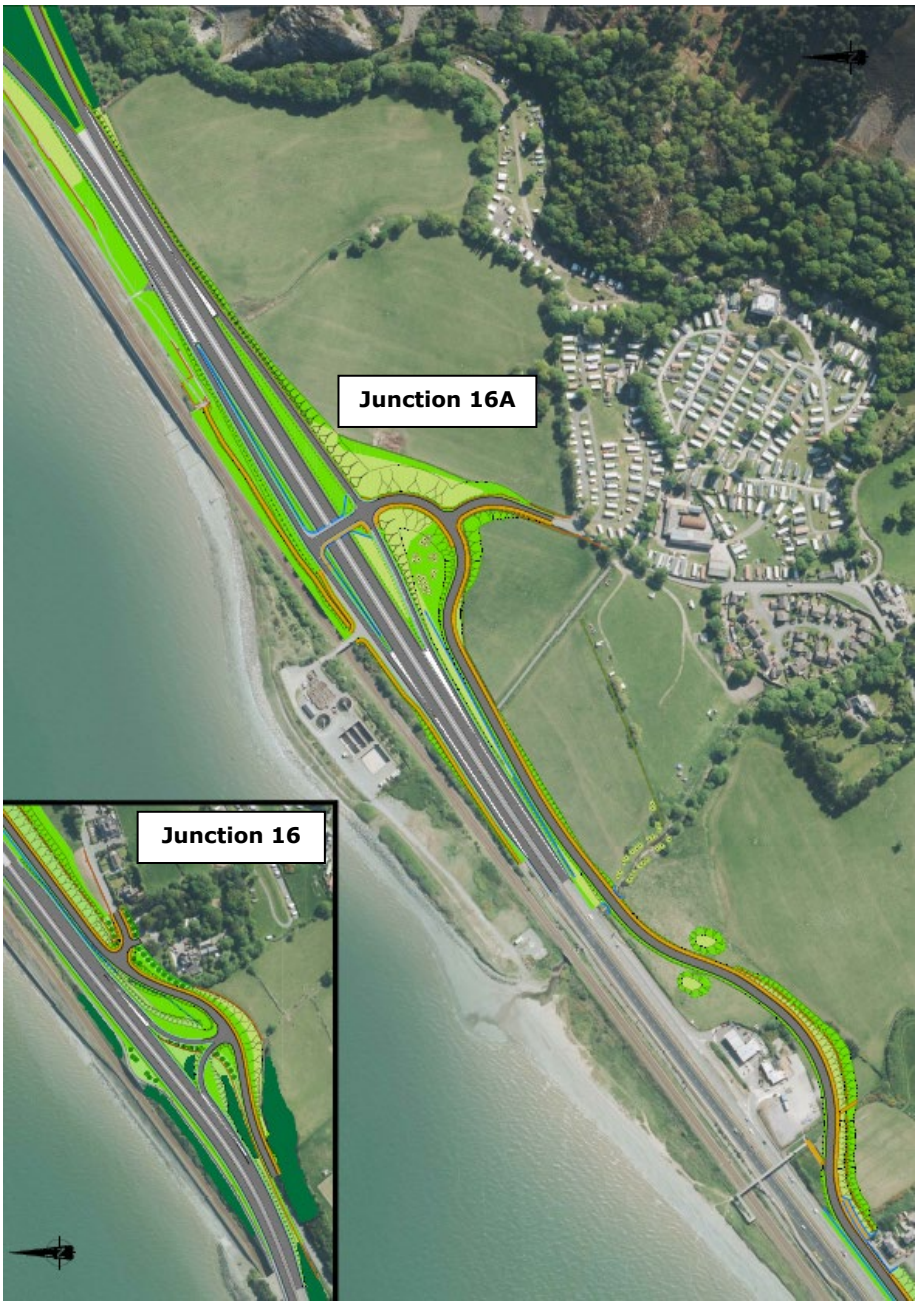
Map data © 2018 Google

Figure 2.11: Junction 16 Option 7

2.15 Junction 16 Preferred Option

2.15.1 The option comprises of a four-way movement junction, replacing junction 16A. The roundabout at junction 16 would be removed and replaced by westbound on and off slip roads. The junction 16A arrangement would consist of an overbridge, located to the north-east of the existing roundabout. The slip roads would be constructed on raised embankments. A new link road would be constructed, running roughly parallel to the A55, behind the Puffin Café linking back into Ysguborwen Road near the existing Junction 16.

2.15.2 Provision would be made to retain the existing SUSTRANS Route 5, which runs parallel to the north of the A55. Traffic Calming would be implemented through Dwygyfylchi to reduce traffic flows through the village and help to direct traffic accessing Junction 16a, to the new Link Road.



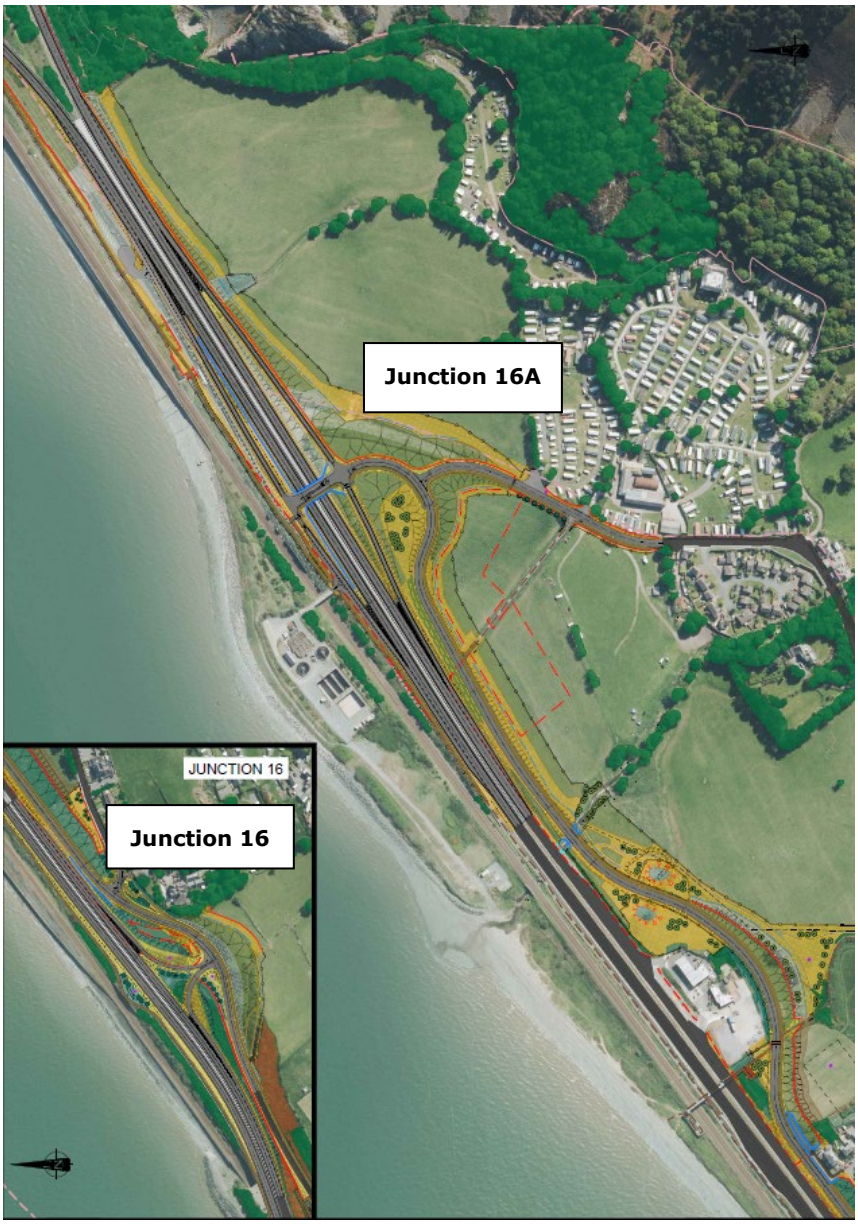
Map data © 2018 Google

Figure 2.12: Junction 16 Preferred Option

2.16 Junction 16 Preferred Option (Mitigated)

This option comprises of a four-way movement junction, replacing junction 16A. The roundabout at junction 16 would be removed and replaced by westbound on and off slip roads. The junction 16A arrangement would consist of an overbridge, located to the north-east of the existing roundabout. The slip roads would be constructed on raised embankments. A new link road would be constructed, running roughly parallel to the A55, behind the Puffin Café linking back into Ysguborwen Road near the existing Junction 16. Glan-yr-Afon Road is to be widened to provide a standard road with a separate footpath / cycleway provision. The proposed improvements tie in with the proposed active travel improvement 'Mini-scheme' 1, which is located between the end of the link road and the caravan park.

2.16.1 Provision would be made to retain the existing Sustrans National Cycle Network Route 5, which runs parallel to the north of the A55. Traffic calming would be implemented through Dwygyfylchi to reduce traffic flows through the village and help to direct traffic accessing Junction 16a, to the new Link Road. Glan



Map data © 2018 Google

Figure 2.13: Junction 16 Preferred Option

3. COMMITTED DEVELOPMENTS

3.1.1 This chapter provides details of the future year committed developments that have been considered within the A55TM to ascertain future demands on the highway network. In order to provide a robust assessment of future developments within the study area, estimates of their likely trip generation have been calculated and are presented below.

3.1.2 In order to find which future developments to consider within the A55TM, the local council, Conwy, and its three neighbouring councils; Denbighshire, Gwynedd and Anglesey, were contacted and asked for a list of all committed developments that would become operational between 2022 (opening year) and 2051 (horizon year).

3.1.3 Each council delivered a list of housing and employment sites with accompanying planning application references of all committed developments with planning permission that are set to be developed between 2022 and 2051.

3.1.4 Each application was assessed to find its location (in relation to the model study area), trip generation, trip distribution and year of opening to ascertain if any trips generated by the developments should be included within the model.

3.1.5 Having assessed all the committed development sites in the neighbouring councils of Denbighshire, Gwynedd and Anglesey, it was ascertained that the majority of trips generated from committed developments in these areas would not enter, exit or pass through the model and the remainder were included in TEMPro growth assumptions. Traffic growth within the model has therefore been determined as being equivalent to TEMPro growth.

3.1.6 Table 3.1 presents a list of 21 committed developments in Conwy of which 11 are residential housing schemes and 10 are employment / retail developments (details taken from Conwy County Borough Council (CCBC) JHLAS 2017 Report). Having assessed all these sites it was determined that only 5 residential sites (CONRES001 to CONRES005) were to be modelled explicitly. These 5 sites are shown in Table 3.2 and lie within the study area. The other sites have not been modelled explicitly due to their size and location and it was ascertained that trips associated with these developments would be accounted for within the TEMPro growth assumptions.

No.	Reference	Development	Location	Planning App No.
1	CONRES001	Residential	Sychnant Pass Road, Conwy	0/41960
2	CONRES002	Residential	Penmaenmawr Road, Llanfairfechan	0/42919
3	CONRES003	Residential	Conway Road, Penmaenmawr	0/30397
4	CONRES004	Residential	Penmaenmawr Road, Llanfairfechan	0/41558
5	CONRES005	Residential	Ysguborwen Road, Dwygyfylchi	0/41637
6	CONRES006	Residential	Marine Road, Pensarn	0/42677
7	CONRES007	Residential	St. George's Road, Abergele	0/42148
8	CONRES008	Residential	Abergele Business Park, Abergele	0/42900
9	CONRES009	Residential	Woodlands, Llandudno Junction	0/44548
10	CONRES010	Residential	Nant-y-Glyn Holiday Park, Colwyn Bay	0/41297
11	CONRES011	Residential	St. George's Road, Abergele	0/40507 0/43058
12	CONEMP001	Retail	A55 J18, Llandudno Junction	NA
13	CONEMP002	Retail	Ffordd Newydd, Llandudno Junction	NA

No.	Reference	Development	Location	Planning App No.
14	CONEMP003	Employment	Mochdre Commerce Park	NA
15	CONEMP004	Employment	Ffordd Maelgwyn, Llandudno Junction	NA
16	CONEMP005	Employment	Narrow Lane, Llandudno Junction	NA
17	CONEMP006	Employment	Station Road, Mochdre	NA
18	CONEMP007	Employment	Penrhyn Avenue, Links Road, Rhos on Sea	NA
19	CONEMP008	Employment	Conway Road, Llandudno Junction	NA
20	CONEMP009	Employment	Morfa Conwy Business Park, Conwy	NA
21	CONEMP010	Employment	Ty Gwyn, Llanrwst	NA

Table 3.1: Committed Developments in Conwy

3.1.7 Table 3.2 presents the 5 committed developments considered within the A55TM, all located in CCBC.

No.	Reference	Development	Location
1	CONRES001	Residential	Sychnant Pass Road, Conwy
2	CONRES002	Residential	Penmaenmawr Road, Llanfairfechan
3	CONRES003	Residential	Conway Road, Penmaenmawr
4	CONRES004	Residential	Penmaenmawr Road, Llanfairfechan
5	CONRES005	Residential	Ysguborwen Road, Dwygyfylchi

Table 3.2: Committed Developments included within Model

3.1.8 Figure 3.1 below shows the locations and site size of all the committed developments considered within the A55TM.

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Figure 3.1: Committed Development Locations

3.1.9 All committed developments considered in the A55TM are located within the model study area. Distribution of trips for these committed developments has been determined as being the same as the existing distribution for trips within the same zone of the model. All the zones the committed housing schemes sit within are residential zones and it is reasonable to assume that the distribution of new trips will match that of existing trips.

3.1.10 Details of the trip generation and a description of the 5 committed developments considered within the model are presented below. Development flows for each development have been broken down into the three A55TM vehicle classifications (Car, LGV and HGV) and show all arriving and departing trips for each modelled time period (AM, Inter and PM Peak) for each development.

3.1.11 The data used to generate trips for the committed developments can be found in Appendix 1.

3.2 Committed Development – CONRES001

Trip Generation	AM Peak (0800-0900)			Inter Peak 10000-16000)			PM Peak (1700-1800)		
CONRES001	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**
Residential Development – 100 Units									
Trip Rates	0.174	0.548	**0.722**	0.212	0.281	**0.494**	0.463	0.296	**0.759**
Total Trips	17	55	**72**	21	28	**49**	46	30	**76**

Table 3.3: CONRES001 Trip Generation

3.2.1 CONRES001 is a residential development located off Sychnant Pass Road in Conwy to the east of the model. The development has planning permission for 100 units and is proposed to be developed by 2022 and has therefore been included in all opening, design and horizon year models.

3.2.2 Trip rates for this development were taken directly from the accompanying Transport Assessment (TA) for the development and are based on peak hour weekday trip rates calculated using the TRICS database for privately owned houses between 50 and 200 units throughout the UK excluding Greater London and Ireland. Details of the TRICS data used to calculate the trip generation this development can be found in Appendix 1.

3.3 Committed Development – CONRES002

Trip Generation	AM Peak (0800-0900)			Inter Peak 10000-16000)			PM Peak (1700-1800)		
CONRES002	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**
Residential Development – 17 Units									
Trip Rates	0.171	0.389	**0.560**	0.219	0.208	**0.427**	0.376	0.231	**0.607**
Total Trips	3	7	**10**	4	4	**7**	6	4	**10**

Table 3.4: CONRES002 Trip Generation

3.3.1 CONRES002 is a residential development located on Penmaenmawr Road to the north of Llanfairfechan to the west of the model. The development has planning permission for 17 units (8 apartments and 9 dwellings with associated access) and is proposed to be developed by 2022 and has therefore been included in all opening, design and horizon year models.

3.3.2 Due to there being no development plans or TA found on the CCBC planning portal for this development, trip rates have been taken from CONRES010 (shown in Table NN). Although the CONRES010 housing development was not considered within this model, the trip rates (calculated using the TRICS database) found within the accompanying TA were considered to be representative of trip rates for this development due to its similar size, location and development use.

3.4 Committed Development – CONRES003

Trip Generation	AM Peak (0800-0900)			Inter Peak 1000-1600)			PM Peak (1700-1800)		
CONRES003	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**
Residential Development – 23 Units									
Trip Rates	0.171	0.389	**0.560**	0.219	0.208	**0.427**	0.376	0.231	**0.607**
Total Trips	4	9	**13**	5	5	**10**	9	5	**14**

Table 3.5: CONRES003 Trip Generation

3.4.1 CONRES003 is a residential development located on Conway Road in Penmaenmawr in the centre of the model. The development has planning permission for 23 units across two blocks (1 block of 16 apartments and 1 block of 7 apartments) and is proposed to be developed by 2022 and has therefore been included in all opening, design and horizon year models.

3.4.2 Similar to CONRES002, as there were no development plans or TA on the CCBC planning portal and the site was of similar size, location and use to CONRES010, trip rates from that development have been used to calculate trip generation for this development (CONRES003).

3.5 Committed Development – CONRES004

Trip Generation	AM Peak (0800-0900)			Inter Peak 1000-1600)			PM Peak (1700-1800)		
CONRES004	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**
Residential Development – 28 Units									
Trip Rates	0.156	0.404	**0.560**	0.203	0.183	**0.386**	0.407	0.149	**0.556**
Total Trips	4	11	**16**	6	5	**11**	11	4	**16**

Table 3.6: CONRES004 Trip Generation

3.5.1 CONRES004 is a residential development located on Penmaenmawr Road in Llanfairfechan to the south west of the model. The development has planning permission for 28 units and is proposed to be developed by 2022 and has therefore been included in all opening, design and horizon year models.

3.5.2 Similar to CONRES002 and CONRES003, as there was no trip rate or trip information provided within the development Transport Statement (TS) found on CBC planning portal, CONRES005 trip rates have been used to calculate trip generation for this development as the sites are of a similar size, nature and location.

3.6 Committed Development – CONRES005

Trip Generation	AM Peak (0800-0900)			Inter Peak 1000-1600)			PM Peak (1700-1800)		
CONRES005	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**	**Arrive**	**Depart**	**Total**
Residential Development – 46 Units									
Trip Rates	0.156	0.404	**0.560**	0.203	0.183	**0.386**	0.407	0.149	**0.556**
Total Trips	7	19	**26**	9	8	**18**	19	7	**26**

Table 3.7: CONRES005 Trip Generation

3.6.1 CONRES005 is a residential development located on Ysguborwen Road in Dwygyfylchi in the centre of the model. The development has planning permission for 46 units and is proposed to be developed by 2022 and therefore has been included in all opening, design and horizon models.

3.6.2 Trip rates for this development were taken directly from the accompanying TA for the development and are based on peak hour weekday trip rates calculated using the TRICS database for privately owned houses between 20 and 80 units throughout the UK excluding Greater London and Ireland. Details of the TRICS data used to calculate the trip generation this development can be found in Appendix 1.

4. TRAFFIC FORECASTING

4.1.1 To test the junction improvement options, assessments have been carried out in the SATURN models for year of opening (2022), a design year 15 years after opening (2037) and a future horizon year 24 years after opening (2051).

Assessment Years	
Base Year	2016
Opening Year	2022
Design Year	2037
Horizon Year	2051

Table 4.1: Assessment Years

4.2 Traffic Forecast Growth Rates

4.2.1 In order to calculate opening, design and horizon year flows, base year traffic matrices presented in the AMVR (Ref: A55J15J16-RAM-60-XX-RP-T-0003) have been factored to opening year 2022, design year 2037 and horizon year 2051 using TEMPro version 7.2 growth forecasts for the North Wales (Region) for cars and the National Transport Model (NTM) forecast (Scenario 1, North Wales, S1 SRN-Local Table 3) for LGV and HGV growth.

4.2.2 These rates were derived for the same 3 peak periods as those used in the Base Model and corresponded to:

- AM Peak – 0800-0900
- Average Inter Peak – 1000-1600
- PM Peak – 1700-1800

4.2.3 The forecast matrices were further disaggregated by vehicle type, representing:

- Cars
- Light Goods Vehicles (LGVs)
- Heavy Goods Vehicles (HGVs)

4.2.4 The Base Model year for the A55TM was 2016 and growth rates were calculated for cars, LGV's and HGV's from 2016 to 2022, from 2022 to 2037 and from 2037 to 2051.

4.2.5 Table 4.2 shows the growth rates derived for the A55TM for cars from 2016 to 2022, from 2022 to 2037 and from 2037 to 2051.

Car Growth Rates	AM Peak	Inter Peak	PM Peak
2016-2022	1.050	1.056	1.048
2022-2037	1.080	1.081	1.079
2037-2051	1.065	1.050	1.059

Table 4.2: TEMPro Car Growth Rates

4.2.6 In line with WebTAG guidance, Unit M4, section 7.4.11, the TEMPro car growth rates have been adjusted to take account of the fixed demand nature of the forecasting model. These adjustments have been made for income and fuel price, with the adjustment factors being calculated from values in the WebTAG data book, Table M 4.2.1. These factors are presented in Table 4.3.

Income & Fuel Adjustment Factors			
	Income	**Fuel**	**Combined Income & Fuel Factor**
2016-2022	1.006	1.007	**1.013**
2022-2037	1.038	1.011	**1.049**
2037-2051	1.026	0.992	**1.018**

Table 4.3: Income & Fuel Adjustment Factors

4.2.7 Table 4.4 presents the adjusted TEMPro car growth rates. TEMPro rates presented in Table 4.2 have been factored by a combined global income and fuel factor for each time period (AM, Inter and PM peak) from base year to opening, design and horizon years. These rates have been used to factor base year matrices to opening, design and horizon years.

Adjusted Car Growth Rates	AM Peak	Inter Peak	PM Peak
2016-2022	1.063	1.070	1.061
2022-2037	1.134	1.134	1.132
2037-2051	1.084	1.069	1.078

Table 4.4: Adjusted TEMPro Car Growth Rates

4.2.8 Table 4.5 shows the growth rates derived for the A55TM for LGVs from 2016 to 2022, from 2022 to 2037 and from 2037 to 2051.

LGV Growth Rates	AM Peak	Inter Peak	PM Peak
2016-2022	1.166	1.166	1.166
2022-2037	1.322	1.322	1.322
2037-2051	1.212	1.212	1.212

Table 4.5: LGV Growth Rates

4.2.9 Table 4.6 shows the growth rates derived for the A55TM for HGVs from 2016 to 2022, from 2022 to 2037 and from 2037 to 2051.

Heavy Vehicle Growth Rates	AM Peak	Inter Peak	PM Peak
2016-2022	1.048	1.048	1.048
2022-2037	1.119	1.119	1.119
2037-2051	1.110	1.110	1.110

Table 4.6: HGV Growth Rates

4.2.10 Prior to assignment, the vehicle type matrices were stacked to represent an all vehicle matrix for each time period being modelled.

4.3 Traffic Forecast Count Sites

Ref.	Junction	Location
TFS001	15	A55 south of J14
TFS002	15	A55 northbound J14 off/on slip
TFS003	15	A55 southbound J14 off/on slip
TFS004	15	A55 between J14 and J15
TFS005	15	Promenade, Llanfairfechan
TFS006	15	Shore Road East, Llanfairfechan
TFS007	15	Aber Road, Llanfairfechan
TFS008	15	Penmaenmawr Road (by Station Road / Village Road Junction), Llanfairfechan
TFS009	15	Penmaenmawr Road (north of TFS008), Llanfairfechan
TFS010	15	A55 north of J15
TFS011	16	A55 between J15 and J15A (north of TFS011)
TFS012	16	High Street (just before J15A southbound on), Penmaenmawr
TFS013	16	A55 northbound off/on slip
TFS014	16	A55 between J15A and J16
TFS015	16	Conway Road (south of J16)
TFS016	16	Ysguborwen Road (north of J16)
TFS017	16	A55 (north of J16)
TFS018	16	A55 northbound (north of J16A)
TFS019	16	Bangor Road, Penmaenmawr
TFS020	16	Conway Old Road, Penmaenmawr
TFS021	16	Conway Old Road, Capelulo
TFS022	16	Ysguborwen Road, Dwygyfylchi
TFS023	16	Glan-Yr-Afon, Dwygyfylchi
TFS024	16	A55 southbound (north of J16A)

Table 4.7: Traffic Forecast Count Site Descriptions

4.3.1 Table 4.7 presents a list of 24 locations within the A55TM network around junctions 15 and 16 of the A55. These sites, referenced as Traffic Forecast Sites (TFS), have been selected to present forecast traffic flows for the "Do Minimum" and "Do Something" networks for the opening, design and horizon years.

4.3.2 For the purpose of assessment these Traffic Forecast Sites have been referenced from TFS001 to TFS024, with TFS001 to TFS010 located around junction 15 and TFS011 to TFS024 located around junction 16. Figure 4.1 below shows the location of the Traffic Forecast Sites within the study area.

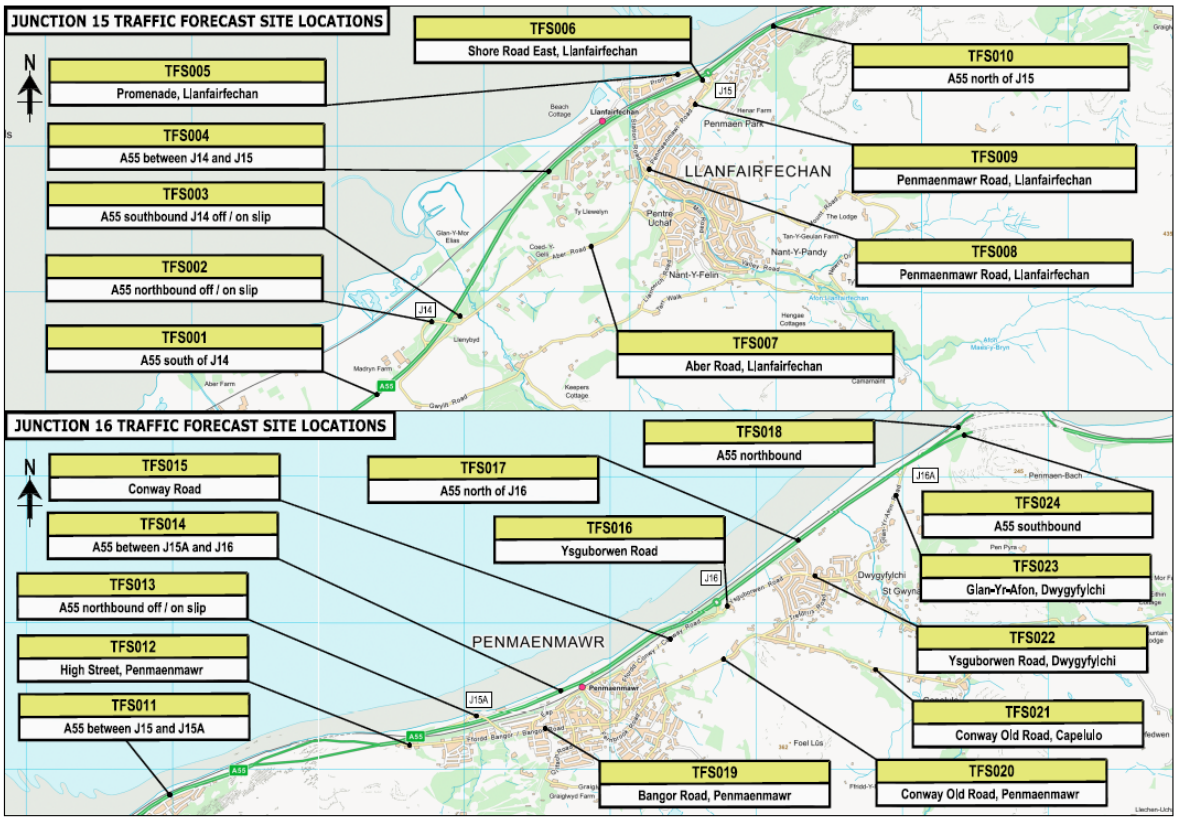

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Table 4.1: Traffic Forecast Site Locations

4.4 Calculation of AADT

4.4.1 For analysis purposes, traffic flows on links around the A55TM network are presented as AADT flows. The A55 base year traffic model has been developed for the AM, Inter and PM peak hours. These peak hours have been determined from assessment of observed count data recorded by ATC's across the study network and detailed in the Traffic and Accident Data Report (TADR - Ref: A55J15J16-RAM-60-XX-RP-T-0001).

4.4.2 The morning peak period was observed between 07:00 to 10:00 with the peak hour occurring from 08:00 to 09:00. The observed evening peak period was between 16:00 to 19:00, with the peak hour occurring from 17:00 to 18:00. For the inter peak period, the data showed that inter peak conditions prevailed between 10:00 and 16:00 with the modelled inter peak hour taken as an average of the 6 hours across this inter peak period.

4.4.3 To calculate representative AADT flows; AM, Inter and PM peak hour modelled average weekday flows have been factored using the ATC data presented in the TADR, to factor peak hour flows to 7-day peak period flows and then into an AADT flow. The AM peak hour modelled flow (08:00 to

09:00) has been factored to the 7-day AM peak period (07:00 to 10:00) using the AM peak hour factor. The average inter peak hour modelled flow (average between 09:00 to 17:00) has been factored to the 7-day inter peak period (10:00 to 16:00) using the inter peak hour factor and the PM peak hour modelled flow (17:00 t0 18:00) has been factored to the 7-day PM peak period (16:00 to 19:00) using the PM peak hour factor. The AM peak, Inter peak and PM peak factors used to convert peak hour flows to peak period flows are presented in Table 4.8.

AADT - Peak Hour Factors	
AM Peak	2.018
IP Peak	5.757
PM Peak	2.565

Table 4.8: AADT Peak Hour Factors

4.4.4 Once the peak hour flows have been factored to peak period flows, they were added together to represent a 12-hour flow. These 12-hour flows have then been factored to 24-hour AADT flows using the 12-hour to 24-hour factor presented in Table 4.9.

AADT – 12h to 24h Factors	
12h > 24h	1.209

Table 4.9: 12 Hour to 24 Hour Factor

4.4.5 This process was undertaken to convert all peak hour flows to AADT flows for the ‘‘Do Minimum’’ and ‘‘Do Something’’ assignments and are presented in tabular and graphical form in chapters 5, 6 and 7.

5. DO-MINIMUM ASSIGNMENTS

5.1.1 The ''Do Minimum'' assignments are produced by assigning the stacked forecast 2022, 2037 and 2051 matrices to the ''Do Minimum'' network. The same assignment techniques adopted for the Base Model development have been used for this purpose.

5.1.2 The resulting ''Do Minimum'' assignment forecast flows, without the improvement schemes are presented in Table 5.1 for 2022, 2037 & 2051. The flows are presented as Annual Average Daily Traffic (AADT) flows at the aforementioned Traffic Forecast Sites at junction 15 and 16.

'Do Minimum' Forecast Flows		AADT (Vehicles)		
TFS	**Junction**	**2022**	**2037**	**2051**
TFS001	15	31864	36899	40575
TFS002	15	1321	1430	1505
TFS003	15	1726	1997	2237
TFS004	15	28817	33472	36833
TFS005	15	1109	1284	1411
TFS006	15	1109	1284	1411
TFS007	15	3047	3427	3742
TFS008	15	3525	4166	4664
TFS009	15	3837	4517	4945
TFS010	15	32827	38012	41790
TFS011	16	32827	38012	41790
TFS012	16	1206	1435	1605
TFS013	16	1007	1158	1268
TFS014	16	30615	35419	38917
TFS015	16	3718	4290	4693
TFS016	16	1132	1294	1398
TFS017	16	34240	39616	43530
TFS018	16	17547	20280	22267
TFS019	16	2562	2997	3314
TFS020	16	489	611	704
TFS021	16	337	411	455
TFS022	16	787	896	961
TFS023	16	827	958	1054
TFS024	16	17520	20294	22317

Table 5.1: ''Do Minimum'' AADT Forecast Flows

5.1.3 The 'Do Minimum' assignments demonstrate that whilst there is significant traffic growth over the modelled period, this does not appear to engender a rerouting of traffic in order to minimise travel delay. This is symptomatic of the fact that while junction delays clearly increase with traffic volume increases, they do not reach a level where they present a deterrent to movement.

6. DO-SOMETHING ASSIGNMENTS

6.1.1 The "Do Something" network has been developed by editing the "Do Minimum" network to incorporate the junction improvements as part of the 13 scheme options.

6.1.2 The 2022, 2037 and 2051 forecast matrices were assigned to the 13 "Do Something" network models to produce the "Do Something" assignment forecast flows. The forecast flows are presented as AADT flows at the Traffic Forecast Sites (TFS) at junction 15 and 16 and are presented in the Tables 6.2 to 6.14 for the 13 different scheme options.

6.1.3 The 'Do minimum', AM peak, Inter peak, PM peak and AADT flows for the 13 improvement schemes at the 24 TFS's are presented in Appendix 2. Tables 6.2 to 6.14 below reference the data in Appendix 2 and provide summaries of the AADT flows for each of the 13 improvement schemes in 2022, 2037 and 2051.

6.1.4 Table 6.1 provides a description of the information provided in the traffic forecast Tables 6.2 to 6.14. The tables have been set up to present the traffic forecast flows at all the traffic forecast sites around junctions 15 and 16 for all the 13 scheme options to show how traffic flows change on the network for each scheme option.

"Do Something" Traffic Forecast Table Title Description	
TFS	Traffic Forecast Sites
DM AADT	"Do Minimum" AADT flows for each option
OP AADT	Option AADT for each TFS
Diff. to DM	Difference in Option AADT flows compared to the "Do Minimum" AADT for each TFS
% Diff.	% Difference of AADT flows

Table 6.1: "Do Something" Traffic Forecast Table Title Descriptions

6.2 Traffic Forecasts – Junction 15 Option 1

J15 OP1	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	4178	2857	216%	1430	4821	3391	237%	1505	5277	3773	251%
TFS003	1726	1559	-167	-10%	1997	1825	-172	-9%	2237	2005	-232	-10%
TFS004	28817	31233	2416	8%	33472	36196	2724	8%	36833	39811	2978	8%
TFS005	1109	1038	-72	-6%	1284	1337	53	4%	1411	1533	122	9%
TFS006	1109	1038	-72	-6%	1284	1337	53	4%	1411	1533	122	9%
TFS007	3047	5453	2405	79%	3427	6264	2837	83%	3742	6850	3108	83%
TFS008	3525	2069	-1456	-41%	4166	2501	-1666	-40%	4664	2803	-1860	-40%
TFS009	3837	2088	-1749	-46%	4517	2520	-1996	-44%	4945	2822	-2122	-43%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.2: Traffic Forecasts – Junction 15 Option 1

6.3 Traffic Forecasts – Junction 15 Option 2

J15 OP2	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	1043	-279	-21%	1430	1103	-327	-23%	1505	1150	-354	-24%
TFS003	1726	1419	-307	-18%	1997	1633	-363	-18%	2237	1788	-450	-20%
TFS004	28817	29403	586	2%	33472	34162	690	2%	36833	37637	804	2%
TFS005	1109	1642	533	48%	1284	1901	617	48%	1411	2082	671	48%
TFS006	1109	0	-1109	-100%	1284	0	-1284	-100%	1411	0	-1411	-100%
TFS007	3047	2462	-586	-19%	3427	2737	-690	-20%	3742	2938	-804	-21%
TFS008	3525	3510	-15	0%	4166	4144	-22	-1%	4664	4588	-76	-2%
TFS009	3837	3889	52	1%	4517	4589	72	2%	4945	5075	131	3%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.3: Traffic Forecasts – Junction 15 Option 2

6.4 Traffic Forecasts – Junction 15 Option 3

J15 OP3	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	1768	447	34%	1430	2040	610	43%	1505	2234	730	48%
TFS003	1726	1907	181	10%	1997	2204	207	10%	2237	2415	178	8%
TFS004	28817	28189	-627	-2%	33472	32655	-817	-2%	36833	35926	-907	-2%
TFS005	1109	1282	172	16%	1284	1595	311	24%	1411	1810	399	28%
TFS006	1109	1282	172	16%	1284	1595	311	24%	1411	1810	399	28%
TFS007	3047	3675	628	21%	3427	4244	817	24%	3742	4649	907	24%
TFS008	3525	3677	152	4%	4166	4357	190	5%	4664	4832	168	4%
TFS009	3837	3746	-91	-2%	4517	4435	-82	-2%	4945	4916	-29	-1%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.4: Traffic Forecasts – Junction 15 Option 3

6.5 Traffic Forecasts – Junction 15 Option 5

J15 OP5	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	1306	-15	-1%	1430	1406	-25	-2%	1505	1480	-25	-2%
TFS003	1726	1843	117	7%	1997	2064	67	3%	2237	2255	18	1%
TFS004	28817	28715	-102	0%	33472	33429	-42	0%	36833	36840	7	0%
TFS005	1109	1109	-1	0%	1284	1284	0	0%	1411	1408	-3	0%
TFS006	1109	1109	-1	0%	1284	1284	0	0%	1411	1408	-3	0%
TFS007	3047	3150	102	3%	3427	3469	42	1%	3742	3735	-7	0%
TFS008	3525	3656	130	4%	4166	4255	88	2%	4664	4707	43	1%
TFS009	3837	3735	-102	-3%	4517	4473	-44	-1%	4945	4952	8	0%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.5: Traffic Forecasts – Junction 15 Option 5

6.6 Traffic Forecasts – Junction 15 Option 6

J15 OP6	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	1313	-8	-1%	1430	1418	-12	-1%	1505	1492	-13	-1%
TFS003	1726	1416	-310	-18%	1997	1631	-366	-18%	2237	1785	-453	-20%
TFS004	28817	29135	318	1%	33472	33850	378	1%	36833	37299	466	1%
TFS005	1109	1382	273	25%	1284	1601	317	25%	1411	1754	343	24%
TFS006	1109	1382	273	25%	1284	1601	317	25%	1411	1754	343	24%
TFS007	3047	2730	-318	-10%	3427	3049	-378	-11%	3742	3276	-466	-12%
TFS008	3525	3495	-31	-1%	4166	4126	-40	-1%	4664	4570	-94	-2%
TFS009	3837	3880	43	1%	4517	4577	60	1%	4945	5064	120	2%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.6: Traffic Forecasts – Junction 15 Option 6

6.7 Traffic Forecasts – Junction 15 Preferred Option

J15 PREF OP	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31864	0	0%	36899	36899	0	0%	40575	40575	0	0%
TFS002	1321	1282	-40	-3%	1430	1384	-47	-3%	1505	1457	-47	-3%
TFS003	1726	1657	-69	-4%	1997	1925	-71	-4%	2237	2121	-116	-5%
TFS004	28817	28926	109	0%	33472	33589	118	0%	36833	36997	164	0%
TFS005	1109	1142	33	3%	1284	1308	24	2%	1411	1420	9	1%
TFS006	1109	1142	33	3%	1284	1308	24	2%	1411	1420	9	1%
TFS007	3047	2939	-109	-4%	3427	3309	-118	-3%	3742	3578	-164	-4%
TFS008	3525	3527	1	0%	4166	4163	-4	0%	4664	4607	-56	-1%
TFS009	3837	3913	76	2%	4517	4610	94	2%	4945	5098	153	3%
TFS010	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%

Table 6.7: Traffic Forecasts – Junction 15 Preferred Option

6.8 Traffic Forecasts – Junction 15 Preferred Option (Mitigated)

J15 PREF OP MIT	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS001	31864	31869	5	0%	36899	36903	5	0%	40575	40575	0	0%
TFS002	1321	1286	-35	-3%	1430	1390	-41	-3%	1505	1471	-34	-2%
TFS003	1726	1693	-34	-2%	1997	1948	-49	-2%	2237	2131	-106	-5%
TFS004	28817	28889	72	0%	33472	33565	93	0%	36833	36979	146	0%
TFS005	1109	1105	-4	0%	1284	1290	6	0%	1411	1408	-3	0%
TFS006	1109	1105	-4	0%	1284	1290	6	0%	1411	1408	-3	0%
TFS007	3047	2978	-69	-2%	3427	3337	-90	-3%	3742	3602	-140	-4%
TFS008	3525	3520	-6	0%	4166	4161	-5	0%	4664	4596	-68	-1%
TFS009	3837	3908	71	2%	4517	4602	86	2%	4945	5079	134	3%
TFS010	32827	32825	-2	0%	38012	38009	-3	0%	41790	41787	-4	0%

Table 6.8: Traffic Forecasts – Junction 15 Preferred Option (Mitigated)

6.9 Traffic Forecasts – Junction 16 Option 3

J16 OP3	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%
TFS012	1206	1177	-29	-2%	1435	1359	-76	-5%	1605	1491	-113	-7%
TFS013	1007	1271	264	26%	1158	1461	303	26%	1268	1605	337	27%
TFS014	30615	30380	-235	-1%	35419	35192	-226	-1%	38917	38694	-224	-1%
TFS015	3718	3622	-97	-3%	4290	4175	-115	-3%	4693	4584	-109	-2%
TFS016	1132	2119	987	87%	1294	2447	1153	89%	1398	2698	1300	93%
TFS017	34240	31882	-2358	-7%	39616	36921	-2695	-7%	43530	40579	-2951	-7%
TFS018	17547	17564	17	0%	20280	20303	24	0%	22267	22289	22	0%
TFS019	2562	2797	235	9%	2997	3223	226	8%	3314	3538	224	7%
TFS020	489	821	332	68%	611	952	342	56%	704	1037	333	47%
TFS021	337	330	-7	-2%	411	378	-33	-8%	455	421	-34	-8%
TFS022	787	495	-292	-37%	896	569	-327	-36%	961	624	-337	-35%
TFS023	827	1226	399	48%	958	1427	469	49%	1054	1551	497	47%
TFS024	17520	17527	7	0%	20294	20323	28	0%	22317	22350	33	0%

Table 6.9: Traffic Forecasts – Junction 16 Option 3

6.10 Traffic Forecasts – Junction 16 Option 4

J16 OP4	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%
TFS012	1206	1177	-29	-2%	1435	1359	-76	-5%	1605	1491	-113	-7%
TFS013	1007	1006	0	0%	1158	1153	-5	0%	1268	1266	-2	0%
TFS014	30615	30644	29	0%	35419	35500	81	0%	38917	39033	115	0%
TFS015	3718	3717	-2	0%	4290	4288	-2	0%	4693	4691	-2	0%
TFS016	1132	2214	1082	96%	1294	2560	1266	98%	1398	2805	1408	101%
TFS017	34240	34243	3	0%	39616	39646	30	0%	43530	43564	33	0%
TFS018	17547	17543	-4	0%	20280	20281	1	0%	22267	22266	-1	0%
TFS019	2562	2533	-29	-1%	2997	2916	-81	-3%	3314	3199	-115	-3%
TFS020	489	462	-27	-6%	611	532	-79	-13%	704	591	-113	-16%
TFS021	337	330	-7	-2%	411	378	-33	-8%	455	421	-34	-8%
TFS022	787	814	28	4%	896	949	54	6%	961	1047	85	9%
TFS023	827	826	0	0%	958	958	0	0%	1054	1053	-1	0%
TFS024	17520	17527	7	0%	20294	20323	28	0%	22317	22350	33	0%

Table 6.10: Traffic Forecasts – Junction 16 Option 4

6.11 Traffic Forecasts – Junction 16 Option 5

J16 OP5	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%
TFS012	1206	1177	-29	-2%	1435	1359	-76	-5%	1605	1491	-113	-7%
TFS013	1007	1299	292	29%	1158	1493	335	29%	1268	1641	373	29%
TFS014	30615	30352	-263	-1%	35419	35160	-259	-1%	38917	38658	-260	-1%
TFS015	3718	3902	183	5%	4290	4450	160	4%	4693	4812	119	3%
TFS016	1132	2399	1267	112%	1294	2722	1428	110%	1398	2926	1529	109%
TFS017	34240	34247	7	0%	39616	39649	33	0%	43530	43566	35	0%
TFS018	17547	17547	0	0%	20280	20284	5	0%	22267	22269	2	0%
TFS019	2562	2825	263	10%	2997	3256	259	9%	3314	3574	260	8%
TFS020	489	569	80	16%	611	710	99	16%	704	845	141	20%
TFS021	337	330	-7	-2%	411	378	-33	-8%	455	421	-34	-8%
TFS022	787	729	-58	-7%	896	902	7	1%	961	1054	93	10%
TFS023	827	826	0	0%	958	958	0	0%	1054	1053	-1	0%
TFS024	17520	17527	7	0%	20294	20323	28	0%	22317	22350	33	0%

Table 6.11: Traffic Forecasts – Junction 16 Option 5

6.12 Traffic Forecasts – Junction 16 Option 7

J16 OP7	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%
TFS012	1206	1177	-29	-2%	1435	1359	-76	-5%	1605	1491	-113	-7%
TFS013	1007	1299	292	29%	1158	1493	335	29%	1268	1641	373	29%
TFS014	30615	30352	-263	-1%	35419	35160	-259	-1%	38917	38658	-260	-1%
TFS015	3718	3902	183	5%	4290	4450	160	4%	4693	4812	119	3%
TFS016	1132	2399	1267	112%	1294	2722	1428	110%	1398	2926	1529	109%
TFS017	34240	34247	7	0%	39616	39649	33	0%	43530	43566	35	0%
TFS018	17547	17547	0	0%	20280	20284	5	0%	22267	22269	2	0%
TFS019	2562	2825	263	10%	2997	3256	259	9%	3314	3574	260	8%
TFS020	489	569	80	16%	611	710	99	16%	704	845	141	20%
TFS021	337	330	-7	-2%	411	378	-33	-8%	455	421	-34	-8%
TFS022	787	729	-58	-7%	896	902	7	1%	961	1054	93	10%
TFS023	827	826	0	0%	958	958	0	0%	1054	1053	-1	0%
TFS024	17520	17527	7	0%	20294	20323	28	0%	22317	22350	33	0%

Table 6.12: Traffic Forecasts – Junction 16 Option 7

6.13 Traffic Forecasts – Junction 16 Preferred Option

J16 PREF OP	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32827	0	0%	38012	38012	0	0%	41790	41790	0	0%
TFS012	1206	1177	-29	-2%	1435	1359	-76	-5%	1605	1491	-113	-7%
TFS013	1007	1270	264	26%	1158	1461	303	26%	1268	1605	337	27%
TFS014	30615	30380	-235	-1%	35419	35192	-227	-1%	38917	38888	-30	0%
TFS015	3718	4028	310	8%	4290	4648	358	8%	4693	5086	393	8%
TFS016	1132	2423	1290	114%	1294	2802	1508	117%	1398	3072	1674	120%
TFS017	34240	31986	-2254	-7%	39616	37039	-2577	-7%	43530	40708	-2822	-6%
TFS018	17547	17564	17	0%	20280	20303	24	0%	22267	22289	22	0%
TFS019	2562	2796	235	9%	2997	3223	227	8%	3314	3538	224	7%
TFS020	489	415	-74	-15%	611	479	-131	-22%	704	535	-170	-24%
TFS021	337	330	-7	-2%	411	378	-33	-8%	455	421	-34	-8%
TFS022	787	495	-291	-37%	896	572	-323	-36%	961	629	-332	-35%
TFS023	827	834	7	1%	958	967	9	1%	1054	1060	6	1%
TFS024	17520	17527	7	0%	20294	20323	28	0%	22317	22350	33	0%

Table 6.13: Traffic Forecasts – Junction 16 Preferred Option

6.14 Traffic Forecasts – Junction 16 Preferred Option (Mitigated)

J16 PREF OP	2022				2037				2051			
Traffic Forecast Sites	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.	DM AADT	OP AADT	Diff. to DM	% Diff.
TFS011	32827	32825	-2	0%	38012	38009	-3	0%	41790	41787	-4	0%
TFS012	1206	1177	-29	-2%	1435	1357	-78	-5%	1605	1493	-112	-7%
TFS013	1007	1271	265	26%	1158	1461	303	26%	1268	1600	332	26%
TFS014	30615	30375	-240	-1%	35419	35188	-231	-1%	38917	38687	-230	-1%
TFS015	3718	4030	312	8%	4290	4649	358	8%	4693	5086	393	8%
TFS016	1132	2425	1293	114%	1294	2802	1508	117%	1398	3073	1675	120%
TFS017	34240	31991	-2249	-7%	39616	37034	-2582	-7%	43530	40708	-2822	-6%
TFS018	17547	17563	16	0%	20280	20300	20	0%	22267	22290	23	0%
TFS019	2562	2794	232	9%	2997	3216	220	7%	3314	3547	233	7%
TFS020	489	416	-74	-15%	611	471	-140	-23%	704	538	-166	-24%
TFS021	337	328	-8	-2%	411	378	-33	-8%	455	414	-41	-9%
TFS022	787	504	-283	-36%	896	583	-313	-35%	961	625	-337	-35%
TFS023	827	832	6	1%	958	967	9	1%	1054	1056	3	0%
TFS024	17520	17524	5	0%	20294	20322	28	0%	22317	22351	33	0%

Table 6.14: Traffic Forecasts – Junction 16 Preferred Option (Mitigated)

6.15 Summary

6.15.1 In general terms, all the 'Do Something' options make the A55 corridor more attractive for through traffic by removing the existing at-grade roundabouts and the inherent junction delays caused by vehicles needing to slow down to negotiate the intersections, therefore is no reassignment away from the A55 with any of the forecast improvement options.

6.15.2 This is not the same for side road traffic which still has to access the strategic route through constrained accesses. In many cases the improvement options reduce the constraint for entry and access speeds are increased slightly, reducing delay.

6.15.3 However, many of the improvement options do not cater for all turning movements and some local traffic has to divert to more remote access points. In some cases, this additional trip length can be of the order of 3-4km and also increase, slightly, the volume of traffic passing through parts of Llanfairfechan and Penmaenmawr.

7. OPTION COMPARISON

7.1.1 The following tables provide comparisons between each improvement option and the 'Do Minimum' scenario for the Design Year of 2037. The tables show differences between the amount of queuing, travel times and vehicle speeds for each of the modelled periods; AM peak, inter peak and PM peak.

2037	Do	J15	J15	J15	J15	J15	J15	J15
AM Peak	**Minimum**	**OP1**	**OP2**	**OP3**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	75.0	56.3	53.6	54.6	54.0	54.0	54.0	55.6
(pcu/hrs)	Difference	-18.7	-21.4	-20.4	-21.0	-21.0	-21.0	-19.4
Travel Time	775.1	766.2	750.2	752.1	749.4	750.6	750.0	751.6
(pcu/hrs)	Difference	-8.9	-24.9	-23.0	-25.7	-24.5	-25.1	-23.5
Ave. Speed	75.1	74.2	77.4	77.2	77.3	77.3	77.3	77.2
(Kph)	Difference	-0.9	2.3	2.1	2.2	2.2	2.2	2.1

Table 7.1: Junction 15 - Queue, Journey Time, Speed Comparisons – 2037 (AM Peak)

2037	Do	J16	J16	J16	J16	J16	J16
AM Peak	**Minimum**	**OP3**	**OP4**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	75.0	53.4	52.9	52.5	52.5	53.2	53.2
(pcu/hrs)	Difference	-21.6	-22.1	-22.5	-22.5	-21.8	-21.8
Travel Time	775.1	751.1	751.0	750.4	750.4	751.0	751.0
(pcu/hrs)	Difference	-24.0	-24.1	-24.7	-24.7	-24.1	-24.1
Ave. Speed	75.1	77.2	77.3	77.4	77.4	77.2	77.2
(Kph)	Difference	2.1	2.2	2.3	2.3	2.1	2.1

Table 7.2: Junction 16 - Queue, Journey Time, Speed Comparisons – 2037 (AM Peak)

2037	Do	J15	J15	J15	J15	J15	J15	J15
Inter Peak	**Minimum**	**OP1**	**OP2**	**OP3**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	37.2	28.8	25.6	28.7	26.3	26.1	26.4	26.4
(pcu/hrs)	Difference	-8.4	-11.6	-8.5	-10.9	-11.1	-10.8	-10.8
Travel Time	606.2	608.9	592.7	596.9	592.6	593.6	593.3	593.3
(pcu/hrs)	Difference	2.7	-13.5	-9.3	-13.6	-12.6	-12.9	-12.9
Ave. Speed	83.1	84.4	84.8	84.1	84.6	84.6	84.6	84.6
(Kph)	Difference	1.3	1.7	1.0	1.5	1.5	1.5	1.5

Table 7.3: Junction 15 - Queue, Journey Time, Speed Comparisons – 2037 (Inter Peak)

2037	Do	J16	J16	J16	J16	J16	J16
Inter Peak	**Minimum**	**OP3**	**OP4**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	37.2	26.2	25.8	25.6	25.6	26.3	26.3
(pcu/hrs)	Difference	-11.0	-11.4	-11.6	-11.6	-10.9	-10.9
Travel Time	606.2	594.6	594.1	593.9	593.9	594.9	594.9
(pcu/hrs)	Difference	-11.6	-12.1	-12.3	-12.3	-11.3	-11.3
Ave. Speed	83.1	84.5	84.6	84.6	84.6	84.4	84.4
(Kph)	Difference	1.4	1.5	1.5	1.5	1.3	1.3

Table 7.4: Junction 16 - Queue, Journey Time, Speed Comparisons – 2037 (Inter Peak)

2037	Do	J15	J15	J15	J15	J15	J15	J15
PM Peak	**Minimum**	**OP1**	**OP2**	**OP3**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	52.6	34.9	32.3	35.8	32.9	32.8	33.1	34.4
(pcu/hrs)	Difference	-17.7	-20.3	-16.8	-19.7	-19.8	-19.5	-18.2
Travel Time	728.0	719.6	703.8	709.0	703.2	704.3	703.8	705.2
(pcu/hrs)	Difference	-8.4	-24.2	-19.0	-24.8	-23.7	-24.2	-22.8
Ave. Speed	81.0	83.2	83.5	82.8	83.3	83.4	83.4	83.2
(Kph)	Difference	2.2	2.5	1.8	2.3	2.4	2.4	2.2

Table 7.5: Junction 15 - Queue, Journey Time, Speed Comparisons – 2037 (PM Peak)

2037	Do	J16	J16	J16	J16	J16	J16
PM Peak	**Minimum**	**OP3**	**OP4**	**OP5**	**OP7**	**PREF OP**	**PREF OP MITIGATED**
Queue	52.6	33.0	32.4	32.3	32.3	33.2	33.2
(pcu/hrs)	Difference	-19.6	-20.2	-20.3	-20.3	-19.4	-19.4
Travel Time	728.0	706.5	704.9	705.7	705.7	707.4	707.4
(pcu/hrs)	Difference	-21.5	-23.1	-22.3	-22.3	-20.6	-20.6
Ave. Speed	81.0	83.2	83.4	83.3	83.3	83.0	83.0
(Kph)	Difference	2.2	2.4	2.3	2.3	2.0	2.0

Table 7.6: Junction 16 - Queue, Journey Time, Speed Comparisons – 2037 (PM Peak)

7.1.2 The summary statistics shown above relate to all vehicles using the network. It can be seen that queuing delay decreases significantly for all options and this reduction is in the range 25-30% for the morning peak period, 22-31% for the inter peak period and 32-38% for the evening peak period. Options 1 and 3 for junction 15 present the lowest queuing delay relief due to the restrictions on turning movements at these improvements and the reassignment of traffic, increasing delays at a number of local junctions.

7.1.3 All options display a reduction in journey time of around 3% with the exception of junction 15 Option 1 where journey times reduce by around 1%. This demonstrates the fact that some traffic has a greatly increased local journey time due to the restrictive nature of the improvement, which partly offsets the reductions in journey times along A55.

7.1.4 Again, there is a similar pattern for average speed increases for the options. Speeds increase by around 2kph in the AM peak and PM peak for all options except Option 1 of junction 15 where

speed increases are below 2kph in the AM peak and inter peak periods. For all other options in the inter peak period, average speeds increase by around 1.5kph.

7.1.5 Figures 7.1 to 7.3 below present the 'Do Something' modelled AADT flows for 2022, 2037 and 2051 for all 13 improvement option schemes with absolute and percentage difference in the flows compared to the 'Do Minimum' scenario for all 3 assessment years.

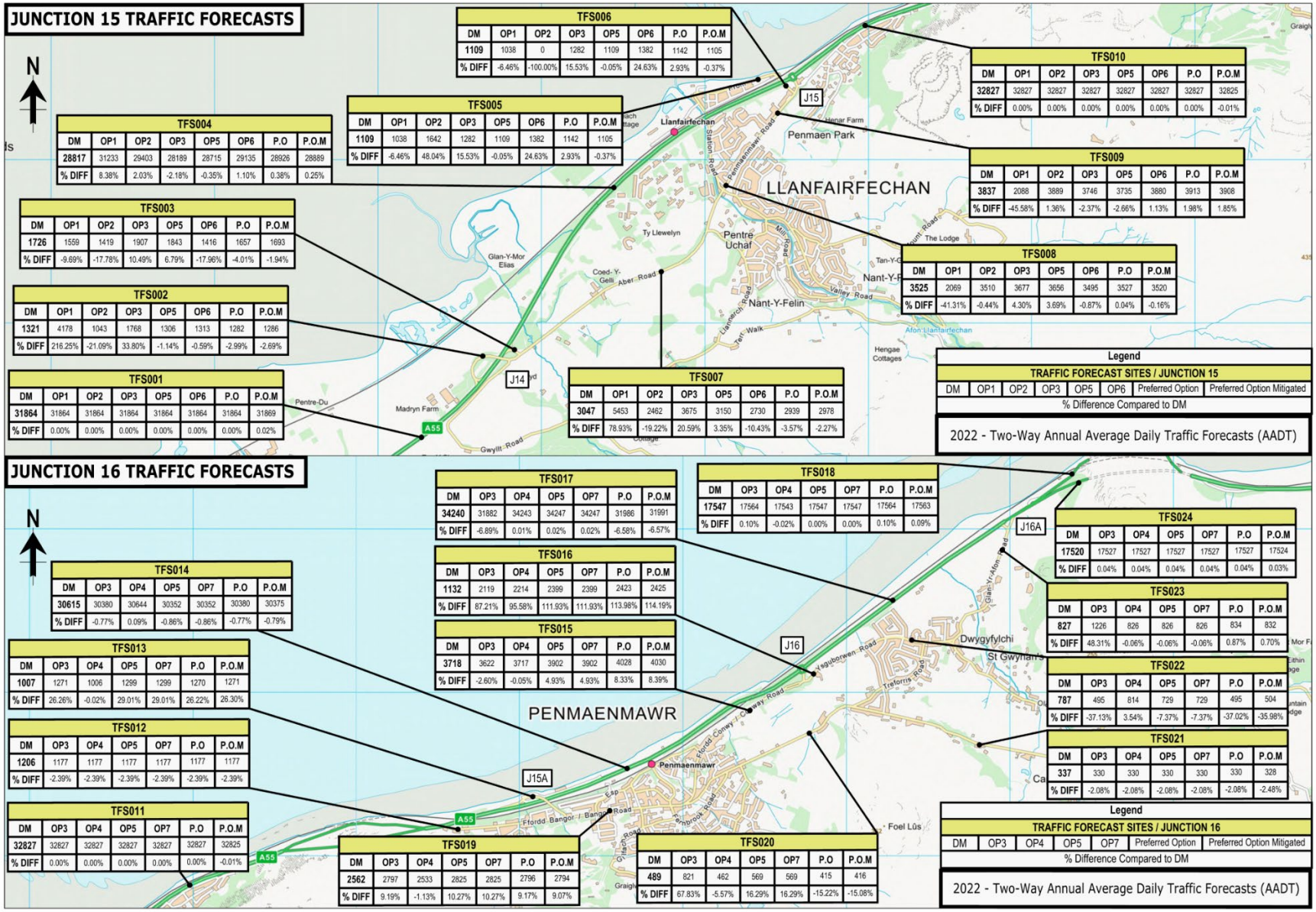

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Figure 7.1: 2022 ''Do Something'' Modelled Flows (AADT)

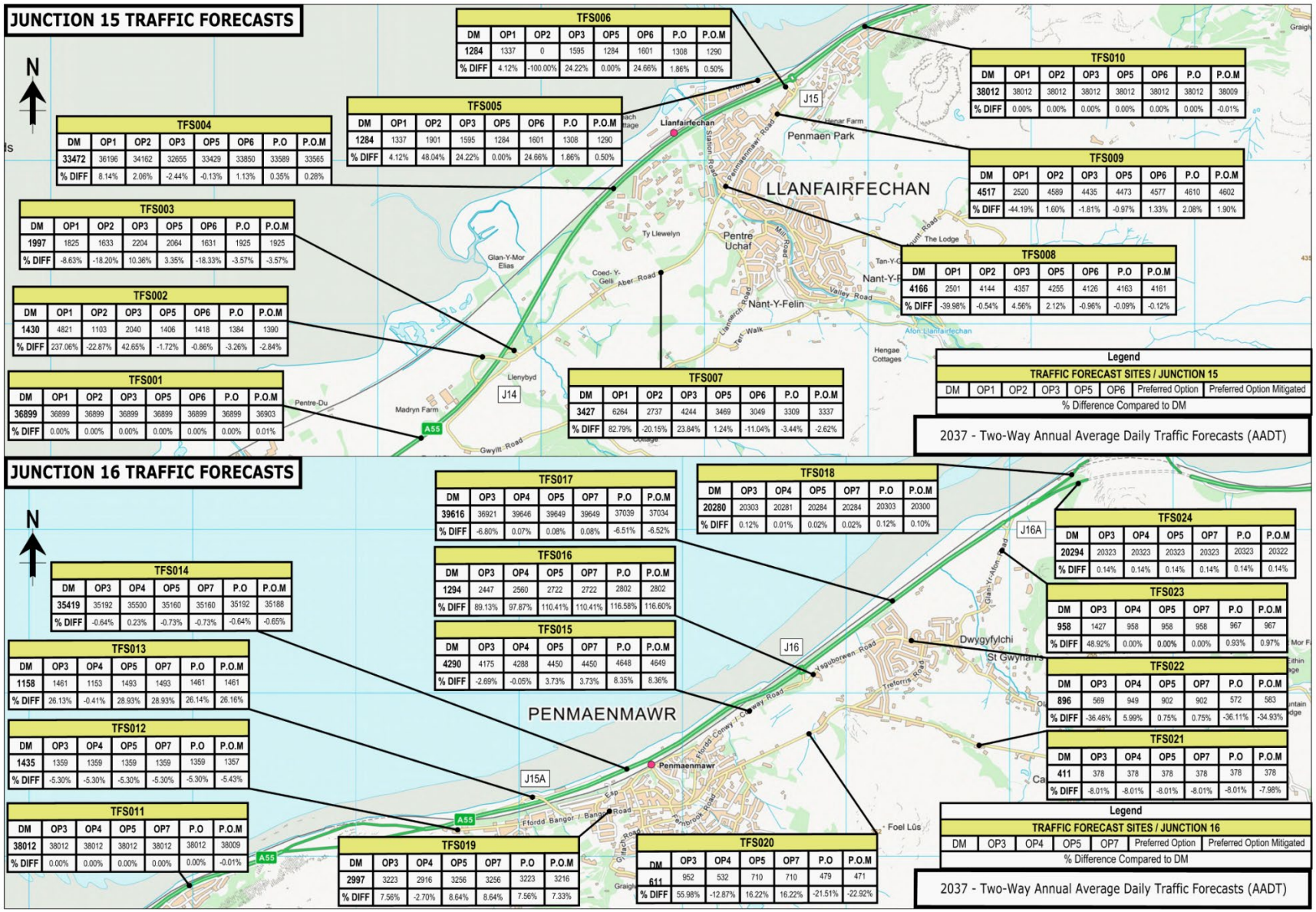

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Figure 7.2: 2037 ''Do Something'' Modelled Flows (AADT)

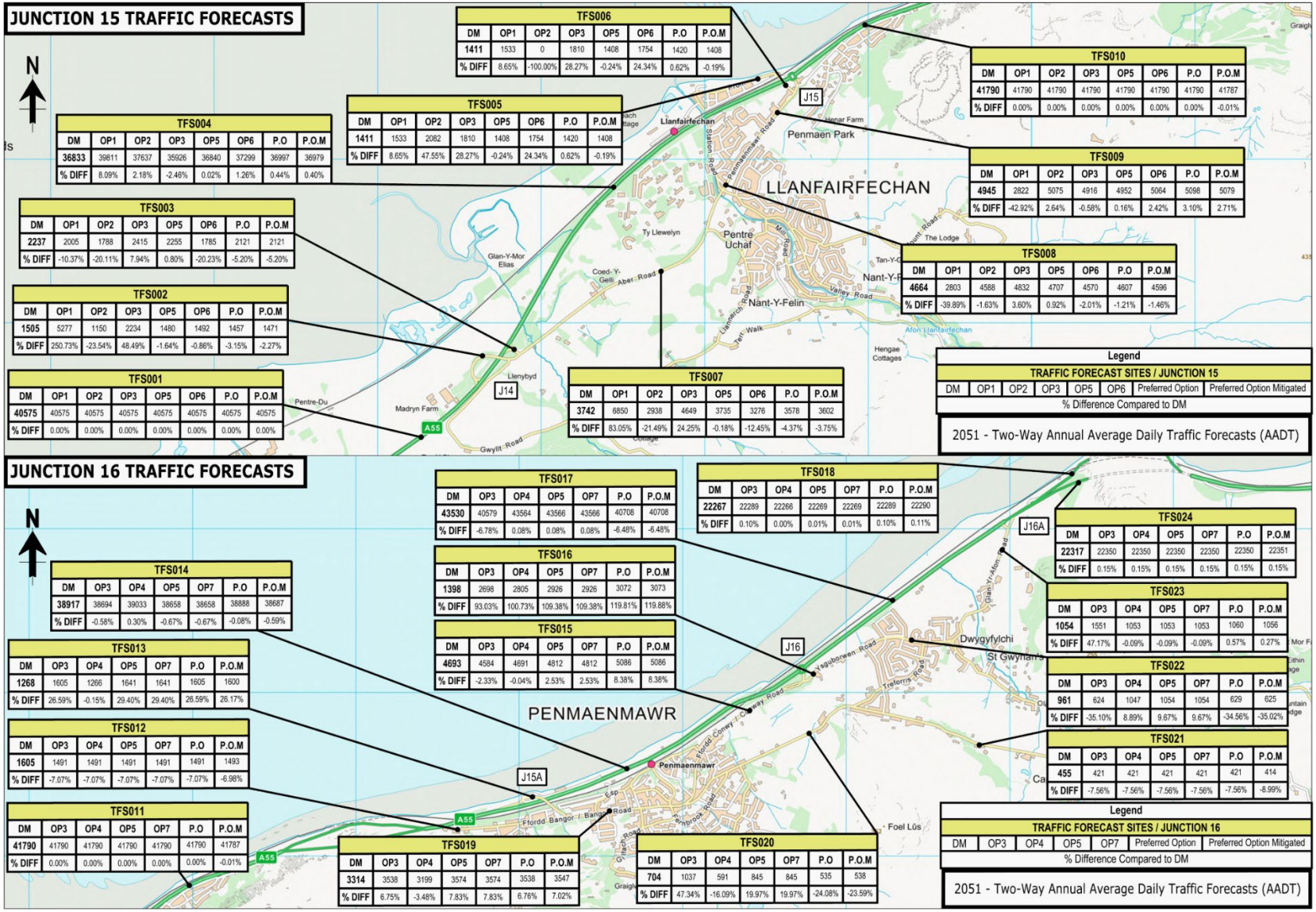

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Figure 7.3: 2051 ''Do Something'' Modelled Flows (AADT)

8. CONCLUSION

8.1.1 The A55TM presents an appropriate assessment of the likely traffic impacts of the proposed improvement options for A55 junctions 15 and 16. The modelling process follows and builds on the modelling carried out for the Base Model assessment.

8.1.2 The traffic forecasting process has followed appropriate WelTAG guidance and DfT WebTAG guidance for traffic forecasting models. Reference is made to the guidance, in this report, at the appropriate stages of model development.

8.1.3 Each of the improvement options considered in this appraisal, demonstrate overall benefits in terms of traffic movements compared to the 'Do Minimum' situation.

8.1.4 There is a reduction in queuing delay and journey travel time for all options assessed. Average vehicle speeds throughout the study area are increased by the adoption of any of the improvement options.

8.1.5 The outputs from this SATURN modelling process will be taken forward to the economic appraisal of all options.

8.1.6 Changes in traffic flow forecasts resulting from this assessment will be used to inform the environmental impact assessments and WelTAG appraisal of the scheme improvement options.

APPENDIX 1
COMMITTED DEVELOPMENTS - TRIP GENERATION & TRICS DATA

A55
COMMITTED DEVELOPMENTS

Council	Conwy
Development	Residential
Reference	CONRES001

Details

App. No.	0/41960
Development	100 dwellings
Location	Sychnant Pass Road, Conwy
Model Year	2022, 2037, 2051

Trip Generation

		Trip Rates		Trips	100
Time Range		**Arr**	**Dep**	**Arr**	**Dep**
07:00	08:00			0	0
08:00	**09:00**	**0.174**	**0.548**	**17**	**55**
09:00	10:00			0	0
10:00	11:00			0	0
11:00	12:00			0	0
12:00	13:00	0.212	0.281	21	28
13:00	14:00			0	0
14:00	15:00			0	0
15:00	16:00			0	0
16:00	17:00			0	0
17:00	**18:00**	**0.463**	**0.296**	**46**	**30**
18:00	19:00			0	0

Trip rates taken from development TA

Final Arriving / Departing Trips

CONRES001	Within Model					
Trips	**Trip Rate**	**Arr**	**Trip Rate**	**Dep**	**Trip Rate**	**Total**
AM Peak	0.174	17	0.548	55	0.722	72
Inter Peak	0.212	21	0.281	28	0.494	49
PM Peak	0.463	46	0.296	30	0.759	76
					1.975	

A55
COMMITTED DEVELOPMENTS

Council	Conwy
Development	Residential
Reference	CONRES002

Details

App. No.	0/42919
Development	17 dwellings (8 Apartments / 9 Houses)
Location	Penmaenmawr Road, Llanfairfechan
Model Year	2022, 2037, 2051

Trip Generation

		Trip Rates		Trips	17
Time Range		**Arr**	**Dep**	**Arr**	**Dep**
07:00	08:00	0.082	0.283	1	5
08:00	**09:00**	**0.171**	**0.389**	**3**	**7**
09:00	10:00	0.17	0.237	3	4
10:00	11:00	0.159	0.189	3	3
11:00	12:00	0.219	0.211	4	4
12:00	13:00	0.203	0.195	3	3
13:00	14:00	0.217	0.204	4	3
14:00	15:00	0.216	0.206	4	4
15:00	16:00	0.262	0.219	4	4
16:00	17:00	0.305	0.204	5	3
17:00	**18:00**	**0.376**	**0.231**	**6**	**4**
18:00	19:00	0.278	0.193	5	3
		2.658	**2.761**		

Used same trip rates as CONRES010

Final Arriving / Departing Trips

CONRES002	Within Model					
Trips	**Trip Rate**	**Arr**	**Trip Rate**	**Dep**	**Trip Rate**	**Total**
AM Peak	0.171	3	0.389	7	0.560	10
Inter Peak	0.219	4	0.208	4	0.427	7
PM Peak	0.376	6	0.231	4	0.607	11
					1.594	

A55
COMMITTED DEVELOPMENTS

Council	Conwy
Development	Residential
Reference	CONRES003

Details

App. No.	0/30397
Development	23 dwellings (23 Apartments in 2 blocks)
Location	Conway Road, Penmaenmawr
Model Year	2022, 2037, 2051

Trip Generation

		Trip Rates		Trips	23
Time Range		**Arr**	**Dep**	**Arr**	**Dep**
07:00	08:00	0.082	0.283	2	7
08:00	**09:00**	**0.171**	**0.389**	**4**	**9**
09:00	10:00	0.17	0.237	4	5
10:00	11:00	0.159	0.189	4	4
11:00	12:00	0.219	0.211	5	5
12:00	13:00	0.203	0.195	5	4
13:00	14:00	0.217	0.204	5	5
14:00	15:00	0.216	0.206	5	5
15:00	16:00	0.262	0.219	6	5
16:00	17:00	0.305	0.204	7	5
17:00	**18:00**	**0.376**	**0.231**	**9**	**5**
18:00	19:00	0.278	0.193	6	4
		2.658	**2.761**		

Used same trip rates as CONRES010

Final Arriving / Departing Trips

CONRES003	Within Model					
Trips	**Trip Rate**	**Arr**	**Trip Rate**	**Dep**	**Trip Rate**	**Total**
AM Peak	0.171	4	0.389	9	0.560	13
Inter Peak	0.219	5	0.208	5	0.427	10
PM Peak	0.376	9	0.231	5	0.607	14
					1.594	

A55
COMMITTED DEVELOPMENTS

Council	Conwy
Development	Residential
Reference	CONRES004

Details

App. No.	0/41558
Development	28 dwellings (7 Houses / 4 Flats / 17 Apartments)
Location	Penmaenmawr Road, Llanfairfechan
Model Year	2022, 2037, 2051

Trip Generation

		Trip Rates		Trips	28
Time Range		**Arr**	**Dep**	**Arr**	**Dep**
07:00	08:00	0.104	0.262	3	7
08:00	**09:00**	**0.156**	**0.404**	**4**	**11**
09:00	10:00	0.175	0.213	5	6
10:00	11:00	0.135	0.173	4	5
11:00	12:00	0.191	0.201	5	6
12:00	13:00	0.182	0.156	5	4
13:00	14:00	0.191	0.175	5	5
14:00	15:00	0.189	0.189	5	5
15:00	16:00	0.243	0.175	7	5
16:00	17:00	0.314	0.184	9	5
17:00	**18:00**	**0.407**	**0.149**	**11**	**4**
18:00	19:00	0.251	0.132	7	4
		2.538	**2.413**		

Used same trip rates as CONRES005

Final Arriving / Departing Trips

CONRES004	Within Model					
Trips	**Trip Rate**	**Arr**	**Trip Rate**	**Dep**	**Trip Rate**	**Total**
AM Peak	0.156	4	0.404	11	0.560	16
Inter Peak	0.203	6	0.183	5	0.386	11
PM Peak	0.407	11	0.149	4	0.556	16
					1.502	

A55
COMMITTED DEVELOPMENTS

Council	Conwy
Development	Residential
Reference	CONRES005

Details

App. No.	0/41637
Development	46 dwellings
Location	Ysguborwen Road, Dwygyfylchi
Model Year	2022, 2037, 2051

Trip Generation

		Trip Rates		Trips	46
Time Range		**Arr**	**Dep**	**Arr**	**Dep**
07:00	08:00	0.104	0.262	5	12
08:00	**09:00**	**0.156**	**0.404**	**7**	**19**
09:00	10:00	0.175	0.213	8	10
10:00	11:00	0.135	0.173	6	8
11:00	12:00	0.191	0.201	9	9
12:00	13:00	0.182	0.156	8	7
13:00	14:00	0.191	0.175	9	8
14:00	15:00	0.189	0.189	9	9
15:00	16:00	0.243	0.175	11	8
16:00	17:00	0.314	0.184	14	8
17:00	**18:00**	**0.407**	**0.149**	**19**	**7**
18:00	19:00	0.251	0.132	12	6
		2.538	**2.413**		

Trip rates taken from development TA

Final Arriving / Departing Trips

CONRES005	Within Model					
Trips	**Trip Rate**	**Arr**	**Trip Rate**	**Dep**	**Trip Rate**	**Total**
AM Peak	0.156	7	0.404	19	0.560	26
Inter Peak	0.203	9	0.183	8	0.386	18
PM Peak	0.407	19	0.149	7	0.556	26
					1.502	

TRICS DATA

USED TO CALCULATE TRIP GENERATION FOR COMMITTED DEVELOPMENT CONRES001

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
MULTI-MODAL VEHICLES

Selected regions and areas:

02	**SOUTH EAST**		
	SC	SURREY	1 days
03	**SOUTH WEST**		
	CW	CORNWALL	1 days
	WL	WILTSHIRE	1 days
04	**EAST ANGLIA**		
	NF	NORFOLK	1 days
	SF	SUFFOLK	2 days
05	**EAST MIDLANDS**		
	LN	LINCOLNSHIRE	2 days
	NT	NOTTINGHAMSHIRE	1 days
06	**WEST MIDLANDS**		
	SH	SHROPSHIRE	2 days
	WM	WEST MIDLANDS	2 days
	WO	WORCESTERSHIRE	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	NE	NORTH EAST LINCOLNSHIRE	1 days
	NY	NORTH YORKSHIRE	3 days
	SY	SOUTH YORKSHIRE	1 days
08	**NORTH WEST**		
	CH	CHESHIRE	1 days
09	**NORTH**		
	CB	CUMBRIA	1 days
10	**WALES**		
	CF	CARDIFF	1 days
11	**SCOTLAND**		
	AD	ABERDEEN CITY	1 days
	FA	FALKIRK	1 days
	FI	FIFE	1 days
	HI	HIGHLAND	2 days
	SR	STIRLING	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Filtering Stage 2 selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter:	Number of dwellings
Actual Range:	52 to 196 (units:)
Range Selected by User:	50 to 200 (units:)

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/06 to 20/05/14

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	9 days
Tuesday	5 days
Wednesday	4 days
Thursday	3 days
Friday	7 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	28 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town Centre	1
Suburban Area (PPS6 Out of Centre)	15
Edge of Town	12

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	23
Out of Town	1
No Sub Category	4

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Filtering Stage 3 selection:

Use Class:

C3	28 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Filtering Stage 3 selection (Cont.):

Population within 1 mile:

1,001 to 5,000	3 days
5,001 to 10,000	7 days
10,001 to 15,000	3 days
15,001 to 20,000	9 days
20,001 to 25,000	4 days
25,001 to 50,000	2 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	2 days
25,001 to 50,000	4 days
50,001 to 75,000	3 days
75,001 to 100,000	5 days
100,001 to 125,000	6 days
125,001 to 250,000	5 days
250,001 to 500,000	3 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.5 or Less	1 days
0.6 to 1.0	7 days
1.1 to 1.5	20 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	28 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

LIST OF SITES relevant to selection parameters

1 **AD-03-A-01** **SEMI-DETACHED** **ABERDEEN CITY**
SPRINGFIELD ROAD

ABERDEEN
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 59
Survey date: FRIDAY *18/05/12* *Survey Type: MANUAL*

2 **CB-03-A-04** **SEMI DETACHED** **CUMBRIA**
MOORCLOSE ROAD
SALTERBACK
WORKINGTON
Edge of Town
No Sub Category
Total Number of dwellings: 82
Survey date: FRIDAY *24/04/09* *Survey Type: MANUAL*

3 **CF-03-A-02** **MIXED HOUSES** **CARDIFF**
DROPE ROAD

CARDIFF
Edge of Town
Residential Zone
Total Number of dwellings: 196
Survey date: FRIDAY *05/10/07* *Survey Type: MANUAL*

4 **CH-03-A-06** **SEMI-DET./ BUNGALOWS** **CHESHIRE**
CREWE ROAD

CREWE
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total Number of dwellings: 129
Survey date: TUESDAY *14/10/08* *Survey Type: MANUAL*

5 **CW-03-A-02** **SEMI D./ DETATCHED** **CORNWALL**
BOSVEAN GARDENS

TRURO
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 73
Survey date: TUESDAY *18/09/07* *Survey Type: MANUAL*

6 **FA-03-A-02** **MIXED HOUSES** **FALKIRK**
ROSEBANK AVENUE & SPRINGFIELD DRIVE

FALKIRK
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 161
Survey date: WEDNESDAY *29/05/13* *Survey Type: MANUAL*

7 **FI-03-A-03** **MIXED HOUSES** **FIFE**
WOODMILL ROAD

DUNFERMLINE
Edge of Town
Residential Zone
Total Number of dwellings: 155
Survey date: MONDAY *30/04/07* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

8 **HI-03-A-11** **BUNGALOWS** **HIGHLAND**
STEVENSON ROAD
INSHES
INVERNESS
Edge of Town
Residential Zone
Total Number of dwellings: 85
Survey date: MONDAY *05/06/06* *Survey Type: MANUAL*

9 **HI-03-A-14** **SEMI-DETACHED** **HIGHLAND**
CALEDONIAN ROAD
DALNEIGH
INVERNESS
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 73
Survey date: FRIDAY *13/05/11* *Survey Type: MANUAL*

10 **LN-03-A-01** **MIXED HOUSES** **LINCOLNSHIRE**
BRANT ROAD
BRACEBRIDGE
LINCOLN
Edge of Town
Residential Zone
Total Number of dwellings: 150
Survey date: TUESDAY *15/05/07* *Survey Type: MANUAL*

11 **LN-03-A-02** **MIXED HOUSES** **LINCOLNSHIRE**
HYKEHAM ROAD

LINCOLN
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 186
Survey date: MONDAY *14/05/07* *Survey Type: MANUAL*

12 **NE-03-A-03** **PRIVATE HOUSES** **NORTH EAST LINCOLNSHIRE**
STATION ROAD

SCUNTHORPE
Edge of Town Centre
Residential Zone
Total Number of dwellings: 180
Survey date: TUESDAY *20/05/14* *Survey Type: MANUAL*

13 **NF-03-A-02** **HOUSES & FLATS** **NORFOLK**
DEREHAM ROAD

NORWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 98
Survey date: MONDAY *22/10/12* *Survey Type: MANUAL*

14 **NT-03-A-03** **SEMI DETACHED** **NOTTINGHAMSHIRE**
B6018 SUTTON ROAD

KIRKBY-IN-ASHFIELD
Edge of Town
Residential Zone
Total Number of dwellings: 166
Survey date: WEDNESDAY *28/06/06* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

15 **NY-03-A-06** **BUNGALOWS & SEMI DET.** **NORTH YORKSHIRE**
HORSEFAIR

BOROUGHBRIDGE
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 115
Survey date: FRIDAY *14/10/11* *Survey Type: MANUAL*

16 **NY-03-A-09** **MIXED HOUSING** **NORTH YORKSHIRE**
GRAMMAR SCHOOL LANE

NORTHALLERTON
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 52
Survey date: MONDAY *16/09/13* *Survey Type: MANUAL*

17 **NY-03-A-10** **HOUSES AND FLATS** **NORTH YORKSHIRE**
BOROUGHBRIDGE ROAD

RIPON
Edge of Town
No Sub Category
Total Number of dwellings: 71
Survey date: TUESDAY *17/09/13* *Survey Type: MANUAL*

18 **SC-03-A-04** **DETACHED & TERRACED** **SURREY**
HIGH ROAD

BYFLEET
Edge of Town
Residential Zone
Total Number of dwellings: 71
Survey date: THURSDAY *23/01/14* *Survey Type: MANUAL*

19 **SF-03-A-01** **SEMI DETACHED** **SUFFOLK**
A1156 FELIXSTOWE ROAD
RACECOURSE
IPSWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 77
Survey date: WEDNESDAY *23/05/07* *Survey Type: MANUAL*

20 **SF-03-A-03** **MIXED HOUSES** **SUFFOLK**
BARTON HILL
FORNHAM ST MARTIN
BURY ST EDMUNDS
Edge of Town
Out of Town
Total Number of dwellings: 101
Survey date: MONDAY *15/05/06* *Survey Type: MANUAL*

21 **SH-03-A-04** **TERRACED** **SHROPSHIRE**
ST MICHAEL'S STREET

SHREWSBURY
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total Number of dwellings: 108
Survey date: THURSDAY *11/06/09* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

22 **SH-03-A-05** **SEMI-DETACHED/ TERRACED** **SHROPSHIRE**
SANDCROFT
SUTTON HILL
TELFORD
Edge of Town
Residential Zone
Total Number of dwellings: 54
Survey date: THURSDAY *24/10/13* *Survey Type: MANUAL*

23 **SR-03-A-01** **DETACHED** **STIRLING**
BENVIEW

STIRLING
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 115
Survey date: MONDAY *23/04/07* *Survey Type: MANUAL*

24 **SY-03-A-01** **SEMI DETACHED HOUSES** **SOUTH YORKSHIRE**
A19 BENTLEY ROAD
BENTLEY RISE
DONCASTER
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 54
Survey date: WEDNESDAY *18/09/13* *Survey Type: MANUAL*

25 **WL-03-A-01** **SEMI D./ TERRACED W. BASSETT** **WILTSHIRE**
MAPLE DRIVE

WOOTTON BASSETT
Edge of Town
Residential Zone
Total Number of dwellings: 99
Survey date: MONDAY *02/10/06* *Survey Type: MANUAL*

26 **WM-03-A-01** **TERRACED** **WEST MIDLANDS**
FOLESHILL ROAD
FOLESHILL
COVENTRY
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 79
Survey date: FRIDAY *03/02/06* *Survey Type: MANUAL*

27 **WM-03-A-03** **MIXED HOUSING** **WEST MIDLANDS**
BASELEY WAY
ROWLEYS GREEN
COVENTRY
Edge of Town
Residential Zone
Total Number of dwellings: 84
Survey date: MONDAY *24/09/07* *Survey Type: MANUAL*

28 **WO-03-A-03** **DETACHED** **WORCESTERSHIRE**
BLAKEBROOK
BLAKEBROOK
KIDDERMINSTER
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 138
Survey date: FRIDAY *05/05/06* *Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

RANK ORDER for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL VEHICLES

Ranking Type: **TOTALS** Time Range: 08:00-09:00

15th Percentile = No. **24** CH-03-A-06 Tot: 0.403

85th Percentile = No. **5** FI-03-A-03 Tot: 0.722

Median Values		Mean Values	
Arrivals:	0.117	Arrivals:	0.142
Departures:	0.393	Departures:	0.382
Totals:	0.510	Totals:	0.524

Rank	Site-Ref	Description	Town/City	Area	DWELLS	Day	Date	Trip Rate (Sorted by Totals)			Park Spaces
								Arrivals	Departures	Totals	Per Dwelling
1	SR-03-A-01	DETACHED	STIRLING	STIRLING	115	Mon	23/04/07	0.165	0.678	0.843	2.86
2	WO-03-A-03	DETACHED	KIDDERMINSTER	WORCESTERSHIRE	138	Fri	05/05/06	0.203	0.543	0.746	3.14
3	SH-03-A-04	TERRACED	SHREWSBURY	SHROPSHIRE	108	Thu	11/06/09	0.287	0.454	0.741	1.86
4	WM-03-A-03	MIXED HOUSING	COVENTRY	WEST MIDLANDS	84	Mon	24/09/07	0.321	0.405	0.726	2.60
5	**FI-03-A-03**	**MIXED HOUSES**	**DUNFERMLINE**	**FIFE**	**155**	**Mon**	**30/04/07**	**0.174**	**0.548**	**0.722**	**2.84**
6	NY-03-A-10	HOUSES AND FLA	RIPON	NORTH YORKSHIRE	71	Tue	17/09/13	0.183	0.521	0.704	0.83
7	SF-03-A-03	MIXED HOUSES	BURY ST EDMUNDS	SUFFOLK	101	Mon	15/05/06	0.109	0.554	0.663	4.34
8	LN-03-A-01	MIXED HOUSES	LINCOLN	LINCOLNSHIRE	150	Tue	15/05/07	0.187	0.440	0.627	4.91
9	LN-03-A-02	MIXED HOUSES	LINCOLN	LINCOLNSHIRE	186	Mon	14/05/07	0.183	0.425	0.608	4.13
10	WM-03-A-01	TERRACED	COVENTRY	WEST MIDLANDS	79	Fri	03/02/06	0.152	0.418	0.570	0.96
11	HI-03-A-11	BUNGALOWS	INVERNESS	HIGHLAND	85	Mon	05/06/06	0.129	0.424	0.553	1.59
12	CB-03-A-04	SEMI DETACHED	WORKINGTON	CUMBRIA	82	Fri	24/04/09	0.183	0.366	0.549	1.74
13	CF-03-A-02	MIXED HOUSES	CARDIFF	CARDIFF	196	Fri	05/10/07	0.107	0.413	0.520	1.98
14	SF-03-A-01	SEMI DETACHED	IPSWICH	SUFFOLK	77	Wed	23/05/07	0.104	0.416	0.520	2.22
15	SH-03-A-05	SEMI-DETACHED/	TELFORD	SHROPSHIRE	54	Thu	24/10/13	0.130	0.370	0.500	1.17
16	NY-03-A-06	BUNGALOWS & SE	BOROUGHBRIDGE	NORTH YORKSHIRE	115	Fri	14/10/11	0.096	0.400	0.496	3.50
17	SC-03-A-04	DETACHED & TER	BYFLEET	SURREY	71	Thu	23/01/14	0.141	0.352	0.493	2.49
18	NF-03-A-02	HOUSES & FLATS	NORWICH	NORFOLK	98	Mon	22/10/12	0.122	0.347	0.469	2.24
19	SY-03-A-01	SEMI DETACHED	DONCASTER	SOUTH YORKSHIRE	54	Wed	18/09/13	0.056	0.389	0.445	1.13
20	NE-03-A-03	PRIVATE HOUSES	SCUNTHORPE	NORTH EAST LINCOLNS	180	Tue	20/05/14	0.144	0.283	0.427	2.68
21	CW-03-A-02	SEMI D./DETATC	TRURO	CORNWALL	73	Tue	18/09/07	0.096	0.329	0.425	3.73
22	NT-03-A-03	SEMI DETACHED	KIRKBY-IN-ASHFIELD	NOTTINGHAMSHIRE	166	Wed	28/06/06	0.108	0.313	0.421	1.61
23	WL-03-A-01	SEMI D./TERRAC	WOOTTON BASSETT	WILTSHIRE	99	Mon	02/10/06	0.071	0.333	0.404	2.12
24	**CH-03-A-06**	**SEMI-DET./ BUNG**	**CREWE**	**CHESHIRE**	**129**	**Tue**	**14/10/08**	**0.163**	**0.240**	**0.403**	**2.59**
25	NY-03-A-09	MIXED HOUSING	NORTHALLERTON	NORTH YORKSHIRE	52	Mon	16/09/13	0.173	0.212	0.385	2.60
26	FA-03-A-02	MIXED HOUSES	FALKIRK	FALKIRK	161	Wed	29/05/13	0.062	0.280	0.342	1.66
27	HI-03-A-14	SEMI-DETACHED	INVERNESS	HIGHLAND	73	Fri	13/05/11	0.096	0.164	0.260	2.05
28	AD-03-A-01	SEMI-DETACHED	ABERDEEN	ABERDEEN CITY	59	Fri	18/05/12	0.017	0.085	0.102	2.68

This section displays actual (not average) trip rates for each of the survey days in the selected set, and ranks them in order of relative trip rate intensity, for a given time period (or peak period irrespective of time) selected by the user. The count type and direction are both displayed just above the table, along with the rows within the table representing the 85th and 15th percentile trip rate figures (highlighted in bold within the table itself).

The table itself displays details of each individual survey, alongside arrivals, departures and totals trip rates, sorted by whichever of the three directional options has been chosen by the user. As with the preceeding trip rate calculation results table, the trip rates shown are per the calculation factor (e.g. per 100m2 GFA, per employee, per hectare, etc). Note that if the peak period option has been selected (as opposed to a specific chosen time period), the peak period for each individual survey day in the table is also displayed.

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
MULTI-MODAL VEHICLES

Selected regions and areas:

02	**SOUTH EAST**		
	SC	SURREY	1 days
03	**SOUTH WEST**		
	CW	CORNWALL	1 days
	WL	WILTSHIRE	1 days
04	**EAST ANGLIA**		
	NF	NORFOLK	1 days
	SF	SUFFOLK	2 days
05	**EAST MIDLANDS**		
	LN	LINCOLNSHIRE	2 days
	NT	NOTTINGHAMSHIRE	1 days
06	**WEST MIDLANDS**		
	SH	SHROPSHIRE	2 days
	WM	WEST MIDLANDS	2 days
	WO	WORCESTERSHIRE	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	NE	NORTH EAST LINCOLNSHIRE	1 days
	NY	NORTH YORKSHIRE	3 days
	SY	SOUTH YORKSHIRE	1 days
08	**NORTH WEST**		
	CH	CHESHIRE	1 days
09	**NORTH**		
	CB	CUMBRIA	1 days
10	**WALES**		
	CF	CARDIFF	1 days
11	**SCOTLAND**		
	AD	ABERDEEN CITY	1 days
	FA	FALKIRK	1 days
	FI	FIFE	1 days
	HI	HIGHLAND	2 days
	SR	STIRLING	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Filtering Stage 2 selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter:	Number of dwellings
Actual Range:	52 to 196 (units:)
Range Selected by User:	50 to 200 (units:)

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/06 to 20/05/14

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	9 days
Tuesday	5 days
Wednesday	4 days
Thursday	3 days
Friday	7 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	28 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town Centre	1
Suburban Area (PPS6 Out of Centre)	15
Edge of Town	12

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	23
Out of Town	1
No Sub Category	4

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Filtering Stage 3 selection:

Use Class:

C3	28 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Filtering Stage 3 selection (Cont.):

Population within 1 mile:

1,001 to 5,000	3 days
5,001 to 10,000	7 days
10,001 to 15,000	3 days
15,001 to 20,000	9 days
20,001 to 25,000	4 days
25,001 to 50,000	2 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	2 days
25,001 to 50,000	4 days
50,001 to 75,000	3 days
75,001 to 100,000	5 days
100,001 to 125,000	6 days
125,001 to 250,000	5 days
250,001 to 500,000	3 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.5 or Less	1 days
0.6 to 1.0	7 days
1.1 to 1.5	20 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	28 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

LIST OF SITES relevant to selection parameters

1 **AD-03-A-01** **SEMI-DETACHED** **ABERDEEN CITY**
SPRINGFIELD ROAD

ABERDEEN
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 59
Survey date: FRIDAY *18/05/12* *Survey Type: MANUAL*

2 **CB-03-A-04** **SEMI DETACHED** **CUMBRIA**
MOORCLOSE ROAD
SALTERBACK
WORKINGTON
Edge of Town
No Sub Category
Total Number of dwellings: 82
Survey date: FRIDAY *24/04/09* *Survey Type: MANUAL*

3 **CF-03-A-02** **MIXED HOUSES** **CARDIFF**
DROPE ROAD

CARDIFF
Edge of Town
Residential Zone
Total Number of dwellings: 196
Survey date: FRIDAY *05/10/07* *Survey Type: MANUAL*

4 **CH-03-A-06** **SEMI-DET./ BUNGALOWS** **CHESHIRE**
CREWE ROAD

CREWE
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total Number of dwellings: 129
Survey date: TUESDAY *14/10/08* *Survey Type: MANUAL*

5 **CW-03-A-02** **SEMI D./ DETATCHED** **CORNWALL**
BOSVEAN GARDENS

TRURO
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 73
Survey date: TUESDAY *18/09/07* *Survey Type: MANUAL*

6 **FA-03-A-02** **MIXED HOUSES** **FALKIRK**
ROSEBANK AVENUE & SPRINGFIELD DRIVE

FALKIRK
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 161
Survey date: WEDNESDAY *29/05/13* *Survey Type: MANUAL*

7 **FI-03-A-03** **MIXED HOUSES** **FIFE**
WOODMILL ROAD

DUNFERMLINE
Edge of Town
Residential Zone
Total Number of dwellings: 155
Survey date: MONDAY *30/04/07* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

8 **HI-03-A-11** **BUNGALOWS** **HIGHLAND**
STEVENSON ROAD
INSHES
INVERNESS
Edge of Town
Residential Zone
Total Number of dwellings: 85
Survey date: MONDAY *05/06/06* *Survey Type: MANUAL*

9 **HI-03-A-14** **SEMI-DETACHED** **HIGHLAND**
CALEDONIAN ROAD
DALNEIGH
INVERNESS
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 73
Survey date: FRIDAY *13/05/11* *Survey Type: MANUAL*

10 **LN-03-A-01** **MIXED HOUSES** **LINCOLNSHIRE**
BRANT ROAD
BRACEBRIDGE
LINCOLN
Edge of Town
Residential Zone
Total Number of dwellings: 150
Survey date: TUESDAY *15/05/07* *Survey Type: MANUAL*

11 **LN-03-A-02** **MIXED HOUSES** **LINCOLNSHIRE**
HYKEHAM ROAD

LINCOLN
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 186
Survey date: MONDAY *14/05/07* *Survey Type: MANUAL*

12 **NE-03-A-03** **PRIVATE HOUSES** **NORTH EAST LINCOLNSHIRE**
STATION ROAD

SCUNTHORPE
Edge of Town Centre
Residential Zone
Total Number of dwellings: 180
Survey date: TUESDAY *20/05/14* *Survey Type: MANUAL*

13 **NF-03-A-02** **HOUSES & FLATS** **NORFOLK**
DEREHAM ROAD

NORWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 98
Survey date: MONDAY *22/10/12* *Survey Type: MANUAL*

14 **NT-03-A-03** **SEMI DETACHED** **NOTTINGHAMSHIRE**
B6018 SUTTON ROAD

KIRKBY-IN-ASHFIELD
Edge of Town
Residential Zone
Total Number of dwellings: 166
Survey date: WEDNESDAY *28/06/06* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

15 **NY-03-A-06** **BUNGALOWS & SEMI DET.** **NORTH YORKSHIRE**
HORSEFAIR

BOROUGHBRIDGE
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 115
Survey date: FRIDAY *14/10/11* *Survey Type: MANUAL*

16 **NY-03-A-09** **MIXED HOUSING** **NORTH YORKSHIRE**
GRAMMAR SCHOOL LANE

NORTHALLERTON
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 52
Survey date: MONDAY *16/09/13* *Survey Type: MANUAL*

17 **NY-03-A-10** **HOUSES AND FLATS** **NORTH YORKSHIRE**
BOROUGHBRIDGE ROAD

RIPON
Edge of Town
No Sub Category
Total Number of dwellings: 71
Survey date: TUESDAY *17/09/13* *Survey Type: MANUAL*

18 **SC-03-A-04** **DETACHED & TERRACED** **SURREY**
HIGH ROAD

BYFLEET
Edge of Town
Residential Zone
Total Number of dwellings: 71
Survey date: THURSDAY *23/01/14* *Survey Type: MANUAL*

19 **SF-03-A-01** **SEMI DETACHED** **SUFFOLK**
A1156 FELIXSTOWE ROAD
RACECOURSE
IPSWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 77
Survey date: WEDNESDAY *23/05/07* *Survey Type: MANUAL*

20 **SF-03-A-03** **MIXED HOUSES** **SUFFOLK**
BARTON HILL
FORNHAM ST MARTIN
BURY ST EDMUNDS
Edge of Town
Out of Town
Total Number of dwellings: 101
Survey date: MONDAY *15/05/06* *Survey Type: MANUAL*

21 **SH-03-A-04** **TERRACED** **SHROPSHIRE**
ST MICHAEL'S STREET

SHREWSBURY
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total Number of dwellings: 108
Survey date: THURSDAY *11/06/09* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

22 **SH-03-A-05** **SEMI-DETACHED/ TERRACED** **SHROPSHIRE**
SANDCROFT
SUTTON HILL
TELFORD
Edge of Town
Residential Zone
Total Number of dwellings: 54
Survey date: THURSDAY *24/10/13* *Survey Type: MANUAL*

23 **SR-03-A-01** **DETACHED** **STIRLING**
BENVIEW

STIRLING
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 115
Survey date: MONDAY *23/04/07* *Survey Type: MANUAL*

24 **SY-03-A-01** **SEMI DETACHED HOUSES** **SOUTH YORKSHIRE**
A19 BENTLEY ROAD
BENTLEY RISE
DONCASTER
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 54
Survey date: WEDNESDAY *18/09/13* *Survey Type: MANUAL*

25 **WL-03-A-01** **SEMI D./ TERRACED W. BASSETT** **WILTSHIRE**
MAPLE DRIVE

WOOTTON BASSETT
Edge of Town
Residential Zone
Total Number of dwellings: 99
Survey date: MONDAY *02/10/06* *Survey Type: MANUAL*

26 **WM-03-A-01** **TERRACED** **WEST MIDLANDS**
FOLESHILL ROAD
FOLESHILL
COVENTRY
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 79
Survey date: FRIDAY *03/02/06* *Survey Type: MANUAL*

27 **WM-03-A-03** **MIXED HOUSING** **WEST MIDLANDS**
BASELEY WAY
ROWLEYS GREEN
COVENTRY
Edge of Town
Residential Zone
Total Number of dwellings: 84
Survey date: MONDAY *24/09/07* *Survey Type: MANUAL*

28 **WO-03-A-03** **DETACHED** **WORCESTERSHIRE**
BLAKEBROOK
BLAKEBROOK
KIDDERMINSTER
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of dwellings: 138
Survey date: FRIDAY *05/05/06* *Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

RANK ORDER for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL VEHICLES

Ranking Type: **TOTALS** Time Range: 17:00-18:00

15th Percentile = No. **24** SH-03-A-05 Tot: 0.371

85th Percentile = No. **5** SH-03-A-04 Tot: 0.759

Median Values		Mean Values	
Arrivals:	0.348	Arrivals:	0.356
Departures:	0.205	Departures:	0.207
Totals:	0.553	Totals:	0.562

Rank	Site-Ref	Description	Town/City	Area	DWELLS	Day	Date	Trip Rate (Sorted by Totals)			Park Spaces
								Arrivals	Departures	Totals	Per Dwelling
1	SR-03-A-01	DETACHED	STIRLING	STIRLING	115	Mon	23/04/07	0.583	0.304	0.887	2.86
2	WO-03-A-03	DETACHED	KIDDERMINSTER	WORCESTERSHIRE	138	Fri	05/05/06	0.558	0.319	0.877	3.14
3	LN-03-A-02	MIXED HOUSES	LINCOLN	LINCOLNSHIRE	186	Mon	14/05/07	0.495	0.355	0.850	4.13
4	WM-03-A-03	MIXED HOUSING	COVENTRY	WEST MIDLANDS	84	Mon	24/09/07	0.405	0.369	0.774	2.60
5	**SH-03-A-04**	**TERRACED**	**SHREWSBURY**	**SHROPSHIRE**	**108**	**Thu**	**11/06/09**	**0.463**	**0.296**	**0.759**	**1.86**
6	SF-03-A-03	MIXED HOUSES	BURY ST EDMUNDS	SUFFOLK	101	Mon	15/05/06	0.525	0.228	0.753	4.34
7	NT-03-A-03	SEMI DETACHED	KIRKBY-IN-ASHFIELD	NOTTINGHAMSHIRE	166	Wed	28/06/06	0.398	0.307	0.705	1.61
8	HI-03-A-14	SEMI-DETACHED	INVERNESS	HIGHLAND	73	Fri	13/05/11	0.356	0.329	0.685	2.05
9	FI-03-A-03	MIXED HOUSES	DUNFERMLINE	FIFE	155	Mon	30/04/07	0.419	0.245	0.664	2.84
10	CW-03-A-02	SEMI D./DETATC	TRURO	CORNWALL	73	Tue	18/09/07	0.425	0.219	0.644	3.73
11	LN-03-A-01	MIXED HOUSES	LINCOLN	LINCOLNSHIRE	150	Tue	15/05/07	0.413	0.213	0.626	4.91
12	CF-03-A-02	MIXED HOUSES	CARDIFF	CARDIFF	196	Fri	05/10/07	0.398	0.214	0.612	1.98
13	NY-03-A-10	HOUSES AND FLA	RIPON	NORTH YORKSHIRE	71	Tue	17/09/13	0.479	0.099	0.578	0.83
14	CB-03-A-04	SEMI DETACHED	WORKINGTON	CUMBRIA	82	Fri	24/04/09	0.354	0.207	0.561	1.74
15	WM-03-A-01	TERRACED	COVENTRY	WEST MIDLANDS	79	Fri	03/02/06	0.342	0.203	0.545	0.96
16	FA-03-A-02	MIXED HOUSES	FALKIRK	FALKIRK	161	Wed	29/05/13	0.317	0.224	0.541	1.66
17	HI-03-A-11	BUNGALOWS	INVERNESS	HIGHLAND	85	Mon	05/06/06	0.376	0.141	0.517	1.59
18	WL-03-A-01	SEMI D./TERRAC	WOOTTON BASSETT	WILTSHIRE	99	Mon	02/10/06	0.374	0.141	0.515	2.12
19	NY-03-A-06	BUNGALOWS & SE	BOROUGHBRIDGE	NORTH YORKSHIRE	115	Fri	14/10/11	0.296	0.174	0.470	3.50
20	SC-03-A-04	DETACHED & TER	BYFLEET	SURREY	71	Thu	23/01/14	0.366	0.099	0.465	2.49
21	NY-03-A-09	MIXED HOUSING	NORTHALLERTON	NORTH YORKSHIRE	52	Mon	16/09/13	0.269	0.192	0.461	2.60
22	SF-03-A-01	SEMI DETACHED	IPSWICH	SUFFOLK	77	Wed	23/05/07	0.247	0.169	0.416	2.22
23	NF-03-A-02	HOUSES & FLATS	NORWICH	NORFOLK	98	Mon	22/10/12	0.235	0.143	0.378	2.24
24	**SH-03-A-05**	**SEMI-DETACHED/**	**TELFORD**	**SHROPSHIRE**	**54**	**Thu**	**24/10/13**	**0.241**	**0.130**	**0.371**	**1.17**
25	SY-03-A-01	SEMI DETACHED	DONCASTER	SOUTH YORKSHIRE	54	Wed	18/09/13	0.278	0.056	0.334	1.13
26	NE-03-A-03	PRIVATE HOUSES	SCUNTHORPE	NORTH EAST LINCOLNS	180	Tue	20/05/14	0.128	0.183	0.311	2.68
27	CH-03-A-06	SEMI-DET./BUNG	CREWE	CHESHIRE	129	Tue	14/10/08	0.132	0.140	0.272	2.59
28	AD-03-A-01	SEMI-DETACHED	ABERDEEN	ABERDEEN CITY	59	Fri	18/05/12	0.085	0.085	0.170	2.68

This section displays actual (not average) trip rates for each of the survey days in the selected set, and ranks them in order of relative trip rate intensity, for a given time period (or peak period irrespective of time) selected by the user. The count type and direction are both displayed just above the table, along with the rows within the table representing the 85th and 15th percentile trip rate figures (highlighted in bold within the table itself).

TRICS DATA

USED TO CALCULATE TRIP GENERATION FOR COMMITTED DEVELOPMENTS CONRES002 & CONRES003

APPENDIX G

Traffic Generation

Holiday Accommodation

TRICS 2008(b)v6.2.2 161208 B13.26 (C) 2008 JMP Consultants Ltd on behalf of the TRICS Consortium **Wednesday 25/02/09**
Page 3
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TRIP RATE for Land Use 03 - RESIDENTIAL/J - HOLIDAY ACCOMMODATION
VEHICLES
Calculation factor: 1 UNITS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. UNITS	Trip Rate	No. Days	Ave. UNITS	Trip Rate	No. Days	Ave. UNITS	Trip Rate
00:00 - 01:00	1	65	0.000	1	65	0.000	1	65	0.000
01:00 - 02:00	1	65	0.000	1	65	0.000	1	65	0.000
02:00 - 03:00	1	65	0.000	1	65	0.000	1	65	0.000
03:00 - 04:00	1	65	0.000	1	65	0.000	1	65	0.000
04:00 - 05:00	1	65	0.000	1	65	0.000	1	65	0.000
05:00 - 06:00	1	65	0.015	1	65	0.031	1	65	0.046
06:00 - 07:00	1	65	0.000	1	65	0.077	1	65	0.077
07:00 - 08:00	1	65	0.108	1	65	0.169	1	65	0.277
08:00 - 09:00	1	65	0.292	1	65	0.277	1	65	0.569
09:00 - 10:00	1	65	0.431	**1**	**65**	**0.708**	1	65	1.139
10:00 - 11:00	1	65	0.092	1	65	0.538	1	65	0.630
11:00 - 12:00	1	65	0.323	1	65	0.231	1	65	0.554
12:00 - 13:00	1	65	0.185	1	65	0.262	1	65	0.447
13:00 - 14:00	1	65	0.169	1	65	0.262	1	65	0.431
14:00 - 15:00	1	65	0.677	1	65	0.415	1	65	1.092
15:00 - 16:00	1	65	0.554	1	65	0.431	1	65	0.985
16:00 - 17:00	**1**	**65**	**0.846**	1	65	0.508	**1**	**65**	**1.354**
17:00 - 18:00	1	65	0.631	1	65	0.431	1	65	1.062
18:00 - 19:00	1	65	0.615	1	65	0.308	1	65	0.923
19:00 - 20:00	1	65	0.338	1	65	0.338	1	65	0.676
20:00 - 21:00	1	65	0.308	1	65	0.200	1	65	0.508
21:00 - 22:00	1	65	0.077	1	65	0.015	1	65	0.092
22:00 - 23:00	1	65	0.185	1	65	0.123	1	65	0.308
23:00 - 24:00	1	65	0.015	1	65	0.092	1	65	0.107
Total Rates:			5.861			5.416			11.277

APPENDIX G

Traffic Generation (continued)

Housing

TRICS 7.2.1 240315 B17.12 (C) 2015 TRICS Consortium Ltd **Monday 20/04/15**
RichardBrounAssociates20042015HousesPrivatelyOwned **Page 7**
Bureau Service TRICS Consortium Limited Bureau Service Licence No: 700101

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	16	80	0.082	16	80	0.283	16	80	0.365
08:00 - 09:00	16	80	0.171	**16**	**80**	**0.389**	16	80	0.560
09:00 - 10:00	16	80	0.170	16	80	0.237	16	80	0.407
10:00 - 11:00	16	80	0.159	16	80	0.189	16	80	0.348
11:00 - 12:00	16	80	0.219	16	80	0.211	16	80	0.430
12:00 - 13:00	16	80	0.203	16	80	0.195	16	80	0.398
13:00 - 14:00	16	80	0.217	16	80	0.204	16	80	0.421
14:00 - 15:00	16	80	0.216	16	80	0.206	16	80	0.422
15:00 - 16:00	16	80	0.262	16	80	0.219	16	80	0.481
16:00 - 17:00	16	80	0.305	16	80	0.204	16	80	0.509
17:00 - 18:00	**16**	**80**	**0.376**	16	80	0.231	**16**	**80**	**0.607**
18:00 - 19:00	16	80	0.278	16	80	0.193	16	80	0.471
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.658			2.761			5.419

	Trip (veh/house)	Vehicles - 33 Houses	Trip Rate (veh/unit)	Vehicles - 34 Holiday Units
Max Departures 0800-0900	.389	13	.277	9
Total 0800-0900	.560	18	.569	19
Max Arrivals 1700-1800	.376	12	.631	21
Total 1700-1800	.607	20	1.062	36
Busiest Hour (Houses) 1600-1700	.607	20	1.062	36
Busiest Hour (Holiday Units) 1600-1700	.509	17	1.354	46
12-hour 0900-1900	5.419	179	9.463	322

TRICS DATA

USED TO CALCULATE TRIP GENERATION FOR COMMITTED DEVELOPMENT CONRES004 & CONRES005

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
MULTI-MODAL VEHICLES

Selected regions and areas:

02	**SOUTH EAST**		
	SC	SURREY	1 days
03	**SOUTH WEST**		
	DC	DORSET	1 days
05	**EAST MIDLANDS**		
	DS	DERBYSHIRE	1 days
06	**WEST MIDLANDS**		
	SH	SHROPSHIRE	1 days
	WO	WORCESTERSHIRE	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	NY	NORTH YORKSHIRE	2 days
08	**NORTH WEST**		
	GM	GREATER MANCHESTER	1 days
09	**NORTH**		
	CB	CUMBRIA	1 days
11	**SCOTLAND**		
	EA	EAST AYRSHIRE	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Filtering Stage 2 selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Number of dwellings
Actual Range: 20 to 71 (units:)
Range Selected by User: 20 to 80 (units:)

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/06 to 24/03/14

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	1 days
Tuesday	2 days
Wednesday	2 days
Thursday	5 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	10 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town	9
Neighbourhood Centre (PPS6 Local Centre)	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	8
No Sub Category	2

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Filtering Stage 3 selection:

Use Class:

C1	1 days
C3	9 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS® .

Population within 1 mile:

1,001 to 5,000	1 days
5,001 to 10,000	2 days
10,001 to 15,000	4 days
15,001 to 20,000	2 days
25,001 to 50,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	1 days
25,001 to 50,000	1 days
75,001 to 100,000	3 days
100,001 to 125,000	2 days
250,001 to 500,000	2 days
500,001 or More	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	9 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	10 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

LIST OF SITES relevant to selection parameters

1 **CB-03-A-03** **SEMI DETACHED** **CUMBRIA**
HAWKSHEAD AVENUE

WORKINGTON
Edge of Town
Residential Zone
Total Number of dwellings: 40
Survey date: THURSDAY *20/11/08* *Survey Type: MANUAL*

2 **DC-03-A-08** **BUNGALOWS** **DORSET**
HURSTDENE ROAD
CASTLE LANE WEST
BOURNEMOUTH
Edge of Town
Residential Zone
Total Number of dwellings: 28
Survey date: MONDAY *24/03/14* *Survey Type: MANUAL*

3 **DS-03-A-01** **SEMI D./ TERRACED** **DERBYSHIRE**
THE AVENUE
HOLMESDALE
DRONFIELD
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total Number of dwellings: 20
Survey date: THURSDAY *22/06/06* *Survey Type: MANUAL*

4 **EA-03-A-01** **DETATCHED** **EAST AYRSHIRE**
TALISKER AVENUE

KILMARNOCK
Edge of Town
Residential Zone
Total Number of dwellings: 39
Survey date: THURSDAY *05/06/08* *Survey Type: MANUAL*

5 **GM-03-A-10** **DETACHED/ SEMI** **GREATER MANCHESTER**
BUTT HILL DRIVE
PRESTWICH
MANCHESTER
Edge of Town
Residential Zone
Total Number of dwellings: 29
Survey date: WEDNESDAY *12/10/11* *Survey Type: MANUAL*

6 **NY-03-A-10** **HOUSES AND FLATS** **NORTH YORKSHIRE**
BOROUGHBRIDGE ROAD

RIPON
Edge of Town
No Sub Category
Total Number of dwellings: 71
Survey date: TUESDAY *17/09/13* *Survey Type: MANUAL*

7 **NY-03-A-11** **PRIVATE HOUSING** **NORTH YORKSHIRE**
HORSEFAIR

BOROUGHBRIDGE
Edge of Town
Residential Zone
Total Number of dwellings: 23
Survey date: WEDNESDAY *18/09/13* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

8	**SC-03-A-04**	**DETACHED & TERRACED**	**SURREY**
	HIGH ROAD		
	BYFLEET		
	Edge of Town		
	Residential Zone		
	Total Number of dwellings:	71	
	Survey date: THURSDAY	*23/01/14*	*Survey Type: MANUAL*
9	**SH-03-A-05**	**SEMI-DETACHED/ TERRACED**	**SHROPSHIRE**
	SANDCROFT		
	SUTTON HILL		
	TELFORD		
	Edge of Town		
	Residential Zone		
	Total Number of dwellings:	54	
	Survey date: THURSDAY	*24/10/13*	*Survey Type: MANUAL*
10	**WO-03-A-02**	**SEMI DETACHED**	**WORCESTERSHIRE**
	MEADOWHILL ROAD		
	REDDITCH		
	Edge of Town		
	No Sub Category		
	Total Number of dwellings:	48	
	Survey date: TUESDAY	*02/05/06*	*Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL VEHICLES

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.104	10	42	0.262	10	42	0.366
08:00 - 09:00	10	42	0.156	**10**	**42**	**0.404**	**10**	**42**	**0.560**
09:00 - 10:00	10	42	0.175	10	42	0.213	10	42	0.388
10:00 - 11:00	10	42	0.135	10	42	0.173	10	42	0.308
11:00 - 12:00	10	42	0.191	10	42	0.201	10	42	0.392
12:00 - 13:00	10	42	0.182	10	42	0.156	10	42	0.338
13:00 - 14:00	10	42	0.191	10	42	0.175	10	42	0.366
14:00 - 15:00	10	42	0.189	10	42	0.189	10	42	0.378
15:00 - 16:00	10	42	0.243	10	42	0.175	10	42	0.418
16:00 - 17:00	10	42	0.314	10	42	0.184	10	42	0.498
17:00 - 18:00	**10**	**42**	**0.407**	10	42	0.149	10	42	0.556
18:00 - 19:00	10	42	0.251	10	42	0.132	10	42	0.383
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.538			2.413			4.951

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL CYCLISTS

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.005	10	42	0.014	10	42	0.019
08:00 - 09:00	10	42	0.000	**10**	**42**	**0.028**	10	42	0.028
09:00 - 10:00	10	42	0.000	10	42	0.007	10	42	0.007
10:00 - 11:00	10	42	0.000	10	42	0.009	10	42	0.009
11:00 - 12:00	10	42	0.005	10	42	0.002	10	42	0.007
12:00 - 13:00	10	42	0.005	10	42	0.002	10	42	0.007
13:00 - 14:00	10	42	0.007	10	42	0.002	10	42	0.009
14:00 - 15:00	10	42	0.005	10	42	0.000	10	42	0.005
15:00 - 16:00	10	42	0.012	10	42	0.002	10	42	0.014
16:00 - 17:00	**10**	**42**	**0.026**	10	42	0.009	**10**	**42**	**0.035**
17:00 - 18:00	10	42	0.012	10	42	0.002	10	42	0.014
18:00 - 19:00	10	42	0.007	10	42	0.000	10	42	0.007
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.084			0.077			0.161

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL VEHICLE OCCUPANTS

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.113	10	42	0.340	10	42	0.453
08:00 - 09:00	10	42	0.203	**10**	**42**	**0.605**	**10**	**42**	**0.808**
09:00 - 10:00	10	42	0.203	10	42	0.258	10	42	0.461
10:00 - 11:00	10	42	0.158	10	42	0.222	10	42	0.380
11:00 - 12:00	10	42	0.253	10	42	0.251	10	42	0.504
12:00 - 13:00	10	42	0.239	10	42	0.201	10	42	0.440
13:00 - 14:00	10	42	0.239	10	42	0.241	10	42	0.480
14:00 - 15:00	10	42	0.255	10	42	0.229	10	42	0.484
15:00 - 16:00	10	42	0.395	10	42	0.229	10	42	0.624
16:00 - 17:00	10	42	0.423	10	42	0.255	10	42	0.678
17:00 - 18:00	**10**	**42**	**0.520**	10	42	0.189	10	42	0.709
18:00 - 19:00	10	42	0.340	10	42	0.173	10	42	0.513
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			3.341			3.193			6.534

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL PEDESTRIANS

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.019	10	42	0.052	10	42	0.071
08:00 - 09:00	10	42	0.083	**10**	**42**	**0.210**	**10**	**42**	**0.293**
09:00 - 10:00	10	42	0.066	10	42	0.085	10	42	0.151
10:00 - 11:00	10	42	0.035	10	42	0.066	10	42	0.101
11:00 - 12:00	10	42	0.054	10	42	0.054	10	42	0.108
12:00 - 13:00	10	42	0.043	10	42	0.047	10	42	0.090
13:00 - 14:00	10	42	0.050	10	42	0.045	10	42	0.095
14:00 - 15:00	10	42	0.043	10	42	0.040	10	42	0.083
15:00 - 16:00	**10**	**42**	**0.139**	10	42	0.052	10	42	0.191
16:00 - 17:00	10	42	0.083	10	42	0.057	10	42	0.140
17:00 - 18:00	10	42	0.071	10	42	0.040	10	42	0.111
18:00 - 19:00	10	42	0.066	10	42	0.031	10	42	0.097
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.752			0.779			1.531

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL PUBLIC TRANSPORT USERS

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.000	10	42	0.007	10	42	0.007
08:00 - 09:00	10	42	0.000	10	42	0.000	10	42	0.000
09:00 - 10:00	10	42	0.000	10	42	0.007	10	42	0.007
10:00 - 11:00	10	42	0.000	**10**	**42**	**0.009**	**10**	**42**	**0.009**
11:00 - 12:00	**10**	**42**	**0.007**	10	42	0.002	10	42	0.009
12:00 - 13:00	10	42	0.005	10	42	0.002	10	42	0.007
13:00 - 14:00	10	42	0.000	10	42	0.002	10	42	0.002
14:00 - 15:00	10	42	0.000	10	42	0.000	10	42	0.000
15:00 - 16:00	10	42	0.005	10	42	0.000	10	42	0.005
16:00 - 17:00	10	42	0.005	10	42	0.000	10	42	0.005
17:00 - 18:00	10	42	0.002	10	42	0.000	10	42	0.002
18:00 - 19:00	10	42	0.007	10	42	0.000	10	42	0.007
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.031			0.029			0.060

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED

MULTI-MODAL TOTAL PEOPLE

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	10	42	0.137	10	42	0.414	10	42	0.551
08:00 - 09:00	10	42	0.286	**10**	**42**	**0.844**	**10**	**42**	**1.130**
09:00 - 10:00	10	42	0.270	10	42	0.357	10	42	0.627
10:00 - 11:00	10	42	0.194	10	42	0.307	10	42	0.501
11:00 - 12:00	10	42	0.319	10	42	0.310	10	42	0.629
12:00 - 13:00	10	42	0.291	10	42	0.253	10	42	0.544
13:00 - 14:00	10	42	0.296	10	42	0.291	10	42	0.587
14:00 - 15:00	10	42	0.303	10	42	0.270	10	42	0.573
15:00 - 16:00	10	42	0.551	10	42	0.284	10	42	0.835
16:00 - 17:00	10	42	0.537	10	42	0.322	10	42	0.859
17:00 - 18:00	**10**	**42**	**0.605**	10	42	0.232	10	42	0.837
18:00 - 19:00	10	42	0.421	10	42	0.203	10	42	0.624
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			4.210			4.087			8.297

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	20 - 71 (units:)
Survey date date range:	01/01/06 - 24/03/14
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

APPENDIX 2
AADT FLOWS

A55 J15 & J16 Improvement Options
AADT Flows
2022: TFS001 to TFS024

TFS001

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**		
J15 OP1	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 OP2	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 OP3	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 OP5	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 OP6	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 PREF OP	2230	447	186	**2863**	1652	312	279	**2242**	2479	358	155	**2991**	**31864**	**0**	**0.00%**
J15 PREF OP MIT.	2230	447	186	**2863**	1652	312	279	**2243**	2479	358	155	**2992**	**31869**	**5**	**0.02%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS002

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	104	18	5	**127**	78	11	6	**95**	95	12	6	**113**	**1321**		
J15 OP1	327	40	16	**383**	251	35	22	**308**	294	40	21	**355**	**4178**	**2857**	**216.25%**
J15 OP2	94	16	5	**114**	54	9	6	**69**	76	10	6	**92**	**1043**	**-279**	**-21.09%**
J15 OP3	123	19	6	**147**	95	13	8	**116**	165	21	8	**193**	**1768**	**447**	**33.80%**
J15 OP5	104	18	5	**127**	77	11	6	**94**	93	12	6	**110**	**1306**	**-15**	**-1.14%**
J15 OP6	104	18	5	**127**	77	11	6	**95**	94	12	6	**112**	**1313**	**-8**	**-0.59%**
J15 PREF OP	104	18	5	**126**	74	11	6	**91**	91	12	6	**109**	**1282**	**-40**	**-2.99%**
J15 PREF OP MIT.	104	18	5	**127**	74	11	6	**91**	92	12	6	**110**	**1286**	**-35**	**-2.69%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS003

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	198	26	3	**227**	91	12	7	**111**	111	14	4	**130**	**1726**		
J15 OP1	190	23	6	**220**	75	11	7	**93**	95	13	13	**121**	**1559**	**-167**	**-9.69%**
J15 OP2	175	21	3	**199**	70	9	7	**87**	90	12	4	**106**	**1419**	**-307**	**-17.78%**
J15 OP3	211	30	5	**246**	100	13	7	**121**	127	20	4	**151**	**1907**	**181**	**10.49%**
J15 OP5	198	26	3	**227**	100	13	7	**120**	125	18	4	**147**	**1843**	**117**	**6.79%**
J15 OP6	175	21	3	**199**	70	9	7	**86**	90	12	4	**106**	**1416**	**-310**	**-17.96%**
J15 PREF OP	176	23	3	**202**	91	12	7	**110**	111	14	4	**129**	**1657**	**-69**	**-4.01%**
J15 PREF OP MIT.	188	23	3	**214**	91	12	8	**111**	111	14	5	**130**	**1693**	**-34**	**-1.94%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS004

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	1928	403	178	**2509**	1483	288	265	**2036**	2273	332	144	**2749**	**28817**		
J15 OP1	2151	431	191	**2772**	1648	313	277	**2238**	2358	346	164	**2868**	**31233**	**2416**	**8.38%**
J15 OP2	1961	410	178	**2549**	1527	294	265	**2087**	2313	336	144	**2793**	**29403**	**586**	**2.03%**
J15 OP3	1896	398	176	**2470**	1457	285	263	**2005**	2188	317	142	**2648**	**28189**	**-627**	**-2.18%**
J15 OP5	1928	403	178	**2509**	1475	288	265	**2028**	2262	328	144	**2734**	**28715**	**-102**	**-0.35%**
J15 OP6	1951	408	178	**2537**	1505	291	265	**2061**	2295	334	144	**2774**	**29135**	**318**	**1.10%**
J15 PREF OP	1951	406	178	**2535**	1487	289	265	**2041**	2278	332	144	**2753**	**28926**	**109**	**0.38%**
J15 PREF OP MIT.	1938	406	178	**2522**	1487	289	265	**2041**	2276	331	144	**2751**	**28889**	**72**	**0.25%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS005

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	57	8	2	**66**	79	15	5	**99**	76	7	0	**83**	**1109**		
J15 OP1	40	8	1	**49**	62	11	2	**74**	118	11	0	**129**	**1038**	**-72**	**-6.46%**
J15 OP2	80	12	2	**94**	122	20	6	**148**	113	12	0	**125**	**1642**	**533**	**48.04%**
J15 OP3	57	8	2	**66**	81	15	5	**101**	122	11	0	**134**	**1282**	**172**	**15.53%**
J15 OP5	57	8	2	**66**	79	15	5	**99**	76	7	0	**83**	**1109**	**-1**	**-0.05%**
J15 OP6	69	10	2	**82**	100	18	5	**123**	97	10	0	**106**	**1382**	**273**	**24.63%**
J15 PREF OP	69	8	2	**79**	79	15	5	**99**	76	7	0	**83**	**1142**	**33**	**2.93%**
J15 PREF OP MIT.	56	7	2	**65**	79	15	5	**99**	76	7	0	**83**	**1105**	**-4**	**-0.37%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS006

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	57	8	2	**66**	79	15	5	**99**	76	7	0	**83**	**1109**		
J15 OP1	40	8	1	**49**	62	11	2	**74**	118	11	0	**129**	**1038**	**-72**	**-6.46%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**-1109**	**-100.00%**
J15 OP3	57	8	2	**66**	81	15	5	**101**	122	11	0	**134**	**1282**	**172**	**15.53%**
J15 OP5	57	8	2	**66**	79	15	5	**99**	76	7	0	**83**	**1109**	**-1**	**-0.05%**
J15 OP6	69	10	2	**82**	100	18	5	**123**	97	10	0	**106**	**1382**	**273**	**24.63%**
J15 PREF OP	69	8	2	**79**	79	15	5	**99**	76	7	0	**83**	**1142**	**33**	**2.93%**
J15 PREF OP MIT.	56	7	2	**65**	79	15	5	**99**	76	7	0	**83**	**1105**	**-4**	**-0.37%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS007

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	302	44	8	**354**	169	24	14	**206**	206	26	11	**242**	**3047**		
J15 OP1	487	58	15	**561**	315	43	30	**388**	380	50	16	**446**	**5453**	**2405**	**78.93%**
J15 OP2	269	37	8	**313**	124	18	13	**156**	167	21	11	**198**	**2462**	**-586**	**-19.22%**
J15 OP3	334	49	10	**393**	195	27	16	**237**	291	40	12	**344**	**3675**	**628**	**20.59%**
J15 OP5	302	44	8	**354**	177	24	14	**214**	217	30	11	**258**	**3150**	**102**	**3.35%**
J15 OP6	279	39	8	**326**	147	20	14	**181**	184	23	10	**218**	**2730**	**-318**	**-10.43%**
J15 PREF OP	279	41	8	**328**	165	22	14	**201**	201	26	11	**238**	**2939**	**-109**	**-3.57%**
J15 PREF OP MIT.	292	41	8	**341**	165	23	14	**202**	203	26	11	**240**	**2978**	**-69**	**-2.27%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS008

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	262	33	11	**306**	213	28	15	**256**	284	34	5	**323**	**3525**		
J15 OP1	132	19	10	**160**	110	16	10	**136**	205	28	4	**237**	**2069**	**-1456**	**-41.31%**
J15 OP2	252	30	11	**293**	215	27	15	**257**	286	34	5	**325**	**3510**	**-15**	**-0.44%**
J15 OP3	294	37	14	**345**	209	28	17	**253**	298	41	7	**346**	**3677**	**152**	**4.30%**
J15 OP5	262	33	11	**306**	223	28	15	**266**	299	38	5	**342**	**3656**	**130**	**3.69%**
J15 OP6	252	30	11	**293**	214	27	15	**255**	284	34	5	**323**	**3495**	**-31**	**-0.87%**
J15 PREF OP	252	30	11	**294**	217	27	15	**258**	287	34	5	**326**	**3527**	**1**	**0.04%**
J15 PREF OP MIT.	252	30	11	**293**	217	27	15	**259**	285	34	5	**324**	**3520**	**-6**	**-0.16%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS009

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	261	31	12	**304**	238	28	15	**281**	319	42	5	**366**	**3837**	TO DM	TO DM
J15 OP1	129	19	7	**155**	113	15	7	**135**	218	28	3	**249**	**2088**	**-2857**	**-45.58%**
J15 OP2	271	34	12	**316**	239	29	15	**284**	321	42	5	**368**	**3889**	**-1055**	**1.36%**
J15 OP3	293	36	14	**343**	215	29	17	**262**	303	41	7	**351**	**3746**	**-1199**	**-2.37%**
J15 OP5	261	31	12	**304**	230	28	15	**274**	307	39	5	**351**	**3735**	**-1210**	**-2.66%**
J15 OP6	271	34	12	**316**	238	29	15	**283**	320	42	5	**367**	**3880**	**-1064**	**1.13%**
J15 PREF OP	271	34	12	**317**	241	30	15	**286**	323	42	5	**370**	**3913**	**-1032**	**1.98%**
J15 PREF OP MIT.	270	34	12	**316**	241	30	15	**286**	321	43	5	**369**	**3908**	**-1037**	**1.85%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS010

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	TO DM	TO DM
J15 OP1	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 OP2	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 OP3	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 OP5	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 OP6	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 PREF OP	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J15 PREF OP MIT.	2240	439	193	**2872**	1753	329	285	**2367**	2496	362	156	**3014**	**32825**	**-2**	**-0.01%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS011

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J16 OP4	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J16 OP5	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J16 OP7	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J16 PREF OP	2240	439	192	**2871**	1753	329	285	**2368**	2496	362	156	**3014**	**32827**	**0**	**0.00%**
J16 PREF OP MIT.	2240	439	193	**2872**	1753	329	285	**2367**	2496	362	156	**3014**	**32825**	**-2**	**-0.01%**

TFS012

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	99	23	14	**136**	64	8	9	**82**	77	12	10	**99**	**1206**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**
J16 OP4	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**
J16 OP5	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**
J16 OP7	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**
J16 PREF OP	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**
J16 PREF OP MIT.	94	19	14	**127**	64	8	9	**81**	76	12	10	**98**	**1177**	**-29**	**-2.39%**

TFS013

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	42	7	24	**74**	40	6	21	**66**	90	10	19	**118**	**1007**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	50	9	25	**84**	51	9	22	**82**	123	15	23	**161**	**1271**	**264**	**26.26%**
J16 OP4	42	7	24	**74**	40	6	21	**66**	90	10	19	**118**	**1006**	**0**	**-0.02%**
J16 OP5	51	10	25	**86**	53	9	22	**83**	125	16	23	**164**	**1299**	**292**	**29.01%**
J16 OP7	51	10	25	**86**	53	9	22	**83**	125	16	23	**164**	**1299**	**292**	**29.01%**
J16 PREF OP	50	9	25	**84**	51	9	22	**82**	123	15	23	**161**	**1270**	**264**	**26.22%**
J16 PREF OP MIT.	50	9	25	**84**	51	9	22	**82**	123	15	23	**161**	**1271**	**265**	**26.30%**

TFS014

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2098	409	155	**2661**	1649	315	255	**2220**	2330	340	128	**2797**	**30615**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2096	410	154	**2660**	1639	312	254	**2205**	2297	334	124	**2755**	**30380**	**-235**	**-0.77%**
J16 OP4	2104	412	155	**2670**	1650	315	255	**2221**	2330	340	128	**2798**	**30644**	**29**	**0.09%**
J16 OP5	2094	409	154	**2658**	1637	312	254	**2203**	2294	334	124	**2752**	**30352**	**-263**	**-0.86%**
J16 OP7	2094	409	154	**2658**	1637	312	254	**2203**	2294	334	124	**2752**	**30352**	**-263**	**-0.86%**
J16 PREF OP	2096	410	154	**2660**	1639	312	254	**2205**	2297	334	124	**2755**	**30380**	**-235**	**-0.77%**
J16 PREF OP MIT.	2096	410	154	**2660**	1639	311	254	**2204**	2297	335	124	**2756**	**30375**	**-240**	**-0.79%**

TFS015

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	266	39	27	**332**	225	28	14	**268**	288	39	10	**337**	**3718**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	238	39	27	**304**	214	29	15	**257**	299	41	13	**353**	**3622**	**-97**	**-2.60%**
J16 OP4	266	39	27	**332**	225	28	14	**268**	288	39	10	**337**	**3717**	**-2**	**-0.05%**
J16 OP5	269	40	27	**336**	233	31	15	**278**	314	42	14	**371**	**3902**	**183**	**4.93%**
J16 OP7	269	40	27	**336**	233	31	15	**278**	314	42	14	**371**	**3902**	**183**	**4.93%**
J16 PREF OP	277	42	27	**346**	240	31	15	**287**	325	43	15	**384**	**4028**	**310**	**8.33%**
J16 PREF OP MIT.	277	41	27	**345**	240	31	15	**286**	326	44	15	**385**	**4030**	**312**	**8.39%**

TFS016

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	100	20	0	**121**	58	13	6	**77**	79	11	7	**97**	**1132**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	196	28	12	**236**	121	21	9	**151**	130	21	8	**159**	**2119**	**987**	**87.21%**
J16 OP4	224	28	12	**264**	132	21	8	**161**	120	19	6	**144**	**2214**	**1082**	**95.58%**
J16 OP5	228	29	12	**269**	140	23	9	**171**	146	22	10	**177**	**2399**	**1267**	**111.93%**
J16 OP7	228	29	12	**269**	140	23	9	**171**	146	22	10	**177**	**2399**	**1267**	**111.93%**
J16 PREF OP	231	31	12	**274**	140	23	9	**172**	147	22	10	**179**	**2423**	**1290**	**113.98%**
J16 PREF OP MIT.	231	31	13	**275**	140	23	9	**172**	148	23	10	**181**	**2425**	**1293**	**114.19%**

TFS017

2022	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	2392	444	181	**3016**	1874	342	270	**2485**	2584	371	136	**3091**	**34240**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2138	421	169	**2727**	1732	320	260	**2311**	2466	355	128	**2949**	**31882**	**-2358**	**-6.89%**
J16 OP4	2392	444	181	**3016**	1874	342	270	**2486**	2583	371	136	**3091**	**34243**	**3**	**0.01%**
J16 OP5	2392	444	181	**3016**	1874	342	270	**2486**	2584	371	136	**3091**	**34247**	**7**	**0.02%**
J16 OP7	2392	444	181	**3016**	1874	342	270	**2486**	2584	371	136	**3091**	**34247**	**7**	**0.02%**
J16 PREF OP	2142	421	169	**2731**	1739	320	261	**2320**	2475	355	129	**2960**	**31986**	**-2254**	**-6.58%**
J16 PREF OP MIT.	2142	421	169	**2732**	1739	320	261	**2320**	2475	356	130	**2961**	**31991**	**-2249**	**-6.57%**

TFS018

2022	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	1355	165	85	**1606**	972	184	148	**1304**	1196	170	103	**1469**	**17547**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1357	166	85	**1608**	973	184	148	**1305**	1197	170	103	**1470**	**17564**	**17**	**0.10%**
J16 OP4	1355	165	85	**1606**	972	184	148	**1304**	1195	170	103	**1468**	**17543**	**-4**	**-0.02%**
J16 OP5	1355	165	85	**1606**	972	184	148	**1304**	1196	170	103	**1469**	**17547**	**0**	**0.00%**
J16 OP7	1355	165	85	**1606**	972	184	148	**1304**	1196	170	103	**1469**	**17547**	**0**	**0.00%**
J16 PREF OP	1357	166	85	**1608**	973	184	148	**1305**	1197	170	103	**1470**	**17564**	**17**	**0.10%**
J16 PREF OP MIT.	1357	166	85	**1608**	973	184	148	**1305**	1197	170	103	**1470**	**17563**	**16**	**0.09%**

TFS019

2022	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	162	34	39	**234**	129	17	31	**177**	195	26	24	**245**	**2562**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	164	33	39	**236**	139	20	32	**191**	228	31	28	**287**	**2797**	**235**	**9.19%**
J16 OP4	156	30	39	**225**	128	17	31	**176**	195	26	24	**245**	**2533**	**-29**	**-1.13%**
J16 OP5	165	33	39	**237**	141	20	32	**193**	231	32	28	**291**	**2825**	**263**	**10.27%**
J16 OP7	165	33	39	**237**	141	20	32	**193**	231	32	28	**291**	**2825**	**263**	**10.27%**
J16 PREF OP	164	33	39	**236**	139	20	32	**191**	228	31	28	**287**	**2796**	**235**	**9.17%**
J16 PREF OP MIT.	164	33	39	**236**	139	20	32	**191**	227	31	28	**286**	**2794**	**232**	**9.07%**

TFS020

2022	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	17	16	19	**52**	15	1	19	**35**	21	7	10	**38**	**489**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	48	16	19	**82**	37	4	19	**60**	44	10	11	**65**	**821**	**332**	**67.83%**
J16 OP4	12	13	19	**44**	14	1	19	**34**	21	7	10	**37**	**462**	**-27**	**-5.57%**
J16 OP5	17	15	19	**51**	20	2	19	**42**	31	10	10	**50**	**569**	**80**	**16.29%**
J16 OP7	17	15	19	**51**	20	2	19	**42**	31	10	10	**50**	**569**	**80**	**16.29%**
J16 PREF OP	8	13	19	**40**	11	1	18	**31**	17	8	9	**33**	**415**	**-74**	**-15.22%**
J16 PREF OP MIT.	8	13	19	**40**	11	1	18	**30**	18	8	8	**34**	**416**	**-74**	**-15.08%**

TFS021

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	7	9	19	**35**	8	0	18	**26**	10	5	9	**23**	**337**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	7	9	19	**35**	7	0	18	**25**	9	5	9	**22**	**330**	**-7**	**-2.08%**
J16 OP4	7	9	19	**35**	7	0	18	**25**	9	5	9	**22**	**330**	**-7**	**-2.08%**
J16 OP5	7	9	19	**35**	7	0	18	**25**	9	5	9	**22**	**330**	**-7**	**-2.08%**
J16 OP7	7	9	19	**35**	7	0	18	**25**	9	5	9	**22**	**330**	**-7**	**-2.08%**
J16 PREF OP	7	9	19	**35**	7	0	18	**25**	9	5	9	**22**	**330**	**-7**	**-2.08%**
J16 PREF OP MIT.	7	9	19	**35**	7	0	18	**25**	9	5	8	**22**	**328**	**-8**	**-2.48%**

TFS022

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	35	12	1	**48**	39	10	3	**51**	87	13	1	**101**	**787**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	32	11	0	**42**	24	4	1	**29**	54	5	2	**60**	**495**	**-292**	**-37.13%**
J16 OP4	41	16	1	**57**	39	10	3	**51**	88	13	1	**102**	**814**	**28**	**3.54%**
J16 OP5	41	15	1	**57**	34	9	2	**45**	79	11	1	**90**	**729**	**-58**	**-7.37%**
J16 OP7	41	15	1	**57**	34	9	2	**45**	79	11	1	**90**	**729**	**-58**	**-7.37%**
J16 PREF OP	32	11	0	**43**	24	4	1	**29**	53	5	2	**60**	**495**	**-291**	**-37.02%**
J16 PREF OP MIT.	31	12	0	**43**	25	4	1	**30**	54	5	2	**61**	**504**	**-283**	**-35.98%**

TFS023

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	22	8	1	**30**	46	8	6	**60**	91	15	3	**108**	**827**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	86	14	0	**100**	72	10	5	**87**	104	12	5	**121**	**1226**	**399**	**48.31%**
J16 OP4	22	8	1	**30**	46	8	6	**60**	91	15	3	**108**	**826**	**0**	**-0.06%**
J16 OP5	22	8	1	**30**	46	8	6	**60**	91	15	3	**108**	**826**	**0**	**-0.06%**
J16 OP7	22	8	1	**30**	46	8	6	**60**	91	15	3	**108**	**826**	**0**	**-0.06%**
J16 PREF OP	47	12	0	**59**	46	7	4	**58**	79	10	3	**92**	**834**	**7**	**0.87%**
J16 PREF OP MIT.	47	12	0	**59**	46	8	4	**58**	79	10	3	**92**	**832**	**6**	**0.70%**

TFS024

2022	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	1059	286	97	**1441**	948	166	128	**1241**	1479	215	36	**1730**	**17520**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1059	286	97	**1441**	948	166	128	**1242**	1479	215	36	**1731**	**17527**	**7**	**0.04%**
J16 OP4	1059	286	97	**1441**	948	166	128	**1242**	1479	215	36	**1731**	**17527**	**7**	**0.04%**
J16 OP5	1059	286	97	**1441**	948	166	128	**1242**	1479	215	36	**1731**	**17527**	**7**	**0.04%**
J16 OP7	1059	286	97	**1441**	948	166	128	**1242**	1479	215	36	**1731**	**17527**	**7**	**0.04%**
J16 PREF OP	1059	286	97	**1441**	948	166	128	**1242**	1479	215	36	**1731**	**17527**	**7**	**0.04%**
J16 PREF OP MIT.	1059	286	97	**1442**	948	166	128	**1242**	1479	215	36	**1730**	**17524**	**5**	**0.03%**

A55 J15 & J16 Improvement Options
AADT Flows
2037: TFS001 to TFS024

TFS001

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**		
J15 OP1	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 OP2	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 OP3	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 OP5	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 OP6	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 PREF OP	2528	591	208	**3327**	1874	412	312	**2597**	2807	473	173	**3453**	**36899**	**0**	**0.00%**
J15 PREF OP MIT.	2528	591	208	**3327**	1874	412	312	**2598**	2807	473	173	**3453**	**36903**	**5**	**0.01%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS002

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	114	23	5	**142**	81	14	7	**102**	100	15	7	**121**	**1430**		
J15 OP1	370	53	17	**441**	284	47	25	**356**	333	53	23	**409**	**4821**	**3391**	**237.06%**
J15 OP2	101	20	5	**126**	54	11	7	**71**	79	12	7	**98**	**1103**	**-327**	**-22.87%**
J15 OP3	139	25	6	**170**	107	17	9	**134**	186	27	9	**222**	**2040**	**610**	**42.65%**
J15 OP5	113	23	5	**140**	79	14	7	**100**	98	14	7	**119**	**1406**	**-25**	**-1.72%**
J15 OP6	113	23	5	**141**	80	14	7	**101**	99	15	7	**120**	**1418**	**-12**	**-0.86%**
J15 PREF OP	111	22	5	**138**	77	14	7	**98**	96	14	7	**118**	**1384**	**-47**	**-3.26%**
J15 PREF OP MIT.	112	22	5	**139**	77	14	7	**98**	98	14	7	**119**	**1390**	**-41**	**-2.84%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS003

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	224	34	3	**262**	104	17	8	**129**	126	19	5	**149**	**1997**		
J15 OP1	226	31	7	**264**	85	14	8	**108**	107	17	15	**139**	**1825**	**-172**	**-8.63%**
J15 OP2	199	27	3	**230**	79	12	8	**100**	102	15	5	**122**	**1633**	**-363**	**-18.20%**
J15 OP3	239	39	5	**284**	113	18	8	**139**	143	26	5	**174**	**2204**	**207**	**10.36%**
J15 OP5	224	34	3	**262**	113	17	8	**138**	126	19	5	**149**	**2064**	**67**	**3.35%**
J15 OP6	199	27	3	**230**	79	12	8	**100**	102	15	4	**122**	**1631**	**-366**	**-18.33%**
J15 PREF OP	205	31	3	**239**	103	15	8	**127**	126	19	5	**149**	**1925**	**-71**	**-3.57%**
J15 PREF OP MIT.	205	31	3	**239**	103	15	8	**127**	126	19	5	**149**	**1925**	**-71**	**-3.57%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS004

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2190	533	199	**2923**	1690	381	296	**2367**	2581	439	161	**3182**	**33472**		
J15 OP1	2449	570	213	**3232**	1870	413	310	**2593**	2670	458	184	**3311**	**36196**	**2724**	**8.14%**
J15 OP2	2229	543	199	**2971**	1741	389	297	**2427**	2626	446	161	**3232**	**34162**	**690**	**2.06%**
J15 OP3	2149	526	197	**2872**	1653	377	294	**2324**	2477	419	159	**3056**	**32655**	**-817**	**-2.44%**
J15 OP5	2191	534	199	**2924**	1682	381	296	**2360**	2583	439	161	**3184**	**33429**	**-42**	**-0.13%**
J15 OP6	2216	541	199	**2956**	1715	386	296	**2397**	2606	443	162	**3211**	**33850**	**378**	**1.13%**
J15 PREF OP	2213	538	199	**2950**	1694	383	296	**2373**	2585	439	161	**3186**	**33589**	**118**	**0.35%**
J15 PREF OP MIT.	2203	538	200	**2941**	1694	383	296	**2373**	2584	439	161	**3184**	**33565**	**93**	**0.28%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS005

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	64	10	2	**76**	89	20	6	**115**	86	9	0	**95**	**1284**		
J15 OP1	56	11	1	**68**	80	15	2	**97**	143	16	0	**159**	**1337**	**53**	**4.12%**
J15 OP2	91	16	2	**109**	138	26	6	**171**	128	16	0	**144**	**1901**	**617**	**48.04%**
J15 OP3	64	10	2	**76**	102	21	6	**129**	149	16	0	**165**	**1595**	**311**	**24.22%**
J15 OP5	64	10	2	**77**	89	20	6	**115**	86	9	0	**95**	**1284**	**0**	**0.00%**
J15 OP6	79	14	2	**94**	113	23	6	**142**	110	13	0	**122**	**1601**	**317**	**24.66%**
J15 PREF OP	73	10	3	**86**	90	20	6	**115**	86	9	0	**95**	**1308**	**24**	**1.86%**
J15 PREF OP MIT.	64	10	3	**77**	90	20	6	**116**	86	10	0	**96**	**1290**	**6**	**0.50%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS006

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	64	10	2	**76**	89	20	6	**115**	86	9	0	**95**	**1284**		
J15 OP1	56	11	1	**68**	80	15	2	**97**	143	16	0	**159**	**1337**	**53**	**4.12%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**-1284**	**-100.00%**
J15 OP3	64	10	2	**76**	102	21	6	**129**	149	16	0	**165**	**1595**	**311**	**24.22%**
J15 OP5	64	10	2	**77**	89	20	6	**115**	86	9	0	**95**	**1284**	**0**	**0.00%**
J15 OP6	79	14	2	**94**	113	23	6	**142**	110	13	0	**122**	**1601**	**317**	**24.66%**
J15 PREF OP	73	10	3	**86**	90	20	6	**115**	86	9	0	**95**	**1308**	**24**	**1.86%**
J15 PREF OP MIT.	64	10	3	**77**	90	20	6	**116**	86	10	0	**96**	**1290**	**6**	**0.50%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS007

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	338	57	8	**404**	184	30	15	**230**	226	33	12	**271**	**3427**		
J15 OP1	542	77	17	**636**	358	57	33	**448**	430	67	18	**515**	**6264**	**2837**	**82.79%**
J15 OP2	299	48	8	**355**	133	23	15	**171**	181	27	12	**220**	**2737**	**-690**	**-20.15%**
J15 OP3	379	65	11	**455**	221	35	18	**274**	330	53	14	**397**	**4244**	**817**	**23.84%**
J15 OP5	337	57	8	**402**	192	30	15	**238**	224	33	12	**269**	**3469**	**42**	**1.24%**
J15 OP6	312	50	8	**371**	159	26	15	**200**	201	30	11	**242**	**3049**	**-378**	**-11.04%**
J15 PREF OP	315	53	8	**376**	180	29	15	**225**	222	33	12	**267**	**3309**	**-118**	**-3.44%**
J15 PREF OP MIT.	325	53	8	**386**	180	29	15	**224**	224	33	12	**269**	**3337**	**-90**	**-2.62%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS008

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	301	44	13	**358**	250	37	16	**304**	329	46	6	**380**	**4166**		
J15 OP1	149	25	11	**185**	135	22	11	**168**	242	38	4	**284**	**2501**	**-1666**	**-39.98%**
J15 OP2	291	41	13	**345**	252	36	16	**304**	330	46	6	**382**	**4144**	**-22**	**-0.54%**
J15 OP3	333	49	15	**398**	247	38	19	**304**	347	55	8	**410**	**4357**	**190**	**4.56%**
J15 OP5	302	44	13	**359**	261	37	16	**315**	330	46	6	**382**	**4255**	**88**	**2.12%**
J15 OP6	290	41	13	**344**	250	36	16	**303**	329	46	5	**380**	**4126**	**-40**	**-0.96%**
J15 PREF OP	293	41	13	**347**	253	36	16	**306**	332	46	6	**384**	**4163**	**-4**	**-0.09%**
J15 PREF OP MIT.	292	41	13	**346**	253	37	16	**306**	331	46	6	**383**	**4161**	**-5**	**-0.12%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS009

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	300	42	13	**355**	277	38	17	**332**	369	57	6	**432**	**4517**	TO DM	TO DM
J15 OP1	146	25	8	**179**	138	21	8	**167**	257	39	3	**298**	**2520**	**-2424**	**-44.19%**
J15 OP2	312	46	13	**371**	279	40	17	**336**	371	57	6	**433**	**4589**	**-356**	**1.60%**
J15 OP3	332	48	16	**396**	255	39	20	**313**	353	56	8	**426**	**4435**	**-510**	**-1.81%**
J15 OP5	301	43	13	**357**	269	38	17	**325**	370	57	6	**433**	**4473**	**-472**	**-0.97%**
J15 OP6	312	46	13	**371**	278	39	17	**335**	370	57	6	**433**	**4577**	**-368**	**1.33%**
J15 PREF OP	314	47	13	**374**	281	40	17	**338**	372	57	6	**435**	**4610**	**-334**	**2.08%**
J15 PREF OP MIT.	313	46	13	**372**	281	39	18	**338**	371	57	6	**434**	**4602**	**-342**	**1.90%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS010

2037	AM				IP				PM				AADT	ACTUAL	%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF	DIFF
DM	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	TO DM	TO DM
J15 OP1	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 OP2	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 OP3	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 OP5	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 OP6	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 PREF OP	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J15 PREF OP MIT.	2539	580	215	**3334**	1989	434	319	**2742**	2827	478	175	**3480**	**38009**	**-3**	**-0.01%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS011

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J16 OP4	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J16 OP5	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J16 OP7	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J16 PREF OP	2539	580	215	**3334**	1989	435	319	**2743**	2826	478	175	**3479**	**38012**	**0**	**0.00%**
J16 PREF OP MIT.	2539	580	215	**3334**	1989	434	319	**2742**	2827	478	175	**3480**	**38009**	**-3**	**-0.01%**

TFS012

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	113	30	15	**158**	73	11	10	**94**	99	18	11	**127**	**1435**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	106	26	15	**148**	72	11	10	**93**	86	16	11	**113**	**1359**	**-76**	**-5.30%**
J16 OP4	106	26	15	**148**	72	11	10	**93**	86	16	11	**113**	**1359**	**-76**	**-5.30%**
J16 OP5	106	26	15	**148**	72	11	10	**93**	86	16	11	**113**	**1359**	**-76**	**-5.30%**
J16 OP7	106	26	15	**148**	72	11	10	**93**	86	16	11	**113**	**1359**	**-76**	**-5.30%**
J16 PREF OP	106	26	15	**148**	72	11	10	**93**	86	16	11	**113**	**1359**	**-76**	**-5.30%**
J16 PREF OP MIT.	106	26	15	**147**	72	11	10	**93**	86	16	11	**113**	**1357**	**-78**	**-5.43%**

TFS013

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	48	10	27	**85**	45	8	23	**76**	101	13	21	**135**	**1158**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	57	13	28	**97**	57	12	24	**94**	139	20	25	**184**	**1461**	**303**	**26.13%**
J16 OP4	48	10	27	**85**	45	8	23	**76**	101	13	21	**135**	**1153**	**-5**	**-0.41%**
J16 OP5	58	13	28	**99**	60	12	24	**96**	142	21	25	**188**	**1493**	**335**	**28.93%**
J16 OP7	58	13	28	**99**	60	12	24	**96**	142	21	25	**188**	**1493**	**335**	**28.93%**
J16 PREF OP	57	13	28	**97**	57	12	24	**94**	139	20	25	**184**	**1461**	**303**	**26.14%**
J16 PREF OP MIT.	57	13	28	**98**	57	12	25	**94**	139	20	25	**184**	**1461**	**303**	**26.16%**

TFS014

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	2378	540	173	**3091**	1870	416	286	**2572**	2626	448	143	**3217**	**35419**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2376	542	172	**3090**	1859	412	285	**2556**	2601	442	138	**3181**	**35192**	**4577**	**-0.64%**
J16 OP4	2385	545	173	**3102**	1872	417	286	**2574**	2639	449	143	**3230**	**35500**	**4884**	**0.23%**
J16 OP5	2374	541	172	**3088**	1857	412	285	**2554**	2598	441	138	**3177**	**35160**	**4544**	**-0.73%**
J16 OP7	2374	541	172	**3088**	1857	412	285	**2554**	2598	441	138	**3177**	**35160**	**4544**	**-0.73%**
J16 PREF OP	2376	542	172	**3090**	1859	412	285	**2556**	2601	442	138	**3181**	**35192**	**4577**	**-0.64%**
J16 PREF OP MIT.	2376	541	173	**3090**	1859	412	285	**2556**	2601	442	138	**3181**	**35188**	**4572**	**-0.65%**

TFS015

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	301	52	30	**384**	256	37	15	**309**	326	51	12	**389**	**4290**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	269	52	30	**351**	241	38	16	**295**	339	54	15	**408**	**4175**	**457**	**-2.69%**
J16 OP4	301	52	30	**383**	256	37	15	**309**	326	51	12	**389**	**4288**	**569**	**-0.05%**
J16 OP5	305	53	30	**388**	259	39	16	**314**	353	55	16	**425**	**4450**	**732**	**3.73%**
J16 OP7	305	53	30	**388**	259	39	16	**314**	353	55	16	**425**	**4450**	**732**	**3.73%**
J16 PREF OP	314	55	30	**399**	272	41	17	**331**	368	57	17	**443**	**4648**	**930**	**8.35%**
J16 PREF OP MIT.	314	55	30	**399**	272	41	18	**331**	368	58	17	**443**	**4649**	**930**	**8.36%**

TFS016

2037	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	113	27	1	**141**	66	17	7	**90**	84	14	8	**105**	**1294**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	222	37	14	**273**	136	28	10	**173**	148	28	9	**185**	**2447**	**1153**	**89.13%**
J16 OP4	254	37	13	**305**	150	27	9	**187**	136	24	6	**166**	**2560**	**1266**	**97.87%**
J16 OP5	258	38	14	**310**	153	29	10	**192**	162	29	11	**202**	**2722**	**1428**	**110.41%**
J16 OP7	258	38	14	**310**	153	29	10	**192**	162	29	11	**202**	**2722**	**1428**	**110.41%**
J16 PREF OP	262	41	14	**316**	159	30	10	**200**	166	30	11	**207**	**2802**	**1508**	**116.58%**
J16 PREF OP MIT.	262	41	14	**317**	159	30	10	**199**	166	30	11	**207**	**2802**	**1508**	**116.60%**

TFS017

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2712	586	202	**3500**	2125	452	302	**2879**	2919	490	153	**3562**	**39616**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2423	556	189	**3168**	1965	422	291	**2678**	2792	469	144	**3404**	**36921**	**-2695**	**-6.80%**
J16 OP4	2712	586	202	**3500**	2126	452	302	**2880**	2926	490	153	**3569**	**39646**	**30**	**0.07%**
J16 OP5	2712	586	202	**3500**	2126	452	302	**2880**	2926	490	153	**3569**	**39649**	**33**	**0.08%**
J16 OP7	2712	586	202	**3500**	2126	452	302	**2880**	2926	490	153	**3569**	**39649**	**33**	**0.08%**
J16 PREF OP	2428	556	189	**3173**	1972	423	292	**2687**	2803	470	145	**3417**	**37039**	**-2577**	**-6.51%**
J16 PREF OP MIT.	2428	556	189	**3173**	1972	423	292	**2687**	2803	469	145	**3417**	**37034**	**-2582**	**-6.52%**

TFS018

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	1537	219	95	**1850**	1102	243	165	**1511**	1354	225	116	**1694**	**20280**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1538	219	95	**1852**	1104	243	165	**1513**	1355	225	116	**1695**	**20303**	**24**	**0.12%**
J16 OP4	1537	219	95	**1850**	1102	243	165	**1511**	1354	225	116	**1694**	**20281**	**1**	**0.01%**
J16 OP5	1537	219	95	**1850**	1103	243	165	**1511**	1354	225	116	**1694**	**20284**	**5**	**0.02%**
J16 OP7	1537	219	95	**1850**	1103	243	165	**1511**	1354	225	116	**1694**	**20284**	**5**	**0.02%**
J16 PREF OP	1538	219	95	**1852**	1104	243	165	**1513**	1355	225	116	**1695**	**20303**	**24**	**0.12%**
J16 PREF OP MIT.	1538	219	95	**1852**	1104	243	165	**1512**	1355	225	115	**1695**	**20300**	**20**	**0.10%**

TFS019

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	183	45	43	**272**	147	23	35	**204**	233	35	27	**295**	**2997**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	186	43	44	**273**	158	27	36	**220**	258	41	32	**330**	**3223**	**226**	**7.56%**
J16 OP4	177	40	43	**261**	145	22	35	**202**	220	34	27	**281**	**2916**	**-81**	**-2.70%**
J16 OP5	187	44	44	**275**	160	27	36	**222**	261	42	32	**335**	**3256**	**259**	**8.64%**
J16 OP7	187	44	44	**275**	160	27	36	**222**	261	42	32	**335**	**3256**	**259**	**8.64%**
J16 PREF OP	186	43	44	**273**	158	27	36	**220**	258	41	32	**330**	**3223**	**227**	**7.56%**
J16 PREF OP MIT.	185	43	44	**272**	158	26	36	**220**	257	41	32	**330**	**3216**	**220**	**7.33%**

TFS020

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	19	22	21	**62**	18	1	21	**40**	36	11	11	**57**	**611**	**0**	**0.00%**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	54	21	21	**96**	43	5	22	**70**	48	13	12	**74**	**952**	**342**	**55.98%**
J16 OP4	13	18	21	**52**	16	1	21	**39**	24	9	11	**44**	**532**	**-79**	**-12.87%**
J16 OP5	19	20	21	**61**	28	4	22	**53**	38	13	11	**61**	**710**	**99**	**16.22%**
J16 OP7	19	20	21	**61**	28	4	22	**53**	38	13	11	**61**	**710**	**99**	**16.22%**
J16 PREF OP	9	17	21	**48**	13	1	21	**35**	19	10	10	**39**	**479**	**-131**	**-21.51%**
J16 PREF OP MIT.	9	17	21	**47**	12	1	20	**33**	19	11	10	**40**	**471**	**-140**	**-22.92%**

TFS021

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	8	12	21	**41**	9	0	20	**30**	17	7	10	**33**	**411**	**TO DM**	**TO DM**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	8	12	21	**41**	8	0	20	**28**	11	6	10	**26**	**378**	**-33**	**-8.01%**
J16 OP4	8	12	21	**41**	8	0	20	**28**	11	6	10	**26**	**378**	**-33**	**-8.01%**
J16 OP5	8	12	21	**41**	8	0	20	**28**	11	6	10	**26**	**378**	**-33**	**-8.01%**
J16 OP7	8	12	21	**41**	8	0	20	**28**	11	6	10	**26**	**378**	**-33**	**-8.01%**
J16 PREF OP	8	12	21	**41**	8	0	20	**28**	11	6	10	**26**	**378**	**-33**	**-8.01%**
J16 PREF OP MIT.	8	12	21	**41**	8	0	20	**28**	11	6	10	**27**	**378**	**-33**	**-7.98%**

TFS022

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	40	16	1	**56**	44	13	3	**60**	93	17	1	**110**	**896**	**TO DM**	**TO DM**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	36	14	0	**50**	27	5	1	**34**	60	6	2	**68**	**569**	**-327**	**-36.46%**
J16 OP4	46	21	1	**68**	44	13	3	**60**	99	17	1	**117**	**949**	**54**	**5.99%**
J16 OP5	47	20	1	**67**	43	13	2	**59**	92	14	1	**107**	**902**	**7**	**0.75%**
J16 OP7	47	20	1	**67**	43	13	2	**59**	92	14	1	**107**	**902**	**7**	**0.75%**
J16 PREF OP	32	18	0	**50**	28	5	2	**34**	60	6	2	**69**	**572**	**-323**	**-36.11%**
J16 PREF OP MIT.	36	15	0	**51**	28	5	2	**35**	60	7	2	**69**	**583**	**-313**	**-34.93%**

TFS023

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	25	10	1	**36**	52	10	7	**69**	103	19	3	**125**	**958**	**TO DM**	**TO DM**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	98	19	0	**116**	83	13	6	**102**	118	16	6	**140**	**1427**	**469**	**48.92%**
J16 OP4	25	10	1	**36**	52	10	7	**69**	103	19	3	**125**	**958**	**0**	**0.00%**
J16 OP5	25	10	1	**36**	52	10	7	**69**	103	19	3	**125**	**958**	**0**	**0.00%**
J16 OP7	25	10	1	**36**	52	10	7	**69**	103	19	3	**125**	**958**	**0**	**0.00%**
J16 PREF OP	53	16	0	**70**	52	10	5	**67**	90	14	3	**106**	**967**	**9**	**0.93%**
J16 PREF OP MIT.	53	16	0	**69**	52	10	5	**67**	90	13	3	**106**	**967**	**9**	**0.97%**

TFS024

2037	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	1200	378	108	**1686**	1075	219	143	**1437**	1668	284	40	**1993**	**20294**	**TO DM**	**TO DM**
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20323**	**28**	**0.14%**
J16 OP4	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20323**	**28**	**0.14%**
J16 OP5	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20323**	**28**	**0.14%**
J16 OP7	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20323**	**28**	**0.14%**
J16 PREF OP	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20323**	**28**	**0.14%**
J16 PREF OP MIT.	1200	378	108	**1686**	1076	219	143	**1438**	1675	285	40	**2000**	**20322**	**28**	**0.14%**

A55 J15 & J16 Improvement Options
AADT Flows
2051: TFS001 to TFS024

TFS001

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 OP1	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 OP2	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 OP3	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 OP5	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 OP6	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 PREF OP	2741	716	231	**3688**	2003	499	346	**2848**	3027	573	192	**3792**	**40575**	**0**	**0.00%**
J15 PREF OP MIT.	2741	716	231	**3688**	2003	499	346	**2848**	3027	572	192	**3791**	**40575**	**0**	**0.00%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS002

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	119	27	6	**152**	82	16	8	**106**	103	17	8	**127**	**1505**	**3773**	**250.73%**
J15 OP1	402	64	19	**485**	304	57	28	**388**	359	64	26	**449**	**5277**	**3773**	**250.73%**
J15 OP2	104	23	6	**133**	53	13	7	**73**	81	14	8	**103**	**1150**	**-354**	**-23.54%**
J15 OP3	151	31	7	**188**	115	21	10	**146**	201	33	10	**244**	**2234**	**730**	**48.49%**
J15 OP5	117	26	6	**149**	80	16	8	**104**	101	18	8	**126**	**1480**	**-25**	**-1.64%**
J15 OP6	118	26	6	**150**	81	16	8	**105**	102	18	8	**127**	**1492**	**-13**	**-0.86%**
J15 PREF OP	116	26	6	**147**	79	16	8	**102**	100	17	8	**125**	**1457**	**-47**	**-3.15%**
J15 PREF OP MIT.	117	26	5	**148**	79	16	8	**103**	101	18	8	**127**	**1471**	**-34**	**-2.27%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS003

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	243	42	4	**289**	118	20	9	**147**	135	23	5	**164**	**2237**	**-232**	**-10.37%**
J15 OP1	247	38	8	**293**	91	17	9	**117**	116	21	16	**153**	**2005**	**-232**	**-10.37%**
J15 OP2	215	33	4	**252**	85	15	9	**109**	110	18	5	**134**	**1788**	**-450**	**-20.11%**
J15 OP3	260	48	6	**313**	121	21	9	**152**	155	31	5	**192**	**2415**	**178**	**7.94%**
J15 OP5	243	42	4	**289**	121	20	9	**150**	135	23	5	**164**	**2255**	**18**	**0.80%**
J15 OP6	215	33	4	**252**	85	15	9	**109**	110	18	5	**133**	**1785**	**-453**	**-20.23%**
J15 PREF OP	227	37	4	**268**	110	19	9	**138**	135	23	5	**164**	**2121**	**-116**	**-5.20%**
J15 PREF OP MIT.	227	37	4	**268**	110	19	9	**138**	135	23	5	**164**	**2121**	**-116**	**-5.20%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS004

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2378	648	221	**3247**	1803	463	329	**2594**	2789	533	179	**3501**	**36833**	**0**	**0.00%**
J15 OP1	2657	691	237	**3584**	1999	501	343	**2843**	2879	555	204	**3637**	**39811**	**2978**	**8.09%**
J15 OP2	2421	660	221	**3302**	1865	472	329	**2667**	2835	540	179	**3555**	**37637**	**804**	**2.18%**
J15 OP3	2330	638	218	**3186**	1767	456	326	**2550**	2671	508	177	**3356**	**35926**	**-907**	**-2.46%**
J15 OP5	2381	648	221	**3250**	1802	463	329	**2594**	2790	532	179	**3502**	**36840**	**7**	**0.02%**
J15 OP6	2407	656	221	**3285**	1837	468	329	**2635**	2815	536	180	**3531**	**37299**	**466**	**1.26%**
J15 PREF OP	2398	653	221	**3273**	1815	464	329	**2608**	2792	532	179	**3503**	**36997**	**164**	**0.44%**
J15 PREF OP MIT.	2392	652	222	**3266**	1815	465	329	**2609**	2790	532	179	**3501**	**36979**	**146**	**0.40%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS005

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	70	12	3	**85**	95	24	7	**126**	94	11	0	**105**	**1411**	**TO DM**	**TO DM**
J15 OP1	63	13	2	**78**	91	19	2	**112**	161	20	0	**182**	**1533**	**122**	**8.65%**
J15 OP2	99	19	3	**121**	148	32	7	**187**	138	19	0	**157**	**2082**	**671**	**47.55%**
J15 OP3	69	12	3	**84**	114	26	7	**147**	167	20	0	**187**	**1810**	**399**	**28.27%**
J15 OP5	70	12	3	**85**	95	24	7	**126**	93	11	0	**104**	**1408**	**-3**	**-0.24%**
J15 OP6	86	16	3	**105**	121	28	7	**156**	118	16	0	**134**	**1754**	**343**	**24.34%**
J15 PREF OP	74	12	3	**89**	96	24	6	**126**	93	11	0	**104**	**1420**	**9**	**0.62%**
J15 PREF OP MIT.	70	12	3	**85**	96	24	6	**126**	93	11	0	**104**	**1408**	**-3**	**-0.19%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS006

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	70	12	3	**85**	95	24	7	**126**	94	11	0	**105**	**1411**	**TO DM**	**TO DM**
J15 OP1	63	13	2	**78**	91	19	2	**112**	161	20	0	**182**	**1533**	**122**	**8.65%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**-1411**	**-100.00%**
J15 OP3	69	12	3	**84**	114	26	7	**147**	167	20	0	**187**	**1810**	**399**	**28.27%**
J15 OP5	70	12	3	**85**	95	24	7	**126**	93	11	0	**104**	**1408**	**-3**	**-0.24%**
J15 OP6	86	16	3	**105**	121	28	7	**156**	118	16	0	**134**	**1754**	**343**	**24.34%**
J15 PREF OP	74	12	3	**89**	96	24	6	**126**	93	11	0	**104**	**1420**	**9**	**0.62%**
J15 PREF OP MIT.	70	12	3	**85**	96	24	6	**126**	93	11	0	**104**	**1408**	**-3**	**-0.19%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS007

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	363	68	9	**440**	200	37	17	**254**	238	40	13	**291**	**3742**	**TO DM**	**TO DM**
J15 OP1	586	93	19	**697**	382	69	37	**488**	463	81	20	**565**	**6850**	**3108**	**83.05%**
J15 OP2	320	56	9	**385**	138	27	17	**182**	191	32	13	**237**	**2938**	**-804**	**-21.49%**
J15 OP3	410	78	13	**501**	236	43	20	**298**	356	65	15	**435**	**4649**	**907**	**24.25%**
J15 OP5	360	68	9	**437**	201	36	17	**254**	236	40	13	**290**	**3735**	**-7**	**-0.18%**
J15 OP6	334	60	9	**403**	166	31	17	**214**	212	36	12	**260**	**3276**	**-466**	**-12.45%**
J15 PREF OP	343	63	9	**415**	188	35	17	**240**	235	40	13	**288**	**3578**	**-164**	**-4.37%**
J15 PREF OP MIT.	348	63	9	**420**	189	35	17	**241**	236	41	13	**290**	**3602**	**-140**	**-3.75%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS008

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	330	55	14	**398**	279	46	18	**343**	359	56	6	**421**	**4664**	**TO DM**	**TO DM**
J15 OP1	162	30	12	**204**	150	27	12	**189**	267	47	5	**319**	**2803**	**-1860**	**-39.89%**
J15 OP2	319	51	14	**384**	273	45	18	**336**	361	56	6	**423**	**4588**	**-76**	**-1.63%**
J15 OP3	361	60	17	**439**	269	47	21	**337**	380	68	8	**457**	**4832**	**168**	**3.60%**
J15 OP5	332	55	14	**402**	283	46	18	**347**	361	56	6	**423**	**4707**	**43**	**0.92%**
J15 OP6	319	51	14	**384**	272	44	18	**334**	360	56	6	**421**	**4570**	**-94**	**-2.01%**
J15 PREF OP	322	52	14	**387**	274	45	18	**337**	362	56	6	**424**	**4607**	**-56**	**-1.21%**
J15 PREF OP MIT.	320	51	14	**385**	275	44	18	**337**	361	55	6	**422**	**4596**	**-68**	**-1.46%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS009

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	329	52	15	**395**	293	47	19	**359**	402	69	6	**478**	**4945**	TO DM	TO DM
J15 OP1	159	30	9	**197**	152	26	9	**187**	284	48	3	**334**	**2822**	**-2122**	**-42.92%**
J15 OP2	343	57	15	**414**	303	48	19	**370**	404	69	6	**480**	**5075**	**131**	**2.64%**
J15 OP3	360	58	18	**436**	278	48	22	**347**	387	68	8	**463**	**4916**	**-29**	**-0.58%**
J15 OP5	331	53	15	**399**	292	47	19	**358**	404	69	6	**479**	**4952**	**8**	**0.16%**
J15 OP6	342	57	15	**413**	302	48	19	**369**	404	69	7	**480**	**5064**	**120**	**2.42%**
J15 PREF OP	345	58	15	**417**	304	49	19	**372**	406	69	6	**481**	**5098**	**153**	**3.10%**
J15 PREF OP MIT.	343	57	15	**415**	304	48	19	**371**	404	68	6	**478**	**5079**	**134**	**2.71%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS010

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	TO DM	TO DM
J15 OP1	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 OP2	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 OP3	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 OP5	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 OP6	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 PREF OP	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J15 PREF OP MIT.	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3820**	**41787**	**-4**	**-0.01%**
J16 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP4	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP7	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**

TFS011

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J16 OP4	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J16 OP5	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J16 OP7	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J16 PREF OP	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3821**	**41790**	**0**	**0.00%**
J16 PREF OP MIT.	2753	703	239	**3695**	2126	527	354	**3007**	3047	579	194	**3820**	**41787**	**-4**	**-0.01%**

TFS012

2051	AM				IP				PM				AADT	DIFF.	% DIFF.
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		TO DM	TO DM
DM	123	37	17	**177**	79	15	11	**105**	109	21	12	**142**	**1605**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1491**	**-113**	**-7.07%**
J16 OP4	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1491**	**-113**	**-7.07%**
J16 OP5	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1491**	**-113**	**-7.06%**
J16 OP7	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1491**	**-113**	**-7.06%**
J16 PREF OP	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1491**	**-113**	**-7.07%**
J16 PREF OP MIT.	116	31	17	**164**	77	13	11	**101**	93	20	12	**125**	**1493**	**-112**	**-6.98%**

TFS013

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	52	12	30	**94**	48	9	26	**83**	109	16	23	**148**	**1268**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	62	15	31	**107**	61	14	27	**103**	150	24	28	**202**	**1605**	**337**	**26.59%**
J16 OP4	52	12	30	**94**	48	9	26	**83**	109	16	23	**148**	**1266**	**-2**	**-0.15%**
J16 OP5	63	16	31	**110**	64	14	27	**105**	153	25	28	**207**	**1641**	**373**	**29.40%**
J16 OP7	63	16	31	**110**	64	14	27	**105**	153	25	28	**207**	**1641**	**373**	**29.40%**
J16 PREF OP	62	15	31	**107**	61	14	27	**103**	150	24	28	**202**	**1605**	**337**	**26.59%**
J16 PREF OP MIT.	62	15	30	**107**	61	14	27	**102**	150	24	28	**202**	**1600**	**332**	**26.17%**

TFS014

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	2578	654	192	**3424**	1999	503	317	**2819**	2829	542	159	**3530**	**38917**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2576	656	191	**3424**	1988	500	316	**2803**	2805	536	154	**3494**	**38694**	**8078**	**-0.58%**
J16 OP4	2585	660	192	**3437**	2001	505	317	**2823**	2845	544	159	**3548**	**39033**	**8417**	**0.30%**
J16 OP5	2574	656	191	**3421**	1985	500	316	**2801**	2801	535	154	**3489**	**38658**	**8042**	**-0.67%**
J16 OP7	2574	656	191	**3421**	1985	500	316	**2801**	2801	535	154	**3489**	**38658**	**8042**	**-0.67%**
J16 PREF OP	2445	856	202	**3503**	1988	500	316	**2803**	2805	536	154	**3494**	**38888**	**8272**	**-0.08%**
J16 PREF OP MIT.	2576	656	191	**3423**	1987	500	316	**2803**	2804	535	153	**3492**	**38687**	**8072**	**-0.59%**

TFS015

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	327	63	33	**423**	273	45	17	**336**	352	62	13	**427**	**4693**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	292	62	34	**388**	259	46	18	**323**	366	66	16	**447**	**4584**	**865**	**-2.33%**
J16 OP4	327	63	33	**422**	273	45	17	**336**	352	62	13	**427**	**4691**	**973**	**-0.04%**
J16 OP5	331	64	34	**429**	277	47	18	**342**	362	67	18	**447**	**4812**	**1094**	**2.53%**
J16 OP7	331	64	34	**429**	277	47	18	**342**	362	67	18	**447**	**4812**	**1094**	**2.53%**
J16 PREF OP	341	67	34	**441**	291	50	19	**360**	397	69	19	**485**	**5086**	**1368**	**8.38%**
J16 PREF OP MIT.	341	66	34	**441**	291	50	19	**360**	397	69	19	**485**	**5086**	**1368**	**8.38%**

TFS016

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	123	32	1	**156**	69	19	8	**95**	90	16	9	**114**	**1398**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	241	45	15	**301**	146	34	11	**191**	160	33	10	**204**	**2698**	**1300**	**93.03%**
J16 OP4	275	45	15	**335**	160	33	10	**204**	146	30	7	**183**	**2805**	**1408**	**100.73%**
J16 OP5	280	46	15	**342**	164	35	11	**210**	156	35	12	**203**	**2926**	**1529**	**109.38%**
J16 OP7	280	46	15	**342**	164	35	11	**210**	156	35	12	**203**	**2926**	**1529**	**109.38%**
J16 PREF OP	284	49	15	**349**	170	37	11	**218**	180	36	12	**227**	**3072**	**1674**	**119.81%**
J16 PREF OP MIT.	284	49	15	**348**	171	36	11	**218**	180	35	12	**227**	**3073**	**1675**	**119.88%**

TFS017

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	2939	710	224	**3874**	2273	548	335	**3155**	3146	593	169	**3909**	**43530**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	2627	674	210	**3511**	2100	512	323	**2935**	3010	568	159	**3738**	**40579**	**-2951**	**-6.78%**
J16 OP4	2940	711	224	**3875**	2273	548	335	**3155**	3155	594	169	**3918**	**43564**	**33**	**0.08%**
J16 OP5	2940	711	224	**3875**	2273	548	335	**3156**	3155	594	169	**3918**	**43566**	**35**	**0.08%**
J16 OP7	2940	711	224	**3875**	2273	548	335	**3156**	3155	594	169	**3918**	**43566**	**35**	**0.08%**
J16 PREF OP	2632	674	210	**3516**	2108	513	324	**2945**	3022	569	161	**3752**	**40708**	**-2822**	**-6.48%**
J16 PREF OP MIT.	2632	673	210	**3515**	2108	514	324	**2946**	3022	569	160	**3751**	**40708**	**-2822**	**-6.48%**

TFS018

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	1666	265	105	**2036**	1179	295	184	**1657**	1460	272	128	**1861**	**22267**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1668	266	105	**2039**	1180	295	184	**1659**	1461	272	128	**1862**	**22289**	**22**	**0.10%**
J16 OP4	1666	265	105	**2036**	1179	295	184	**1657**	1460	272	128	**1861**	**22266**	**-1**	**0.00%**
J16 OP5	1666	265	105	**2036**	1179	295	184	**1657**	1460	272	128	**1861**	**22269**	**2**	**0.01%**
J16 OP7	1666	265	105	**2036**	1179	295	184	**1657**	1460	272	128	**1861**	**22269**	**2**	**0.01%**
J16 PREF OP	1668	266	105	**2039**	1180	295	184	**1659**	1461	272	128	**1862**	**22289**	**22**	**0.10%**
J16 PREF OP MIT.	1668	266	105	**2039**	1180	295	184	**1659**	1461	272	128	**1861**	**22290**	**23**	**0.11%**

TFS019

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	199	54	48	**302**	157	29	39	**225**	254	43	30	**327**	**3314**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	201	52	49	**302**	169	32	40	**241**	278	50	35	**363**	**3538**	**224**	**6.75%**
J16 OP4	192	49	48	**289**	155	27	39	**221**	238	41	30	**309**	**3199**	**-115**	**-3.48%**
J16 OP5	203	53	49	**305**	171	32	40	**243**	282	51	35	**367**	**3574**	**260**	**7.83%**
J16 OP7	203	53	49	**305**	171	32	40	**243**	282	51	35	**367**	**3574**	**260**	**7.83%**
J16 PREF OP	201	52	49	**302**	169	32	40	**241**	278	50	35	**363**	**3538**	**224**	**6.76%**
J16 PREF OP MIT.	201	53	49	**303**	169	33	40	**242**	278	49	35	**362**	**3547**	**233**	**7.02%**

TFS020

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	22	26	23	**71**	19	4	24	**47**	42	13	12	**66**	**704**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	59	25	23	**107**	45	6	24	**75**	52	16	13	**82**	**1037**	**333**	**47.34%**
J16 OP4	15	21	23	**59**	18	1	24	**42**	26	11	12	**49**	**591**	**-113**	**-16.09%**
J16 OP5	21	24	23	**69**	30	5	24	**59**	59	16	12	**87**	**845**	**141**	**19.97%**
J16 OP7	21	24	23	**69**	30	5	24	**59**	59	16	12	**87**	**845**	**141**	**19.97%**
J16 PREF OP	10	21	23	**54**	13	2	23	**38**	21	13	11	**44**	**535**	**-170**	**-24.08%**
J16 PREF OP MIT.	10	21	23	**54**	14	2	23	**39**	21	12	10	**43**	**538**	**-166**	**-23.59%**

TFS021

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	9	15	23	**47**	9	0	23	**32**	20	8	11	**39**	**455**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	8	15	23	**46**	9	0	23	**31**	11	7	11	**29**	**421**	**-34**	**-7.56%**
J16 OP4	8	15	23	**46**	9	0	23	**31**	11	7	11	**29**	**421**	**-34**	**-7.56%**
J16 OP5	8	15	23	**46**	9	0	23	**31**	11	7	11	**29**	**421**	**-34**	**-7.56%**
J16 OP7	8	15	23	**46**	9	0	23	**31**	11	7	11	**29**	**421**	**-34**	**-7.56%**
J16 PREF OP	8	15	23	**46**	9	0	23	**31**	11	7	11	**29**	**421**	**-34**	**-7.56%**
J16 PREF OP MIT.	8	14	23	**45**	8	0	23	**31**	12	7	10	**29**	**414**	**-41**	**-8.99%**

TFS022

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	43	19	1	**63**	46	14	3	**63**	99	20	1	**120**	**961**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	39	17	0	**56**	29	6	2	**37**	65	8	2	**75**	**624**	**-337**	**-35.10%**
J16 OP4	50	25	1	**76**	47	16	3	**66**	107	21	1	**129**	**1047**	**85**	**8.89%**
J16 OP5	51	24	1	**75**	46	16	3	**65**	117	18	1	**136**	**1054**	**93**	**9.67%**
J16 OP7	51	24	1	**75**	46	16	3	**65**	117	18	1	**136**	**1054**	**93**	**9.67%**
J16 PREF OP	39	18	0	**57**	29	6	2	**37**	65	8	2	**75**	**629**	**-332**	**-34.56%**
J16 PREF OP MIT.	38	18	0	**56**	29	6	2	**37**	65	8	2	**75**	**625**	**-337**	**-35.02%**

TFS023

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	27	13	1	**40**	56	12	8	**76**	111	23	3	**138**	**1054**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	106	22	0	**128**	87	16	6	**110**	127	20	6	**153**	**1551**	**497**	**47.17%**
J16 OP4	27	13	1	**40**	56	12	8	**76**	111	23	3	**138**	**1053**	**-1**	**-0.09%**
J16 OP5	27	13	1	**40**	56	12	8	**76**	111	23	3	**138**	**1053**	**-1**	**-0.09%**
J16 OP7	27	13	1	**40**	56	12	8	**76**	111	23	3	**138**	**1053**	**-1**	**-0.09%**
J16 PREF OP	58	20	0	**77**	56	12	5	**73**	97	16	3	**116**	**1060**	**6**	**0.57%**
J16 PREF OP MIT.	57	20	0	**77**	57	11	5	**73**	96	16	3	**115**	**1056**	**3**	**0.27%**

TFS024

2051	AM				IP				PM				AADT		%
	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT	Car	LGV	HGV	TOT		DIFF.	DIFF.
DM	1300	458	120	**1878**	1150	266	159	**1574**	1798	344	44	**2186**	**22317**	TO DM	TO DM
J15 OP1	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP2	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP3	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP5	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 OP6	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J15 PREF OP MIT.	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**0.00%**
J16 OP3	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2196**	**22350**	**33**	**0.15%**
J16 OP4	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2196**	**22350**	**33**	**0.15%**
J16 OP5	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2196**	**22350**	**33**	**0.15%**
J16 OP7	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2196**	**22350**	**33**	**0.15%**
J16 PREF OP	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2196**	**22350**	**33**	**0.15%**
J16 PREF OP MIT.	1301	458	120	**1879**	1150	266	159	**1575**	1806	345	44	**2195**	**22351**	**33**	**0.15%**

APPENDIX 2.2
CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (PRECEMP)

1 INTRODUCTION

1.1 Purpose of this Report

1.1.1 This document is a Pre-Construction Environmental Management Plan (Pre-CEMP) and it sets out expected environmental obligations / measures that would be adopted during the construction phase in order to manage the environmental impact of the works. This Pre-CEMP will form the basis of the full CEMP which is expected to be produced by the appointed contractor and it will be more targeted and specific to the proposed works.

1.1.2 The appointed contractor's CEMP will be issued to Statutory Bodies for comment/review prior to any construction commencing on site.

1.2 Proposed Development

1.2.1 The proposed development comprises two major single carriageway improvement schemes for the A55 at Junctions 15 and Junctions 16.

1.2.2 Further details on the project history and proposed scheme are included in the Environmental Statement Chapters 1 and 2[1] for this project and in the same chapters of the ES for the Junction 16 project.

2 OUTLINE SITE WASTE MANAGEMENT PLAN

2.1 Introduction

Purpose

2.1.1 The purpose of the Outline Site Waste Management Plan (SWMP) is to set out proposals for the identification, segregation, handling and storage of different types of wastes identified as arising from the works. These wastes (by quantity/type/chemical composition/EWC code, etc.) will be recorded and their disposal route, including the place of their final disposal shall be reported in the CEMP.

2.1.2 The aim of using a SWMP is to minimise the amount of waste produced due to activities as a result of the project, minimising environmental impacts and maximising cost savings. The Client shall take all reasonable steps to ensure all waste from this site shall be dealt with in accordance with the waste duty of care in section 34 of the Environmental Protection (Duty of Care Regulations 1991 (b) and materials will be handled efficiently, and waste managed appropriately.

2.2 Regulatory Framework

Definition of Waste

2.2.1 Waste is defined in Article 1 (1) (a) of the Waste Framework Directive (2006/12/EC) and means….'*any substance or object …. which the holder discards or intends or is required to discard*'. All waste that falls within the scope of this definition will be recorded in the SWMP.

[1], ES - Chapter 1: Introduction; and Chapter 2: The Project

"*Holder' means the producer of the waste or the natural or legal person who is in possession of it'*. It rests, in the first place, with the producer or holder of a substance or object to decide whether it is being discarded and is waste.

2.2.2 Waste is widely defined and includes excess unwanted materials, effluents, unwanted surplus substances arising from the application of any process and any substance or article which is broken, worn out, contaminated or otherwise damaged. Waste becomes controlled by legislation when it is discarded by the holder. Materials being returned to the company stores or supplier for credit are not considered as waste. Materials sold for re-use or re-cycling are still classified as waste and subject to all the statutory controls, including Duty of Care.

2.2.3 Waste can cease to be waste once it has achieved 'Final Recovery'. This is when the waste material (in the view of the Regulator) has been incorporated into a final product.

2.3 Legislation and Guidance

2.3.1 A list of relevant current legislation and guidance is given below:

- Control of Pollution (Amendment) Act 1989
- Environmental Protection Act 1990
- The Controlled Waste (Registration of Carriers and Seizure of Vehicles) (Amendment) Regulations (1998)
- Environmental Protection (Duty of Care) Regulations 1991
- Environment Act 1995
- Landfill (England and Wales) Regulations 2005
- Hazardous Waste Regulations 2005
- The Environmental Permitting (England and Wales) Regulations 2016
- Site Waste Management Plans Regulations 2008 (have now been revoked)
- Waste Minimisation in Construction – Site Guide, CIRIA Special Publication 133 (1997)
- Waste Management – the Duty of Care, Code of Practice (2018)
- Landfill (England and Wales) Regulations 2011
- The Waste (England and Wales) (Amendment) Regulations 2012
- The Well-being of Future Generations (Wales) Act 2015
- National Policy: Planning Policy Wales (Edition 9), November 2016
- National Policy: Towards Zero Waste, One Wales: One Planet 2010 (Welsh Assembly Government, 2010)

- Technical Advice Note 21: Waste, 2014
- WRAP Cymru Delivery Plan: 2011-15 For a World Without Waste
- Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (2009)
- EU Waste Framework Directive 2008/98/EC
- CL:AIRE - The Definition of Waste: Development Industry Code of Practice Version 2, 2011

2.4 Waste Arisings

Waste Forecasting

2.4.1 In order to identify the types of waste generated by the proposed development, the construction programme will be divided into the following key activities that have the potential to generate waste:

A. Site clearance

B. Earthworks

C. Construction / Installation of pavement

Waste Types

2.4.2 The key waste streams produced on site can be classified as:

INERT	waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater. Examples of inert wastes are rocks, concrete, mortar, glass, uncontaminated soils and aggregates.
NON-HAZARDOUS	any waste that is neither hazardous nor inert is non-hazardous. Examples of non-hazardous wastes include timber, paper and cardboard.
HAZARDOUS	waste that is harmful to human health or the environment (for example, pollution of watercourses) and displays one or more of the hazardous properties listed in Annex III of the EU Waste Framework Directive 2008/98/EC (explosive, flammable, poisonous, toxic, ecotoxic, carcinogenic, mutagenic, corrosive, infectious substances).

2.4.3 The waste generated during construction is to be assigned a European Waste Catalogue code. A list of potentially relevant codes is provided in the table below, however the contractor will need to confirm any further relevant codes in the SWMP. These codes are to be provided on each waste transfer note that would accompany every movement of waste from the site.

Table 1 List of Waste Categories for Construction Wastes

17 Construction and demolition wastes (including excavated soil from contaminated sites)
17 01 Concrete, bricks, tiles and ceramics
17 01 01 Concrete
17 01 02 Bricks
17 01 03 Tiles and ceramics
17 01 06* Mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing dangerous substances
17 01 07 Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02 Wood, glass and plastic
17 02 01 Wood
17 02 02 Glass
17 02 03 Plastic
17 02 04* Glass, plastic and wood containing or contaminated with dangerous substances
17 03 Bituminous mixtures, coal tar and tarred products
17 03 01* Bituminous mixtures containing coal tar
17 03 02 Bituminous mixtures other than those mentioned in 17 03 01
17 03 03* Coal tar and tarred products
17 04 Metals (including their alloys)
17 04 01 Copper, bronze, brass
17 04 02 Aluminium
17 04 03 Lead

17 Construction and demolition wastes (including excavated soil from contaminated sites)
17 04 04 Zinc
17 04 05 Iron and steel
17 04 06 Tin
17 04 07 Mixed metals
17 04 09* Metal waste contaminated with dangerous substances
17 04 10* Cables containing oil, coal tar and other dangerous substances
17 04 11 Cables other than those mentioned in 17 04 10
17 05 Soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03* Soil and stones containing dangerous substances
17 05 04 Soil and stones other than those mentioned in 17 05 03
17 05 05* Dredging spoil containing dangerous substances
17 05 06 Dredging spoil other than those mentioned in 17 05 05
17 05 07* Track ballast containing dangerous substances
17 06 Insulation materials and asbestos–containing construction materials
17 06 01* Insulation materials containing asbestos
17 06 03* Other insulation materials consisting of or containing dangerous substances
17 06 04 Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05* Construction materials containing asbestos
17 08 Gypsum – based construction material
17 08 01* Gypsum–based construction materials contaminated with dangerous substances
17 08 02 Gypsum–based construction materials other than those mentioned in 17 08 01
17 09 Other construction and demolition wastes
17 09 01* Construction and demolition wastes containing mercury

17 Construction and demolition wastes (including excavated soil from contaminated sites)
17 09 02* Construction and demolition wastes containing PCB (for example PCB–containing sealants, PCB–containing resin–based floorings, PCB–containing sealed glazing units, PCB–containing capacitors)
17 09 03* Other construction and demolition wastes (including mixed wastes) containing dangerous substances
17 09 04 Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03

Estimated Waste Arisings

2.4.4 The estimated waste arisings during the various project activities are presented in the table 2 below (as presented in Chapter 16 of the Environmental Statement)[2].

Table 2 Summary of waste arisings

Project Activity	**Waste arisings from the project**	**Quantities of waste arisings**	**Additional information on waste arisings**
Site clearance	Vegetation surface strip, kerbs, trees, traffic signs, lighting etc.	Quantities not available at this stage.	Likely to be a combination of locally recycled, disposal at an inert or non-hazardous landfill site.
Earthworks	Excess Topsoil	XXXm^3	To be used in landscaping where possible. If necessary, likely to be local recycling facilities.
	Excess Subsoil	XXXm3	To be reused in land restoration to agriculture or habitat creation.
	Surplus excavated material (acceptable and unacceptable materials)	XXXm3	It is anticipated that the earthworks part of the balance would be neutral. This is considered to be achievable provided that the

[2] Environmental Statement Chapter 16: Materials

Project Activity	Waste arisings from the project	Quantities of waste arisings	Additional information on waste arisings
			excavated materials are suitably excavated and stockpiled for reuse.
Installation of pavement	Surface planings	Tie-ins at both ends of the Scheme.	Potential to be reused for access tracks to attenuation ponds and private means of access tracks.
Installation of manufactured products	No significant waste arisings.	No significant waste arisings.	
Operation of the road	No significant waste arisings.	No significant waste arisings.	

*Please note that these figures are based on the estimates made at the current preliminary design stage.

2.5 Management of waste

Waste Hierarchy

2.5.1 Construction waste generated from the scheme will be managed according to the principles of the waste hierarchy which ranks waste management options according to environmental impact. The waste hierarchy indicates "waste prevention" as the best outcome for the environment and "disposal" as the least favoured.

2.5.2 The SWMP will set out how waste will be managed throughout each stage of the project. Prior to the commencement of site development, the Contractor will identify suitable waste management contractors and investigate opportunities to recycle other materials.

Prevention

2.5.3 The Contractor will ensure that waste is prevented where possible by using less material in design and manufacture and only ordering quantities of material required.

2.5.4 The SWMP will record identified measures to be implemented to prevent and minimise the quantity of waste produced during the project. The following measures have been identified as ways of preventing and minimising the quantity of waste produced during this project:

A. Using the material in design and manufacture;

B. Keeping products for longer; re use; and

C. Using less hazardous materials.

2.5.5 The Materials Management Plan (see Section 3 of this document) sets out the procedure for managing the materials and identifies how the materials will be managed in order to minimise the amount of waste generated.

Re-use

2.5.6 The Contractor will ensure that any waste generated on site will be segregated and re-used where possible in accordance with the waste hierarchy and in accordance with applicable waste regulations (The Waste (England and Wales) (Amendment) Regulations 2012, The Site Waste Management Plan Regulations 2008, CL:AIRE - The Definition of Waste: Development Industry Code of Practice V2 2011). The materials that have the potential to be re-used on site have been identified to include earthworks material and demolition material. Reuse is subject to confirmation of materials requirement at the next design phase. Re-usable materials will be identified on site and removed for storage and re-sale. The SWMP will detail the estimated quantities of waste material and the opportunities for reuse, recycling, recovery or disposal.

Recycling

2.5.7 Any recyclable materials will be removed from site for processing in licenced facilities. Recycling facilities in the vicinity of the proposed scheme location will be identified by the Contractor. Only appropriately qualified and licensed waste management facilities would be used as a requirement of this SWMP. There is potential for the available sites for recycling, reprocessing and disposal to change and it is the responsibility of the Contractor to evaluate the waste management market and identify suitable options.

Recovery

2.5.8 Opportunities for the recovery of waste generated by the scheme will be considered by the Contractor. Recoverable materials will be removed from site for processing in licenced facilities.

Disposal

2.5.9 Any waste that cannot be prevented, re-used, recycled or recovered, will be disposed of in a responsible manner.

2.5.10 Local waste management facilities will be identified and assessed by the Contractor to ensure adequate capacity for the waste generated by the proposed scheme. It is not anticipated that there will be a large amount of waste associated with the proposed scheme.

2.5.11 Details on requirements for waste transportation (including consignment notes in line with Duty of Care) are provided below.

Storage of Waste

2.5.12 Under the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations, it is a criminal offence for anyone who is not registered as a waste carrier to transport controlled waste.

2.5.13 All waste carriers to be used on the Contract should hold a carrier's licence. Confirmation will be obtained from the NRW that all carriers' registrations are currently valid, and the evidence filed in the Contract Filing System. This will be carried out by the Contractor, who is considered to be the waste producer in this instance.

2.5.14 At the site compounds the waste will be stored in an appropriate, clearly labelled container. The Waste Champion will maximise the recycling opportunities and ensure that waste streams are separated to facilitate this.

2.5.15 Hazardous waste will be sufficiently described by the Contractor (or their consultants) to waste contractors to enable them to comply with any labelling etc. requirements under the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations.

2.5.16 All materials brought to site will be stored and handled appropriately to minimise unnecessary wastage. Any site welfare facilities will be equipped with sufficient waste disposal containers for their needs, including recycling containers for plastic and cans.

2.5.17 Any sewage from welfare facilities and site toilets that is stored on site (i.e. tanks); will be collected and disposed of by licensed carrier.

2.6 Waste Management Options

2.6.1 It is proposed that all materials arising from construction would be managed in accordance with the waste hierarchy defined within the Waste Framework Directive.

2.6.2 Site clearance would include clearing existing trees, safety barriers, concrete kerbs, lighting columns, and traffic signs. The materials would be segregated and appropriately reused and/or recycled wherever possible. Materials that cannot be reused or recycled will be segregated and disposed of at an appropriate waste handling facility.

2.6.3 Earthworks estimates predict a balance of the majority of earthworks materials but a surplus of some 20,000m3 of topsoil3. If removal of materials from site is required, the location for the disposal of these materials is likely to include a combination of local recycling facilities and disposal at an inert or non-hazardous landfill site. It is anticipated that a local recycling facility would be favoured.

2.6.4 It is proposed that all materials/arisings from construction should, if possible, be reused on site in accordance with the waste management hierarchy defined within the waste framework directive. There may be some waste associated with the works which cannot be reused on site. This may include waste generated from the demolition of any

[3] Environmental Statement Chapter 16: Materials

existing drainage and lighting infrastructure or barriers which would be replaced. The export of excess construction materials may have an impact on sites receiving the material. The facilities to which material would be taken are likely to be established recycling facilities or landfill sites and are therefore considered to have a low to medium sensitivity. The quantities of excess materials requiring disposal are relatively small and would be a very small proportion of the overall construction and demolition waste disposal in the region, therefore the magnitude of impact is assessed to be minor. The significance of effect from construction is therefore slight.

2.6.5 Construction would include milling the surface of the existing pavement at the tie-ins with the existing highway. The surface planings shall be reused where possible in access tracks to attenuation ponds and private means of access tracks, which would result in no impact on material resources. Should the planings are assessed to be hazardous then further assessment will be undertaken for appropriate treatment or disposal.

2.6.6 In general, based on anticipated waste arisings the following processes should be set for the management of waste:

A. Each waste stream is identified, and appropriate storage and disposal measures provided in line with Duty of Care;

B. Wherever practical, waste will be re-used or recycled;

C. A diversion from landfill percentage rate or re-use/recycling target will be set in line with Highways England targets;

D. Only when all other routes are exhausted will waste be sent to landfill, accompanied by a Pre-Treatment Confirmation Form;

E. Targets for re-use and recycling will be recorded at the start of the contract on the Waste Targets and Monitoring Form and monthly progress towards this monitored;

F. The site registers with the NRW as a producer of hazardous waste and obtains a premises code for use on all Consignment Notes;

G. The waste is segregated, secured, labelled and disposed of safely and completely;

H. Waste Transfer Notes are correctly completed for each consignment of inert or non-hazardous waste;

I. Hazardous Waste Consignment Notes are correctly completed for each consignment of hazardous waste.

2.7 Implementation

Training

2.7.1 A training regime focused on the provisions of the SWMP would be implemented for all relevant members of the construction team,

including those carrying out demolition works to ensure their competence in carrying out their duties on the Scheme.

2.7.2 Any SWMP training would be additional to the mandatory training requirements on site Health and Safety.

2.7.3 A general site induction should be developed to introduce all site personnel to the main provisions of the SWMP, important environmental controls associated with the construction of the Scheme and effective delivery of the SWMP (for example, waste storage arrangements, waste segregation at source). A full register of induction attendance would be maintained on site.

2.7.4 Toolbox talks and method statement briefings should be given to the construction (and demolition) teams as work proceeds and would cover the types of wastes produced at each key build stage, and the SWMP controls related to specific activities undertaken during the works. A full register of toolbox talks and method statement briefing attendance would be maintained on site.

2.7.5 All training records ware to be maintained and filed on site. The records would include the content of the training courses (induction and toolbox training), record of attendance and schedule of review.

2.8 Compliance with SWMP

Monitoring

2.8.1 Monitoring of the SWMP would principally be achieved through the completion of the waste management data sheets, which will detail waste arising and subsequent reuse recycle and disposal, and regular inspections of the works areas by the Contractor to ensure that the provisions of the SWMP and control measures outlined in relevant method statements are being implemented. In addition, the Contractor's waste targets will be monitored to confirm compliance and any documentation relating to waste sent to landfill will be monitored for compliance with the Duty of Care.

2.8.2 Duty of Care paperwork documenting the movements of waste from the site (Waste Transfer Notes for Inert and Non-Hazardous Waste and Hazardous Waste Consignment Notes) and the registered carriers' details would be retained.

Review

2.8.3 During the construction process, the SWMP would be reviewed as often as necessary or at least once every three months to ensure that the plan accurately reflects the progress of the Scheme in terms of waste estimates and targets. As part of the review, the Contractor must record the following:

A. The types and volumes of waste produced;

B. Identify on the plan the work area where the waste was removed from; and

C. The types and volumes of waste that have been:

D. re-used (and whether this was on or off site);

E. recycled (and whether this was on or off site);

F. sent for another form of recovery (and whether this was on or off site);

G. sent to landfill; or

H. otherwise disposed of.

I. The location where the waste produced has been sent to.

Report

2.8.4 The contractor should review and report on the performance of the SWMP periodically during the construction phase. This would include confirmation that the plan has been monitored on a regular basis to ensure compliance with the provisions of the SWMP, that the plan was updated accordingly and that any deviations from the plan would be explained. The Contractor would continue to report on the performance of the SWMP on an annual basis throughout the construction period.

2.8.5 In addition to the above, the report would include a comparison of the estimated quantities of each waste type against the actual quantities of each waste type, performance against the scheme standards, as proposed by the Contractor at the start of the scheme, and an estimate of the cost savings achieved by and costs incurred in completing and implementing the plan.

Site Waste Management Plan Checklist

2.8.6 A Waste Summary Table should be completed for each waste material leaving or entering the site. All supporting documentation will be kept in the Contract Filing System.

2.8.7 An example checklist of actions that should be completed at the appropriate time in the contract is included on the following pages.

Site Waste Management Plan Checklist

Questions to consider	**Tick if 'Yes'**	**Comment: If 'yes', what action have you taken/do you propose to take? If 'no', why not?**
Questions 1-21 to be completed before work on site begins		
1. Have you read and understood the company Policies?		
2. Have relevant sub-contractors producing significant waste streams been identified and their competence verified?		
3. Has a careful evaluation of materials been made so that over-ordering and site wastage is reduced?		
4. Have areas suitable for all components and materials been identified to prevent damage during storage?		
5. Has full consideration been given to the use of secondary and recycled materials?		
6. Is unwanted packaging to be returned to the supplier for recycling or re-use?		
7. Can unused materials be returned to purchaser or used on another job?		
8. Has a 'Waste Champion' with responsibility for waste management planning and compliance with environmental legislation been assigned?		
9. Has a contract programme been developed to include likely waste arisings?		
10. Has an area of the site been designated for waste management, including segregation of waste?		
11. Have targets been set for the different types of waste likely to arise from the contract?		
12. Have measures been put in place to deal with expected (and unexpected) hazardous waste? *(Site registered as a hazardous waste producer?).*		

Questions to consider	**Tick if 'Yes'**	**Comment: If 'yes', what action have you taken/do you propose to take? If 'no', why not?**
13. Has disposal of liquid wastes such as wash-down water and sewage been considered?		
14. Have opportunities been considered for re-use of materials on-site?		
15. Have opportunities been considered for re-use of materials off-site?		
16. Have opportunities been considered for on-site processing and re-use of materials?		
17. Have opportunities been considered for reprocessing materials off-site?		
18. Have you identified the most appropriate sites for disposal of residual waste (non-hazardous and hazardous) from the contract?		
19. Do any of the planned waste activities require an environmental permit or an exemption to be registered?		
20. Have copies of all relevant duty of care documentation and other waste related legal documents been obtained and referenced on the Waste Summary Table		
21. Have toolbox talks been planned for all site personnel about waste management on-site?		
Questions 22-29 to be completed during the delivery of the contract on site		
22. Are selected waste materials segregated to allow best value to be obtained from good waste management practices?		
23. Are containers/skips clearly labelled to avoid confusion?		
24. Is the waste being stored securely to prevent any losses, in particular of hazardous substances?		

Questions to consider	**Tick if 'Yes'**	**Comment: If 'yes', what action have you taken/do you propose to take? If 'no', why not?**
25. Are Duty of Care procedures complied with, including provision of transfer/consignment notes and checking authorisation of registered carriers, registered exempt sites and licensed waste management facilities?		
26. Are any checks made that waste is received at the intended site?		
27. Is implementation of agreed waste management procedures monitored?		
28. Are reports regularly produced regarding waste quantities and treatment/disposal routes, and on costs incurred?		
29. During site operations, are barriers to good waste management practice considered and noted for incorporation into the post-completion review?		
Questions 30-32 to be completed once operational activity on site is complete		
30. Has a final report of the use of recycled and secondary materials, waste reduction, segregation, recovery and disposal, with costs and savings identified, been completed?		
31. Have key waste management issues been considered for action at future contracts?		
32. What lessons have been learnt and communicated within the company?		

The above Checklist should be completed by the person responsible for producing the Site Waste Management Plan. If waste is being managed to sufficient standards, the contract should be able to answer 'yes' to all questions.

3 MATERIALS MANAGEMENT OBLIGATIONS

3.1 Introduction

3.1.1 The key to reducing waste lies in the efficient and legally compliant management of materials. The following are examples of onsite procedures will be followed to reduce potential waste being generated from the storage, handling and use of materials.

3.2 Receipt of materials

3.2.1 The Contract Head, as part of the contract management planning activities, shall assign responsibility for the storage and control of materials arriving on the contract.

3.1.2 Upon delivery, materials shall be checked against the delivery note and the purchase order to ensure that they conform to requirements before they are incorporated into the Works.

3.2.3 Any comments / qualifications resulting from accepting or rejecting a delivery are clearly detailed on the delivery note before signing.

3.2.4 Where goods are rejected as unsatisfactory or non-conforming they shall be set aside and clearly identified as 'not for use' and will be returned to the supplier. Purchasing Teams should be made aware of rejection detail and any on-going quality issues with suppliers / materials. The non-conformance report system shall be utilised to report and monitor unacceptable materials.

3.2.5 Where required under the terms of the contract, subcontractors shall operate a suitable quality system designed to ensure that any materials are adequately inspected / verified on receipt for compliance with the specification.

3.3 Handling, Storage and Preservation

3.3.1 Adequate consideration shall be given to the material storage locations on the contract. When determining storage locations, the following shall be considered:

3.3.2 To prevent wastage and damage as well as making the contract safer and easier to manage good housekeeping shall be maintained.

3.3.3 All materials shall be stored in a manner that minimises environmental pollution and wastage. This includes protection from adverse situations likely to cause contamination (weather events). (See Pollution Prevention and Control Management Plan in Section 4 of this document).

3.3.4 To protect susceptible material from contamination; pallets, packaging or blocking pieces shall be used. Loose materials shall be stored in bunkers, containers or separate piles, so that no inadvertent mixing between different grades of types occurs.

3.3.5 Where necessary, materials will be stored so that 'stock rotation' is in effect.

3.3.6 Storage location shall be positioned / located to minimise the handling and moving of material around sites and contracts. This will reduce the level of safety risk, damage and in turn increase efficiency

3.3.7 When lifting or moving materials, appropriate slings chains, forks, lifting appliances, transport and mechanical protection will be used. Loads shall be adequately secured in transit. At all sites, particular attention shall be given to the safety, obstruction or inconvenience to the public and third parties.

3.3.8 All materials shall be handled, stored and protected in accordance with manufacturers / supplier's recommendations.

3.4 Use of Materials within the Contract

3.4.1 The Contractor shall ensure that materials are treated and used as set out in the outline MMP and, at the completion of the works, shall complete all lines of evidence in relation to suitability for reuse, certainty of use and quantity required in the CL:AIRE Materials Management Plan form which will be submitted to the Qualified Person along with all supporting information.

3.4.2 All materials shall be prepared, fixed and used in accordance with the manufacturers / suppliers' recommendations. A request for this information should be clearly communicated to the Supply Chain Function.

3.4.3 Where manufacturer / supplier recommendations are not available materials shall be handled, stored, fixed, used and protected by a method which will avoid damage, deterioration or loss.

3.4.4 Where traceability of materials is required, the Contract Head shall ensure that this is carried out by means of physical location, labelling/marking and/or contract records. The level of traceability required shall be identified within Contract Management Plans and supporting quality inspection regimes.

3.4.5 Any material becoming unacceptable is to be clearly identified and disposed of safely. The non-conformance report system shall be utilised to report and monitor unacceptable materials.

3.5 Material Resources to be Used

3.5.1 A variety of different materials will be required for the construction phase of the Scheme. The Scheme would be designed to prevent, where possible, the generation of waste materials and the import of construction materials by reusing or recycling the available existing materials along the Scheme.

3.5.2 Where possible, site won materials would be reused for the earthworks, however, some materials would be unsuitable for reuse and other materials cannot be sourced on site and would need to be imported.

3.5.3 A summary of the predicted material resources use as detailed in Chapter 15 (Materials) of the Environmental Statement[4] for this junction improvement scheme is presented in Table 3.

Table 3 Summary of materials resource use

Project Activity	**Material resources required for the project**	**Quantities of material resources required**	**Additional information on material resources**
Earthworks	Topsoil	Some XXXm^3* of topsoil would be reused*	Sourced from site
	General fill for embankments – primary or secondary / recycled materials	Some XXXXm^3* of material would be reused in earthworks	Sourced from site
	Capping	Some XXXm^2* of granular selected fill would be used as Capping	Sourced from local suppliers
	Subsoil for land restoration to agriculture or habitat creation/restoration	TBC	Sourced from site
Installation of pavement	Type 1 subbase	XXXm^3*	Sourced from local suppliers
	Base, binder, and surface course. Primary or Secondary / Recycled materials	XXXm^3*	Sourced from local suppliers
Structures	Concrete	TBC	Local batching plants
Installation of manufactured products	Drainage, kerbs, trees, traffic signs, lighting etc.	Various quantities relative to road length and necessary safety measures	To be established local/national suppliers
Operation of the road	No significant material resources required	No significant material resources required	

* Please note that these figures are based on estimates made at the current preliminary design stage (presented in Chapter 15 of the Environmental Statement).

[4] Environmental Statement Chapter 15: Materials

3.6 Supporting Documentation

3.6.1 The following provides a list of the expected documentation requirements to support the completion of an MMP for the scheme:

A. Earthworks Strategy;

B. Land Contamination Management Strategy;

C. Remediation Strategy including a verification plan;

D. Earthworks Specification;

E. Cut/Fill requirements and earthworks movements plan;

F. Design Statement;

G. Qualified Person Declaration;

H. Verification Report;

I. Proforma MM;

J. Soils Management Plan;

K. Logistics Plan;

L. Materials Management Plan Form and Contingency Arrangements Plan;

M. Evidence of regulatory approvals for proposed works.

3.6.2 The other supporting documentation referenced will be prepared separately and references incorporated into the MMP as regulator agreement is obtained. The outline MMP shall be reviewed and updated during detailed design of the proposed scheme.

4 OUTLINE POLLUTION PREVENTION AND CONTROL MANAGEMENT PLAN

4.1 Introduction

Purpose

4.1.1 Measures for minimising pollution risks to prevent pollution incidents occurring as a result of the proposed construction activities are required. This pollution control and prevention plan has been developed to manage these risks.

4.1.2 The purpose of the plan is to identify the main risks of pollution occurring on the site, to identify and implement appropriate pollution prevention measures, and to reduce the effects of any pollution incidents that may occur. The plan should be read in conjunction with the Outline Ground and Surface Water Management Plan (Section 5 of this document).

4.1.3 As the detailed design progresses, the Plan shall be reviewed and updated accordingly. The final Pollution Control and Prevention Plan would be agreed with Natural Resources Wales (NRW) and approved by Conwy County Borough Council Council (CBCC) prior to the start of construction.

4.1.4 The plan shall be implemented throughout the construction process of the scheme and all construction staff would be required to follow its provisions.

A. Legislation and Best Practice

B. Pollution control shall be carried out in accordance with the following:

C. Health and Safety at Work Act. 1974.

D. Control of Substances Hazardous to Health Regulations 2002.

E. Control of Pollution Act 1974.

F. Control of Pollution (Amendment) Act 1989.

G. Control of Major Accident Hazards 1999.

H. Environmental Protection Act 1990.

I. Noise and Statutory Nuisance Act 1993.

J. Town and Country Planning Act 1990.

K. Noise Emission in the Environment by Equipment for Use Outdoors Regulations 2001.

L. Environmental Noise Regulations 2006.

M. Control of Pollution (Oil Storage) (England) Regulations.

N. BS5228-1 :2009 - Part 1 – Noise.

O. BS5228-2 :2009 - Part 2 – Vibration.

P. Water Resources Act 1991.

Q. Water Industry Act 1991.

R. Groundwater (England and Wales) Regulations 2009.

S. Environmental Permitting Regulations 2010 (Amended 2013).

T. Salmon and Freshwater Fisheries Act 1975.

U. Contaminated Land (Wales) Regulations 2006.

V. Environment Agency Pollution Prevention Guidelines (PPG 6) 2012.

4.2 Responsibilities

4.2.1 The project manager shall have overall responsibility for the construction of the new Scheme. An Environmental Co-ordinator (ECO) would be appointed before construction commenced. Their main responsibility would be managing the environmental issues through construction and will be supported on site by a permanent Environmental Clerk of Works (ECoW).

4.2.2 For the purpose of the Outline Pollution Control and Prevention Plan, the key roles are set out in Table 4 below. Additional roles and responsibilities will be developed as the detailed design progresses.

Table 4 Responsibilities details

Name	Position/Responsibilities	Contact Details
	Welsh Government Project Manager	
	Site Manager	
	Environmental Co-ordinator	
	Environmental Clerk of Works	

4.3 Pollution Risk Assessment

Identification of Potential Pollutants and Contaminated Areas

4.3.1 It is anticipated that the following pollutants may arise from the construction operations:

A. Plant fuels and lubricating oils.

B. Detergents and degreasers.

C. Cement and concrete.

D. Silty water (surface water/ sediment runoff from works).

E. Sewage.

F. Herbicides.

G. Emissions to the atmosphere of fumes and dust.

H. Noise and vibration (from construction operations).

I. Light.

4.3.2 Under the Control of Substances Hazardous to Health (COSHH) Regulations assessments will be carried out on all hazardous substances which are intended for use on the project.

4.3.3 All new substances brought onto site will be dealt with through the implementation of the COSHH procedures.

Contaminated Areas

4.3.4 Details on land contamination are included in Chapter 6 the Environmental Statement and in the Geotechnical Design Report[5,6]. A summary of identified source-pathway-receptor linkages within the study area is presented in Table 5.

[5] Environmental Statement Chapter 6: Geology and Soils
[6] Geotechnical Design Report

Table 5 Identified Baseline Source-Pathway-Receptor Linkages within the study area

Sources	**Pathways**	**Receptors**	**Comments**
During Construction			
Baseline sources: *On site (within scheme footprint)* Made ground associated with: Existing road network Agricultural activities Historical infilled quarries/ gravel pits Localised leaks and spillages of petroleum products from operation of the existing road network and agricultural activities. Groundwater impacted by off-site sources.	Direct exposure to soil and/or soil dust via ingestion, dermal contact and inhalation Inhalation of gas and volatile contamination	Human health: Residents and workers of the farms; Existing maintenance workers and users; Agricultural land users; *Additional during construction works* Construction workers;	Construction workers, and also the existing maintenance workers and highway users may be directly exposed to soil and potentially contaminated dust generated from made ground during construction. The risk of significant levels of contaminants is low as no evidence of contamination has been observed during the completed ground investigations. Risk of exposure to ground gas is considered to be low, as no elevated levels of ground gas were measured during the ground investigations.

Sources	**Pathways**	**Receptors**	**Comments**
Off site (outside scheme footprint): Sewage treatment works, sewage soakaway, burial ground, infilled quarries/ gravel pits <u>Additional sources during construction</u> Unexpected contamination Imported and site won construction materials Dust created during construction Groundwater removed from ground during dewatering	Leaching and migration	<u>Controlled waters:</u> Surface water features (streams, springs and ponds); Groundwater secondary aquifers; Water abstractions;	Potential contaminants within the identified sources may leach to groundwater and via lateral migration have potential to impact the controlled waters quality. Surface run-off where made ground is exposed during excavation works may impact surface water receptors. However, no areas of made ground have been identified in the vicinity of the surface waters, and therefore no risk to surface water from potentially impacted made ground is anticipated. During dewatering, groundwater removed from the cuttings will require discharge, which may impact the quality of the surface water courses.
During Operation			

Sources	**Pathways**	**Receptors**	**Comments**
<u>Baseline sources</u>: *On site (within scheme footprint):* Made ground associated with: Existing road network Agricultural activities Historical infilled quarries/ gravel pits Localised leaks and spillages of petroleum products from operation of the existing road network and agricultural activities. Groundwater impacted by off-site sources. *Off site (outside scheme footprint):* Sewage treatment works, sewage soakaway, burial ground, infilled quarries/ gravel pits <u>Additional sources during Scheme operation</u> Imported and site won construction materials	Direct exposure to soil, soil dust and/or groundwater via ingestion, dermal contact and inhalation Inhalation of gas and volatile contamination	<u>Human health:</u> Existing maintenance workers and users; Agricultural land users; *Additional during Scheme operation;* Maintenance workers; Scheme users;	Maintenance workers, and highway users may be directly exposed to soil, soil dust generated from made ground during maintenance works and/or contaminated groundwater if deep excavations are undertaken. There is a potential risk of ground gas upward migration into confined spaces e.g. manholes. However, the risk of exposure to ground gas is considered to be low, as no elevated levels of ground gas were measured during the ground investigations.
	Leaching and migration	<u>Controlled waters:</u> Surface water features (streams, springs and ponds); Groundwater secondary aquifers; Water abstractions;	Potential contaminants within the identified sources may leach to groundwater, which may have potential to impact the river quality via lateral migration.

4.4 Construction Mitigation

4.4.1 The completed assessments detailed in Section 6 of the Environmental Statement[7], indicated the overall neutral to slight adverse effect of construction works as a result of land contamination. Therefore, no mitigation measures are considered necessary with respect to ground contamination.

4.4.2 The absence of the requirement for mitigation is based on the following:

4.4.3 The environmental management of the construction activities will be undertaken in line with this Outline Construction Environmental Management Plan and as such will not have an impact on identified receptors.

4.4.4 Any discharge to surface water bodies would only be carried out with appropriate approval from NRW, following monitoring and if needed, treatment to ensure it is of acceptable quality.

4.4.5 The reuse of site won or import of materials to the Scheme will be managed by a verification system applied via the Specification for Highway Works, Series 600 – Earthworks, and only materials found suitable for use, assessed in terms of potential effects on human health and the water environment, would be acceptable for construction works.

4.4.6 In addition, the available soil and groundwater chemical testing results from such an action plan could be used to inform health and safety risk assessments for the construction works.

4.4.7 The applied environmental management best practice would include the following considerations:

4.4.8 Adoption of a watching brief for identification of potential contamination. The discovery of any unexpected contaminated land would require appropriate measures to limit the risk to construction workers and controlled waters.

4.4.9 Dust control measures to ensure that dust generation and off-site migration is minimised. This may involve dust suppression measures during excavation works, wheel washing facilities and conveyance of materials in covered wagons.

4.4.10 Water impacted by chemical contamination and/or cement would require the application of mitigation measures before discharge. Measures may include bunding around working areas to contain any overspill, the use of settlement lagoons, settlement tanks and/or silt busters.

4.4.11 Water with high concentrations of suspended solids can arise from dewatering excavations, exposed ground, stockpiles, plant and wheel washing, site roads and disturbance of watercourse beds. Sediment control measures and dust suppression techniques would be

[7] Environmental Statement Chapter 6: Geology and Soils

implemented where work is to be undertaken adjacent to or within a watercourse. Disposal of silty water would be undertaken in accordance with current best practice and measures developed and agreed with NRW prior to commencement of the works. This is in addition to the approval requirements with respect to the quality of the discharge water to the river.

4.4.12 Environmental monitoring in accordance with the obligations set out within this document shall be undertaken through the construction period to ensure that environmentally sound working practices are adopted and maintained. NRW may require environmental sampling, particularly in relation to surface water and groundwater quality and shall be consulted regarding monitoring programmes.

4.4.13 All contractors would have a briefing on environmental protection measures to protect the water environment during site induction training. This would highlight the methods and working practices employed.

4.5 Pollution Prevention Planning

Deliveries and Vehicles on Site

4.5.1 Deliveries to site can be a common cause of pollution, either from the delivery vehicle itself causing dust and noise pollution, or from the delivered materials themselves e.g. spillages of hazardous substances such as fuel or oil.

4.5.2 The contractor will control this potential hazard through careful planning and organisation of all site deliveries. The following hazards which may result in a pollution incident will be reviewed:

4.5.3 Site access routes for deliveries will be clearly signed to prevent nuisance.

Designated areas for deliveries.

A. Ensuring designated areas are as far away from watercourses and drains as possible.

B. Restricting delivery times to site – between 9am and 4pm to minimise noise and traffic disruption to neighbours.

C. 20 mph speed restriction thorough the site to minimise dust (as well as for Health & Safety).

D. Haul roads to be damped down during dry weather to minimise dust nuisance (see Outline Air Quality Management Plan in Section 6 of this document).

E. One-way system instigated through all delivery areas to minimise reversing alarm nuisance (as well as for Health & Safety).

F. Where possible turning circles will be provided at the end of site access roads to eliminate the need for wagons to reverse and hence reduce the usage of reversing alarms (see Outline Noise and Vibration Management Plan in Section 7 of this document).

G. All suppliers will be made aware of the delivery requirements when material orders are placed.

H. Gatemen located at all entrances to site to direct delivery vehicles to the correct area.

I. Store man located at all storage areas to oversee all delivery operations and ensure correct off load and storage of materials.

J. Store man will check all containers and drums etc. on delivery, to ensure they are not damaged or leaking.

K. Once off loaded all materials will be stored in an appropriate manner.

L. All hazardous materials will be off loaded directly to the safe storage area.

5.5.4 When practical, road vehicles should be segregated from the construction site to minimise the risk. Wheel washing facilities should be considered. However, road sweepers can often be a more sustainable and cost-effective measure to implement.

4.5.5 Bunds and drip trays will be checked daily and emptied as regularly to ensure that maximum effectiveness of the drip trays is maintained.

Excavations

4.5.6 Excavations can increase the risk of pollution on site by:

A. Generating excessive dust.

B. Producing silt and silty water.

C. Spreading contaminated soils.

D. Exposing contaminated soil/ materials.

E. Encouraging rainwater or contaminated run-off to collect in the excavation.

4.5.7 In general, all excavations are expected to accumulate water and therefore it is necessary to plan how excess water will be treated and disposed of. The following approaches will be reviewed:

A. Where possible cut off trenches will be used to reduce the amount of surface water run-off entering the excavation, thereby reducing the amount of contaminated water to be disposed of.

B. The amount of topsoil stripped at any one time will be minimised in order to reduce silt transportation.

C. Vegetation corridors will be maintained along the sides of watercourses to act as a buffer strip and prevent suspended solids entering the watercourse.

D. Watercourses will be protected with silt traps to prevent run-off silt from entering them.

E. Silt traps will be inspected and maintained regularly, and records kept.

F. Prior to undertaking any excavation works the history of the site/ areas will be reviewed so that potential areas of contamination can be identified, and treatment or specialist removal arranged.

G. All members of the ground works team will be briefed on what to look for when working in potentially contaminated ground, and what to do if contamination is found.

H. If the site is contaminated or a working area with anything other than silt, then the water must be tested prior to removal from the excavation.

I. If the water proves to be contaminated, then it will need to be taken off site for disposal.

J. Any water to be pumped from an excavation can only be done so when a "Permit to Pump" has been issued.

4.5.8 Where possible a sump will be dug in the corner of the excavation. A perforated pipe surrounded by clean stone will be placed in the sump and the head of the pump placed inside the perforated pipe. This may not eliminate all the silt from the water to be pumped, but it should reduce the level of suspended solids within the water.

4.5.9 The pump will always be supervised to ensure that leaks are spotted immediately and to stop the pump before it sucks up the last dregs of the water, as this is likely to contain high levels of silt.

4.5.10 Any silt in the pumped water needs to be settled out prior to discharge into any sewer or watercourse (further details on silt pollution prevention measures are given in section 4.2.2).

4.5.11 Permission to discharge the settled water into a watercourse must be obtained from the NRW.

4.5.12 Permission to discharge the settled water into a sewer must be obtained by the local sewerage provider. Please note that there are certain locations within the site boundary where the material is "colloidal" therefore, this will not naturally settle out and will require the application of flocculant and potentially a coagulant. Prior to using any chemicals to settle out water, the Environmental Clerk of Works (ECoW) must be consulted.

4.5.13 The contractor shall contact Natural Resources Wales (NRW) and/or Conwy County Borough Council (CCBC) at the start of the project to determine if there is requirement of:

A. Permission to extract / dewater on site.

B. Permission to discharge anything to surface waters or groundwater.

C. To use silt traps settlement tanks or lagoons etc.

4.5.14 The contractor will ensure all necessary consents and permits are in place prior to works commencing with sufficient notice provided to the regulatory body.

4.6 Site Design

Location and Layout of Construction Compounds

4.6.1 Site compounds and carparks will be located away from all surface water features and watercourses and outside of the floodplain.

4.6.2 Water pollution, storage of fuels, oils, wheel wash facilities, drainage and surface water run-off are detailed in the Outline Ground and Water Management Plan.

4.7 Pollution Incident Response Plan

Response Plan

4.7.1 A pollution incident response plan will be designed for every construction compound. The plan will set out the actions to be taken in the event of a pollution incident and identify the pollution control equipment and the control devices and where they should be located.

4.7.2 The Response Plan would contain the following key information:

A. external and internal list containing contacts 24 hour contact details for organizations that may need to be involved during or after an incident, for example, the emergency services, NRW, or PCC.

B. Chemical and waste inventory: an up-to-date record of all substances stored on site would be maintained together with an estimate of the likely quantities stored and product data sheets. The location of drums, containers or bulk storage vessels used for storing potentially polluting chemicals would be identified on the site plan. The inventory would be made accessible to emergency responders.

C. Pollution prevention equipment inventory. This would include equipment and materials on site to deal with pollution incidents (for example spill kits, drain mats/covers, pipe blockers, absorbents) and contact details of staff trained in the use of specialist equipment (where relevant).

D. Site plan showing access routes and meeting points for emergency services; areas or facilities used to store raw materials, products and wastes; watercourses located within or near the site; and site drainage.

4.7.3 Key actions for the response plan would include:

A. stop the works immediately;

B. contain the spillage to avoid escalation of the problem (refer to Pollution Control Hierarchy);

C. notify the Environmental Coordinator immediately and any other key staff;

D. evacuate staff if necessary;

E. call for emergency services if necessary;

F. implement pollution control equipment;

G. document the cause of the incident and the action take;

H. replace pollution control equipment where required.

Practice

4.7.4 Staff will be trained in the procedures which to follow if there is a pollution incident, in particular:

A. where the personnel protective equipment and pollution control equipment is stored;

B. how to use the equipment; and

C. the location of pollution incident response plan.

4.7.5 In the development of the pollution incident response plan, drafts will be sent to NRW, and/or PCC, as relevant, for comment, including advice on when to notify the regulators of a spill.

Fire Plan

4.7.6 Action to be taken in the event of fire:

A. Raise the alarm

B. Call the Fire Brigade

C. On hearing the alarm, the area must be evacuated immediately and staff to assemble at the Muster point.

D. Visitors, clients and contractors to be escorted to the same assembly point.

E. Turn off generators, compressors and other powered equipment.

F. Turn off heat producing equipment and shut cylinder valve.

G. Attack fire with the equipment if it is safe to do so.

H. Obey instructions from the Office Fire Marshall or supervisory staff.

I. Do not re-enter the working area until told it is safe to do so. If necessary, inform others who may be affected by effects of the fire (smoke near hospitals, schools etc.)

4.7.7 The capacity of the construction surface water management system will be sufficient to contain within the site boundaries the water rejected by a fire truck, avoiding direct spillage of potentially contaminated material into the natural watercourses.

4.8 Pollution Control Options

Pollution Hierarchy

4.8.1 This section identifies the options that may be used to manage a pollution incident. The options are presented in the order of the preferred response.

4.8.2 Preferred response in order of priority:

A. Contain at Source

B. Contain close to the Source

C. Contain on the Surface

D. Contain in the Drainage

E. Contain on or in the watercourse

F. Spill Response Plans

G. The most likely causes of a pollution incident would involve:

H. spillage of oils or chemicals;

I. a discharge of sediment-laden water or other pollutant into a watercourse; or

J. firewater runoff.

4.8.3 Pollution control equipment would be appropriate for the location of the site and the chemical/substance targeted. For example, absorbent materials such as sand, spill granules, absorbent pads and booms will be kept at each site compound, on plant working near water courses and particularly at refuelling areas and where fuel or oil is stored.

4.8.4 Following a pollution incident, used pollution control equipment (for example, spill kits) would be disposed of appropriately and new/replacement equipment would be provided.

4.8.5 Some of the key actions that would be included in the action plans are as follows:

4.8.6 Priority action plan to be implemented when possible:

A. Stop at source or as close as possible from the source (especially prior to the drainage system).

B. Stop pollutant spreading by using oil booms, Terram wrapped barriers, hay bales as applicable.

C. Trace impacts further downstream to establish extent of pollution.

D. Review the activity that caused the pollution prior to restarting work.

E. Action plan to be implemented when it is impossible to contain the spill at source and it has entered a watercourse:

F. Stop the flow at point of discharge

G. Stop the flow spreading

H. Dam the flow with earth/sand/polythene/absorbent material;

I. Divert the flow from drains/watercourses where possible;

J. Black off drains with drain covers or sandbags

K. Check the site drainage plan- where will spill end up?

4.9 Discovery of Contaminated Land

4.9.1 The following will need to be adhered to in relation to encountering previously unidentified ground contamination and asbestos during construction works.

4.9.2 Ensure personnel involved in the earthworks are briefed on the likely nature and type of soils that could indicate the presence of contamination (e.g. asbestos, discolouration, oils, odours, ash and clinker materials).

4.9.3 If such material is encountered, the Environmental Co-ordinator would be immediately contacted to inspect the material.

4.9.4 Testing of the material will be undertaken and the material will not be reused or removed until the results of the tests have been reviewed.

4.10 Training

4.10.1 All personnel must attend a site induction before commencing work on the site. The induction will discuss the Pollution Control and Prevention Plan and also include key environmental issues on the project including the sensitivity of the watercourses, contamination, asbestos and air quality management. The briefing will emphasise the methods and working practices employed for protection, including emergency procedures for reporting and dealing with environmental incidents.

4.10.2 All staff will receive relevant training on environmental issues throughout the construction of the project.

4.10.3 All method statements will include an environmental section and any specific pollution control and prevention information.

4.10.4 Drills of this emergency response plans will be carried out regularly to ensure understanding.

4.11 Monitoring, Review and Reporting

4.11.1 In accordance with the Environment Agency's Pollution Prevention Guidelines (PPGs) (although revoked they still maintain relevant as best practice guidance until updates are made available), and relevant construction industry guidance including CIRIA, best practice

measures to prevent pollution will be implemented during the construction of the Scheme.

4.11.2 Should a situation arise where our proposed mitigation is not adequate, this plan will be reviewed. It will also be reviewed quarterly by the Environmental Co-ordinator to ensure it is up to date and accurate.

4.11.3 Specific monitoring requirements will be detailed. Nominated staff will carry out regular site inspections to control measures are in place and adhered to during the works.

4.11.4 Any instances of pollution or spill will be reported immediately to the Environmental Co-ordinator who will investigate and communicate investigation's conclusions to the project team to aid continuous improvement and to prevent reoccurrence of the event.

4.11.5 Records will be produced to show compliance with our Pollution Control and Prevention Plan, including inspections records, site plans and progress reports

4.11.6 Surface water monitoring will be undertaken to demonstrate no adverse effects on water quality during construction works. An appropriate monitoring schedule and programme will be agreed with NRW.

5 OUTLINE GROUND AND SURFACE WATER MANAGEMENT PLAN

5.1 Introduction

Purpose

5.1.1 The purpose of this Outline Ground and Surface Water Management Plan is to set out the construction measures to prevent the risk of pollution and contamination to ground and surface water. The contractor will manage risk in accordance with best practicable means which include general site management procedures, and control and measures to mitigate any effects of potential adverse effects caused by the construction works.

5.2 Structure and Scope of the Outline Ground and Surface Water Management Plan

5.2.1 This document is an Outline Ground and Surface Water Management Plan and is based on the information available at the outline design stage. As the detailed design progresses, the plan would be reviewed and updated accordingly. The Outline Ground and Surface Water Management Plan would be developed in consultation with Natural Resources Wales (NRW) and would be agreed prior to the start of construction.

5.2.2 The final Ground and Surface Water Management Plan (GSWMP) will consider all drainage required during the construction phase and will reference all industry and regulatory pollution prevention guidelines. It shall describe the design of each element of surface water management system required to manage surface water runoff during construction and potential risks to surface waters. This shall include consideration of temporary storage and settlement requirements to manage sediment load of waters. The GSWMP shall define the water quality criteria to ensure any discharge to receiving watercourses meets regulatory requirements.

5.2.3 With regard to groundwater, the GSWMP shall consider all activities to be undertaken during the construction phase that may require groundwater control through pumping. The GSWMP will reference all relevant industry and regulatory pollution prevention guidelines. The GSWMP shall consider excavations within borrow pits, structures required for managing groundwater in areas of cut and excavations required for subsurface structures/utilities that may encounter shallow groundwater. The GSWMP shall define the nature and approach for groundwater management following its abstraction, including monitoring to determine the acceptability of chemical and physical quality with respect to discharge to the surface water system.

5.3 Responsibilities

5.3.1 Competent managers and key team members will be appointed to work on this plan and support it along the project duration. Additional roles and responsibilities will be developed as the detailed design progresses.

Table 6 Responsibilities details

Name	Position/Responsibilities	Contact Details
	Welsh Government Project Manager	
	Principle Contractor Environmental Manager	
	Site Manager	
	SHE Manager	

5.4 Consents

5.4.1 The treatment of waters arising from construction activities, including point source discharges resulting from the treatment of materials regulated by mobile plant licence will require regulation by the NRW. An application for an environmental permit (Discharge Consent) will be submitted prior to works commencing. The permit will regulate the discharge of treated contaminated waters to ground, via re-injection (or possibly soakaway). A separate environmental permit will be required for each location.

5.4.2 An abstraction licence will be in place for de-watering operations on site. A separate licence may be required for each location or activity. An impoundment of water in any watercourse or abstraction exceeding 20 cubic metres a day will be controlled by means of an NRW consent (Abstraction Licence).

5.4.3 Construction works carried out over, under or near a main river, or in a flood plain or flood defence will require a Flood Risk Activity Permit. A permit will be required for each location.

5.4.4 An Ordinary Watercourse Consent is required for all works carried out over, under or near an ordinary watercourse. Ordinary watercourses include non-main rivers and all ditches, drains, cuts, culverts, dikes, sewers (other than public sewers) and passages through which water flows. The consenting authority for this scheme will be Conwy County Borough Council (CCBC).

5.5 Mitigation Measures

General Measures

5.5.1 Temporary surface water management systems will be installed early in the construction sequencing and carefully managed to prevent localized flooding or pollution of surface and groundwater from silt and other contaminants.

5.5.2 In areas where potentially contaminated land has been identified, specific mitigation measures will be designed to manage and contain potential contamination. Detailed method statements will be prepared for works in these areas.

Induction of site personnel

5.5.3 All personnel will attend a site induction before commencing work on site. The briefing will emphasise the sensitivity of the watercourses, surrounding habitat and methods and working practices employed to protect the water environment.

Emergency Response Planning

5.5.4 An emergency response plan will be developed in accordance with EA Guidance PPG21- Pollution Incidence Response Planning. The plan will be communicated to all personnel. Emergency spill control equipment such as spill kits, oil booms and absorbent materials, will be held at appropriate locations on site and within site compounds.

Climate Change Resilience Planning

5.5.5 The contractor should consider the potential impacts of extreme weather events during construction. To ensure resilience of the scheme to such extreme weather events, the contractor should use a short to medium-range weather forecasting service from the Met Office or other approved weather forecast provider to manage climate-related risks and inform programme management and impact mitigation measures. The contractor should register with the NRW's Floodline Warnings Direct service.

5.5.6 The contractor's Environmental Management System (EMS) should consider all measures deemed necessary and appropriate to manage extreme weather events and should specifically cover training of personnel and prevention and monitoring arrangements.

5.6 Mitigation Measures Forming Part of the Scheme Design

5.6.1 The design philosophy of the carriageway drainage includes a series of mitigations to ensure that flood risk in not increased in the vicinity of the Scheme and to ensure that soluble and suspended pollutants in carriageway runoff are reduced to acceptable levels prior to discharge to groundwater or local watercourses. These mitigations are described in detail within Chapter 7 (Road Drainage and Water Environment) of the Environmental Statement.

Silt Pollution

5.6.2 Pollution can be caused by the discharge of suspended solids into a watercourse. Pollution from suspended solids is most likely to occur from pumping out excess rainwater from accumulations as a result of seepage or rainfall, or from uncontrolled rainwater run-off from the work site into an adjacent watercourse.

5.6.3 To avoid silt pollution, wherever possible, the Contractor shall implement a series of methods to manage sediment runoff and eliminate the likelihood of producing silt and silty water.

5.6.4 Given the varying nature of the watercourses, topography and local hydrology across site and activities being carried out each section of the scheme, the following sediment control measures will be reviewed, and the most appropriate approaches adopted. As the works progress it will be necessary to adapt the measures implemented and review effectiveness. The measures put in place will also need to be regularly maintained.

A. The hazards of silt pollution will be emphasised in the Site Induction.

B. No water will ever be pumped directly into a watercourse.

C. All water pumped into a watercourse must be treated first to settle or remove suspended solids.

D. The minimum area of topsoil will be stripped at any one time.

E. The spread will be 'lipped' or bunded as it crosses a watercourse to prevent direct run-off. In addition, where considered appropriate silt fencing will also be installed.

F. A 5-metre buffer strip of vegetation will be left on either side of a watercourse if possible to provide a barrier and treatment area.

G. Straw bales and spill kits will be stored at all sensitive receptors, in supervisor vehicles and machine cabs (where appropriate).

H. All pumping operations will be carried out under the Permit Procedure.

I. Water will be pumped at low volume and treated as necessary.

J. A settlement tank and straw bales will be used if the quantity of water justifies this.

K. Care will be taken to avoid soil erosion of river and stream banks.

L. Settlement lagoons will be constructed. However, given the limited working area available it will be necessary to carefully consider the locations of these and whether other methods would be more practicable.

M. Silty water can be disposed of by pumping to grassland, to sewer or to a watercourse after sufficient treatment and with consent from the sewer undertaker/ statutory body. The correct permissions and consents must be obtained prior to disposal.

N. Wheel washing will be carried out in a designated area of hard standing, at least 10 m from any surface water at the site compound.

O. Any run off generated will be collected in a sump where conditions permit. If the construction of a sump is not an option, other measures will need to be put in place.

P. Settled solids from the sump water will be removed regularly and appropriately disposed of.

Q. Where possible sump water will be recycled and re-used, potentially for damping down the haul road where necessary.

R. Excess water will be discharged into the foul sewer (permission will be sought from the sewerage provider) or removed from site in a tanker for authorised disposal.

S. Any facilities used to control silt will be correctly installed and will be regularly checked and maintained.

T. Concrete washout will not be dispersed onto the natural ground and will be dealt with in accordance with the Environment Agency guidelines for dealing with concrete washout.

5.6.5 Where none of the above measures can be implemented (due to the nature of the sediment particles) Siltbusters will be installed and the use of flocculant reviewed. A flocculant supplier (Goldcrest) will be consulted and discussions held with NRW/ PCC to confirm they are in agreement with the approach adopted. Nothing hazardous will be discharged into controlled waters. Please note that care does need to be taken when using flocculant and the appropriate blocks installed in accordance with the guidance provided by the supplier.

Drainage

5.6.6 It is essential that all drainage routes on the site are identified and that the contractor knows where they lead and/ or outfall, in order to prevent pollution incidents occurring which remain undetected until adverse impacts are sustained and clearly visible (e.g. a fish kill).

5.6.7 All pollutants must be stopped from entering the drainage system and the contractor should ensure this through the careful planning and organisation of all site operations. The following guidelines will be reviewed:

A. Permission must be sought from NRW or local sewerage provider in order to discharge anything except for clean uncontaminated surface water to a drain or watercourse.

B. All drainage on site will be identified by type and where appropriate colour coded using spray paint.

C. Drains will be checked to see if they have existing protection, such as oil interceptors or silt traps.

D. Existing protection measures will be inspected and repaired, emptied or cleaned, as necessary prior to the commencement of any works.

E. Drains and their associated protection measures will be checked regularly and maintained throughout the contract, as well-maintained drains will also reduce the risk of flooding.

F. Potential pollutants which could enter the drains will be identified and reported.

G. Drains at risk from spills, contamination or misuse will be identified and protected when "risky activities" are being undertaken and no other location to carry out such activities is possible e.g. re-fuelling areas, concrete mixing and washout areas etc. Any additional requirements / control measures detailed in permits / authorisations will be strictly adhered to and recorded. Such information will include the locations of Spill kits and emergency procedures will be available at regular location either via workforces' vehicles or at site emergency points.

H. If drains are flushed during the contract, the contractor will ensure that the water used to flush the pipes is classified as "dirty" and is not allowed to enter a watercourse without undergoing appropriate treatment first.

I. Water supplies and underfield drainage adversely affected by the scheme will be replaced or repaired where possible to maintain the current condition of the farmland.

J. Section-specific incident response plans will also include measures to avoid the pollution of the drainage systems and emergency procedures in the event of an incident occurring.

K. In the event of a spillage/ accident/ emergency, the contractor will try and stop any pollutants from entering the drainage network. Clay drainage seals will be available in each section to cover drains to avoid any runoff discharging into the drainage network. NRW and/ or DCWW will be immediately notified if surface water drains, local sewers or foul water drains are affected.

L. Emergency spill kit boxes will be stored at the main compound

M. Any pollution incident will be reported to NRW via the Incident Hotline.

N. Records of any incidents and subsequent actions will be maintained.

5.7 Materials

Stockpiles and Exposed Ground

6.7.1 Exposed ground and materials stockpiled on site, such as topsoil, hardcore and sand, can pollute water with silt and the air with dust. The contractor will ensure that all stockpiles on site are well managed and maintained and where appropriate seeded if to be left in position for more than six months. Where appropriate the following measures will be implemented:

A. Stockpiles will be located well away from watercourses, ditches and drains.

B. Where possible stockpiles will be located on level ground.

C. Slope stability of the stockpiles will be checked and maintained.

D. Stockpiles will be covered (or damped down) to prevent the material from drying out and causing dust.

E. Run-off from stockpiles will be controlled so as not to enter drains or ditches etc. If necessary silt fencing will be installed and settlement lagoons to ensure the integrity of all watercourses and ditches is maintained.

F. Silt fencing will be used around the base of stockpiles to prevent suspended solids from escaping.

G. Contaminated material will be stockpiled on an impermeable surface, in a bunded area, at least 10 m away from the nearest watercourse and will be covered to prevent contaminated run-off.

H. Any run-off from a contaminated stockpile will be legally disposed of.

I. Where possible works will be phased to reduce stockpiling.

J. Top soiling and seeding of finished slopes will be carried out as soon as possible as work progresses to establish grass at the earliest opportunity, which will help to minimise run off problems.

K. Any stockpiles of topsoil / subsoil which will remain for a reasonable length of time will be seeded, to bind the material together preventing both dust and surface water run-off.

L. Where feasible the main earthmoving activities will be undertaken during the late spring and summer months.

5.8 Oil Storage, Use and Refuelling

Storage

5.8.1 Oil must not be stored in high risk areas, including:

A. Where there is a risk or damage from impact e.g. from site traffic.

B. Within 50m of a spring, well or borehole.

C. Within 10m of a watercourse, ditch or drainage channel.

D. Where spilt oil could enter open drains or through loose fitting manhole covers.

E. Where spilt oil could soak into unmade ground and pollute groundwater.

F. Where a spill could run over hard ground and enter a watercourse.

G. Areas that are at risk from flooding.

5.8.2 Appropriate locations will be designated within each section where materials including oil and diesel can be appropriately stored. Although the Oil Storage Regulations are applicable in England, they are still adopted as best practice in Wales.

5.8.3 In order for the tank storage system to operate correctly the following points need to be considered:

A. Are all valves, filters, gauges, pipes, taps etc arranged so that oil is caught within the secondary containment system (SCS)?

B. Is the flexible draw-off pipe fitted with a nozzle at the delivery end that closes automatically when not in use?

C. Are all taps, valves, flexible hoses and pumps through which oil can be discharged, located within the SCS?

D. Are all taps and valves, where oil could escape, kept locked shut when not in use?

E. Is the primary oil container in good condition and doesn't look likely to burst or leak?

F. Is the pump set fitted with a check valve in the feed line to prevent tank drain down in the event of damage to the pump or feed line?

G. Is the fill pump situated within the SCS?

H. Is the SCS and its ancillary pipework protected from damage caused by collision or impact?

I. Is the SCS capacity 110% of the capacity of the primary tank?

J. Is the SCS impermeable to oil and water?

K. Does the SCS have any drain down valves?

L. Can the SCS provide maximum containment at all times?

M. Is accumulated oil / water removed regularly from the SCS?

N. Is the tank clearly labelled with product type and maximum capacity?

5.8.4 Oil and lubricants will be stored within the confines of a bund, and where possible the bund will be covered to prevent rainwater collecting, alternatively an appropriate drainage system will be put in place.

5.8.5 Where the site deploys a generator and external fuel tank set to provide electricity, the units will be contained within a single adequate bund /provided as a proprietary single self-bunded unit.

5.8.6 There will be a nominated person to oversee deliveries to ensure correct storage etc in each section; they will be recorded. These individuals will also be responsible for cleaning up any minor spills.

Refuelling

5.8.7 All refuelling of plant will be undertaken by a nominated trained person in predetermined areas, with an impermeable surface, located well away from any watercourse.

5.8.8 The fuel bowsers will carry the necessary pollution control kits to deal with any emergency spills and leaks. In a similar manner, any servicing of plant will only be carried out in designated areas.

5.8.9 A fuel bowser will be used for refuelling on the spread. The bowser driver will be responsible for ensuring that drip trays are used for all refuelling of mobile plant and ensure that no refuelling takes place within 10m of a watercourse.

5.8.10 The refuelling bowser and the Supervisor's vehicle will be equipped with a "Grab Pack" spillage control kit and personnel will be trained in their use as part of the Site Induction.

5.8.11 Fuelling up of the bowser is restricted to the designated area within the site compound.

5.8.12 Regular monitoring of fuel storage should be recorded. Any storage that is being carried out in key areas will also be recorded.

5.9 Cement, Concrete and Grout

5.9.1 Cements, concrete and grouts are highly alkaline and corrosive and can cause serious pollution to the ground and watercourses.

General Concrete Work

5.9.2 Neither wet or dry concrete / cement will be allowed to enter watercourses:

A. Concrete and cement mixing will be carried out on an impermeable designated area.

B. Designated area will be located at least 10 m away from a watercourse or drain. If this is not possible alternative measures will be put in place to ensure that environmental receptors are protected.

C. Concrete quantities will be accurately calculated in order to minimise concrete wastage.

D. However, any excess concrete will be allowed to dry and will be used, if possible, as inert rubble on site.

E. Designated concrete wash out areas will be created for drivers to wash out their delivery wagons.

F. Water from the washout areas will be stored and the suspended solids allowed to settle out.

G. Where possible the settled water will be re-used for mixing concrete and washing out.

H. Excess washout water will either be discharged to the foul sewer (with permission from the local sewerage provider) or disposed off-site by a registered waste carrier. All concrete washout areas will be clearly demarcated on site.

Working with Concrete in Water

5.9.3 Where it is necessary to work with concrete in water, concrete mixes will be specified and those which minimise pollution risks used (see Environment Agency Pollution Prevention Guidelines - Works and Maintenance in or Near Water - PPG 5).

5.9.4 The first thing to do when working with concrete in water is to divert the flow of water away from the working area or by damming upstream and over-pumping the water beyond the working area.

5.9.5 The inlet to the pump will be screened. Loose cement and/or concrete will be removed prior to the return of the watercourse to its original course.

5.9.6 Tools and equipment will not be cleaned in the watercourse. Should it be necessary to clean tools and equipment on site, this will be done well away from watercourses. Washout water will not be poured away into watercourses or surface drains or disposed of in any way as to cause/permit a discharge into a watercourse.

5.9.7 If concrete has to be sprayed, sheeting will be used to cover the water surface and the open faces of the structure to prevent deposits of concrete dropping into the water. The area will be thoroughly cleaned before removing the sheeting.

5.9.8 In the event of release of concrete into a watercourse, all measures will be taken to stop further ingress of material. Flow will be diverted and straw bales placed appropriately.

5.10 Watercourse Monitoring

5.10.1 Where work is being undertaken adjacent to a watercourse regular checking and monitoring should be undertaken and recorded.

5.11 Sewage

Site Offices

5.11.1 Sewage will either drain to the public foul sewer with consent from the local sewerage undertaker or to a cesspit / effluent tank, from where it will be collected and disposed of by a registered waste carrier (will be verified with the NRW).

Site Toilets

5.11.2 The tanks within portable toilet facilities will be emptied regularly. Sewage from portable facilities will be disposed by a registered waste carrier (a copy of their Waste Carriers Licence will be inserted in kept avaiaible for verification by the NRW). These details will be included in relevant the Pollution Strategy Documents (where portable toilets are located within the strategy area).

5.11.3 Waste transfer tickets for all movements of sewage / foul water will be retained on site and kept on records.

6 OUTLINE AIR QUALITY MANAGEMENT PLAN

6.1 Introduction

Purpose

6.1.1 The purpose of the Outline Air Quality Management Plan (AQMP) is to set out the management of dust, air pollution, odour and exhaust emissions during the construction works. The contractor will manage dust, air pollution, odour and exhaust emissions in accordance with best practicable means (BPM), which include the following:

A. reference to the general site management and good housekeeping procedures (relevant to limiting dust and air pollution);

B. controls and measures to control or mitigate the effect of potential adverse effects caused by the construction works; and

C. dust and air pollution monitoring measures to be employed during construction of the project.

6.2 Structure and Scope of the Outline Air Quality Management Plan

6.2.1 This is an outline AQMP which will be developed by the Contractor as the detailed design progresses.

6.2.2 The scope of the plan will comprise:

A. Best practical means for site management;

B. Measures to limit emissions from construction plant and vehicles

C. Measures to limit pollution from transportation, storage and handling of materials;

D. Measures to manage dust from Haul roads;

E. Measures to limit dust pollution from demolition activities

F. Measures to limit dust pollution from excavations and earthworks activities

G. Measures to limit dust pollution from drilling activities; and

H. Measures to limit dust pollution from processing, crushing, cutting and grinding activities.

6.3 Responsibilities

Table 7 Responsibilities details

Name	Position/Responsibilities	Contact Details
	Welsh Government Project Manager	
	Site Manager	
	Principle Contractor Environmental Manager	

6.4 Air Quality Management

Legislation and guidance

6.4.1 The contractor will reference, as appropriate, national/industry standards and codes of best practice and guidance when developing the AQMP including the following:

A. Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites - Institute of Air Quality Management (IAQM, 2012);

B. Guidance on the assessment of dust from demolition and construction - Institute of Air Quality Management (IAQM, 2014); and

C. Statutory Process Guidance Notes PG3/01(12), PG3/08(12) and PG3/16(12).

General

6.4.2 Obligations for the contractors in relation to using best practicable means to prevent or counteract the effects of any nuisance are set out in the sections below:

A. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;

B. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;

C. Display the head or regional office contact information; and

D. Develop and implement a Dust Management Plan, which will include measures to control other emissions, approved by the local authority.

Site management

6.4.3 The site layout will be planned to locate machinery and dust-causing activities away from sensitive receptors, where reasonably practicable.

6.4.4 Appropriate methods, such as the erection of hoardings or other barriers along the site boundary, will be used where appropriate, to mitigate the spread of dust to any sensitive buildings or other environmental receptors.

6.4.5 All dust and air quality complaints will be recorded, the cause(s) will be identified, and appropriate measures will be taken and recorded to reduce emissions in a timely manner:

A. The complaints log will be made available to the local authority when asked;

B. Any exceptional incidents that cause dust and/or air emissions, either on-site or off-site will be recorded and the

action taken to resolve the situation will also be recorded in the log book;

C. Site runoff of water or mud will be avoided;

D. Site fencing, barriers and scaffolding will be kept clean using wet methods;

E. Materials that have a potential to produce dust will be removed from site as soon as possible, unless being re-used on site; and

F. Stockpiles will be covered, seeded or fenced to prevent wind whipping.

Construction plant and vehicles

6.4.6 Measures will be implemented by the contractor to limit emissions from construction plant and vehicles, including the following, as appropriate:

A. The contractor will operate construction plant in accordance with the manufacturer's written recommendations;

B. All vehicles and plant will be switched off when not in use;

C. Vehicle and construction plant exhausts should be directed away from the ground and be positioned at a height to facilitate appropriate dispersal of exhaust emissions;

D. On plant likely to generate excessive quantities of dust beyond the site boundaries, enclosing, shielding or provision of filters will be employed. Items such as dust extractors, filters and collectors on drilling rigs and silos will be used;

E. The movement of construction traffic around the site will be kept to the minimum reasonable for the effective and efficient operation of the site and construction of the scheme;

F. Construction plant will be located away from site boundaries which are close to sensitive receptors where reasonable and practicable;

G. Site access points will be designed to avoid queuing traffic;

H. The use of diesel or petrol-powered generators will be reduced by using mains electricity or battery powered equipment where reasonable and practicable;

I. All non-road mobile machinery will use ultra-low sulphur tax exempt diesel where available and machinery with power outputs of over 36kW will be fitted with appropriate exhaust after-treatment from approved Energy Saving Trust list (achieving filtration efficiency of over 85%);

J. Cutting and grinding operations will be conducted using equipment and techniques which incorporate appropriate dust suppression measures;

K. Vehicle, plant and equipment maintenance records will be kept on site and these will be made available to the employer's representative upon request;

L. A maximum speed limit of 15mph will be imposed and signposted on surfaced haul roads and work areas, and a 10mph speed limit will be imposed and signposted on un-surfaced haul roads and work areas;

M. Vehicles entering and leaving the site must be covered to prevent escape of materials during transport;

N. A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials; and

O. A Travel Plan should be implemented, which supports and encourages sustainable travel (public transport, cycling walking and car-sharing).

6.5 Transportation, storage and handling of materials

6.5.1 Measures will be implemented by the contractor to limit pollution due to the transportation and storage of materials, including the following, as appropriate:

A. Materials deliveries or loads entering and leaving the construction site will be covered by a fixed cover or sheeting appropriately fixed and suitable for the purposes of preventing materials and dust spillage. This will apply to the transport of materials by road, rail or waterway;

B. Vehicles transporting materials within or outside the construction site will not be overloaded;

C. Stockpiles and mounds will be kept away from sensitive receptors, watercourses and surface drains and sited to take into account the predominant wind direction;

D. Stockpiles and mounds will be at a suitable angle of repose and avoid sharp changes in shape to prevent material slippage;

E. Materials stockpiles will be enclosed or securely sheeted or kept watered by the contractor;

F. Surfaces of long-term stockpiles, which give rise to a risk of dust or air pollution, will be stabilised or be covered with appropriate sheeting;

G. Fine dry material will be stored inside buildings or enclosures;

H. Mixing of large quantities of concrete or bentonite slurries will be undertaken in enclosed or shielded areas;

I. The number of handling operations for materials will be kept to the minimum practicable;

J. Materials handling areas will be maintained to constrain dust emissions and appropriate measures such as watering

undertaken to reduce or prevent escape of dust from the site boundaries; and

K. Mixing of grout or cement-based materials will be undertaken using a process suitable for the prevention of dust emissions.

6.6 Demolition activities

6.6.1 Measures to limit dust pollution from demolition activities will be implemented by the contractor through the use of the following measures, as appropriate:

A. The contractor will spray any buildings or structures to be demolished with water prior to and during demolition;

B. Appropriate screening of buildings or structures to be demolished will be used;

C. Waste chutes will be shielded and skips covered and secured; and

D. Where reasonable, the contractor will avoid prolonged storage of waste materials on site.

6.7 Excavations and earthworks activities

6.7.1 Measures by the contractor to limit dust pollution from excavations and earthworks activities will include the following, as appropriate:

A. Topsoil will be stripped as close as reasonably practicable to the period of excavation or other earthworks activities to avoid risks associated with run-off or dust generation;

B. Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable;

C. Hessian, mulches and trackifiers will be used where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;

D. The cover will only be removed in small areas during work and not all at once;

E. Drop heights from excavators to vehicles involved in the transport of excavated material will be kept to the minimum practicable to control dust generation associated with the fall of materials;

F. Suppressing dust emissions by spraying with water or using other appropriate measures;

G. Compacting deposited materials, with the exception of topsoil, as soon as possible after deposition; and

H. Soiling, seeding, planting or sealing of completed earthworks will be undertaken by the contractor as soon as reasonably practicable following completion of the earthworks.

6.8 Drilling activities

6.8.1 Measures by the contractor to limit dust pollution associated with drilling activities will include the following, as appropriate:

A. On plant likely to generate excessive quantities of dust beyond the site boundaries measures such as enclosing, shielding or provision of filters will be employed. Items such as dust extractors, filters and collectors on drilling rigs and silos will be used, as appropriate;

B. Where appropriate dust will be extracted at source to prevent exposure of workers to excessive dust inhalation;

C. Where drilling is used for the purposes of excavating within rock, the exposed surfaces will be watered to limit dust emissions as necessary;

D. Materials used such as cements or pulverised fuel ash, will be stored in accordance with the requirements of for materials storage to prevent them becoming an airborne hazard; and

E. Mixing of grout or cement-based materials will be undertaken using a process suitable for the prevention, as far as reasonably practicable, of dust emissions

6.9 Processing, crushing and grinding activities

6.9.1 Appropriate measures will be used by the contractor for any processing, crushing, cutting and grinding activities as required to limit dust pollution. Permits will be sought for concrete crushing and batching plant operations as required.

6.10 Monitoring

610.1 The contractor will implement inspection and monitoring procedures to assess the effectiveness of measures to prevent dust and air pollutant emissions. Relevant local authorities will be consulted regarding the monitoring procedures to be implemented which will include the following measures, as appropriate:

A. Regular site inspections will be carried out to monitor compliance with the Dust Management Plan (inspection results will be recorded and inspection log will be made available to the local authority, when asked).

B. Daily on-site and off-site inspections where receptors (including roads) are nearby, monitoring of dust and recording of inspection results (log to be made available to the local authority when asked).

C. The frequency of site inspections by the person accountable for air quality and dust issues on site will be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

D. Liaising with the local authority to determine if instrumented monitoring of dust is required.

E. Reference to inspection and maintenance schedules for construction vehicles, plant and machinery.

F. Inspection procedures relating to the level of trafficking, use and condition of haul routes.

8 OUTLINE NOISE AND VIBRATION MANAGEMENT PLAN

8.1 Introduction

Purpose

8.1.1 The purpose of this Outline Noise and Vibration Management Plan is to set out measures for the Contractor to control and manage noise and vibration from machinery and construction.

8.1.2 The effects of noise and vibration from construction sites will be controlled by introducing management and monitoring processes to ensure that best practicable means (BPM) are planned and employed during construction.

8.2 Structure and Scope of the Outline Noise and Vibration Management Plan

6.2.1 As part of the contractors' detailed CEMP, a noise and vibration management plan will be prepared and will set out these processes. The plan will include management and monitoring processes to ensure as a minimum:

A. Integration of noise control into the preparation of method statements;

B. Ensuring proactive links between noise management activities and community relations activities;

C. Preparing details of site hoardings, screens or bunds that will be put in place to provide acoustic screening during construction, together with an inspection and maintenance schedule for such features;

D. Developing procedures for the installation of noise insulation or provision of temporary re-housing and to ensure such measures are, where required, in place as early as reasonably practicable;

E. Preparing risk assessments to inform structural surveys of buildings and structures which may be affected by vibration from construction;

F. Developing a noise and vibration monitoring protocol including a schedule of noise and vibration monitoring locations and stages during construction of the scheme when monitoring will be undertaken;

G. Preparing and submitting Section 61 consent applications;

H. Undertaking and publishing all monitoring required to ensure compliance with all acoustic commitments and consents; and

I. Implementing management processes to ensure ongoing compliance, improvement and rapid corrective actions to avoid any potential non-compliance.

Responsibilities

Table 8 Responsibilities details

Name	Position/Responsibilities	Contact Details
	Welsh Government Project Manager	
	Site Manager	
	Principle Contractor Environmental Manager	

6.3 Measures to reduce potential noise and vibration impacts

Best Practicable Means

6.3.1 The Control of Pollution Act 1974 and the Noise and Statutory Nuisance Act 1993 contain powers to control noise emission and to require the employment of the best practicable means for preventing or counteracting the effect of noise.

6.3.2 Well defined noise control procedures will be implemented for all construction plant equipment and all site activities. The contractor will comply with BS 5228: Noise control on construction sites and open sites. Noise control measures will include:

A. Noisy equipment will be located at furthest practicable distance from properties with provision of temporary screening where possible to reduce construction noise impacts at properties. The contractor will identify optimum positions for noisy equipment and screening to minimize disruption.

B. In order to reduce construction vibration impacts at properties, vibratory rollers will not be used within 90m of properties during operation (125m for start-up/run down) unless further risk assessment and monitoring can demonstrate no likely adverse effect due to vibration. The contractor will undertake further risk assessment prior to works and/or vibration monitoring at the start of works within the stipulated distances to confirm no adverse effects due to vibration.

C. Low noise road surfacing will be used to reduce operational noise impacts by at least 3dB compared with a typical 1.5mm texture depth HRA surface (where speeds are over 75kph) - To allow NMUs (Non-Motorised Users) to move around the village safely without undue risk from traffic.

D. All plant and machinery will have effective silencers fitted and kept in good condition.

E. Areas of traffic movement will be designed to minimise reversing alarm use principally by the use of one-way systems.

F. Natural features and buildings will be used to minimise noise from operations where practical

G. Noise levels can be predicted from knowledge of the type and number of plant to be used for various activities.

H. The activities listed will not necessarily occur continuously or simultaneously but in stages with peaks of activity separated by periods of relative inactivity.

I. Noise from standard construction plant is of short duration therefore impact is minimised.

J. Occasionally 24hr. operations will be necessary but discussions will take place with the local Environmental Health Officer before such operations begin.

K. Baseline noise levels will be established and monitored throughout the construction works.

L. Where there is expectation of considerably more noise than the baseline, consideration for applying to the Council for a Section 61 Consent will be given, whereby the Council approves working methods and noise mitigation measures (Note Section 61 Consent only applies to nuisance and doesn't consider disturbance to ecology). Further details on Section 61 Consent are given in section 6.2.2 below.

M. Construction activity will normally be confined to 07.00-19.00 hours, Monday to Friday and 07.00-13.00 hours on Saturdays.

N. As the requirement for Sunday working and/or night working cannot be ruled out, discussions will take place with the local Environmental Health Officer before such operation begins.

O. All activities which have the potential to cause vibration issues will be identified and receptors (particularly local residents) will be informed of activities such as blasting.

P. During the construction phase, haul roads will be maintained and kept as smooth as possible and maintain them to reduce vibration impacts caused by heavy plant movement.

Q. Where practicable anti-vibration mountings should be fitted to rotating / impacting equipment.

6.4 Noise insulation or temporary re-housing?

6.4.1 If situations arise where despite the implementation of BPM, the noise exposure exceeds the criteria defined in this Noise and Vibration Management Plan (NVMP), the contractor may offer:

Section 61 consents

6.4.2 The contractor will seek to obtain consents from the relevant local authority under Section 61 of the Control of Pollution Act 1974 for the proposed construction works, excluding non-intrusive surveys. Applications will be made to the relevant local authority for a Section 61 consent at least 28 days before the relevant work is due to start or earlier if reasonably practicable.

6.4.3 Details of construction activities, prediction methods, location of sensitive receivers and noise and vibration levels will be discussed with the relevant local authority, or authorities, both prior to construction work and throughout the construction period. Prediction, evaluation and assessment of noise and vibration as well as discussion between the employer's representative and its contractor

and the relevant local authority will continue throughout the construction period.

6.4.4 Unless otherwise agreed with the relevant local authority, noise levels will be predicted in accordance with the methods set out in BS 5228 – 1.

6.4.5 All construction noise levels will be predicted or measured at a distance of 1m from any affected eligible facade, which must have windows to bedrooms or living rooms.

6.4.6 Annex A of BS 5228-1 provides a flow diagram demonstrating the process of a Section 61 application.

6.4.7 The employer's representative and/or the contractor will seek to agree with local authorities a common format and model consent conditions for Section 61 applications or any dispensations and variations to an existing consent.

6.4.8 The application for a Section 61 consent will require noise (and where appropriate vibration) assessments to be undertaken and BPM measures set out to manage noise associated with construction of the scheme. The contractor will submit the assessment initially to the employer's representative for review, prior to submission to the relevant local authority.

6.4.9 The contractor will carry out noise (and vibration where appropriate) predictions for Section 61 applications.

6.4.10 In the event that works for which Section 61 consent has been applied for have to be rescheduled or modified (e.g., method or working hours) for reasons not envisaged at the time of submitting the Section 61 consent application, the contractor will apply for a dispensation or variation from the appropriate local authority, before commencing those works, at the time specified within the Control of Pollution Act 1974.

6.4.11 The dispensation will be sought by means of an application to vary the agreed matters, setting out the revised construction programme or method and the relevant noise calculations.

Noise insulation and temporary re-housing policy

6.4.12 Welsh Government/employer's representative will implement a noise insulation and temporary rehousing policy. The policy is intended to provide additional protection to residents in the event that it is not practicable to mitigate airborne noise, or reduce their exposure to it, to levels that are tolerable during certain intensive construction phases.

6.4.13 The contractor will submit a noise insulation/temporary rehousing appraisal at least six months prior to starting that phase of work on site or such time appropriate to the scale and nature of the works. It is essential that the assessment is carried out early enough so that noise insulation can be installed before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

6.4.14 Typically, a noise insulation package will include secondary glazing, an alternative method of ventilation and, on certain aspects, venetian blinds.

6.4.15 The contractor will use BPM to minimise the extent to which noise insulation work or temporary re-housing of occupiers of dwellings adjacent to the works needs to be considered.

6.4.16 Notwithstanding the measures set out in this NVMP and any Section 61 consents, noise insulation or temporary re-housing will be offered to qualifying parties when:

A. noise levels are predicted or measured by the contractor to exceed the relevant trigger level defined in Table 9 at that property for at least ten days out of any period of fifteen consecutive days or alternatively 40 days in any six-month period;

B. the property complies with all other requirements of the Noise Insulation (Amendment) Regulations 1988;

C. the property is lawfully occupied as a permanent dwelling; and

D. in respect of insulation, noise insulation does not already exist that is of an equivalent standard to that which would be allowed for under the Noise Insulation (Amendment) Regulations 1988.

Table 9 Noise thresholds for noise insulation/temporary rehousing

Day	**Time (hrs)**	**Average period T**	**Noise insulation trigger level $L_{pAeq,T}$(dB)*/****	**Temporary re-housing trigger level $L_{pAeq,T}$(dB)*/****
Monday-Friday	07:00-08:00	1 hr	70	80
	08:00-18:00	10 hrs	75	85
	18:00-19:00	1 hr	70	80
	19:00-22:00	1 hr	65	75
Saturday	07:00-08:00	1 hr	70	80
	08:00-13:00	5 hrs	75	85
	13:00-14:00	1 hr	70	80
	14:00-22:00	1 hr	65	75
Sunday and public holidays	07:00-22:00	1 hr	65	75
Any day	22:00-07:00	1 hr	55	65

*Proposed Scheme construction sound only. Trigger levels are defined as 1m in front of the closest facade of a habitable room.
**Where the current ambient noise level is greater than the noise insulation trigger level:
a) the ambient noise level shall be used as the noise insulation trigger level, and
b) the ambient noise level +10dB shall be used as the temporary rehousing trigger level.

6.4.16 Welsh Government/employer's representative will develop and seek to agree with local authorities a noise insulation and temporary rehousing policy that will set out all roles, responsibilities and actions required in respect of these measures.

6.4.17 Welsh Government/employer's representative will consider at its discretion applications supported by evidence for noise insulation or temporary rehousing from occupiers who may have special circumstances. Special circumstances could include night workers, those working in home occupations, local businesses or buildings that provide community facilities requiring a particularly quiet environment and those with a medical condition which will be seriously aggravated by construction noise, and provide noise insulation or temporary rehousing where it is demonstrated that this is necessary.

6.5 Monitoring

6.5.1 Monitoring will include physical measurements and observational checks/audits.

6.5.2 The contractor will undertake and report noise and vibration monitoring, including real time noise and vibration monitoring, as is necessary to ensure and demonstrate compliance with all noise and vibration commitments, the requirements of this Outline CEMP and any Section 61 consent(s).

6.5.3 Regular on-site observation monitoring and checks/audits will be undertaken to ensure that BPM is being employed at all times. The site reviews will be logged and any remedial actions recorded. Such checks will include:

A. hours of working;

B. presence of mitigation measures, equipment (engines doors closed, airlines not leaking, etc.) and screening (location and condition of local screening, etc.);

C. number and type of plant;

D. construction method; and

E. where applicable, any specific Section 61 consent conditions.

6.5.4 The monitoring and compliance assurance process will be set out in the contractors' noise and vibration management plan, as part of their CEMP.

6.5.5 The Section 61 applications will include a detailed description of the monitoring and monitoring locations proposed for the particular works covered by the consent application.

7 OUTLINE ECOLOGICAL MANAGEMENT PLAN

7.1 Introduction

Purpose

7.1.1 The purpose of the outline Ecological Management Plan is to set out appropriate measures to protect the ecology of the site with special attention to specified ecological resources, as identified in the Environmental Statement. The Outline Ecological Management Plan will:

A. Specify measures that will be implemented during construction to ensure that impacts on sensitive ecological features are reduced;

B. Outline principles for the monitoring and maintenance of the above features.

7.1.2 If significant new ecological information comes to light, then the plan should be revised accordingly by the scheme ecologist. This outline plan will be superseded by a final Ecological Management Plan which will elaborate on the information presented herein.

7.2 Structure and scope of the Outline Ecological Management Plan

7.2.1 Management measures for potential ecological impacts are addressed in other sections of the Outline CEMP and are not repeated here. These include measures relating to Pollution prevention and control management.

7.2.2 The contractor will be responsible for producing a Construction Environmental Management Plan (CEMP) during the detailed design stage of the scheme and agreed with Statutory Environmental Bodies prior to construction.

7.2.3 The following important receptors will be considered and protected through the implementation of the detailed CEMP (as referenced in Chapter 8 of the Environmental Statement):

A. Statutory designated sites including SSSIs, SACs and non-statutory designated sites including County Wildlife Sites (CWS);

B. protected and notable species (e.g. including bats, birds, otters, reptiles and fish;); and

C. other habitats and features of ecological importance (tree and hedgerow root protection is considered within the Outline Arboricultural Method Statement and Tree Protection Plan).

7.2.4 Where reasonably practicable, environmental mitigation will be provided via the design and implemented by the contractor within the works. This will require preparatory work to be undertaken ahead of the start of construction to permit timely progress of the programme.

7.4.5 Detailed measures to deal with ecological constraints will be prepared including the following, as appropriate:

A. summary of features of interest for all known areas of nature conservation interest which may be affected due to construction;

B. provision of guidance on ecological best practice methods to be followed to mitigate potential ecological effects during construction;

C. procedures to be adopted in the event of unanticipated discovery or disturbance of protected species;

D. reference to the relevant procedures, including any special measures, to be implemented in the event of a pollution incident, where this occurs on or adjacent to an area where protected and/or notable species are known to be present; and

E. individual species or habitat management plans to include the information above (where appropriate) for:

F. terrestrial habitats;

G. European Protected Species (otter and bats);

H. badger;

I. breeding birds;

J. invertebrates

K. freshwater fish, including migratory species; and

L. common reptiles;

M. other protected and/or notable species, e.g. amphibians.

N. Species or habitat management plans will be prepared by the Contractor.

7.4.6 The contractor will, where reasonably practicable, reduce any habitat loss within the land provided for the scheme by keeping the working area to the minimum required for construction of the Scheme.

7.5 Responsibilities

7.5.1 Contractor – to ensure effective management of the works in line with their Employer's, legal and any other requirements/agreements regarding invasive species. Also, to ensure any requirements are communicated on to sub-contractors.

7.5.2 Site agents – to provide information on programme and timing of works, and issue to the Environmental advisor.

7.5.3 Environmental Manager – responsible for liaising with all parties and ensuring that they are aware of the requirements of this control plan. The environmental manager shall report the results and progress to the project management team and employer's site representative.

7.5.4 Subcontractors – to undertake works in accordance with the control plan.

7.5.5 Operatives – to follow any instruction from the project management team and conduct works in accordance with method statements.

Table 10 Responsibilities details

Name	Position/Responsibility	Contact Details
	Welsh Government Project Manager	
	Principle Contractor Environmental Manager	
	Ecological Clerk of Works	
	Site Manager	

7.6 Methods to reduce potential impacts on ecological resources

Provision of habitat and supporting species diversity

7.6.1 Low fertility soils will be used within soft estate where appropriate to encourage the development of species diversity and reduced aftercare costs. The use of topsoil will be avoided for areas of grassland, unless there is a need for normal agricultural levels of fertility.

7.6.2 Where rock encountered in cuttings is adequate, consideration will be given to retain rock exposures allowing natural weathering and regeneration to occur. Suitable locations will be identified during excavation works, then during soiling works.

7.6.3 The species rich soil from grassland and hedges that will be cleared is to be translocated to areas to be identified during detailed design and managed appropriately. Early identification of donor and receptor sites and careful soil handling with limited periods of soil storage.

7.6.4 Protected Species fencing (otter and badger) is to be installed along much of the scheme. Where otters are present the fence will include a cranked top. A barrier to species crossing the road will be provided with guidance to suitable crossings under the road.

Birds

7.6.5 During construction, mitigation for the temporary loss of habitat will include the provision of new nesting habitat including bird boxes in trees and buildings to be retained.

7.6.6 Procedures for vegetation clearance to minimise the impact on birds are described below.

Badger

7.6.8 No badgers were found during KS 3 surveys, but this highly mobile species could establish a sett in the area surrounding the scheme. If required, a badger licence from NRW would be obtained which will detail mitigation for any impacts including disturbance to any badger sett. This will be drawn up in consultation with NRW. Monitoring post-construction will be required as part of the licence.

7.6.9 Licensable activities include:

A. Artificial setts will be provided to replace any main setts which will be lost to the scheme or which will need to be temporarily closed to accommodate the scheme.

B. Any sett closures can only be carried out during the licensable period - July to December, with 21 clear days from badger activity before construction can commence.

C. Any holes/excavations created during construction period which badgers or other mammals could fall into must be covered and a ramp provided.

Otter

7.6.10 Where otters are known to be present on watercourses in the wider area, work by the Contractor would be done under a precautionary method of working as direct by a suitably qualified ecologist/ Ecological Clerk of Works.

7.6.11 In addition, no steep-sided, deep and/or water-filled excavations would be left unguarded overnight as otters could fall in and become trapped. Any major excavations that need to be left uncovered overnight would have their slopes battered. If it is necessary to leave small deep, steep-sided or water-filled excavations open overnight they would be protected with suitable fencing.

7.6.12 Night working should be avoided where possible. If it cannot be avoided, it should be restricted in the vicinity of known commuting routes and valuable areas of foraging habitat.

7.6.13 The following measures should be considered within the construction stage lighting design:

A. No known commuting routes, or important foraging should be directly illuminated;
B. Lighting levels should be as low as current standards and guidelines allow;
C. Lighting should only be provided only in essential areas;
D. Lighting should be directed to where it is needed and light spill avoided;
E. LED lighting produces no ultraviolet component and therefore is ideally suited as it greatly reduces the attraction of insects;

7.6.14 The height of lighting columns in general should be as low as possible. However, there are cases where taller columns will enable light to be directed downwards at a more acute angle and therefore reduce horizontal spill light.

Bat

7.6.15 European protected species (EPS) mitigation licences from NRW will be obtained to cover any loss or disturbance of bat roosts as a result of the scheme. These will be drawn up by the Contractor in consultation with NRW. The details in the method statements of the licences must be adhered to.

7.6.16 A Toolbox Talk regarding bats and foraging and commuting routes should be given by the ECoW prior to any works commencing.

7.6.17 Where potential presence of roosting bats in any building or tree cannot be ruled out after the full suite of field surveys and pre-construction surveys (undertaken in accordance with best practice guidance), these must be precautionary measures must be carried out including the soft-felling of trees and the soft-stripping of buildings or other built structures.

7.6.18 Where possible planting for the scheme will take in to account general habitat requirements for bats and seek to create habitat and to replace severed linkages/ commuting corridors such as hedgerows through translocations and/ or new planting through habitat creation.

7.6.18 As a general precaution, tree felling would only be undertaken in autumn, between late August and October/early November. This is because bats do not have dependent young at this time and are not hibernating and should therefore be active enough to escape harm if proper precautions are taken.

7.6.19 Night working should be avoided where possible. If it cannot be avoided, it should be restricted in the vicinity of known bat commuting routes and valuable areas of foraging habitat (i.e. commuting routes should not be illuminated nor have generators placed next to them).

7.6 20 Production of a construction stage lighting strategy to limit the use of construction lighting and ensure all essential lighting is specified and designed to reduce light spill. This is to include locations of lighting and lighting levels details. The following measures should be considered within the construction stage lighting strategy:

A. No bat roosts, or important foraging and commuting habitat should be directly illuminated;

B. Lighting levels should be as low as current standards and guidelines allow;

C. Lighting should only be provided only in essential areas;

D. Lighting should be directed to where it is needed and light spill avoided;

E. LED lighting produces no ultraviolet component and therefore is ideally suited as it greatly reduces the attraction of insects;

7.6.21 The height of lighting columns in general should be as low as possible. However, there are cases where taller columns will enable light to be directed downwards at a more acute angle and therefore reduce horizontal spill light.

Fish

7.6.22 Where instream work is required, fish relocation should take place in watercourses where fish where recorded in order to move fish from impacted reaches to suitable habitat elsewhere. This would only be done under licence from the NRW.

7.6 23 Pollution could negatively impact species, such as pollution intolerant salmonid fish. This will be mitigated by the implementation of best practice construction techniques for pollution prevention and control, as detailed within the Outline Pollution Prevention and Control Management Plan.

Section 41 Species

7.6.24 Method statements will be drawn up at the detailed design stage comprising a series of mitigation measures including timing of works, to prevent adverse impacts in any Section 41 species are identified as potentially being present throughout the scheme (including hedgehog, harvest mouse, brown hare, polecat, pine martin, common toad etc.)

7.7 Pre-construction Surveys

7.7.1 Prior to the construction phase of the Scheme pre-construction surveys will be undertaken in accordance with best practice guidelines. These surveys will include surveys of:

A. Bat surveys of buildings and trees up to 50m from any construction activities to determine if roosts are present.

B. Otter surveys on waterbodies and associated habitat within the construction area and up to 1km (500m either side of the scheme) to determine any breeding or resting sites.

C. Badger surveys up to 50m from any construction activities.

7.7.2 The results of the pre-construction surveys will be reviewed to determine if any protected species licences (or changes to the Draft licences as provided for the application) are required and shared with the Statutory Environmental Bodies.

7.8 Procedures for Vegetation Clearance

General Site Clearance

7.8.1 Any site clearance activities must be in accordance with any mitigation licences from NRW including European Protected Species mitigation licences (for bats or otter), and licences to disturb a badger sett.

Birds

7.8.2 Where possible vegetation clearance will be undertaken outside of the breeding bird season (March to August inclusive). If this is not possible, an Ecological Clerk of Works (ECoW) should be appointed to carry out a nesting bird check on any vegetation to be cleared, or vegetation directly adjacent to major works, no more than 47 hours prior to works commencing. If an active nest is identified, an appropriate exclusion zone will be decided by the ECoW based on the construction activity taking place. This exclusion zone will be marked out and protected from any clearance activity until the young are fully fledged and have left the nest.

Bats: soft felling of trees

7.8.3 If during the pre-construction surveys, any new confirmed tree roosts are identified within or in close proximity to the construction footprint, not already covered by the draft EPS licences, these must also be subject to mitigation licensing.

7.8.4 For any tree roosts where the potential presence of bats remains as low, moderate or high following all levels of presence /likely absence survey, i.e. where the possibility of roosting bats cannot be ruled out, these will require soft felling.

7.8.5 Soft felling must be undertaken in suitable weather conditions (above 10 degrees Celsius) and during the bat activity season (April to October inclusive). It involves removing the top branches first and working down the tree removing it in sections. Cutting through cavities/other potential roost features is avoided. Any sections of the tree identified as having bat roost potential will be lowered carefully using ropes to ground level. These sections will be laid on the ground with holes and cracks facing upward for as long as possible (at least 24 hours under suitable weather conditions is advisable). This gives bats/any other wildlife a chance to vacate the feature.

Bats: Dead Hedging

7.8.6 Dead hedges can be used to allow bats to continue using a favoured flight line during construction after tree lines/hedgerows/other structures are removed to accommodate the development.

7.8.7 Dead hedges may comprise a line of herras fencing panels or similar with hessian or netlon fencing stretched across them to provide a solid feature along which bats can commute during the construction phase. Such structures are only suitable to maintain connectivity for bats across short distances and are only required during the bat activity season. If they need to be moved during the day due to construction activities, they must be put back before dusk so that the mitigation is effective between dusk and dawn every night.

Amphibians and Reptiles

7.8.8 Amphibians, reptiles or any Section 41 mammal (if encountered) will be carefully moved out of the construction areas to suitable receptor areas outside of the construction footprint.

7.8.9 Within grassland and heathland areas the following methods will be considered:

A. The height of the vegetation sward will be reduced in stages (Phased habitat manipulation) within works footprint to encourage reptiles to move out of these areas - strimming to 300mm above ground level. The use of this method may vary depending on the time of year and ambient temperatures.

B. installation of exclusion fencing and placement of artificial refugia (roofing felt, corrugated tin) installed at a density of at least 100 per hectare.

C. Capture and translocation of reptiles to receptor area.

D. Any drift fencing can be removed prior to construction but exclusion fencing to remain in place throughout construction.

E. Inspection of reptile fencing, if required, throughout construction period and maintenance where necessary.

7.8.10 Habitat manipulation methods should be used first, but if reptile translocation programme is required due to numbers, a number of visits will be required, with 5 clear days at the end. Reptile enhancement features such as stone and/or log pile hibernacula's will be provided in the habitat adjacent to that being removed. If required one-way exclusion fencing will be used to prohibit amphibians and reptiles returning to the construction area.

7.9 Procedure for instream works (if required)

7.9.1 Where instream works are required in waterbodies where fish were identified, they will be drained down under the supervision of an Ecological Clerk of Works. As water levels decrease the speed of dewatering will be slowed to allow any fish or amphibians to be removed to suitable receptor locations. Where possible aquatic vegetation from drained waterbodies will be placed on the banks of retained waterbodies for a minimum of 24 hours to allow invertebrates to move out of the vegetation.

7.9.2 Care will be taken during the draining of waterbodies to adhere to the requirements of the invasive species management plan as outlined in Annex D in relation to invasive aquatic plant species.

8 OUTLINE ARBORICULTURAL METHOD STATEMENT AND TREE PROTECTION PLAN

8.1 Introduction

Purpose

8.1.1 The Arboricultural Method Statement must ensure the safe and healthy retention of all trees and hedges to be retained on this scheme.

8.1.2 The arboricultural method statement will describe how trees and hedges will be protected and managed during construction. It will need to be updated throughout the process. The purpose of the arboricultural method statement will be to explain:

A. how and when the protection measures should be installed; and

B. how they will be maintained for the duration of construction.

8.1.3 Integral to achieving this goal is the implementation of the special construction details and protection methods detailed within this report.

8.2 Structure and Scope of the Outline Arboricultural Method Statement and Tree Protection Plan

8.2.1 This document comprises an Outline Arboricultural Method Statement and is based on the information available at the preliminary design stage. As the detailed design progresses, the plan would be reviewed and updated accordingly.

8.2.2 The plan would be implemented through the construction of the scheme and all construction staff would be required to follow its provisions.

8.2.3 The arboricultural method statement must be read in conjunction with the tree protection plan.

8.3 Responsibilities

8.3.1 It is the Contractor's responsibility to ensure that the details of this arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents will be available on site and the site manager will brief all personnel who could have an impact on trees on the specific tree protection requirements. This will be a part of the site induction procedures and written into appropriate site management documents.

8.3.2 The Arboricultural Method Statement will ensure the safe and healthy retention of all trees to be retained on this scheme. Integral to achieving this goal is the implementation of the special construction details and protection methods to be detailed within the Arboricultural Method Statement (AMS) and Tree Protection Plan.

8.3.3 The key responsibilities for tree related issues on this site are provided in Table 11.

Table 11 Responsibilities details

Name	**Position/Responsibilities**	**Contact Details**
	Welsh Government Project Manager	
	Site Manager	
	Principle Contractor Environmental Manager	
	Local Authority Arboricultural Officer	
	Ecological Consultant	
	Arboricultural Consultant	
	Landscape Architect	

8.3.4 The Method Statement must be made available to all contractors and operatives on the site during the construction process so that they fully understand the importance of the measures set out for tree protection.

The controlling authority is Conwy County Borough Council (CCBC).

8.4 Landscape/Visual Mitigation Measures

8.4.1 The contractor will be responsible for the landscape and visual mitigation measures as these have been identified in the Register of Actions and Commitments (REAC) sufficient to achieve the required mitigation as set out in the ES:

A. Translocation of existing trees and shrubs should be pre-planned to allow translocation directly to permanent receptor sites so that the hedge shrubs, flora and fauna of the bank can re-establish and provide fast regrowth.

B. Planting of dense linear belt of trees and shrubs for visual screening, landscape integration, amenity or for ecological measures.

C. Planting of the various areas identified in the masterplan with a range of species after construction is completed.

D. All subsoil and soiled cutting and embankment slopes to be planted or seeded with appropriate grasses, will use suitable grass and wildflower seed from a suitable indigenous certified seed from a reputable supplier, to provide visual interest and nature conservation/biodiversity benefits. Seed is to be spread on subsoil or selected low-fertility topsoil. Subsequent management will require specific mowing regime.

E. A design to be prepared during detailed design to take account of sightlines, utilities and maintenance requirements to provide landscape integration and visual amenity.

F. A design to be prepared during detailed design to take account of nature conservation, visual screening and landscape integration requirements. Species selected for these areas will not include willow or alder, which are highly invasive species in damp ground. spreading by seed (to provide landscape integration and nature conservation).

G. The Existing Vegetation Design is to be prepared by the Contractor to identify vegetation that is to be removed, translocated or protected from damage, and areas to be prepared for landscape seeding and planting.

H. The Existing Vegetation Design is to identify vegetation that is to be retained, areas to be soiled seeded and planted.

I. The loss of trees could sever bat flightlines. Replacement planting will be required to reinstate the canopy and to reduce the gap created by felling.

8.5 Outline Arboricultural Method Statement

8.5.1 The detailed Arboricultural Method Statement will provide an instruction manual and work schedule for the site manager to inform tree and hedge root protection measures prior to and during construction. The method statement will include information regarding the following:

A. A schedule of remedial tree surgery and tree removal works to be completed prior to the commencement of all other operations on site;

B. The final location, specifications and installation details of the construction exclusion zones to include both tree protection fencing and ground protection measures;

C. The final details and specifications for the special engineering measures where works are proposed to take place within the RPAs of trees to be retained;

D. An application to the local authority must be made for any tree works, or construction works within a trees root protection area (RPA) that are subject to Tree Preservation Orders (TPO);

E. The location of site compounds, site offices and facilities, including parking arrangements, and areas for the storage of materials. Access routes for heavy plant and machinery, delivery vehicles and issues related to lifting plans for proposed crane use or access to site where aerial tree crown parts may affect intended operations;

F. Positions of responsibility on site, communication channels and details of intended contractors to be employed to undertake all arboricultural-related operations;

G. A programme setting out the sequence and timing for all works related to the trees on the site;

H. The system to be employed for monitoring the completion of each stage of the works and the protection measures specified; and

I. The appointment of an Arboricultural Clerk of Works. This will be an appropriately qualified and experienced person charged with the supervision and monitoring of the works related to trees and the reporting of satisfactory completion of operations to the client and the Local Planning Authority.

9 ARCHAEOLOGICAL OUTLINE WRITTEN SCHEME OF INVESTIGATION

9.1 Introduction

9.1.1 The Outline Written Scheme of Investigation (WSI) sets out the archaeological requirements of the contract.

9.2 Purpose

9.2.1 This WSI provides the framework through which archaeological mitigation would be managed and monitored.

9.2.2 Appropriate measures will be adopted to protect or record heritage assets affected by the scheme, as identified within the ES.

9.3 Structure and Scope of the Outline Written Scheme of Investigation

9.3.1 This document comprises an Outline Written Scheme of Investigation (WSI) and is based on the information available at the preliminary design stage. As the detailed design progresses, the plan would be reviewed and updated accordingly.

9.3.2 The detailed WSI will set out the methods and procedures for the identification and treatment of any significant archaeological remains that may be discovered during construction. Including any mitigation of effects on archaeological remains through archaeological excavation.

9.3.3 The WSI would be implemented potentially through advanced works and the construction of the scheme and all construction staff would be required to follow its provisions.

9.3.4 The Written Scheme of Investigation must be read in conjunction with the detailed Construction Environmental Management Plan.

9.3.5 The contractor will manage the impact of construction works on cultural heritage assets. Non-designated buried archaeological remains will be considered and protected through the implementation of the detailed Construction Environmental Management Plan (CEMP).

9.4 Responsibilities

9.4.1 A full detailed CEMP will be produced during the detailed design stage of the scheme and agreed with NRW and the Gwynedd Archaeological Trust (GAT) prior to construction.

9.4.2 It is the Contractor's responsibility to ensure that the details of this Written Scheme of Investigation and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents will be available on site and the site manager will brief all personnel who could have an impact on cultural heritage assets and unknown buried archaeology. This will be a part of the site induction procedures and written into appropriate site management documents.

Contacts

9.4.3 The key contacts, with responsibility for archaeological mitigation on this scheme are provided below.

Table 12 Responsibilities details

Name	Position/Responsibilities	Contact Details
	Welsh Government Project Manager	
	Principle Contractor Environmental Manager	
	Site Manager	
	Archaeological Curator (Gwynedd Archaeological Trust)	
	Coroner	
	Archaeologist Consultant	

9.5 Cultural heritage Pre-construction surveys

9.5.1 All archaeological works shall be governed by a Written Scheme of Investigation (WSI). This will be produced and agreed with the Gwynedd Archaeological Trust (Curator) to manage the pre-construction archaeological investigations required as mitigation for the direct impacts of the scheme. This will include:

9.5.2 A generic Written Scheme of Investigation (WSI) which will describe common standards and approaches to the recording of archaeological deposits that will be applied on the project;

9.5.3 Clear commitments for post excavation analysis, archiving, reporting, and where appropriate, publication.

9.6 Archaeological Watching Brief

9.6.1 During construction, an archaeological watching brief will be undertaken within areas identified in the detailed WSI that should be monitored. A watching brief is proposed in all areas where there is a potential for as-yet undiscovered significant archaeological remains to be identified

9.6.2 Any archaeological remains not previously identified which are revealed during construction must be retained in situ and reported to the Dyfed Archaeological Trust (Curator) as soon as reasonably practicable; and subject to appropriate mitigation.

9.7 Monitoring, Review and Reporting

9.7.1 A programme of archaeological reporting, post excavation and publication will be required.

9.7.2 The Archaeologist consultant would be responsible for all liaisons with the Gwynedd Archaeological Trust (Curator). They would notify when field work is due to commence and prepare monitoring reports.

9.8 Site Specific Requirements

9.8.1 As identified in Chapter 10 of the Environmental Statement, the contractor, will be responsible for assessment of site which could include recording, evaluation trenching, soil stripping and recording, excavation, protection from harm, or a watching brief, to be agreed with the DAT Curator in advance of any construction works on site, in the final draft of this Written Scheme of Investigation, to determine the state of the sites and any further actions required through an archaeological monitoring management plan:

10.8.2 A geophysical survey has been carried out for the full extent of the scheme land take with limited additional areas included where the archaeologist considered that there was an increased risk of discovery. Any further land that a future Contractor's requires for compounds, haul roads or stockpiles will need to be surveyed using a similar method to identify and characterise unknown archaeological features (Specialist subcontractor to be commissioned during Key Stage 3). Archaeological evaluation may be required as indicated by the results of the geophysical survey.

10 PUBLIC RIGHTS OF WAY MANAGEMENT PLAN

10.1 Introduction

Purpose

10.1.1 As with any linear infrastructure scheme of this size/nature, the scheme interacts with a number of Public Rights of Way (PRoW) and the following section presents a general PRoW management plan for the construction and operational phases of the scheme.

10.2 Management Plan

Signage and Information

10.2.1 At all points where PRoWs intersect or cross the proposed development, appropriate signage will be erected to advise of planned works and dates of any planned closures. Signage will also, where applicable, provide information on any alternative routes/diversions and new routes. The location and details of these signs will be discussed and agreed with PCC PRoW Officers.

10.2.2 Information signs detailing works and giving the project Community Relations team contact number details will be maintained across the construction site.

10.2.3 A high-level programme of PRoW closures and alternative/new routes will be produced and the PCC PRoW Officers, affected Town or Community Councils and if required, Land Agents and/or Persons with Interest in Land (PILs) will be notified at least seven days in advance of any closure. A separate notification will be issued when the closure has ceased, or an alternative/new route has been provided. Advance notice will include planned dates of any closures and the programmed dates for reopening/re-providing PRoW.

Forms of Managed Closure

10.2.4 Every effort will be made to minimise disruption along the PRoW network and will follow the following decision-making process which sets out a hierarchy of actions, starting with those that create the minimum impact:

A. Use of signage where PRoW can remain open but users need to be warned of the presence of construction vehicles (local management);

B. Implementation of short, temporary closures where local works might affect safety of users (local closures);

C. Closure of/extinguishment of a PRoW following the early implementation of an alternative/new route (e.g. via a new overbridge/underbridge) (early re-provision);

D. Closure of/extinguishment of a PRoW without re-provision (e.g. where works sequencing will not provide a new crossing in advance on the carriageway works) and/or permanent extinguishment of a PRoW (full closure).

E. Provision of new crossings/routes as part of the scheme (new routes).

10.2.5 All such interventions will be developed in liaison with CBCC PRoW Officer and will be confirmed upon the appointment of a contractor.

10.2.6 The following paragraphs provide more detailed examples of key forms of intervention that are likely to be required.

Local Management

10.2.7 Where it is considered safe to do so, PRoW in close proximity to construction works or that adjoin roads that may be affected by works will remain open with appropriate signage to warn of the presence of construction vehicles, and to warn drivers of the presence of walkers, cyclists and horse riders. It is considered that it would be disproportionally disruptive to close PRoW in this instance, particularly when works may only be taking place for short periods of time and risk to the public is likely to be low.

10.2.8 In certain instances, a banks person could be used to hold users of the PRoW network for short periods to allow for safe passage of construction traffic (e.g. where a PRoW is to be used for construction access).

Local Closures

10.2.9 Where works are predicted to affect the safety of PRoW users to an extent that cannot be controlled by local management, local closures would be sought. Such closures would be temporary and short-term in order to facilitate periods of construction works that are discrete in nature and can be completed in a matter of days/weeks, rather than months.

10.2.10 Where it is not considered safe to keep PRoW open with appropriate signage during construction works, the need for a diversion, signage and other relevant details will be discussed and agreed with PCC.

Full Closure

10.2.11 Given the linear nature of the proposed scheme, and the programme of works, it will not always be possible for Welsh Government to retain access across the works for the full extent of construction. In these instances, Welsh Government are seeking a full closure of certain PRoW to enable construction. Where possible, access across the new road has subsequently been provided via new structures, however, there are a few instances where no re-provision is planned.

New Routes

10.2.12 The provision of new routes to enhance the current PRoW network or new routes to facilitate access across the proposed scheme.

11 ASBESTOS MANAGEMENT PLAN

11.1 Assets affected by the scheme

11.1.1 The only asset affected by the scheme are two properties on Penamenmawr Road beside Shore Road East which will be demolished.

11.2 Procurement of Asbestos Services

11.2.1 Any required asbestos surveys shall be procured by Welsh Government in accordance with the requirements of GD 5/16[8], reproduced as follows.

A6.6.1 The HSE recommends, that asbestos surveying and laboratory testing organisations shall be accredited to ISO 17020 and 17025 respectively (UKAS or other). The Major Project Service Provider will let the appropriate contract with the Surveying and Testing Organisation. Furthermore, the AAPs may state a requirement to undertake Management Surveys and/or Refurbishment/Demolition Surveys.

A6.6.2 Major Project Provider shall obtain approval from the MPD Scheme Project Manager prior to awarding any contract for the proposed specialist services.

A6.6.3 All surveys shall comply with the requirements of HSG 264[9].

A6.6.4 In planning for surveys the following issues shall be considered:

Whether records indicate a strong likelihood of ACM or not.

The risk posed by working under traffic management compared to the likely risk of disturbing ACMs during planned maintenance work.

Known consistency of materials/components based on contract limits during the original construction work and the repeated detailing on bridges and culverts. This will allow representative sampling and assessment work to take place. However, previous modifications to Asset need to be considered.

Similarity in the appearance of construction details in buildings and other similar structures.

Combining survey work for asbestos with other maintenance activities within planned traffic management measures.

Whenever possible combine asbestos surveys with any planned inspections to take advantage of shared access arrangements.

A6.6.5 The survey specification shall comply with HSG 264 and HSG 248 and requires the surveyor to recommend actions for each known or presumed ACM. Recommended actions must be produced by the surveyor in conjunction with the Service Provider to make sure decisions on actions are appropriate for the Asset in question. These actions form the 'action plan' column on the asbestos register required for inclusion in the AAP format.

A6.6.6 The following survey types will be appropriate in the following general circumstances in the table below.

Asset Type	Element/Feature included in the Survey	Survey Type (As HSG 264)

[8] Design Manual for Roads and Bridges, Part 4, GD 5/16 (2016), Asbestos Management in Trunk Road Assets.
[9] HSE, HSG264, Asbestos: The Survey Guide, Second Edition (2012).

Buildings, compounds, miscellaneous structures	All visible components or materials in roofs, ceilings, walls, floors etc where no intrusive maintenance work is planned to hidden components.	Management Survey.
	All components where intrusive work is planned during refurbishment, modification, demolition, reconstruction or extension of a building structure.	Refurbishment/Demolition Survey unless works deemed to be minor.
Highway Structures	All visible materials in structure – no intrusive work planned.	Management Survey.
	All materials/components in the structure which would be affected by intrusive work e.g. waterproofing or joint repairs.	Refurbishment/Demolition Survey.
	Any demolition or reconstruction.	Refurbishment/Demolition Survey.
Highways Generally	All visible surface features – no work planned which could affect ACMs in the ground, e.g. in ducts and surface water drains.	Management Survey.
	All elements which could be affected by major construction work – e.g. ducts, chambers, surface water drains, buried joints, utilities infrastructure.	Refurbishment/Demolition Survey.
	Any demolition or reconstruction – e.g. major widening, new slip roads or junctions.	Refurbishment/Demolition Survey.

11.2.2 In addition to the above, any potential asbestos surveys shall also comply with the requirements of HSG 248[10].

11.2.3 If asbestos materials are identified during surveys for structures proposed for refurbishment of demolition, then prior to works commencing asbestos containing materials should be removed in accordance with the requirements of the Control of Asbestos Regulations (CAR), 2012, appropriate HSE guidance documents and Codes of Practice, and the Hazardous Waste (England and Wales) Regulations, 2005.

11.2.4 Any asbestos containing product or material is defined as hazardous waste when it contains more than 0.1 % asbestos. Asbestos waste can include contaminated building materials, contaminated soils, tools that cannot be decontaminated, personal protective equipment and damp rags used for cleaning.

[10] HSE, HSG248, Asbestos: The Analysts' Guide for Sampling, Analysis and Clearance Procedures (2010)

11.4.5 Asbestos removal must be undertaken by competent and trained persons / companies, licensed by the HSE where necessary, and with all necessary notifications to the HSE.

APPENDIX 2.3
REGISTER OF ENVIRONMENTAL ACTIONS AND COMMITMENTS (REAC)

Register of Environmental Actions and Commitments **JUNCTION 16** **ES Appendix 2.3**

Commitment Identity				Commitment and Actions										
Ref/Number		**Environmental Aspect**	**Secondary aspects**	**Description of Environmental Action or Commitment**	**Objective (desired outcome)**	**Main source of action or commitment**	**Recorded where? ES text,table or Masterplan Sheet**				**Responsibility for completion**	**When?**	**Commitment to mitigate or enhance?**	**How is outcome to be achieved?**	**How is outcome to be monitored during D&B contract**
							Table in Chapter	**Sheet or chainage**	**Secondary source**	**Ref**					
Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown					Pulldown	Pulldown		Description	Description
Arch	1	Archaeology and Cultural Heritage		Archaeological Trenching and scheme of work, noise reducing surfacing	No Archaeological features identified are not preserved or alternatively recorded.	Env Statement	T.6				Contractor's team	Pre-construction	Mitigation	Evaluation trenching followed by archaeological written scheme of investigation	Local GAT Curator monitoring Archaeological work. Noise survey monitoring
Arch	2	Archaeology and Cultural Heritage		Archiving of recording and investigation reports	To ensure records are maintained in a public archive	Env Statement					Contractor's team	Pre-construction	Mitigation	Submission o freports to the Historic Environment Record (HER) and Coflein	Contractor to ensure that records are submitted within 12 months of completion
Arch	3	Noise and Vibration	Geology and Soils	Archaeological Trenching and scheme of work, noise reducing surfacing	No Archaeological features identified are not preserved or alternatively recorded.	Env Statement	T.6				Contractor's team	Pre-construction	Mitigation	Evaluation trenching followed by archaeological written scheme of investigation	Local GAT Curator monitoring Archaeological work. Noise survey monitoring
Assets	1	Community and Private Assets	Landscape Visual	The loss of Public Open Space within the Scheme footprint is to be replaced within the CPO in the form of Exchange Land that shall form part of the linear green space to the south of the false cutting.	To ensure that public open space is not lost	Env Statement			Masterplan		Contractor's team	Construction	Mitigation	During detailed design and construction the contractor is to ensure that the areas included in the CPO as exchange land are designed and laid out in accordance with the layout in the Environemntal Masterplan	Reviews of detailed design and inspections during construction and aftercare
Bio	1	Nature Conservation	Air Quality	Dust Management Plan	Dust supression preventing exposure for sensitive receptors.	Other	T.16		Env Statement	Section 8.7.12	Contractor's team	Construction	Avoidance	Dust Management Plan as part of the CEMP	Dust supression measures to be included in the Construction Environment Management Plan
Bio	2	Nature Conservation	Landscape Visual	Planting design which allows movement of species, i.e. linear habitats including shrub and tree planting which provide cover and shelter, inlcuing aling the Afon Gyrach	Connectivity of habitat to form resiliant ecolosystmes	Masterplan	T.16		Masterplan	W228	Maintaining Agent	Contract aftercare	Mitigation and enhancement	Detailed landscape drawings including topsoiling, seeding and planting plans will be submitted for approval to the Project manager prior to any works commencing on site.	Planting design is outlined in the Landscape Management Plan
Bio	3	Nature Conservation	Landscape Visual	Planting species rich grassland	Net gain in biodiversity replacing species poor grassland with species rich grassland	Masterplan	T.16		Env Statement	Section 8.8.9	Maintaining Agent	Contract aftercare	Mitigation and enhancement	Detailed landscape drawings including topsoiling, seeding and planting plans will be submitted for approval to the Project manager prior to any works commencing on site.	Planting design is outlined in the Landscape Management Plan
Bio	4	Nature Conservation		Sensitive design of lighting to avoid lighting of the river channels and banks of the Afon Gyrach. The recommended lux is 0.2 lux on the horizontal plane and 0.4 on the vertical (or are less than this). Where lighting is required on the road section with traverses the Afon Gyrach, this would have minimal UV, with a warm colour temperature – 3000K or 2700K with light sources that peak higher than 550nm.	Retention of dark corridors of movement along the riparian habitat	Env Statement	T.16		Env Statement	Section 8.8.9 and 8.8.49	Maintaining Agent	Operation	Avoidance	Approved lighting design specification in consultation with NRW and ecologist. Lower lux levels and the installation of baffles to ensure lighting does not spill onto the river corridor.	Approved lighting design for final design
Bio	5	Nature Conservation	Road drainage and Water Env	The implementation of SuDs which incorporate enhancements to biodiversity	Net gain in bidoiversity	Env Statement	T.16		Env Statement	Section 8.8.9 Schedule 3 of the Flood and Water Management Act 2010 (Standard S5).	Maintaining Agent	Operation	Mitigation and enhancement	The design of SuDS to be carried out in consulation with ecologist so as to gain maximum biodiversity benefits	Planting design to be outlined in the Landscape Management Plan
Bio	6	Nature Conservation		Minimise light spill along existing and proposed landscape planting	Retention of dark corridors of movement along habitat	Env Statement	T.16		Env Statement	Section 8.8.9 and 8.8.47	Maintaining Agent	Operation	Mitigation and enhancement	Approved lighting design specification in consultation with NRW and ecologist. Lower lux levels and the installation of baffles to ensure lighting does not spill onto habitats and is directional to where it is required.	Approved lighting design for final design
Bio	7	Nature Conservation	Noise and Vibration	Where reasonably practicable, adopt quiet working methods, using plant with lower noise emissions	Reduce noise pollution	Env Statement	T.16		Env Statement	Section 8.8.9	Contractor's team	Construction	Avoidance	Specified within the CEMP, noise control	Noise supression measures to be included in the Construction Environment Management Plan
Bio	8	Nature Conservation	Noise and Vibration	Use silenced and well-maintained plant conforming with the relevant EU directives relating to noise and vibration	Reduce noise pollution	Env Statement	T.16		Env Statement	Section 8.8.9	Contractor's team	Construction	Avoidance	Specified within the CEMP, noise control	Noise supression measures to be included in the Construction Environment Management Plan
Bio	9	Nature Conservation	Noise and Vibration	Use rubber linings for chutes and dumpers to reduce impact noise	Reduce noise pollution	Env Statement	T.16		Env Statement	Section 8.8.9	Contractor's team	Construction	Avoidance	Specified within the CEMP, noise control	Noise supression measures to be included in the Construction Environment Management Plan

Ref/Number		Environmental Aspect	Secondary aspects	Description of Environmental Action or Commitment	Objective (desired outcome)	Main source of action or commitment	Recorded where? ES text,table or Masterplan Sheet				Responsibility for completion	When?	Commitment to mitigate or enhance?	How is outcome to be achieved?	How is outcome to be monitored during D&B contract
Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown	Table in Chapter	Sheet or chainage	Secondary source	Ref	Pulldown	Pulldown		Description	Description
Bio	10	Nature Conservation		Removal of vegetation outside of the breeding bird season	Avoid contravening the legislation protecting nesting birds	Env Statement	T.16		Env Statement	Section 8.8.10 and 8.8.73	Contractor's team	Pre-construction	Avoidance	Clear all vegetation outside of the main nesting bird season generally considered to be March – August inclusive but can commence earlier or extend later in the season dependent upon current climatic conditions. Where this is not possible, then an ecologist to check vegetation prior to removal to ensure that it is free of nesting bird activity.	Checks done by Environmental and Ecological Clerk of Works prior to removal, agree areas with contractors.
Bio	11	Nature Conservation		Installation of otter exclusion fencing along the new bypass road. Fencing would be as specified within DMRB. The height of the fence would be a 1500mm, with an overhang of 300mm angled at 45^{o} at the top and 90^{o} at the bottom, underground. The fence would continue underground for 500mm angled at 90^{o} by 300mm. The fence would be installed on both sides of the road for at least 100 m from the watercourse and SUDs pond. Designs would be carried out in consulation with NRW and NMWTRA.	To deter otters from entering onto the new road	Masterplan	T.16	W231	Env Statement	Section 8.8.10 and Section 8.8.64	Contractor's team	Operation	Avoidance	As specified in DMRB. Design and extent to be agreed with NRW and NMWTRA.	Checks done by Environmental and Ecological Clerk of Works, extent to be agreed with NRW and NMWTRA .
Bio	12	Nature Conservation		An otter ledge would be installed within the new bridge either constructed of solid concrete or as a bolt on design. The ledge would be at least 500mm wide and accessible from the banks. The ledge should be sited at least 150 mm above highest water level and allow for 600 mm headroom. Final designs would be discussed and agreed with NRW and NMWTRA	To facilitate the passage of otters if necessary	Env Statement	T.16		Env Statement	Section 8.8.10 and Section 8.8.64	Contractor's team	Construction	Mitigation and enhancement	Design and extent to be agreed with NRW and NMWTRA.	
Bio	13	Nature Conservation		Installation of reptile exclusion fencing. Fencing to be used should be herpetosure® as this is more sustainable than that specified in the DMRB, can reused, and the panels are made from recycled material. The fence would be 375 mm high above ground with a with a 75mm 90 degree top curl and buried 300 mm below ground and backfilled.	To exclude reptiles from the works area so as to avoid killing or injury to reptiles during site clearance and contravening any legislation protecting reptiles.	Env Statement	T.16		Env Statement	Section 8.8.10 and 8.8.77	Contractor's team	Pre-construction	Avoidance	Resonable Avoidance Measure to be set out within an approved Method Statement (LPA, NMWTRA). Contractors to install exclusion fenicng in the presence of ecologist under watching brief.	Checks done by Environmental and Ecological Clerk of Works. Ecological Watching Brief and approved Method Statements.
Bio	14	Nature Conservation	Road drainage and Water Env	Installation of environmentally friendly gully pots or alternative measures to the use of gully pots	NWTRA looking into research to phase out the sue of gully pots.	Env Statement	T.16	Section 8.8.1	ELG	18.4	Welsh Government	Operation	Avoidance	This would need to be carried out in consultation with the drainage design team and WG/NMWTRA to see what is feasible.	In consultation with the design team and NMWTRA
Bio	15	Nature Conservation	Materials	Installation of integrated bat boxes within the new bridge. X 4 (two either side) of 2FE Schwegler Wall-Mounted Bat Shelter or cavities to be created within the structure as it is built as per recommendations within DMRB Volume 10 Section 1 Part 8 HA 80/99 (now withdrawn)	To provide roosting habitat for bats and a provide a biodiversity net gain	Env Statement	T.16	Section 8.8.1	ELG	17.1	Contractor's team	Construction	Enhancement only	In consultation with NMWTRA and the structures team and ecologists.	Checks done by Environmental and Ecological Clerk of Works in consultation with the design team and NMWTRA.
Bio	16	Nature Conservation	Landscape Visual	Removal of and safe disposal of any Invasive Non Native plants	To avoid the spread of INNS and to control/eradicate these	Env Statement	T.16		Env Statement	Section 8.8.10 and 8.8.15	Contractor's team	All	Mitigation and enhancement	Areas to be identified on site by Environmental Clerk of Works. Measures of control during site clearnce and construction under approved Method Statement compiled by contractor which will form part of the CEMP.	Checks done by Environmental and Ecological Clerk of Works. Ecological Watching Brief and approved Method Statements.
Bio	17	Nature Conservation		Toolbox talks to contractors	To highlight ecological contraints, best practice and legistaltion and Reasonable Avoidance Measures	Env Statement	T.16		Env Statement	Section 8.8.11	Contractor's team	Pre-construction	Avoidance	Tool Box Talks	To be carried out Environmental and Ecological Clerk of Works and records reatined as an audit trail.

Ref/Number		Environmental Aspect	Secondary aspects	Description of Environmental Action or Commitment	Objective (desired outcome)	Main source of action or commitment	Recorded where? ES text,table or Masterplan Sheet				Responsibility for completion	When?	Commitment to mitigate or enhance?	How is outcome to be achieved?	How is outcome to be monitored during D&B contract
Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown	Table in Chapter	Sheet or chainage	Secondary source	Ref	Pulldown	Pulldown		Description	Description
Bio	18	Nature Conservation		Pre-commencement site walkovers and surveys	To update current ecological baseline and identify and further requirements.	Env Statement	T.16		Env Statement	Section 8.8.11 and 8.8.13	Contractor's team	Pre-construction	Avoidance	Site walkovers to be carried out by ecologist prior to works commening on site.	Checks done by Environmental and Ecological Clerk of Works. Any findingd reported back to Environmental Manager.
Bio	19	Nature Conservation		Minimise overnight working	So as to avoid disturbance to nocturnal mammals	Env Statement	T.16		Env Statement	Section 8.8.11	Contractor's team	Construction	Avoidance	As specified by working hours on site, detailed within the CEMP.	Construction Manager
Bio	20	Nature Conservation		Surveys to any trees which need to be removed for their potential to support bats roosts (Tree Grp BRP 7 and BRP 8 and BRP 1 - 4). Initial surveys highlighted tree to have negligible - low potential.	So as to avoid the disturbance to or destruction of bat roosts and contravening any legislation protecting bats	Env Statement	T.16		Env Statement	Section 8.8.11 and 8.8.50	Contractor's team	Pre-construction	Avoidance	Experienced ecologist to re-assess the trees and advise on further survey requirements or Reasonable Avoidance Measures. Climb and inspect surveys may be required.	Checks done by Ecological Clerk of Works. If a roost is found a licence from NRW would be required. Emeregnce surveys can aonly be consucted between May - September.
Bio	21	Nature Conservation	Road drainage and Water Env	Pollution control and prevention to water courses and the marine environment	To avoid pollution to the water course and the marine environment and associated features	Env Statement			Env Statement	Section 8.8.21	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan and Ground and Surface Water Management Plan developed in consultation with NRW	Works within and adjacent to the watercourse would be monitored by an Environmental Clerk of Works. If discolouration of the watercourse is noted, works would stop and working practices reviewed.
Bio	22	Nature Conservation	Road drainage and Water Env	An impermeable coffer dam would be placed between any concreting works and the Afon Gyrach	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Works within and adjacent to the watercourse would be monitored by an Environmental Clerk of Works.
Bio	23	Nature Conservation	Road drainage and Water Env	Management of silt by the use of cut-off drains, silt curtains, straw bales as necessary, placed downstream of the works area to minimise transfer of any excess sediments downstream.	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Works within and adjacent to the watercourse would be monitored by an Environmental Clerk of Works.
Bio	24	Nature Conservation	Road drainage and Water Env	All fuel, oil and chemicals used on site to be stored away in a locked store which would be bunded to 110% capacity of the volume stored	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Environmental Manager
Bio	25	Nature Conservation	Road drainage and Water Env	Concrete pouring for the construction of the new culvert/bridge would not take place if heavy rain is forecast	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Environmental and Construction Manager to monitor weather conditions
Bio	26	Nature Conservation	Road drainage and Water Env	No contaminants, e.g. concrete mixings, would be washed out within 10m of any trees or watercourses unless contained	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Environmental Manager
Bio	27	Nature Conservation	Road drainage and Water Env	An oil spill kit would be available on site, and all relevant staff trained in its use	To avoid pollution to the water course and the marine environment and associated features	Env Statement	T.16		Env Statement	Section 8.8.22	Contractor's team	Construction	Avoidance	Pollution Control and Prevention Plan	Environmental Manager and Construction Manager
Bio	28	Nature Conservation	Landscape Visual	Mitigation measures to protect retained trees and hedgerows to include demarcating and fencing off the Root Protection Zone (RPZ)	To avoid damage to retained trees and hedgerows	Env Statement	T.16		Env Statement	Section 8.8.34	Contractor's team	Pre-construction	Avoidance	Trees and vegetation to be protected in accordance with BS 5837:2012 prior to works commencing on site.	Environmental Clerk of Works to agree areas of existing vegetation to be retained with Contractor.

Ref/Number		Environmental Aspect	Secondary aspects	Description of Environmental Action or Commitment	Objective (desired outcome)	Main source of action or commitment	Recorded where? ES text,table or Masterplan Sheet				Responsibility for completion	When?	Commitment to mitigate or enhance?	How is outcome to be achieved?	How is outcome to be monitored during D&B contract
Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown	Table in Chapter	Sheet or chainage	Secondary source	Ref	Pulldown	Pulldown		Description	Description
Bio	29	Nature Conservation		Sensitive design of bridge to include an arch construction and width of 4.88m and rise of 2.21m to match the existing.	So as to retain the continued functionality as a corridor of movement by bats and otters	Env Statement	T.16		Env Statement	Section 8.8.54	Contractor's team	Construction	Mitigation	Detailed design approved by NRW and Ecologists	Environmental Manager and Construction Manager
Bio	30	Nature Conservation		Capture and relocation of reptiles to be conducted spring/early-summer period (April to June) when captures are at their most efficient.	To remove reptiles from the works area so as to avoid killing or injury to reptiles during site clearance and contravening any legislation protecting reptiles.	Env Statement	T.16		Env Statement	Section 8.8.78 and 8.8.82	Contractor's team	Pre-construction	Avoidance	Resonable Avoidance Measure to be set out within an approved Method Statement (LPA, NMWTRA). Reptiles would not be relocated later than mid- to late-September depending upon weather conditions. A minimum of 340/ha of refugia would be deployed based on the DMRB guidance. Refugia would be left in situ for a minimum of two weeks. Once a 'reasonable capture effort' has been expended, ideally once capture rates have declined towards zero, site clearance works can commence.	Refugia to be deployed and checks done by Environmental and Ecological Clerk of Works and approved Method Statements.
Bio	31	Nature Conservation		In areas where reptiles have been captured and excluded (land to the north of Ysguborwen Rd) habitat manipulation would be carried out after the relocation of reptiles has been carried out.	So as to avoid killing or injury to reptiles during site clearance and contravening any legislation protecting reptiles.	Env Statement	T.16		Env Statement	8.8.79	Contractor's team	Pre-construction	Avoidance	Resonable Avoidance Measure to be set out within an approved Method Statement (LPA, NMWTRA). Any vegetation to be removed would be strimmed or flailed down to 15 cm, then left for a day and checked by the ecologist and then taken to ground level (stage strimmed). Trees and scrub would be taken down to stumps prior to uplifting, a 'destructive search fo the stone wall would be conducted.	Site supervision and checks done by Environmental and Ecological Clerk of Works and approved Method Statements.
Bio	32	Nature Conservation		No removal of reptile habitat would be conducted over the winter months (between Nov – February or within frosty conditions) this includes the stone walls and dense scrub/grassland located within land to the north of Ysguborwen Rd.	To avoid distrbance to hibernating reptiles.	Env Statement	T.16		Env Statement	8.8.81	Contractor's team	Pre-construction	Avoidance	Resonable Avoidance Measure to be set out within an approved Method Statement (LPA, NMWTRA).	Monitrored by the Environmental and Ecological Clerk of Works.
Bio	33	Nature Conservation	Road drainage and Water Env	Retain existing river bed beneath new bridge over Afon Gyrach	Retention of the existing riverbed beneath the bridge would minimise any changes in the hydromorphology of this portion of the Afon Gyrach (and thus the aquatic populations that rely on it)	Env Statement	T.16		Env Statement	8.8.90	Contractor's team	Construction	Avoidance	Inclusion of river bed retention in Scheme design	Design drawings for final design. Consultation with aquatic ecologist and NRW as necessary.
Bio	34	Nature Conservation	Landscape Visual	Intallation of bee bricks within masonry wall	To increase biodiversity and attaract pollinators	Masterplan		W220 and W221	Env Statement	8.8.10	Contractor's team	Construction	Enhancement only	Integration of bee bricks to be specified at detailed design	Design drawings for final design. Consultation with NMWTRA as necessary.
Clima	1	Air Quality	Climate Change	Temporary storage of water should be considered during construction stage to be used in drought conditions.	Dust supression preventing exposure for sensitive receptors.	Env Statement	T.10		Env Statement		Contractor's team	Construction	Mitigation	Store sufficient water supply onsite during construction	Dust supression measures to be included in the Construction Environment Management Plan
Clima	2	Air Quality	Climate Change	Watering vegetation should be considered during construction and planting establishment stages in drought conditions.	Earthworks should be revegetated to stabilise surfaces preventing dust exposure for sensitive receptors.	Env Statement	T.10		Env Statement		Contractor's team	Construction	Mitigation	Water vegetation during construction and planting establishment stages	Post scheme monitoring to confirm establishment of vegetation
Vis	3	Landscape Visual	Climate Change	A wide genetic base of vegetation types and a mix of provenances is recommended to build in adaptability to an unpredictable future climate.	Vegetation planting is more resilient to warmer and drier weather.	Env Statement	T.10		Env Statement		Contractor's team	Construction	Mitigation	Select a wide genetic base of vegetation types and a mix of provenances for landscape planting.	Planting design is outlined in the Landscape Management Plan

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Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown	Table in Chapter	Sheet or chainage	Secondary source	Ref	Pulldown	Pulldown		Description	Description
Vis	1	Landscape Visual	Landscape Visual	**Arboricultural Survey** Undertake an arboricultural survey in accordance with BS 5837 of the existing roadside vegetation including mature trees and vegetation within the Scheme footprint and adjacent to temporary works and construction compound areas.	Identify vegetation and Root Protection Areas and vegetation to be retained and protected,or cleared, in advance of site operations commencing. To identify requirements for temporary protection fencing and remedial works to trees.	Masterplan		Figure 2.6			Contractor's team	Construction	Avoidance	Following the survey a set of existing vegetation drawings shall be produced showing vegetation to be removed, or protected in accordance with BS 5837 prior to works commencing on site.	Environmental Clerk of Works to agree areas of existing vegetation to be retained with Contractor.
Vis	2	Landscape Visual	Landscape Visual	**Retention and protection of Existing Trees and Vegetation** in accordance with BS 5837: 2012.	Retention and protection of existing vegetation to maintain visual screening and integration of the existing road infrastructure into localised landscape	Masterplan		Figure 2.6			Contractor's team	Construction	Mitigation	Trees and vegetation to be protected in accordance with BS 5837 prior to works commencing on site. The design and construction of the Scheme shall minimise the loss of established trees, shrubs and important habitat whilst achieving the other objectives of the Scheme. Areas shown in the EMP drawings as 'vegetation requiring pruning' in the manner set out for each plot. These areas shall not be cleared for temporary works without the agreement of the Project Manager.	Environmental Clerk of Works to implement tree protection fencing and monitor throughout construction period
Vis	3	Landscape Visual	Geology and Soils	**Soil Resource Strategy (SRS)** Prepare a SRS for all existing soils within the Scheme extents with the aim of re-use on site. The soils will be certified and tested in accordance with BS3882:2015 and recommendations made for any ameliorants necessary for the use of soils to provide a sustainable growing medium for the Landscape Elements (LE).	To establish the suitability of the existing soils to be disturbed and removed as part of the Scheme as a suitable growing medium for wildflower grassland and for tree and shrub planting	Env Statement					Contractor's team			The SRS will be submitted for approval of the Project Manager prior to commencing on site. Topsoil may be used for for use in the soft estate for landscape elements as identified on the Environmental Masterplans at Figure 2.6. A Welsh Government requirement of all trunk road projects is that all grass areas and areas of trees and shrubs planted into grass shall be seeded with suitable mix of grass and wildlflower species. The inclusion of grass seed shall be at a suitable low density /m2 to allow wildflower species to establish diuring construction and aftercare. To achiee this, fertile topsoil shall only be used where land is restored to agriculture, or used for sport pitches.	The SRS is to be included within the CEMP and submitted for approval by the Project Manager.
Vis	4	Landscape Visual	Nature Conservation	**Detailed Planting Plans and Specification** Prepare detailed planting plans and specification in accordance with DMRB Series 3000 Landscape and Ecology for all Landscape Elements (LE) as indicated on the Environmental Masterplan in Appendix 2.6.	To provide detailed design of Landscape Elements (LE)appropriate to achieving the Environmental Functions (EF) of each Environmental Functions of each of the LE's.	Env Statement					Contractor's team			Detailed landscape drawings including topsoiling, seeding and planting plans will be submitted for approval to the Project Manager prior to any works commencing on site. Planting mixes shall include a variety of species suited to the conditions and the functions of the planting plots concerned.	Planting design is outlined in the Landscape Management Plan
Vis	4	Landscape Visual	Nature Conservation	Prepare detailed drawings and specification for all Landscape Elements (LE) as indicated on Environmental Masterplan (ES Appendix 2.6) and planting plans in accordance with Manual of Contract Documents for Highway Works Series 3000 (05/01) Landscape and Ecology.	To ensure all Landscape Elements (LE's) presented in the Environmental Masterplan are adequately detailed and specified to ensure effective mitigation measures for the purposes shown on the Environmental Masterplan and described in the ES.	Masterplan		Drawing Nos. A55J15J16-RML-30-15-DR-X-0201 and 0202	Env Statement		Contractor's team	Construction	Mitigation	By undertaking appropriate planting and other mitigation measures during the Construction Period and Establishment Maintenance Period.	Contractor shall undertake the works in accordance with the requirements opf Volume Speficitation for Highway Works Series 3000 Landscape and Ecology.
Vis	5	Landscape Visual	Nature Conservation	Completion of the proposed planting and seeding to meet the requirements for mitigation as set out in the ES	Effective mitigation. Acheivement of the Ministerial Green Corridors Initiative.	Env Statement		Chapter 9 and chapter 8	Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	Implementation of the seeding and planting meausres through detailed design, construction and aftercare to ensure establishment and growth to meet mitigation objectives.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
Vis	6	Landscape Visual	Nature Conservation	Provision of coastal scrub habitat	Effective mitigation that is apprpriate to the setting. Acheivement of the Ministerial Green Corridors Initiative.	Env Statement		Chapter 9 and chapter 8	Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	Planting along the A55 roadside and north of the proposed linkroad shall adopt the species mix described in the ES Chapter 9 to provide a visually and ecologically appropriate coastal habitat.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
Vis	7	Landscape Visual	Nature Conservation	Planting in the context of the existing A55 plantations	Effective mitigation that is apprpriate to the setting. Acheivement of the Ministerial Green Corridors Initiative.	Env Statement		Chapter 9 and chapter 8	Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	As necessary for visual integration, planting adjacent to all existing retained A55 plantations, other than described in Vis8 (above) shall adopt some species from the original plantaion to achive visual continuiyt and integration.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.

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Vis	8	Landscape Visual	Noise and Vibration	False cutting along the south side of the trunk road, between chainage 800 and 1650 on the mainline) shall be constructed to have a finished crest line to achieve the required screening from residential areas and public open space to the south of the proposed link road.	Effective visual and noise screening to meet the requirements and thresholds set ot in the ES. It is likely that the false cutting earthwork shall be a nomibal 5 metre high.	Env Statement		Chapter 9 and chapter 13	Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	The degree of visual and noise mitigation reported in the ES is dependant upon the false cutting and associated measures, walls, fences and other barriers achieving the required height. Planting shall be completed on the north side of the false cutting such that it will enhance the visual screening of this earthwork, whilst also allowing sea views over to top. This planting will include native species found in coastal scrub habitat. Note that whilst the north slopes of the false cutting shall be at a gradient to suit engineering requirements, the southerly slopes are to designed in accordance with the EMP and the ES. These southerly slopes are to be graded out no steeper than the profiles shown in the EMP (nominally 1:6 to provide safe access for grazing animals and mowers, with the tops and bottoms of slopes rolled-over to blend with the adjacent landform.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
Vis	9	Landscape Visual	Noise and Vibration	Completion of the proposed earthworks, structures, boundary walls, cloddiau noise barriers, planting and seeding to meet the requirements for mitigation as set out in the ES.	Achievement of noise and visual screening objectives	Env Statement		Chapters 9 and 13	Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	Implementation of mitigation and enhancement measures through detailed design, constructioin and aftercare to ensure establishment and growth to meet mitigation objectives. It is essential that the fasle cutting earthoworks and the proposed measures listed here acheive the required height above the proposed road and so provide adequate screening.	monitoring in accordance with measures set out in the ES Chapter 9
Vis	10	Landscape Visual	Noise and Vibration	Provision of Public open space	To ensure replacement of public open space in accordance with the ES and CPO.	Env Statement		Chapters 9 and 11	Masterplan	Sheet 2 (central sheet)	Contractor's team	Construction	Mitigation and compensation	The area defined in the ES and EMP shall be provided as public open space with the relcoated sports pitch, footpaths, fencing and planting. Apart from the sports pitcvh all grass seeding will be in accordance with VIS 3 and Vis 7 above.	monitoring in accordance with measures set out in the ES Chapter 10
Vis	11	Landscape Visual	Road drainage and Water Env	Design of open space around the Junction 16 attenuation capacity	To create an attractive and easily maintained open space that can provide for biodiversity	Env Statement		Chapters 9 and 7	Masterplan	Sheet 2 (central sheet)	Contractor's team	Construction	Mitigation and enhancement	The measures shown in the EMP are the minimum required to meet the requirement for drainage mitigation. The design for the drainage attenuation measures shall integrate the with the public open space so that a safe, attractive open space is created free of obstruction and easily maintained. The design and aftercare of all public and open space areas shall be developed in consultation with the community, local authority and Town Council and the Maintaining Agent to be compatible withurban and residential areas.	monitoring in accordance with measures set out in the ES Chapter 9
Vis	12	Landscape Visual	Road drainage and Water Env	The landscape,vegetation and attenuation pond shall be designed to appear natural	To create an attractive and easily maintained open space that can provide for biodiversity	Env Statement		Chapters 9 and 8	Masterplan	Sheet 2 (central sheet)	Contractor's team	Construction	Mitigation and enhancement	The pond shall be maintained withnaturalistic slope profiles so that the pond can develop a natural appearance to allows. Only grass and wildflower seeding , and no planting is to be undertaken within the attenuation basin. Once seeded the vegetation is to be mown when dry each august or september until handover so that the natural progession to reedbed is supressed and no reed, reedmace, or woody vegetation is to be allowed to establish.	monitoring in accordance with measures set out in the ES Chapter 9 and 8
Vis	13	Landscape Visual	Road drainage and Water Env	Pond maintenance access	To maintain access to the pond				Masterplan	Sheet 2 (central sheet)	Contractor's team	Construction	Maintenance	A 9metre wide access strip, kept free of planting, is to be maintained between the link road at chainage 400 and the boundary with the adjacent field so that pond maintenance and dredging vehicles can access the pond if the boundary fence is removed.	monitoring in accordance with measures set out in the ES Chapter 9 and 8
Vis	14	Landscape Visual		Planting on the south side of the A55 between chainage 2230 to chainage 2600	To achieve visual intergration with the existing planting in the vicinity of the national park				Masterplan	Sheet 3 (east sheet)	Contractor's team	Construction	Mitigation	Planting shall include a pines species to match those already present to the east so that a graded transition from 100% in the east to a scattering of these trees in the west by chainage 2230 is achieved.	monitoring in accordance with measures set out in the ES Chapter 9 and 8
Vis	15	Landscape Visual	Nature Conservation	Invasive Non-Native Species	Control and eradication	Env Statement		Chapters 9 and 8	Masterplan		Contractor's team	Construction	Mitigation	The contractor shall prepare and implement an invasive species management plan and this shall include measures to survey and record each stand, a plan for avoidance of spreading the species and for control of species within the Scheme boundary.	monitoring in accordance with measures set out in the ES Chapter 9 and 8
Vis	16	Landscape Visual		Protection of the gardens of the former Oasis Centre and Llysfor near the existing Junction 16	Minimsing the impact on the garden and established garden trees and shrubs				Masterplan	Sheet 1 (west sheet)	Contractor's team	Construction	Avoidance	The contractor shall consult with the owners of the propoerty and discuss how imapcts on the established garden trees and shrubs can be reduced or avoided.	monitoring in accordance with measures set out in the ES Chapter 9 and 8
Vis	17	Landscape Visual	Noise and Vibration	Mitigation for 17, 19, 37 and 38 Maes y Llan,	Achieving adequate mitigation of noise and viual impacts	Env Statement		Chapters 8 and 13	Masterplan	Sheet 2 (central sheet)	Contractor's team	Construction	Mitigation	The Contractor shall consult with residents of Maes Y Llan, in particular properties 17, 19, 37 and 38 that are close to the Scheme, and 14 to 20 and 33 to 36 that also face the scheme from a slighlty greater distance on the form and height of mitigastion wwithin the limits set within the ES. It is kown that some residents wish to retain their seaward views. The assumpotion is that noise barrier, walls and planting shall screen the A55 and its traffic. Some of the existing mature shrub planting on the road side embankment could be retained, particularly at the top of the cutting slope and opportunities to do this should be considered by the contractor.	monitoring in accordance with measures set out in the ES Chapter 9
Vis	18	Landscape Visual	Noise and Vibration	Advanced mitigation works. There are several areas within the Scheme where there is potential to complete the enviromental mitigation in advance or in parallel with the engineering works.	To provide effective mitigation at the earliest opportunity.				Masterplan	All sheets	Contractor's team	Construction	Mitigation and enhancement	The Contractor shall plan the works so that any permanent mitigation that is in undisturbed land will be completed early in the contract: The false cutting could be completed and seeded/ planted on the south side early. The mass planting along the south side of the link road could be completed in the first planting season following commencement. The public open space could be opened for use once the south face of the false cutting is completed east of Maes y Llan. Other areas of planting and seeding should be completed during the first suitable season collowing completion of that section of road.	monitoring in accordance with measures set out in the ES Chapter 9 and 13

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Pulldown	Pulldown	Pulldown	Add as necesssary	Description	Description	Pulldown	Table in Chapter	Sheet or chainage	Secondary source	Ref	Pulldown	Pulldown		Description	Description
Vis	19	Landscape Visual	Nature Conservation	Mainenance and establishment of planting and seeding during construction and aftercare	To ensure successful establishment and good growth to meet performance requirements for mitigation as early as possible	Masterplan		Sheets 1 to 3	Env Statement	Chapter 8 and 9	Contractor's team	Construction	Mitigation and enhancement	The contratcor shall be undertaken the necessary watering of all new planting and seeding to ensure successful establishment and minimise losses due to drought. Weed control shall be maintained at all times and shall be carried out by skilled and experienced personnel so as to minimse losses due to inexpert planting, herbicide spray drift and strimming damage. Losses by these means shall be made good with replacement planting in the same or immediately following season to ensure successful establishment and growth by the end of the 3 year aftercare period. Grass cutting shall be carried out in a manner that supports the objective of creating wildflower grassland, whilst also providing sightlines and visibility splays	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
	20	Landscape Visual		Protection and establishment of planting and seeding during construction and aftercare	To ensure successful establishment and good growth to meet performance requirements for mitigation as early as possible	Masterplan		Sheets 1 to 4	Env Statement	Chapter 8 and 10	Contractor's team	Construction	Mitigation and enhancement	The Contractor shall provide all necessary protection for new planting to address the severity of weather conditions in this coastal site. Windbreaks may be required and many trees will require staking (not canes) and regular refirming in the ground to minimise the adverse effects of wind-rocking. Use of tree shelters may not be appropriate. Care of this kind from the time of planting onwards is likely to be more cost effective and will reduce the losses of trees than assuming a more conventional approach to planting.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
Vis	21	Landscape Visual	Nature Conservation	Design and maintenance of planting adjacent to sightlines and visibility splays	To ensure successful establishment and good growth without obstructing road signs and visibility splays	Masterplan		Sheets 1 to 3	Env Statement	Chapter 8 and 9	Contractor's team	Construction	Mitigation and enhancement	The contractor's designer shall ensure that visibility splays and sightlines are kept clear of trees and shrubs.	monitoring in accordance with measures set out in the ES Chapter 8 and 9.
Vis	22	Landscape Visual	Nature Conservation	Learning from the site	To understand how grass and wildflowers respond to site conditions and cutting regimes	ELG				Green Corridors Initiative	Contractor's team	Construction	Mitigation and enhancement	Monitoring of the soil type seeded, aspect of the site, moisture regime, exposure and mowing regime affect the establishment and species diversity acheived during construction and aftercare. Monitor the frequency, eefectiveness and resources required for the three years of aftercare	Monitoring as described in column 'Q'.
Vis	23	Landscape Visual		Footpaths and cycleways	Visual quality						Contractor's team	Construction	Mitigation	Paving materials should be selected to provide an attractive, light, all ability surface that can be readily cleaned and maintained.	
Wat	1	Road drainage and Water Env	Environmental Management	Water protection measures in CEMP	protect water quality downstream of the Scheme	Env Statement		section 7.8			Contractor's team	Construction	Mitigation	implementation of protocol (including monitoring) in the CEMP to protect water quality is maintained	Inclusion of reporting protocol to be followed - third party checks that protocol being followed
Wat	2	Road drainage and Water Env	Environmental Management	Provision of flow attenuation	maintain flow rates from Scheme at existing level (allowing for climate change)	Env Statement		section 7.8			Contractor's team	Construction	Mitigation	Inclusion of flow attenuation measures within the drainage design	Design drawings/flow calcs for existing situation and final design
Wat	2	Road drainage and Water Env	Environmental Management	Provision of flow attenuation	maintain flow rates from Scheme at existing level (allowing for climate change)	Env Statement		section 7.8			Contractor's team	Construction	Mitigation	Inclusion of flow attenuation measures within the drainage design	Design drawings/flow calcs for existing situation and final design
Wat	3	Nature Conservation	Environmental Management	Retain existing river bed beneath new bridge over Afon Gyrach	Maintain hydromorpholical characteristics of the river and thus protect macroinvertebrate populations within it	Env Statement		Section 7.6			Contractor's team	Construction	Mitigation	Inclusion of river bed retention in Scheme design	Design drawings for final design
Wat	3	Nature Conservation	Environmental Management	Retain existing river bed beneath new bridge over Afon Gyrach	Maintain hydromorpholical characteristics of the river and thus protect macroinvertebrate populations within it	Env Statement		Section 7.6			Contractor's team	Construction	Mitigation	Inclusion of river bed retention in Scheme design	Design drawings for final design
Wat	4	Road drainage and Water Env	Environmental Management	Where Afon Gyrach is culverted under the new link road, the new arch culvert is to be at least as large (height/width) as the existing culvert under the A55.	Maintain flow capacity of Afon Gyrach at current capacity so as not to increase flood risk upstream	Env Statement		Section 7.6			Contractor's team	Construction	Mitigation	As part of detailed design of structure	Design drawings for final design
Wat	4	Road drainage and Water Env	Environmental Management	Where Afon Gyrach is culverted under the new link road, the new arch culvert is to be at least as large (height/width) as the existing culvert under the A55.	Maintain flow capacity of Afon Gyrach at current capacity so as not to increase flood risk upstream	Env Statement		Section 7.6			Contractor's team	Construction	Mitigation	As part of detailed design of structure	Design drawings for final design

APPENDIX 2.4
COMMENTS FROM THE DESIGN COMMISSION FOR WALES

DESIGN
COMMISSION
FOR WALES
COMISIWN
DYLUNIO
CYMRU

Design Review Report

A55 Junctions 15 & 16 Improvements

DCFW Ref: 201

Meeting of 13th June 2019

Review Status	**PUBLIC**
Meeting date	13th June 2019
Issue date	28th June 2019
Scheme location	A55 Junctions 15 & 16, Conwy County
Scheme description	Improvements
Scheme reference number	201
Planning status	Pre-application

Declarations of Interest

Martin Knight of Knight Architects made a declaration noting that he had previously worked with this department of the Welsh Government but had no relationship with this project.

Consultations to Date

Ongoing consultation as part of the process with the Welsh Government, the Local Authority and other stakeholders.

The Proposals

The purpose of the project is to replace the two at grade roundabouts at Junction 15 and 16 on the A55 in North Wales. This is with grade-separated junctions allowing free-flow of traffic, thus reducing delays and make the junctions safer both to traffic travelling along the A55 and for people wishing to enter and leave the A55 in these locations; primarily by car. The scheme's key objective is to improve access to regional, national and international markets and employment opportunities for strategic highway traffic. The scheme also incorporates objectives to support building healthier communities and better environments; and to enable north-south access across the A55 for cyclists, equestrians and pedestrians (NMUs)

Summary

The panel welcomes the team analysis and insight regarding travel, traffic, future opportunities and the area overall enhancement. It was clear the proposals have already been taken through the initial stages of an appraisal process in accordance with Welsh Government procedures.

Based on the material provided, there is a clear design ambition behind the project 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 consider within a holistic design impact rational and this is not evident in the proposal. It is imperative that the access narrative is translated into all levels in the design process. It would have been helpful to understand the more strategic options available, including improving at grade provision for people, before the decision to arrive at grade separating the interchanges was arrived at.

It is the view of the panel that exploring a design approach focusing on community benefits at all levels and at this stage will contribute to a positive outcome. This would manifest itself with further contextual analysis, potentially by an urban designer, particularly examining how the area is used by cyclists, pedestrians, equestrians and local servicing traffic. In particular to explore the existing opportunities and constraints between the communities and the sea/local facilities – independent initially of the proposed highway infrastructure interventions. This may aid an understanding of the degree to which the locations proposed for non-vehicular crossings etc provide meaningful connection; or are a convenient by-product of the junction changes.

This exercise would better identify the degree to which the interventions proposed within the highway boundary by one part of Welsh Government might most effectively be combined with other WG and public sector interventions "off-site", to provide a more holistic approach to improving the places in proximity to the proposed works.

On the junction improvement works themselves, the panel were concerned over the height of the walls proposed; particularly in views from the landward side of the A55. They also commented that any detailing in features proposed to adorn the walls should acknowledge that they will either be seen/experienced close-up and slowly, or at high speed and from a distance by vehicle travellers.

Main Points in Detail

Taking into account your previous information, we suggest that that the following aspects should be incorporated in your next public consultation:

- To make the project 'story' transparent through a clear holistic vision and emphasizing who is going to benefit with the project on the basis that it will accomplish wider aspirations such as future generations act;
- Start from community, listening to local community real experiences, aspirations and strategically incorporate them into the project, this as an opportunity to make a difference and add value to the community;
- To make explicit the environmental narrative behind the proposal, the strategic decisions regarding the green infrastructure and its future benefits such as linkages and crossing points and the sea connectivity;
- Consider the opportunity of improving existing physical accesses, restoring stone walls and native planting;
- Explore the road junction's distinctive character and emphasize their sense of sense of arrival through calming road strategies, including the parallel roads; consider viewer's and resident's point of view and proximity;
- Consider strategies of how statutory and non-statutory, stakeholders might be incorporated and/or enabled by the infrastructure intervention.

The Design Commission welcome the team for a further review.

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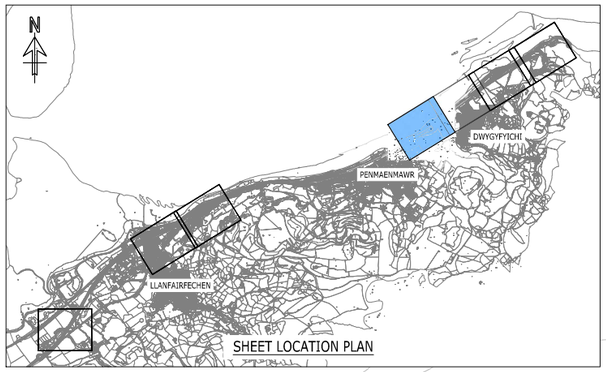
Design Review through our Design Review Service, is provided in the public interest for the consideration of local planning authorities as a material consideration, and other users of the Design Review Service. It is not and should not be considered 'advice' and no third party is bound or required to act upon it. The Design Review Service is delivered in line with DCFW's published protocols, code of conduct and complaints procedure, which should be read and considered by users of the service.

A Welsh language copy of this report is available upon request.

Attendees

Agent/Client/Developer	Welsh Government
Architectural/Urban Designer	Rob Griffiths, Jenny Bringloe (Ramboll) Andrew Sumner (Richards, Moorhead, Laing)
Local Authority	Peris Jones (Welsh Government)
Design Review Panel	
Chair	Carole-Anne Davies
Lead Panellist	Martin Knight
Panel	Lynne Sullivan
	Simon Power
	Toby Adam
	Larissa Berquó

APPENDIX 2.5
GENERAL ARRANGEMENT OF THE SCHEME



SHEET LOCATION PLAN

CH16+0200.000

CH16+0400.000

CH16+0600.000

CH16+0800.000

REFER TO SHEET 2

Mean High Water

Mean Low Water

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13/01/2021 14:39:27

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4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

KEY

GENERAL
- PROPOSED RED LINE BOUNDARY
- EXISTING WATERCOURSE

NON MOTORISED USERS (MNU ROUTES)
- PUBLIC RIGHT OF WAY
- PUBLIC RIGHT OF WAY (TO BE DIVERTED)
- CYCLE ROUTE

STRUCTURES
- PROPOSED RETAINING WALL / STRUCTURE

ACCESS
- STOCK PROOF FENCING
- TIMBER POST & RAIL FENCING
- ENVIRONMENTAL FENCING
- STONEWALL
- ACCESS GATE

Rev	Description	Date	By	Chk	App
P04	FOR INFORMATION	13/01/2021	DB	JMB	RG
P03	FOR INFORMATION	04/09/2020	DB	JB	RG
P02	FOR INFORMATION	28/07/2020	DB	JMB	RG
P01	FOR INFORMATION	19/02/2020	JW	JB	JB

FOR INFORMATON

A55 JUNCTION 15 & 16 IMPROVEMENTS

Llywodraeth Cymru
Welsh Government

RML YGC
Gateley HAMER

RAMBOLL
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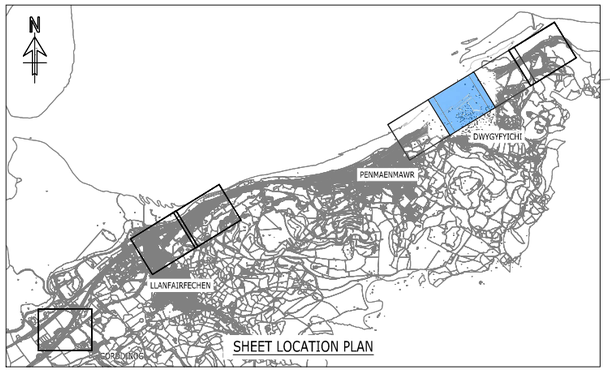
A55 JUNCTION 16 GENERAL ARRANGEMENT

SHEET 1 OF 4

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:1250	DB	JAN 20

Drawing No: A55J15J16-RAM-00-16-DR-J-0001

Rev: P04



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Rev	Description	Date	By	Chk	App
P04	FOR INFORMATION	13/01 2021	DB JMB		RG
P03	FOR INFORMATION	28/07 2020	DB JMB		RG
P02	FOR INFORMATION	09/04 2020	DB JB		RG
P01	FOR INFORMATION	19/02 2020	JW JB		JB

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A55 JUNCTION 16 GENERAL ARRANGEMENT

SHEET 2 OF 4

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:1250	DB	JAN 20

Drawing No: A55J15J16-RAM-00-16-DR-J-0002 Rev: P04

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- STONEWALL
- ACCESS GATE

Rev	Description	Date	By	Chk	App
P05	FOR INFORMATION	13/01/2021	DB	JMB	RG
P04	FOR INFORMATION	04/09/2020	DB	JB	RG
P03	FOR INFORMATION	28/07/2020	DB	JMB	RG
P02	FOR INFORMATION	09/04/2020	DB	JB	RG
P01	FOR INFORMATION	19/02/2020	JW	JB	JB

FOR INFORMATION

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A55 JUNCTION 16 GENERAL ARRANGEMENT

SHEET 3 OF 4

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:1250	DB	JAN 20

Drawing No: A55J15J16-RAM-00-16-DR-J-0003 Rev: P05

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SHEET LOCATION PLAN

13/01/2021 14:35:26

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NON MOTORISED USERS (MNU ROUTES)
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- CYCLE ROUTE

STRUCTURES
- PROPOSED RETAINING WALL / STRUCTURE

ACCESS
- STOCK PROOF FENCING
- TIMBER POST & RAIL FENCING
- ENVIRONMENTAL FENCING
- STONEWALL
- ACCESS GATE

CH16+2400.000

REFER TO SHEET 3

CH16+2600.000

CH16+2762.087

2400 2450 2500 2550 2600 2650 2700

Mean High Water

Shingle

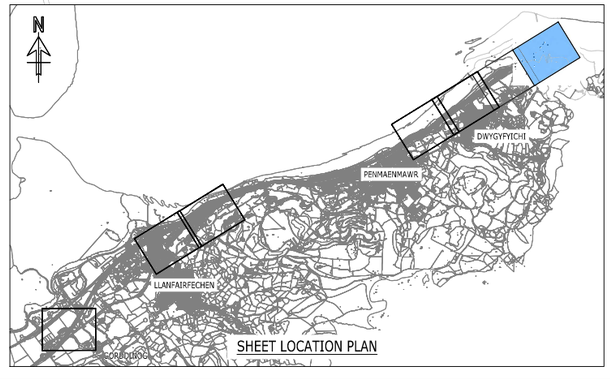
The Giants Thumb

Penmaen-bach Tunnel

Drain

Track

METRES @ 1:1250 0 10 25 50 125



SHEET LOCATION PLAN

Rev	Description	Date	By	Chk	App
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P03	FOR INFORMATION	04/09/2020	DB JB		RG
P02	FOR INFORMATION	09/04/2020	DB JB		RG
P01	FOR INFORMATION	19/02/2020	JW JB		JB

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A55 JUNCTION 16 GENERAL ARRANGEMENT

SHEET 4 OF 4

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:1250	DB	JAN 20

Drawing No: A55J15J16-RAM-00-16-DR-J-0004

Rev: P04

13/01/2021 14:32:16

APPENDIX 2.6
ENVIRONMENTAL MASTERPLAN

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Notes

Reference number
Environmental Function
Landscape Element (LE)
Environmental Element (E)
Planning and Policy Feature (P)
Brief description or brief justification for inclusion

Environmental Functions (EF)

Ref	Data Set
EFA	Visual screening;
EFB	Landscape Integration;
EFC	Enhancing the built environment;
EFD	Nature conservation and biodiversity;
EFE	Visual amenity;
EFF	Heritage;
EFG	Auditory amenity;
EFH	Water quality;
EFJ	Agricultural / Highway boundary;
EFK	Access / Landscape management.

Original Features Retained
- Existing roads
- Watercourse or Waterbody
- Tree and shrub areas
- Vegetation requiring pruning

Environmental Elements (E)
- 1.2 Noise Barriers
- 3.2 Wildlife barrier

Planning and Policy Features (P)
- 4.4 Public Right of Way
- 4.4 Altered Right of Way

Landscape Elements (LE)
LE1 Grassland
- 1.2 Grassland with Bulbs
- 1.3 Species Rich Grassland
- 1.4 Rock and Scree
- 1.5 Heath and Moorland
- 1.6 Open Grassland

LE3 Ornamental Planting
- 3.1 Amenity Tree and Shrubs
- 3.2 Ornamental Shrubs
- 3.3 Groundcover

LE5 Trees
- 5.1 Individual Trees

LE2 Native Planting
- 2.4 Linear Belts
- 2.5 Shrubs with Trees
- 2.6 Shrubs
- 2.7 Scattered trees

LE4 Hedges
- 4.1 Ornamental Hedges
- 4.3 Native Hedgerows

LE6 Wetland Habitats
- 6.2 Banks and Ditches
- 6.4 Marsh and Wet Grassland

Hard Landscape Features (LE7)
LE7.1 Earthworks
- 7.11 Earth Bunds / Cloddiau

LE7.2 Retaining Structures
- 7.21 Retaining Walls

LE7.3 Barriers and Fences
- 7.31 Concrete Barriers
- 7.32 Metal Barriers
- 7.33 Masonry Walls
- 7.34 Railings / Fences
- 7.35 Hand rails

LE7.4 Pavement Surfaces
- 7.41 New Roads
- 7.42 Non-motorised ways
- 7.44 Other Hard Surfaces

Environmental Elements (E)
E1 Noise
- E1.1 Noise-reducing surfaces
- E1.2 Noise barrier built elements
- E1.3 Noise-reducing earthworks

E2 Water
- E2.1 Water pollution control measures
- E2.2 Surface-water outfalls
- E2.3 Soakaways

E3 Nature Conservation and Biodiversity
- E3.1 Protected species
- E3.2 Ecological protection measures

E4 Pests and Injurious Weeds
- E4.1 Injurious weeds
- E4.2 Legislated pests

Planning and Policy Features (P)
P1 Nature Conservation Designations
- P1.1 Statutory nature conservation designation
- P1.2 Non-statutory designation

P2 Landscape Designations
- P2.1 Statutory landscape designation
- P2.2 Local landscape designation

P3 Cultural Heritage
- P3.1 Cultural heritage feature
- P3.2 Conservation area

P4 Land Use
- P4.1 Agricultural land
- P4.2 Land management
- P4.3 Public open spaces
- P4.4 Public rights of way

P5 Third Party Claim
- P5.1 e.g. sensitive location or complaint

P6 Water Quality
- P6.1 Watercourse quality
- P6.2 Area of groundwater sensitivity

Rev	Description	Date	By Chk	App
11	REVISED LAYOUT TO J16	14/01 2021	RhE JS	APCS

E101 | EFK | P4,4 — Wales Coast Path and National Cycle Network Route 5 promoted routes

E102 | n/a | P1.1 — Menai Strait and Conwy Bay SAC Liverpool Bay SPA

E103 | EFG | E1,2 — Existing noise barrier retained

E104 | EFC EFE | LE3,3 /5,1 — Groundcover and amenity trees to maintain coastal views and enhance the gateway into Penmaenmawr and Dwygyfylchi

E105 | EFC EFE | LE3,3 /5,1 — Grassland with bulbs to enhance the gateway into Penmaenmawr and Dwygyfylchi

W101 | EFK | LE 7,42 — Non-motorised way link to Penmaenmawr

W102 | EFK | LE 7,42 — Retain existing mortared stone wall as separation between pavement and non-motorised way

W103 | EFK | LE 7,42 — Field gates for agricultural access

W104 | EFA | LE3,1 — Manage existing plantation, remove or prune back vegetation to enable construction access

W105 | EFK | P4,4 — Public Footpath PENMAENMAWR 29/06

W106 | EFA | LE3,1 — Manage existing plantation, raise crown and prune back vegetation encroaching onto non-motorised way

W107 | EFB | LE 7,33 — Mortared stone wall to enhance entrance into Penmaenmawr and tie in with existing boundary features

W108 | EFA | LE3,1 — Manage existing plantation, raise crown and prune back vegetation encroaching onto non-motorised way

W109 | EFK | P5,1 — Access track retained

W110 | EFA | LE2,6 — Visual screen to benefit Conwy Old Road retained

W111 | EFH | E2,1 — Location for surface water attenuation

W112 | EFC | LE3,2 /5,1 — Ornamental trees and groundcover to enhance gateway

W113 | EFC EFE | LE3,3 /5,1 — Groundcover and amenity trees

W114 | EFE | LE1,2 — Possible location for gateway feature within wide verge

W115 | EFJ | P4,1 — Location for construction site compound

W116 | EFB EFJ | LE 7,32 — Amenity trees and shrubs to provide visual separation between A55 and Penmaenmawr/ Ysguborwen Roads

W117 | EFA | LE4,1 — Ornamental hedge boundary to provide visual screen

W118 | EFC | LE1,2 — Possible location for gateway feature within verge

W119 | EFB EFJ | LE4,1 /7,32 — Tie-in to existing ornamental hedge and mortared stone wall

W120 | EFB EFJ | LE 7,33 — Mortared stone wall to tie-in with exiting

W121 | EFA | LE1,3 /2,7 — Area managed to encourage reptiles / mitigation for area of lost habitat

W122 | EFA | LE3,2 — False cutting with mortared stone wall, north facing slope planted with ornamental shrubs to screen views of traffic

Mean Low Water
Mean High Water
Shingle
Sand
Boulders
Slipway
Tunnel
Groynes
Cycle Tr
Pavilion
Playing Field
Football Ground
Bron Wylfa
Bodlwyfan
Drain
Llyn Fach
The Quays
Berthau
Awel-y-Mor
YSGBORNEN ROAD
CH16+0200.000
CH16+0400.000
CH16+0600.000
CH16+0800.000
CONTINUATION REFER TO SHEET 2 OF 3

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13/01/2021 17:12:28

A55 JUNCTION 15 & 16 IMPROVEMENTS

Llywodraeth Cymru
Welsh Government

RML YGC Gateley HAMER

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JUNCTION 16 ENVIRONMENTAL MASTERPLAN SHEET 1 OF 3

Project No:	Scale (@A1):	Drawn:	Date:
1620000620	1:1250	RhE	JAN 21

Drawing No: A55J15J16-RML-30-16-M2-X-0201

Rev: 11

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Environmental Element (E)
Planning and Policy Feature (P)
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- Tree and shrub areas
- Vegetation requiring pruning

Environmental Elements (E)
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- 3,2 Wildlife barrier

Planning and Policy Features (P)
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- 4,4 Altered Right of Way

Landscape Elements (LE)
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- 1,5 Heath and Moorland
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- 3,1 Amenity Tree and Shrubs
- 3,2 Ornamental Shrubs
- 3,3 Groundcover

LE5 Trees
- 5,1 Individual Trees

LE2 Native Planting
- 2,4 Linear Belts
- 2,5 Shrubs with Trees
- 2,6 Shrubs
- 2,7 Scattered trees

LE4 Hedges
- 4,1 Ornamental Hedges
- 4,3 Native Hedgerows

LE6 Wetland Habitats
- 6,2 Banks and Ditches
- 6,4 Marsh and Wet Grassland

Hard Landscape Features (LE7)
LE7,1 Earthworks
- 7,11 Earth Bunds / Cloddiau

LE7,3 Barriers and Fences
- 7,31 Concrete Barriers
- 7,32 Metal Barriers
- 7,33 Masonry Walls
- 7,34 Railings / Fences
- 7,35 Hand rails

LE7,2 Retaining Structures
- 7,21 Retaining Walls

LE7,4 Pavement Surfaces
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- E1,2 Noise barrier built elements
- E1,3 Noise-reducing earthworks

E2 Water
- E2,1 Water pollution control measures
- E2,2 Surface-water outfalls
- E2,3 Soakaways

E3 Nature Conservation and Biodiversity
- E3,1 Protected species
- E3,2 Ecological protection measures

E4 Pests and Injurious Weeds
- E4,1 Injurious weeds
- E4,2 Legislated pests

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- P3,1 Cultural heritage feature
- P3,2 Conservation area

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- P4,1 Agricultural land
- P4,2 Land management
- P4,3 Public open spaces
- P4,4 Public rights of way

P5 Third Party Claim
- P5,1 e.g. sensitive location or complaint

P6 Water Quality
- P6,1 Watercourse quality
- P6,2 Area of groundwater sensitivity

Rev	Description	Date	By	Chk	App
11	REVISED LAYOUT TO J16	14/01 2021	RhE	JS	APCS

FOR CONTINUATION REFER TO SHEET 3 OF 3

FOR CONTINUATION REFER TO SHEET 1 OF 3

E102 | n/a | P1.1
Menai Strait and Conwy Bay SAC Liverpool Bay SPA

E203 | EFD | E4.1
Location of Japanese Knotweed

W233 | EFK | P4,4
Pedestrian access to A55 stopped up

W224 | EFA | LE2,6
Shrubs to provide visual separation between link road and main road

W222 | EFB | LE4,3 LE2,7
Hedgerow with trees seperating main road and link road

E202 | EFK | LE 7,42
Ramp to improve connection to Wales Coast Path and NCN5

E201 | EFK | P4,4
Wales Coast Path and National Cycle Network Route 5 promoted routes

W211 | EFH | E2,1
Location for surface water attenuation

W210 | EFK | P4,4
Pedestrian access to A55 stopped up

W206 | EFH | E2,1
Location for surface water attenuation in verge

W233 | EFA | LE2,4
Trees and shrubs to screen view of road and traffic from Cae Gwynan

W230 | EFD | E3,2
Fencing near to Afon Gyrach to be Otter proof

W226 | EFH | E2,2
Existing surface water outfall from Gwel-y-Mor housing estate

W225 | EFA | LE2,6
Shrubs to screen view of road and traffic from Maes Gwynan

W229 | EFD | LE2,7
Trees along river bank to encourage use of river corridor by wildlife

W227 | EFD | LE2,4
Trees and shrubs to shade river from night-time lighting and maintain its use by bats and otters

W223 | EFH | LE6,4
Surface water attenuation basin

W221 | EFK | LE7,5
New footpath to connect Gwel-y-Mor and new link road

W228 | EFD | E4,1
Location of Japanese Knotweed and Himalayan Balsam, Multiple locations alongside watercourse

W220 | EFB | LE1,5 /2,7
South facing slope of false cutting planted and seeded with species appropriate for dry heath

W219 | EFA | LE2,6 /7,33
False cutting with wall and shrub planting to screen views of road and traffic from Gwel-y-Mor

W218 | EFK | LE1,3 /2,7
New public open space to mitigate loss of amenity area

W216 | EFK | P4,4
Signal controlled crossing for pedestrians and cyclists realignment of public footpath

W215 | EFK | P4,3
Kick-about pitch repositioned to accommodate false cutting

W217 | EFK | P4,4
Public Footpath PENMAENMAWR 29/08

W214 | EFK | LE 7,34
Ball Stop fence

W213 | EFB | LE1,5
Heath planting and seeding to replace existing

W212 | EFA | LE2,6 /7,33
False cutting with wall to screen views of road and traffic from Maes-y-Llan

W208 | EFA EFE | LE3,2
Ornamental shrub planting to screen view of roads yet maintain long distance coastal views

W209 | EFA EFG | E1,2
Barrier to screen view of roads and attenuate traffic noise

W207 | n/a | P5,1
Noise Action Planning Priority Area

W205 | EFK | LE1,3
Maintenance access

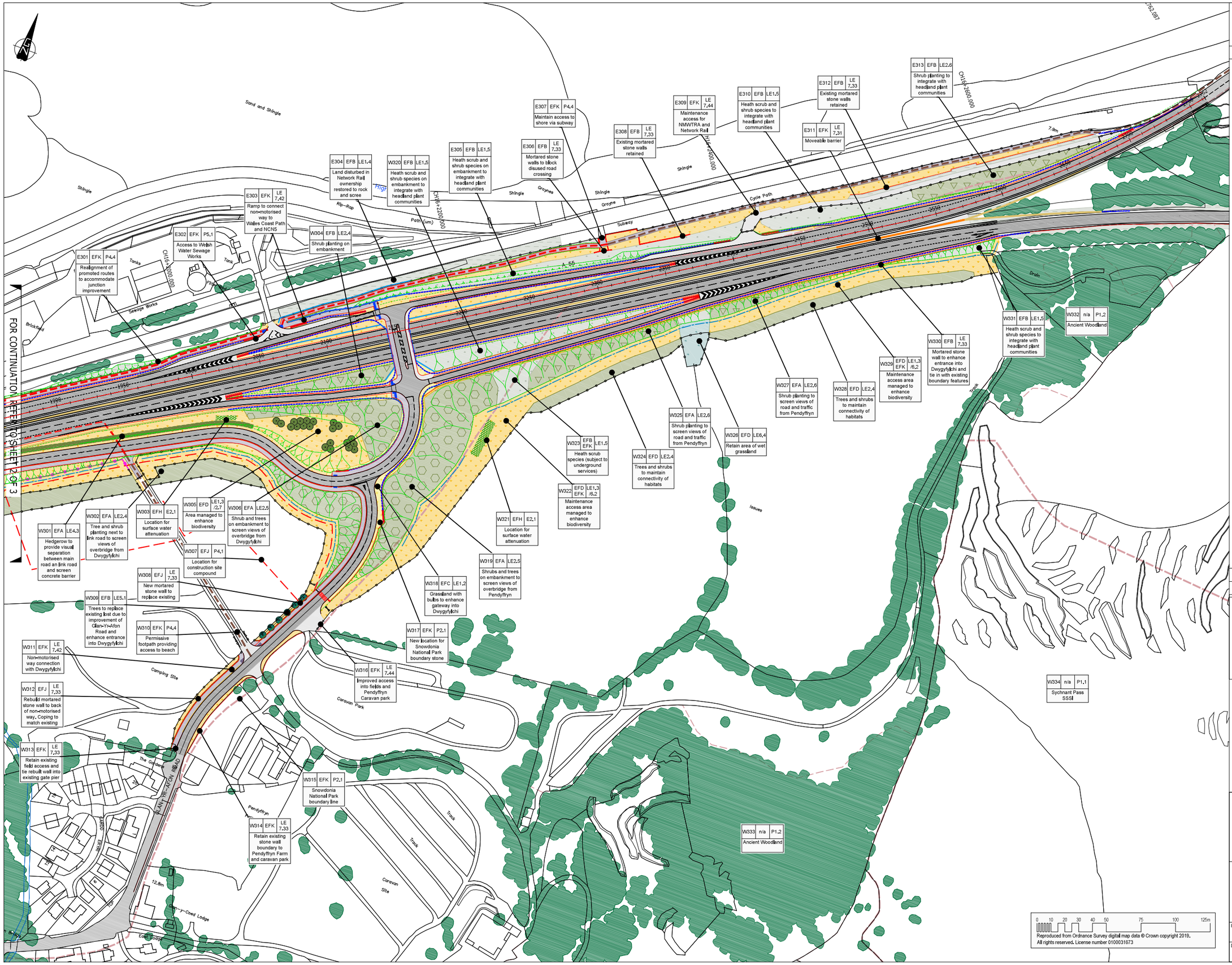
W204 | EFD | LE1,3 /2,7
South facing slope managed to encourage use by reptiles

W203 | EFH | E2,1
Existing watercourse culverted

W202 | EFB EFJ | LE1,6
South facing slope seeded with herbal ley and restored to pasture

W201 | EFA | LE3,2 /7,33
False cutting with wall to screen views of road and traffic from dwellings on Ysguborwen Road

Mean High Water
Shingle
Sand
Spreads
Filling Sta
Mast
Pipe Sta
Path (um)
Play Area Maes-y-Llan
Sub St
Elec Sub Sta
Cycle Tk
Ch15+1800.000
Ch15+1600.000
Ch15+1400.000
Ch16+1200.000
Ch16+1000.000
MP 225
MP 226
MP 227
MP 228
MP 75
MP 76
Sea Mount
Ormes View
Cae Mynydd
Maes-y-Llan
Bryn Awelon
Gwynfa
Trawsnant
Bryn Hyfryd
Bryn Teg
Bryn Gwyn
Maes-y-Mor
Gwynfa
Ysguborwen Road
MORFA DRIVE
Tregarth
Bryn Awelon
Bryn Gwyn
Gwynfa
Bryn Hyfryd
Kilvarnock
Varnole
Ysguborwen Cottage
CAE GWYNAN
CAE GWYNAN PARK
Hillside
Ael-y-mor
Watercress
Row of Trees
Dyffryn
Glanllyn
Kiln
Nursery
Glan-y-afon Bungs
Glan-y-afon
The Old School House
Glan Gyrach
Glan Gyrach Cottage
Cemetery
Shelter
Hall
Tŷ Gwyn Isaf
Tŷ Gwyn Uchaf
Gryl
Lyndale
Bryn Gwyn
Afon Gyrach
Afon Gyrach Bridge
Afon Gyrach Bridge
Afon Gyrach Bridge



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Notes

Reference number
Environmental Function
Landscape Element (LE)
Environmental Element (E)
Planning and Policy Feature (P)
Brief description or brief justification for inclusion

Environmental Functions (EF)

Ref	Data Set
EFA	Visual screening;
EFB	Landscape Integration;
EFC	Enhancing the built environment;
EFD	Nature conservation and biodiversity;
EFE	Visual amenity;
EFF	Heritage;
EFG	Auditory amenity;
EFH	Water quality;
EFJ	Agricultural / Highway boundary;
EFK	Access / Landscape management.

Original Features Retained
- Existing roads
- Watercourse or Waterbody
- Tree and shrub areas
- Vegetation requiring pruning

Environmental Elements (E)
- 1,2 Noise Barriers
- 3,2 Wildlife barrier

Planning and Policy Features (P)
- 4,4 Public Right of Way
- 4,4 Altered Right of Way

Landscape Elements (LE)

LE1 Grassland
- 1,2 Grassland with Bulbs
- 1,3 Species Rich Grassland
- 1,4 Rock and Scree
- 1,5 Heath and Moorland
- 1,6 Open Grassland

LE2 Native Planting
- 2,4 Linear Belts
- 2,5 Shrubs with Trees
- 2,6 Shrubs
- 2,7 Scattered trees

LE3 Ornamental Planting
- 3,1 Amenity Tree and Shrubs
- 3,2 Ornamental Shrubs
- 3,3 Groundcover

LE4 Hedges
- 4,1 Ornamental Hedges
- 4,3 Native Hedgerows

LE5 Trees
- 5,1 Individual Trees

LE6 Wetland Habitats
- 6,2 Banks and Ditches
- 6,4 Marsh and Wet Grassland

Hard Landscape Features (LE7)

LE7,1 Earthworks
- 7,11 Earth Bunds / Cloddiau

LE7,2 Retaining Structures
- 7,21 Retaining Walls

LE7,3 Barriers and Fences
- 7,31 Concrete Barriers
- 7,32 Metal Barriers
- 7,33 Masonry Walls
- 7,34 Railings / Fences
- 7,35 Hand rails

LE7,4 Pavement Surfaces
- 7,41 New Roads
- 7,42 Non-motorised ways
- 7,44 Other Hard Surfaces

Environmental Elements (E)

E1 Noise
- E1,1 Noise-reducing surfaces
- E1,2 Noise barrier built elements
- E1,3 Noise-reducing earthworks

E2 Water
- E2,1 Water pollution control measures
- E2,2 Surface-water outfalls
- E2,3 Soakaways

E3 Nature Conservation and Biodiversity
- E3,1 Protected species
- E3,2 Ecological protection measures

E4 Pests and Injurious Weeds
- E4,1 Injurious weeds
- E4,2 Legislated pests

Planning and Policy Features (P)

P1 Nature Conservation Designations
- P1,1 Statutory nature conservation designation
- P1,2 Non-statutory designation

P2 Landscape Designations
- P2,1 Statutory landscape designation
- P2,2 Local landscape designation

P3 Cultural Heritage
- P3,1 Cultural heritage feature
- P3,2 Conservation area

P4 Land Use
- P4,1 Agricultural land
- P4,2 Land management
- P4,3 Public open spaces
- P4,4 Public rights of way

P5 Third Party Claim
- P5,1 n/a sensitive location or complaint

P6 Water Quality
- P6,1 Watercourse quality
- P6,2 Area of groundwater sensitivity

Rev	Description	Date	By	Chk	App
11	REVISED LAYOUT TO J16	14/01 2021	RhE	JS	APCS

A55 JUNCTION 15 & 16 IMPROVEMENTS

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JUNCTION 16 ENVIRONMENTAL MASTERPLAN SHEET 3 OF 3

0 10 20 30 40 50 75 100 125m

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1620000620	1:1250	RhE	DEC 21

Drawing No: A55J15J16-RML-30-16-M2-X-0203 Rev: 11

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APPENDIX 2.7
VISUALISATIONS OF THE SCHEME

Appendix 2.7: Visualisations

1 Introduction

These visualisations of the proposed Scheme are computer generated using specialist software that combines natural topography and the proposed three-dimensional information about the proposed road, its earthworks, retaining walls, bridges and other elements such as lighting columns. Vehicles are shown to give a sense of scale.

2 Locations of the views

Viewpoint A	Elevated view east showing Junction 16, looking towards Junction 16A. In the middleground is the original design of a priority junction, however this will be replaced by a roundabout as shown in the scheme drawings. The link Road from J16 to 16A is visible immediately to the right of the A55 dual carriageway. Dwygyfylchi and the proposed false cutting can be seen to the right of the link road.
Viewpoint B	High level view north towards Junction 16A with Dwygyfylchi in the foreground. The fields in the middle ground separate the A55 dual carriageway and the link road from the village. The ink road can be seen looping to the south of the Puffin Café and fuel station.
Viewpoint C	High level view looking west over the link road and Puffin Café, with houses on Glan yr Afon Road in the foreground, the Afon Gyrach crossing the view in the middle ground.
Viewpoint D	Road level view on the proposed junction 16A looking west towards the slip roads and the overbridge.
Viewpoint E	High level view of the grade separated junction 16A with the railway to the right and Dwygyfylchi to the left. In the background, under the slopes of Pen y Clip can be see Penmaenmawr
Viewpoint F	View looking north towards the A55 and link road from the playing field to the east of Maes y Llan. The footbridge is left of centre, behind trees, and the roof of the Puffin Café is visible right of centre with the Great Orme in the background. This view shows how the false cutting along the south side of the link road will hide or partially screen the A55 and its traffic from most views in Dwygyfylchi.

3 Topographical data

The images for the ES are screen captures of a 3D model created within Autodesk's Infraworks software. The 3D models have been constructed from a mixture of existing data and proposed. Existing data consists of ground topography built from a combination of topographical survey and LiDAR which is then supplemented by a mixture of high resolution drone imagery and satellite imagery which adds visual context to the models.

The topographical survey is the most accurate data available to create the topography from and is accurate to within 5mm. This has been produced for the area within the planning boundary where all the construction work is to take place. Outside of the planning boundary the topography has been created from a mix of LiDAR data at differing resolutions. 1m resolution is used where closest to the planning boundary and 2m resolution is used slightly further away. The LiDAR data is provided by Welsh Government for free and is accurate to within 50mm and 100mm respectively.

4 Resolution of the topographical data

In the far distance the topographical resolution drops to 20m as the models are now using United States Geological Survey (USGS) data, which originated from space shuttle survey of the entire globe during the 1980's. This is the least accurate of the data utilized by the models but is required to keep the models to a manageable size.

5 Satellite Imagery

The satellite imagery for the ground layer is taken from Bing Maps and shows roughly 30cm of imagery within 1 pixel. The high-resolution drone imagery is 15 times more detailed with 1 pixel representing 2cm if image. The drone imagery is used within the planning boundary and slightly outside the boundary. The Bing Mapping is used further away from the scheme and in areas where the drone imagery is not present.

6 Buildings

The buildings in the models have been placed using Ordnance Survey Mastermap data. The footprints of buildings have been imported into the models and an arbitrary height and colour applied so they can be represented as 3D objects to add some additional context.

7 Trees

Existing foliage has been placed and sized based on assessment of Google Street View imagery in the area.

8 Software

The proposed designs are built upon the canvas of existing data detailed above. Design models were constructed in industry leading software packages - primarily Autodesk's Civil 3D and Bentley's MX, both highway design suites used extensively in the industry. The outputs from these programs provide the models with new topography, 3D objects and colour schemes to represent the proposed highway designs. Signing and lining software have then been used to provide the model with the necessary road markings and road signs. Street lighting design has also been undertaken in order to accurately position the lighting apparatus for the new road layouts. Additional foliage is then placed in the models according to Landscape Architects guidance and drawings.

The culmination of the particulars mentioned above are represented in an interactive 3D representation within the Infraworks program. This interactive model was presented at the Public Information Exhibitions to give context to the design proposals and to facilitate dialogue with stakeholders. The images within this Environmental Statement are taken directly from these interactive models.

Viewpoint A

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JUNCTION 16
APPENDIX 2.7
VISUALISATION OF SCHEME
SHEET 1 OF 6

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Drawing No: A55J15J16-RML-30-16-DR-X-0212 Rev: 01

Viewpoint B

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VISUALISATION OF SCHEME
SHEET 2 OF 6

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Drawing No: A55J15J16-RML-30-16-DR-X-0213 Rev: 01

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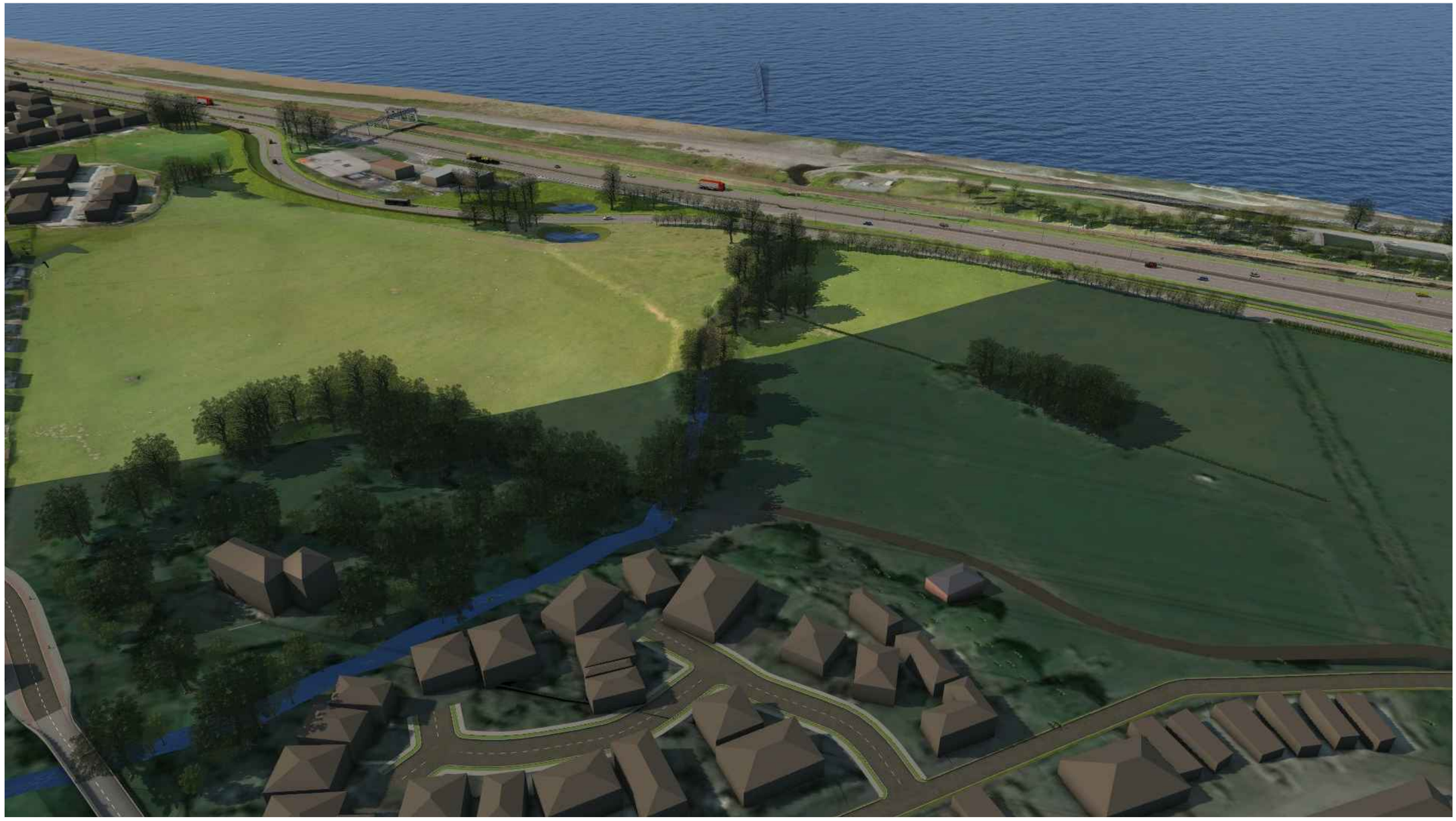
Viewpoint C



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APPENDIX 2.7
VISUALISATION OF SCHEME
SHEET 3 OF 6

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Viewpoint D

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APPENDIX 2.7
VISUALISATION OF SCHEME
SHEET 4 OF 6

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Viewpoint E

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Viewpoint F

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SHEET 6 OF 6

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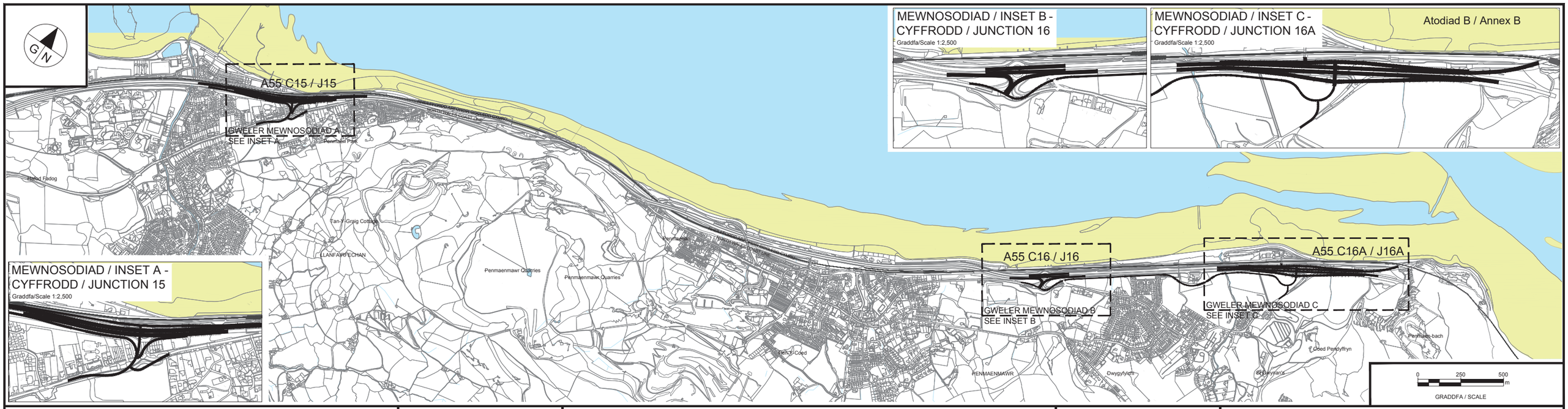
ES Chapter 3 Appendices	
3.1	TR111 Plan for the Junction 15 and 16 Improvements
3.2	WelTAG Stage 2 Outline Business Case Report

APPENDIX 3.1
TR111 PLAN FOR THE JUNCTION 15 AND 16 IMPROVEMENTS



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ALLWEDD / KEY

LLWYBR A FFEFRIR / PREFERRED ROUTE

GWELLIANNAU CYFFYRDD 15 AC 16 YR A55
TR111 LLWYBR I'W AMDDIFFYN DROS BWRIADAU CYNLLUNIO
A55 JUNCTIONS 15 & 16 IMPROVEMENTS
TR111 ROUTE PROTECTED FOR PLANNING PURPOSES

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Welsh Government

RHIF DRG/ DRG NO. A55J15J16 - TR111 - 1 - 2019
EBRILL 2019 / APRIL 2019

APPENDIX 3.2
WELTAG STAGE 2 OUTLINE BUSINESS CASE REPORT

Intended for
Welsh Government

Document type
Final Report

Date
September 2020

A55 JUNCTIONS 15 & 16 IMPROVEMENTS WELTAG STAGE TWO: OUTLINE BUSINESS CASE REPORT

CORDEROY WSP TACP RAMBOLL RICHARD MOORHEAD & LAING PLANNING | LANDSCAPE | ENVIRONMENT YGC

A55 JUNCTIONS 15 & 16 IMPROVEMENTS
WELTAG STAGE TWO: OUTLINE BUSINESS CASE REPORT

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Date	**Version P01 Issued 11/10/2018** **Version P02 Issued 20/11/2018** **Version F03 Issued 03/12/2018 – Updated figures** **Version F04 Issued 04/08/2020 – Updated to take account of further work on the preferred option(s) and updated Economic Assessment (issued Dec 2019)** **Version F05 Issued 14/09/2020 – Updated to address client comments** **Version F06 Issued 21/09/2020 – Updated to address client comments**
Prepared by	**Jenny Bringloe and Laura Foster**
Checked by	**Nigel Roberts and Rob Griffiths**
Approved by	**Steve Chewins**
Description	**WelTAG Stage Two: Outline Business Case Report** **Final report**

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A55 JUNCTIONS 15 & 16 IMPROVEMENTS
WELTAG STAGE TWO: OUTLINE BUSINESS CASE REPORT
EXECUTIVE SUMMARY

This document sets out the Outline Business Case (OBC) for the A55 Junctions 15 & 16 Improvements scheme. The A55 Junctions 15 and 16 are the only two roundabouts on the mainline of the Euroroute E22 Trans-European Transport Network (TEN-T). This causes problems to the traffic using the A55 travelling along the route, in particular in relation to resilience, delays and safety.

A key factor behind both transport and non-transport related issues relates to the fact that the A55 was constructed parallel to the railway in extremely close proximity to the centres of Llanfairfechan, Penmaenmawr and Dwygyfylchi. Consequently, the population has been severed from the coastline and is to a greater extent reliant on the A55 to access services or employment located out of the immediate area. The only other routes out the towns are either on foot or bike, using a relatively expensive railway service or (in the case of Penmaenmawr and Dwygyfylchi) via the Sychnant Pass to Conway; something which is particularly an issue if an incident occurs on the A55. These communities have an older population and higher rates of unemployment (compared with the Welsh average), in addition to the associated health issues. This means that vulnerable groups such as children are disproportionally adversely impacted.

The purpose of the project is to remove the two roundabouts at the junctions and replace them with upgraded junctions. It is forecast this will increase the average annual traffic speed along the mainline A55 in the vicinity of the junctions by 6% eastbound and 11% westbound. The economic appraisal work has shown that the scheme is forecast to result in a benefit to the wider economy, much of which will be felt by the local communities. All of the options are forecast to reduce the amount of traffic using the Sychnant pass, supporting the argument that the current issues in relation to delays and unreliability of the A55 as a route, will be improved by the removal of the roundabouts.

The purpose of the OBC, as described in WelTAG 2017, is to "examine in greater detail the short list of options for tackling the problem under consideration" and to provide the evidence required for the selection of the preferred option to be taken forward to stage three, full business case. The report builds on the findings of the Strategic Outline Case (SOC) Report which summarised the work carried out to investigate the problems at the junctions, under a number of studies carried out between 2005 and 2017. It describes the appraisal of the short-list of five options for Junction 15 and four options for Junction 16, which were presented during the 12-week WelTAG Stage Two Public Consultation (which commenced on the 4 June 2018). The findings, of this report, take the views of key stakeholders and the public into consideration.

Each of the options has been assessed qualitatively against the following project objectives and the WelTAG criteria to allow the economic, environmental and social impacts to be compared:

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
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
TECH OBJ9	Minimising technical departures from standard (to improve safety)
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)

The OBC has been produced, in accordance with the Welsh Transport Appraisal Guidance (WelTAG 2017), the HM Treasury Green Book and appropriate Department for Transport Transport Appraisal Guidance (WebTAG). The WelTAG appraisal process adopts the requirements of legislation such as the *Well-being of Future Generations (Wales) Act* 2015; which 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. Throughout the report, the five "ways of working" principles that public bodies are required to follow when applying sustainable development have been applied. The project aligns with a number of policies including those related to transport, sustainable development and equality.

The findings with respect to the preferred options for Junctions 15 and 16, in addition to how they performed with respect to the project objectives, key viability and acceptability criteria, plus the risk associated with delivery are summarised below for the options. Where enhancement measures are proposed, they could be funded either as part of the A55 Junctions 15 and 16 Improvements scheme, other transport schemes or collaboratively by partner organisations.

Junction 15 (Llanfairfechan)

It is recommended that the **Mitigated Option D** at Junction 15 should be considered for being taken forward as the preferred option. The option comprises of the measures to minimise the need to demolish residential properties (to meet project objective OBJ7). It is recommended that mitigation and enhancement measures should be adopted to maximise opportunities with respect to the well-being goals, including (not-exclusively):

- Promote improvements to Junction 14 (to meet project objective OBJ2);
- Incorporate measures to ensure reduction in traffic speeds on link roads to levels commensurate with the local road system (to meet project objective OBJ5)
- The replacement of the existing footbridge to minimise the impact of severance to the coast for non-motorised users (to meet project objective OBJ6);
- Encourage and enable active travel enhancements – such as improving the Sustrans National Cycle Route 5 (NCN 5) through Pendalar or improvements to the North Wales Coast Path (to meet project objectives OBJ6 and OBJ7);

- As part of development of the design for Option D, consider further the viability of further mitigation to negate the impact;
- Incorporate environmental enhancements as part of the scheme – such as the creation of new, or more accessible, public open space within land take associated with the scheme, and the improvement of habitat connectivity along the A55 (to meet project objective OBJ7); and
- Investigate measures to minimise the impact of the closure of the bus gate on the population of Pendalar (to meet project objective OBJ8).

The enhancement measures could be funded either as part of the scheme, other transport schemes or collaboratively by partner organisations.

Junction 16 (Penmaenmawr and Dwygyfylchi)

It is recommended that the **Mitigated Option A** at Junction 16 should be considered for being taken forward as the preferred option. The option comprises mitigation measures, including traffic calming and extension of link road, to minimise changes in traffic flows through Dwygyfylchi and along Ysguborwen Road (to meet project objective OBJ7). It also incorporates changes to the junction arrangement at Junctions 16 and 16A. It is recommended that mitigation and enhancement measures should be adopted to maximise opportunities with respect to the well-being goals, including (not-exclusively):

- Investigate whether the Puffin Services access could be improved (to meet project objective OBJ2);
- Investigate ways of increasing linkages to the Sustrans National Cycle Route 5 (NCR5), to maximise opportunities associated with reducing severance to the coast for non-motorised users (to meet project objective OBJ6);
- Encourage and enable active travel enhancements – such as creating a new active travel route along the link road, which will create improved linkages with Dwygyfylchi and Penmaenmawr (to meet project objectives OBJ6 and OBJ7);
- Incorporate environmental enhancements as part of the scheme – such as the creation of new, or more accessible, public open space within land take associated with the scheme, measures to improve the overall landscape and visual effect of the A55, and opportunities for the creation of habitats, and the improvement of habitat connectivity along the A55 (to meet project objective OBJ7).

The enhancement measures could be funded either as part of the scheme, other transport schemes or collaboratively by partner organisations.

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1. INTRODUCTION

1.1 The purpose of the Outline Business Case (OBC)

The Welsh Transport Appraisal Guidance (WelTAG) process covers the complete lifecycle of a proposed intervention in the transport system from assessment of the problem, consideration of possible solutions and scheme design, through to implementation and project evaluation. This report covers the second of the five WelTAG stages, the Outline Business Case (OBC).

The purpose of the OBC, as described in the Welsh Transport Appraisal Guidance (WelTAG) 2017 [1], is to "examine in greater detail the short list of options for tackling the problem under consideration" and to provide the evidence required for the selection of the preferred option to be taken forward to stage three, full business case.

1.2 Document Purpose

This report sets out the OBC for the A55 Junctions 15 & 16 Improvements scheme and has been structured such that it aligns with the WelTAG 2017 guidance [1]. In accordance with the principle of proportionality described in WelTAG 2017, the assessment has been developed since the WelTAG Stage One Strategic Outline Case (SOC) as follows:

- **Section 2 - Strategic case**: The case for change, fit with policies and well-being objectives have been updated and verified. Details of how the short-list was derived, and the assessment process has been provided.
- **Section 3 - Transport case**: A more detailed assessment of whether the proposals offer good public value for money and maximise contribution to the well-being goals has been carried out.
- **Section 4 - Financial case**: Information whether the proposed spend affordable, including the lifetime costs of the project, source of funding and accounting implications has been given.
- **Section 5 - Commercial case**: Information regarding how the scheme can be procured, and if it is viable has been provided.
- **Section 6 - Management case**: Provides information regarding whether the scheme is achievable and if it can be delivered.

In particular, the report highlights any relevant changes that may have occurred in the transport system since the completion of Stage One. Further details of the appraisal work carried out as part of the OBC can be found in the live WelTAG Impact Assessment (IAR) Report [2] for the project; which references studies that have been produced to support these findings. The supporting appendices for the OBC contain the following information:

- **Appendix 1** – Strategic Case: Details of local bus services, the population profiles of the Wards of Bryn / Pandy (Junction 15) and Pant-yr-Afon-Penmaenan / Capelulo (Junction 16), Environmental Constraints Plan, Option layout drawings presented at the Public Consultation.
- **Appendix 2** – Transport Case: Potential environmental benefits, Risk Assessment for Junctions 15 and 16; Appraisal Summary Table and Economics Table.
- **Appendix 3** – Financial case: not used.
- **Appendix 4** – Commercial case: not used.
- **Appendix 5** – Management case: not used.

As detailed in the SOC report, the appraisal process has adopted the requirements of legislation such as the *Well-being of Future Generations (Wales) Act* 2015. This legislation 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. As described on the Welsh Government webpage:

> "The Future Generations 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. This approach provides an opportunity for innovative thinking, reflecting the way we live our lives and what we expect of our public services."

Throughout the report, the following five "ways of working" principles that public bodies are required to follow when applying sustainable development have been applied.

In particular, the following means of achieving the five ways of working have been adopted:

- Looking to the **long term** so that we do not compromise the ability of future generations to meet their own needs;
- Taking an **integrated** approach so that public bodies look at all the well-being goals in deciding on their well-being objectives;
- **Involving** a diversity of the population in the decisions that affect them; and
- Working with others in a **collaborative** way to find shared sustainable solutions.
- Understanding the root causes of issues to **prevent** them from occurring or getting worse

1.3 Scheme Context

The A55 Junctions 15 and 16 are the only two roundabouts on the mainline of the Euroroute E22 Trans-European Transport Network (TEN-T). This causes problems to the traffic using the A55 travelling along the route. The purpose of the project is to remove the two roundabouts at the junctions and replace them with upgraded junctions. The key objective for the scheme is to improve access to regional, national and international markets and employment opportunities; in addition to improving resilience and safety, and reducing delays both to local traffic as well as people travelling along the A55.

The location of the A55 Junctions 15 & 16 Improvement scheme in the context of North Wales and the North West of England is shown in the following figure.

Figure 1-1: Location of the A55 Junctions 15 & 16 Improvements Scheme

A number of studies have been undertaken to date to progress the progress of the project. These are schematised in following two figures, showing the studies on which the SOC and more recently the OBC have been based on.

It should be noted that the studies carried out by Atkins between 2008 and 2011 were produced for the WelTAG 2008 [3] Planning Stage. Although as stated in the Supplementary Guidance for the Transitional Arrangements [4], the WelTAG 2008 Planning stage maps to WelTAG 2017 Stage One. However as described in the Supplementary Guidance covering legislative requirements [5], gaps exist in the works required primarily due to the enactment of the *Well-being of Future Generations (Wales) Act* 2015 and the *Active Travel Act* 2013, which were addressed in the SOC.

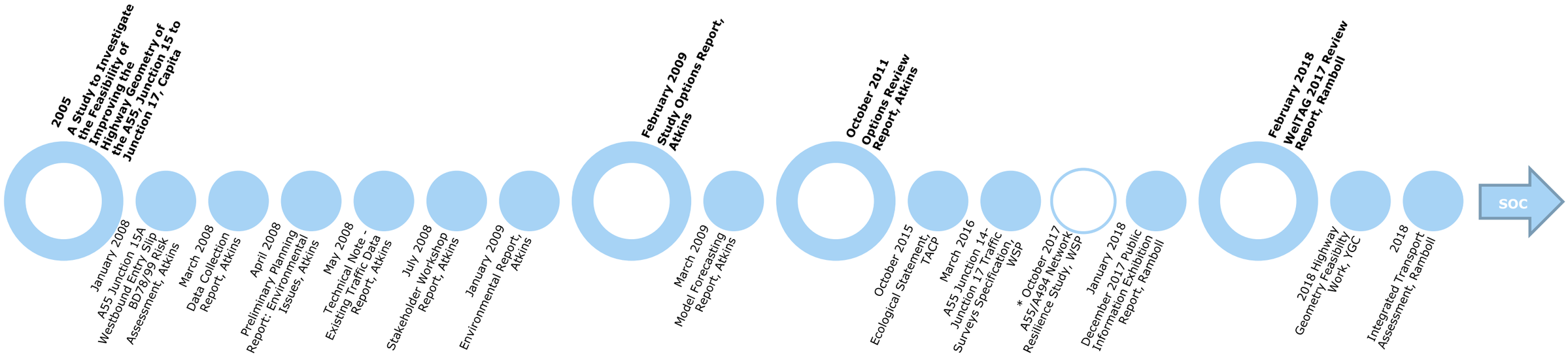

Figure 1-2: Development of the A55 Junctions 15 & 16 Scheme up to Strategic Outline Case

Key:

Key WelTAG Stage One Reports

Supporting information, including studies and investigations

* Study not produced for the A55 Junctions 15 & 16 Improvement scheme

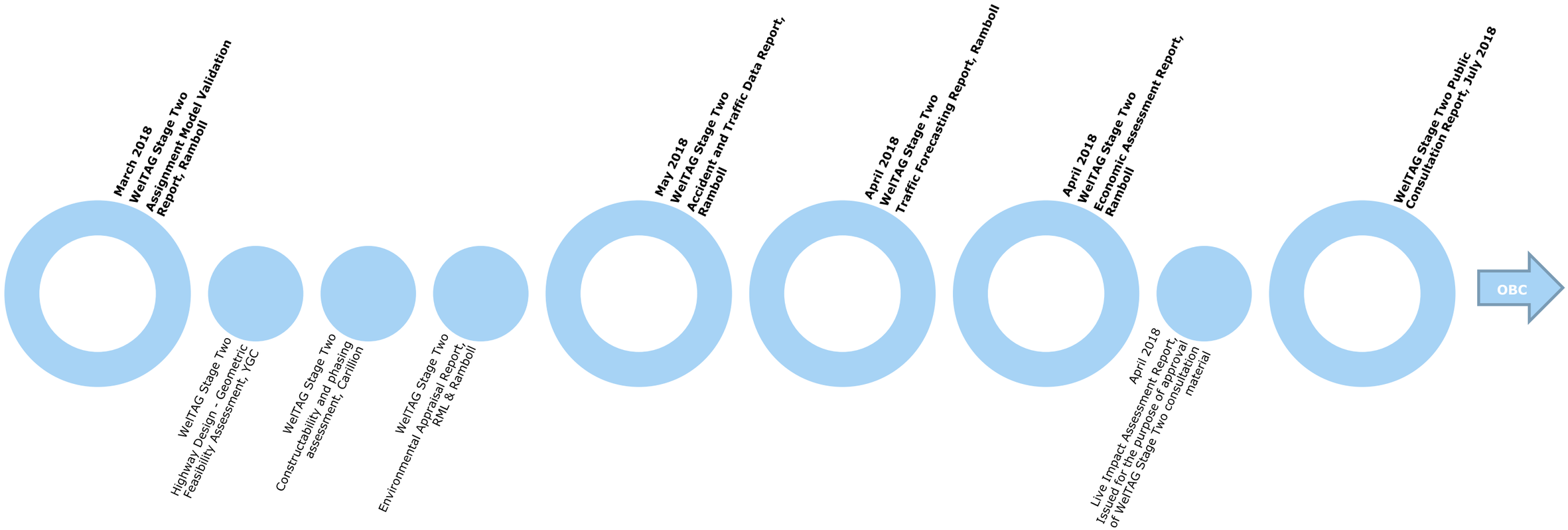

Figure 1-3: Development of the A55 Junctions 15 & 16 Scheme up to Outline Business Case

Key:

Key WelTAG Stage Two Reports

Supporting information, including studies and investigations

2. THE STRATEGIC CASE

2.1 Introduction

As described in the WelTAG 2017 guidance [1], the "strategic case tells us if we need change and why. It presents an evidence based description of the current situation, describes the likely future situation if no action is taken, and presents the reasons why an intervention is required. It includes details of the wider context for the proposed intervention, including key trends in non transport areas such as job availability and the environment."

This section follows the same structure as the WelTAG 2017 guidance checklist, detailing:

- **The scope** – including a description of the study area, what is in scope and what is not in scope;
- **The case for change** – including the background to the problem, the current situation and the likely situation if no action is taken;
- **The objectives for the intervention** – including National Objectives, how the objectives align with the objectives of other public bodies, local objectives and how success will be measured;
- **The short list of options** – including how the short-list was derived, and for each option how it tackles the problem and meet the objectives, plus any risks / opportunities identified.

2.2 The scope

Although as shown in Figure 2-1 below, the study area considered extends from A55 Junction 14 to Junction 16A, the scope of the project primarily concerns improvements to A55 Junctions 15 and Junction 16.

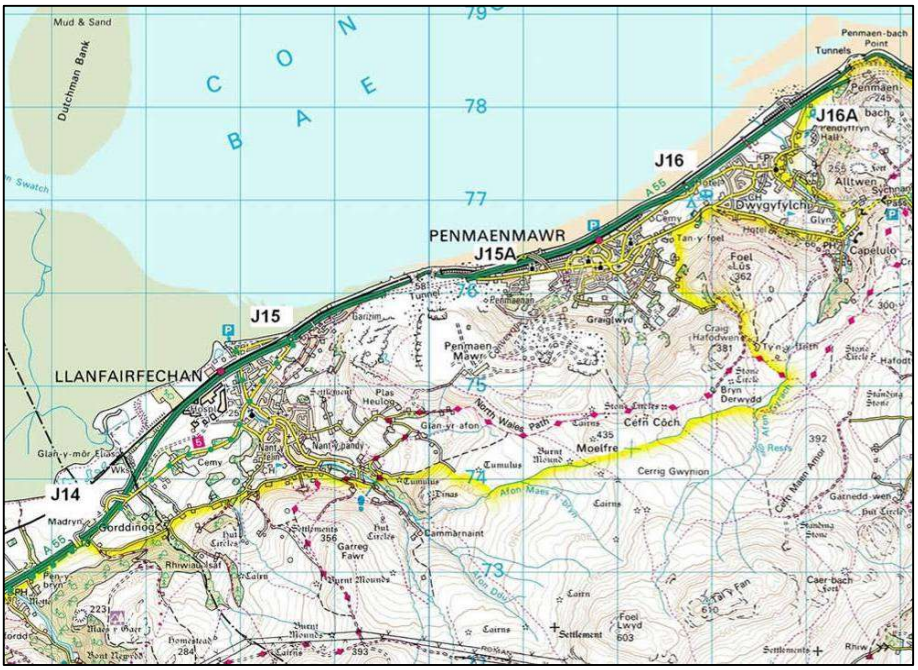

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Figure 2-1: Locations of Junctions 15 and 16, within the study area[1]

For the purpose of the traffic modelling and forecasting, as illustrated in Figure 2-2, the study area was extended to comprise of a detailed highway network along the A55 corridor from the

[1] Extract from the Atkins 2009 Options Report (Figure 1.2 – The Study Area – Junction 14 to 16A) [30]

west of Llanfairfechan to the eastern fringes of Conwy. The detailed study area consists of the simulation and buffer areas and the rest of the map denotes part of the external area which extends to the rest of the UK. The A55 Traffic Model was calibrated and validated to a base year of 2016. The junction improvement options were then tested for the year of opening (2022), a design year 15 years after opening (2037) and a future horizon year 24 years after opening (2051).

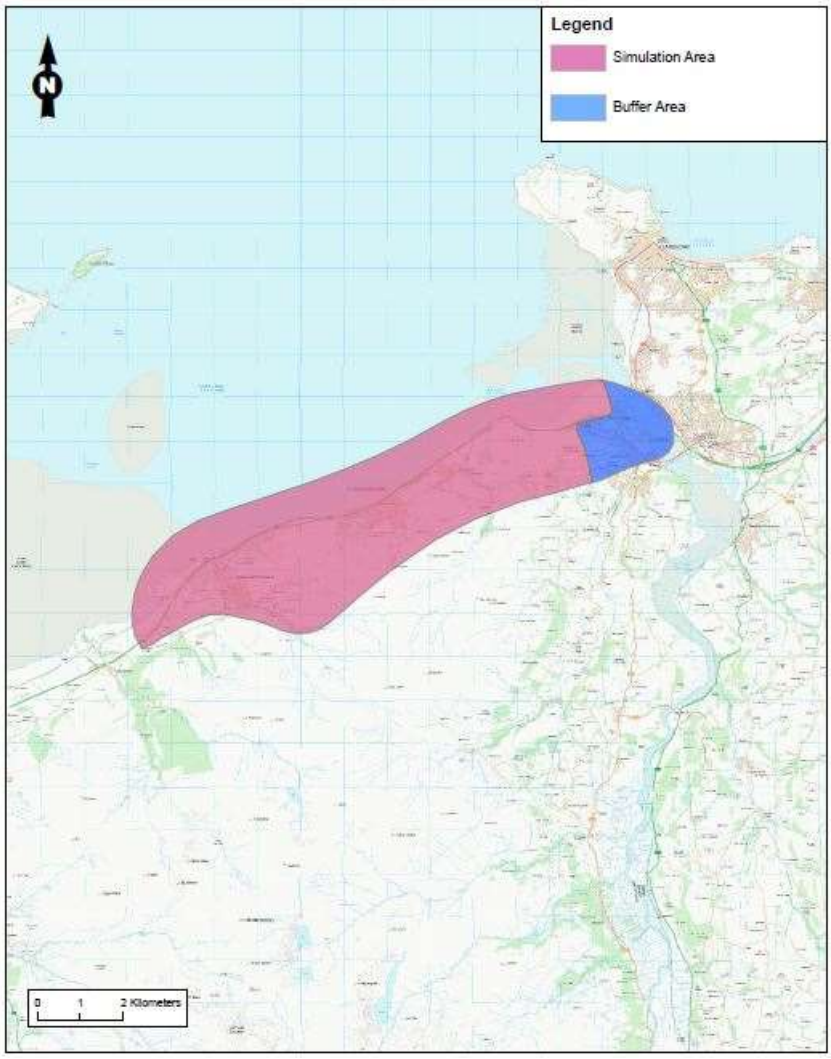

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Figure 2-2: Traffic Model and Forecasting Study Area, extending from A55 Junction 14 to Junction 16A

In addition to options that primarily concentrate on improvements at the A55 Junctions 15 and 16, as described in the SOC [6], other transport and non-transport modes have been considered to identify whether they might help address the issues in the study area either in the short, medium or long term. Although this assessment found that there would be an overall benefit in pursuing some of these options (for example integrated transport and improvements to active travel routes), they would not as standalone options address the project objectives. Therefore, it was recommended that reasonable steps should be taken to incorporate them into the design where appropriate and/or identify opportunities for collaborative working with other public bodies or organisations (especially where it might help a public body meet their well-being objectives). In line with the *Well-Being of Future Generations (Wales) Act* 2015 and to ensure that the local

population had an opportunity to be involved in the decisions that affect them, the WelTAG Stage Two Public Consultation was designed to identify these opportunities as well as learning what the respondent's views are in relation to the options presented. These views have been incorporated into the WelTAG assessment described in the following sections. The stakeholder engagement is discussed further in Section 2.4.

2.3 The case for change

2.3.1 Alignment with Policy and Cross-Cutting Themes

The A55 Junctions 15 and 16 Improvement project has links with a number of key policy documents including:

- The 'One Wales' agreement published in 2007;
- The Wales Spatial Plan, 'People, Places, Futures' which was adopted by the Welsh Government in 2004 (updated in 2013[2]), and sets out strategic spatial planning guidance over a 20-year horizon;
- The Wales Transport Strategy, 'One Wales: Connecting the Nation' [7], which was published in 2008;
- The National Transport Plan [8], which was published in 2015;
- The North Wales Joint Local Transport Plan [9], which was published in 2015;
- Planning Policy Wales, 2016; and
- Planning Policy Wales, Technical Note, 18 Transport.

The Wales Transport Strategy document sets out Wales' commitments to sustainable development, the environment and "an economy which encourages strong innovative and competitive businesses." Moreover, it noted that "connections with the rest of the UK and internationally are vital for business and tourism. Reliability can be at least as important as the time taken for a journey." The long-term outcomes of the Wales Transport Strategy are shown in the Table 2-1.

Under the Wales Transport strategy, two tiers of transport plans have been developed: The National Transport Plan (NTP) and Local Transport Plans (LTP's). The National Plan identifies National and Regional improvements, whereas Local Authorities have developed LTP's to identify priorities for transport investment at a local level to support the outcomes in the Wales Transport Strategy and in line with guidance provided by Welsh Government[3]. The section of the A55 between Junctions 14 and 16A sits within the area covered by the joint North Wales LTP.

As reported in the 2015 North Wales LTP, a North Wales Ministerial Task Force was set up in 2013 to advise the Minister for Economy and Transport on transport issues. They identified several key strategic high-level transport interventions including (not exclusively):

- Transport network resilience improvements – improvements to the rail and road networks to increase resilience, particularly to the A55 corridor;
- Rail modernisation including new stations and faster and more frequent rail services to key destinations;
- Improved links to and between Enterprise Zones, ports and other key employment sites, including those in rural areas;
- Strategic integrated transport measures to improve access to employment and other services by non-car modes, including regional and cross border bus routes, rail station multi modal hubs, active travel routes and car share sites; and
- Facilitating the provision of rail freight facilities subject to a viable business case.

[2] Source: https://gov.wales/topics/planning/development-plans/wales-spatial-plan/?lang=en

[3] See Overview Section of the NTP [8]

The recommendations from the Task Force helped to inform the development of the North Wales LTP in 2015[4].

Table 2-1: Wales Transport Strategy: long-term outcomes[5]

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

In particular the North Wales LTP noted opportunities to capitalise on, and improve the strategic connections and develop the growth corridors to help the economy to prosper.[6] The report noted that "whilst the A483/A55 corridor is the trunk investment corridor of the region the other key links such as the A470, A487 and A5, in combination with the A483/A55, provide the opportunity to maximise economic links with neighbouring regions and spread investment opportunities to peripheral areas of the region."

Wales' commitments were subsequently reinforced in the consultation version of the Draft NTP which was published in 2015[7]. This Draft NTP highlighted that "transport has a critical role to play in improving Wales' economic competitiveness and provides enhanced access to jobs and services." The need to make improvements to A55 Junctions 15 and 16 has been identified in the National Transport Finance Plan 2015 [10] as scheme reference R18[8].

In addition to the policy documents discussed above, other policies and cross-cutting themes that align with the scheme include:

- *The Well Being of Future Generations (Wales) Act* 2015;
- *Active Travel (Wales) Act* 2013;
- Design Guidance for the Active Travel (Wales) Act 2013;
- Strategy for the Horse Industry in England and Wales;
- The Welsh Government Tackling Poverty Action Plan 2015[9];

[4] See Page 12 North Wales Joint LTP 2015 [9]
[5] Source: Executive 'One Wales: Connecting the nation' [7]
[6] See Page 24 [9]
[7] See Section 1 NTP [8]
[8] See Page 18 2015 National Transport Finance Plan [10]
[9] https://gov.wales/topics/people-and-communities/tackling-poverty/taking-forward-tackling-poverty-action-plan/?lang=en

- A living language: a language for living 2012[10];
- The 'Environment Strategy for Wales' 2011[11]
- The Climate Change Strategy for Wales 2010[12];
- 'Trunk Road Forward Programme' 2009[13];
- The Conwy Local Development Plan 2007-2022;
- 'North West Wales Economic Futures' 2006[14]; and
- Children and Young People: Rights to Action.

2.3.2 The Current Situation

The problems associated with the roundabouts were acknowledged in Section 2.9.12 of the Draft National Transport Plan (NTP) [8], which was issued for consultation in 2014. This document stated that "There are a number of capacity issues on the North Wales network on the A55, linked with ferry traffic and summer traffic, in particular around Junctions 15 and 16...".

The North Wales Joint LTP was published in January 2015. This identified a number of key transport issues for North Wales:

- The ability of the strategic trunk 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.[15]

Additionally, as illustrated by the consultation held as part of the PIE in December 2017 and more recently the WelTAG Stage Two Public Consultation which commenced in 2018[16], local concerns regarding the problems related to the roundabouts at Junctions 15 and 16 (in addition to other access/slip roads between Junctions 14 and 16A) remain, particularly in relation to noise, visual impact, delays and safety issues. Further information regarding the stakeholder engagement carried out can be found in Section 2.4.

For the purpose of this WelTAG Stage Two report, the existing problems associated with the A55 corridor in the vicinity of Junctions 15 and 16 have been grouped into the following transport and non-transport related themes and are summarised in Table 2-2.

- Transport issues – Safety and Delays; Network Resilience; Sustainable Travel,
- Non-Transport issues: Including the environmental and social impact associated with the A55 corridor.

[10] https://gov.wales/topics/welshlanguage/welsh-language-strategy-and-policies/welsh-language-policies-upto-2017/a-living-language-a-language-for-living-strategy-2012-2017/?lang=en

[11] https://gov.wales/topics/environmentcountryside/epq/envstratforwales/?lang=en

[12] https://gov.wales/topics/environmentcountryside/climatechange/emissions/climate-change-strategy-for-wales/?lang=en

[13] http://www.assembly.wales/NAfW%20Documents/09-37.pdf%20-%2027102011/09-37-English.pdf

[14] https://gov.wales/statistics-and-research/economic-futures-wales/?lang=en

[15] See Page 16 [9]

[16] See Atkins 2008 Stakeholder Workshop Report [19], the December 2017 Public Information Exhibition Report [11] and the WelTAG Stage Two Public Consultation Report [12]

Table 2-2: The existing problems associated with the A55 corridor in the vicinity of Junctions 15 and 16

Problem	
Transport - Safety	The junctions and A55 mainline between Junctions 14 and 16A do not comply with current design standards. This was identified in the Atkins 2009 Options Report and the key stakeholder consultation carried out at the time, to be an issue that affect safety and capacity[17]. During both the public consultations carried out in December 2017 [11] as part of the Public Information Exhibition and June 2018 for the WelTAG Stage Two Public Consultation [12], a number of members of the public stated that they had either themselves or knew someone who had been involved in a near miss or an accident on the roundabout. People also mentioned that they did not use certain junctions for fear of accidents. In addition to Junctions 15 and 16, a number of respondents identified safety concerns in relation to other locations along the A55 corridor, including at Junctions 14, Junction 14A (where there is restricted DCWW and private property access on and off the A55 eastbound carriageway), Junction 15A, the bus-gate at Pendalar off the westbound carriageway prior to Junction 15, the Puffin Services access on and off the westbound carriageway, and at Junction 16A.
Transport - Delays	The need to reduce journey times and delays was identified in the WSP 2017 Network Resilience Study especially during peak periods (for example due to ferry flows)[18]. The A55 corridor also experiences seasonal traffic and delays, especially during summer weekends.
Poor Network Resilience	A number of issues associated with poor network resilience were identified in the WSP 2017 Network Resilience Study [13], including: the need to reduce the number of incidents; and issues associated with the lack of local and strategic diversion routes, in case of incidents or planned works. In addition to the need to address operational issues associated with the tunnel maintenance.[19] The need to address these issues was confirmed in meetings with NMWTRA, held during the 2018 WelTAG Stage 2 Public Consultation.
Sustainable Travel	During both stakeholder engagement carried out by Atkins in 2008 and the Public Information Exhibition held in 2017, it was identified that there is perception that there is a lack of competitive sustainable travel options, poor coastal access for non-motorised Users and issues associated with the safety of cyclists[20]. This has been confirmed more recently with a number of the respondents to the 2018 WelTAG Stage 2 Public Consultation stating that that they did not use public transport due to its unreliability and, particularly in relation to trains, its expense.
Environmental and social issues	Environmental issues associated with 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 based on the 2007 noise maps[21]. Other environmental constraints include air quality, greenhouse gas emissions, landscape and townscape impacts, biodiversity, soil, heritage and the water environment. Social issues associated with the communities' reliance on the A55 plus the impact of the A55 severing the communities from themselves and the coast, such as transport safety, personal security, permeability, physical fitness and social inclusion.

[17] For details see Section 4 [30] and Section 7 [19]

[18] See pg. 21 WSP 2017 Network Resilience Study [13]

[19] See Section 7 Atkins 2008 Stakeholder Workshop Report [19], Section 10 Atkins 2009 Study Options Report [30] and pg. 21 [13]

[20] See Section 7 [19] and pg. 19 [13]

[21] Noise Action Planning Areas were published by the Welsh Government in 2014. These include areas in the vicinity of junctions 15, 15A and 16 https://gov.wales/docs/desh/publications/140516-north-west-wales-en.pdf Figure 6 A noise action plan for Wales 2013-2018 [37]

Transport – Current safety issues

Records of all accidents and casualties in and around the A55 from Llanfairfechan to Llandudno Junction over a 5-year period from 2012-2016 were presented in the Traffic and Accident Data Report (TADR) [14]. This report identified the location and severity (fatal, serious and slight) of all accidents during this period to help understand any accident trends and areas of particular concern within the area. Figure 2-3 below, extracted from the TADR shows the location of accidents between Llanfairfechan and Llandudno Junction over the 5-year period.

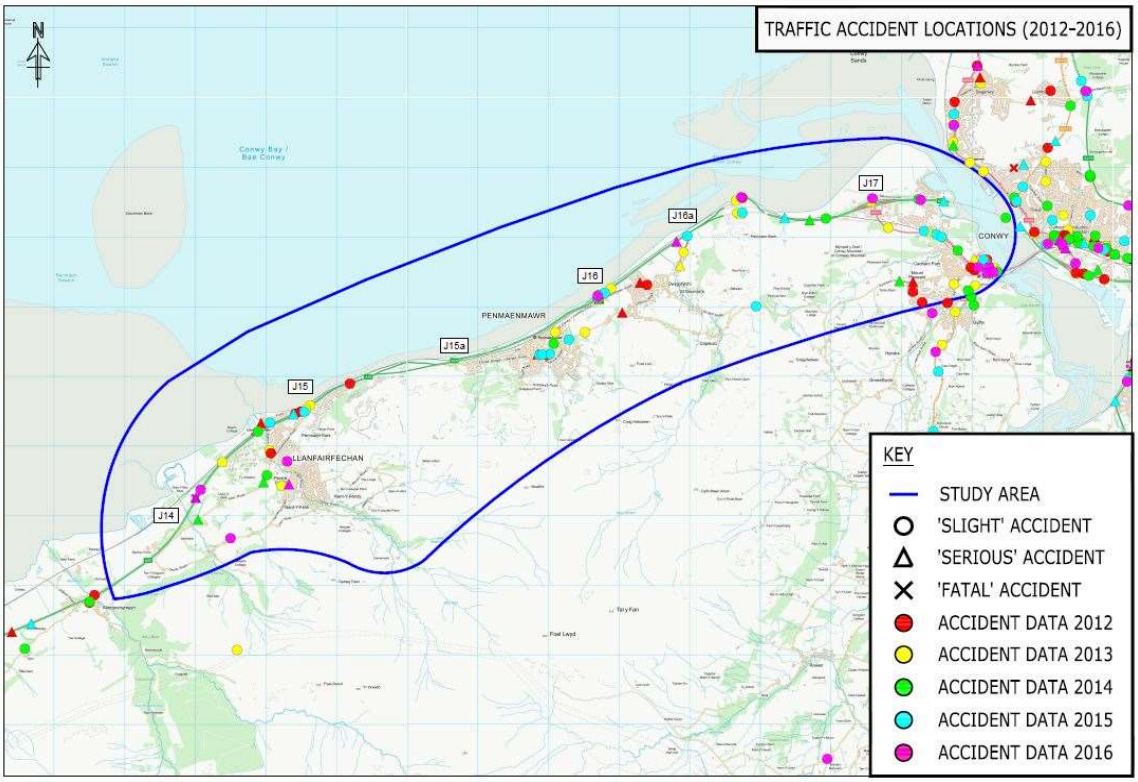

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Figure 2-3: Total Accidents in A55 Study Area (2012-2016)

The blue line indicates the boundary for the study area. Data within the boundary has been used to assess and identify any safety issues within the study area. Table 2-3 shows severity of these accidents for a five-year period, for the A55 corridor within the study area.

Table 2-3: Total Accidents and Attributed Casualties between Llanfairfechan and Llandudno Junction (2012-2016)

Year	Severity			Total Accidents	Total Casualties	Vulnerable Road User Casualties		
	Slight	Serious	Fatal			Pedestrians	Cyclists	Motorcycle
2012	14	4	0	18	25	2	1	4
2013	17	4	0	21	28	2	1	5
2014	12	6	0	18	28	2	0	4
2015	13	4	0	17	22	4	1	2
2016	10	4	1	15	21	4	0	0
Total	**66**	**22**	**1**	**89**	**124**	**14**	**3**	**15**

For the purpose of this report, the existing situation with respect to safety at the junctions has been split into the junctions that provide access to Llanfairfechan (Junction 15) and Penmaenmawr and Dwygyfylchi (Junction 16).

Safety of junctions providing access to Llanfairfechan (Junction 15).
The primary junction providing access to Llanfairfechan is the roundabout at Junction 15. However, in addition, traffic can also access the town from the west via the priority junction at Junction 14.

The locations and severity of all accidents at these junctions over the last 5 years are shown in Figure 2-4 and Figure 2-5 below.

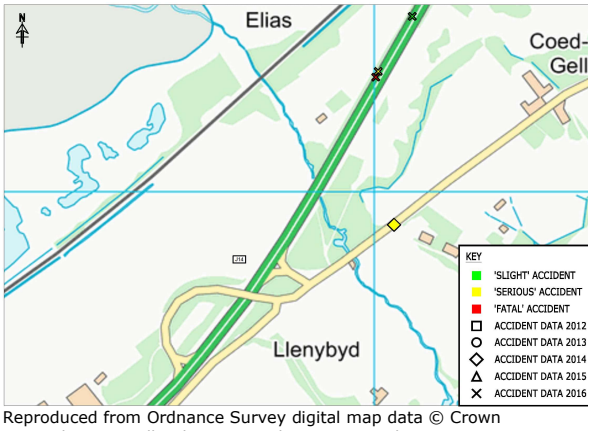

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Figure 2-4: Accidents at Junction 14 (2012-2016)

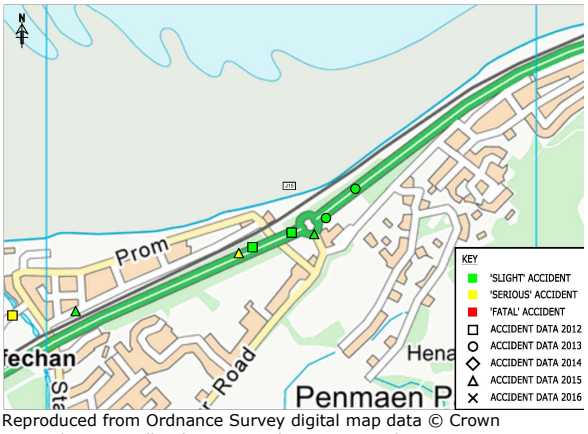

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Figure 2-5: Accidents at Junction 15 (2012-2016)

Reviewing the data identifies there were the following accidents at the junctions over the 5-year period:

- **Junction 14**: no accidents reported.
- **Junction 15**: 4 slight injury accidents, 1 severe injury accident and no fatal injury accidents.

Safety of junctions providing access to Penmaenmawr and Dwygyfylchi (Junction 16).
The primary junction providing access to Penmaenmawr is the roundabout at Junction 16. In addition, traffic can also access the town from the west via the priority junction at Junction 15A.

For the villages of Dwygyfylchi and Capelulo the primary access route is via Junction 16. However alternatively they can also access the villages when travelling westbound via the priority junction at Junction 16A.

The locations and severity of all accidents at these junctions over the last 5 years, using the latest publicly available data, are shown in Figure 2-6 to Figure 2-9.

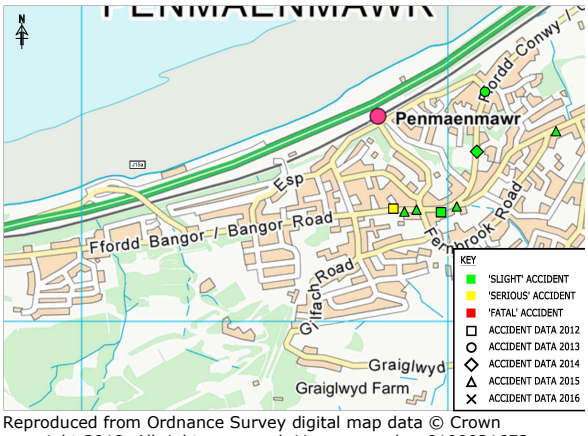

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Figure 2-6: Accidents at Junction 15A Eastbound (2012-2016)

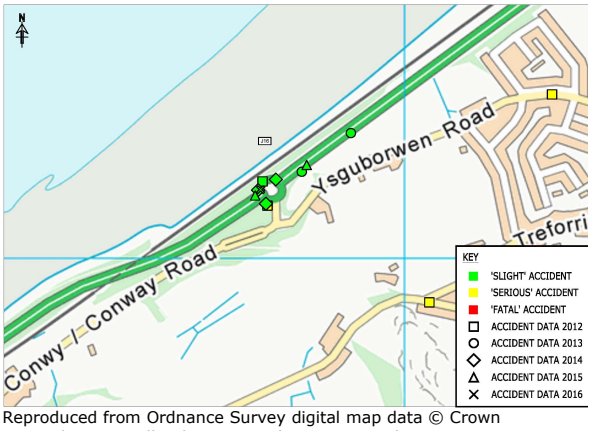

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Figure 2-7: Accidents at Junction 16 (2012-2016)

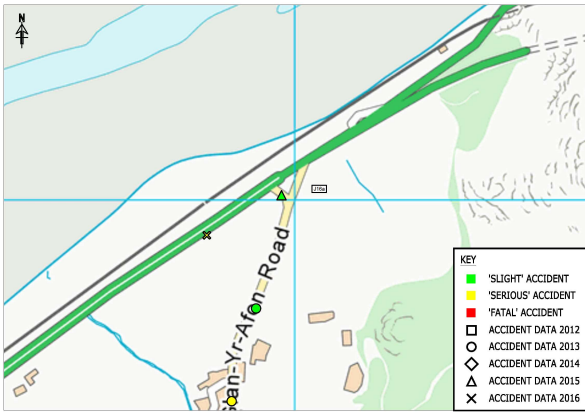

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Figure 2-8: Accidents at Junction 16A (2012-2016)

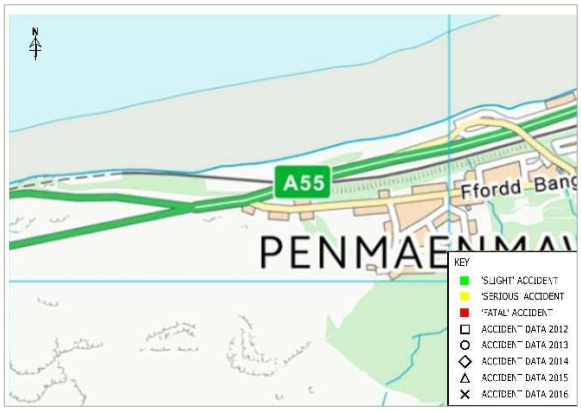

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Figure 2-9: Accidents at Junction 15A Westbound (2012-2016)

Reviewing the data identifies there were the following accidents at the junctions over the 5-year period:

- Junction 15A: no recorded accidents
- Junction 16: 8 slight injury accidents, 2 severe injury accidents and no fatal injury accidents.
- Junction 16A: 1 recorded slight injury accident. The incident at Junction 16A is understood to have occurred on the slip road when they were pulling onto the A55.

<u>The current situation in relation to safety</u>

As identified by the WSP A55/A494 Network Resilience Study [13], it was noted that the section of the A55 between Junction 14 and Junction 16A and both Junction 15 and Junction 16 roundabouts do not meet modern day standards, therefore there are safety concerns if accidents or breakdowns occur due to the lack of a hard shoulder and minimal laybys as well as traffic negotiating these junctions at speed. Accidents or breakdowns between Junction 14 and Junction 16A will have a greater impact on delays due to the geometrical constraints of the carriageway and roundabouts which can potentially increase the severity of the incidents in the area.

Although there have been no recorded accidents at Junction 14 or 15A, there are perceived safety issues at the junctions from local residents and road users due to vehicles pulling onto the A55 from the on-slip roads, which have been reported during the consultation in December 2017 [11] and more recently in the WelTAG Stage Two Public Consultation [12]. The feedback provided

suggests that due to the negative perception of safety at these junctions, local residents try to avoid these slips where possible or are extremely cautious when pulling onto the A55.

The cluster of slight accidents along the roundabout approaches is what would be expected for an A-road roundabout of this type but as with Junctions 14, 15A and 16A there are locally perceived safety concerns at these two roundabouts.

Transport – Current problems with traffic delays

The SOC Stage 1 report and Draft National Transport Plan 2015, identified that the section of the A55 between Junction 14 and Junction 16A currently operates at an average of 50 mph. Updated traffic modelling and forecasting has been undertaken as part of WelTAG Stage Two. As illustrated in Table 2-4, the updated traffic modelling has found that the road operates at an average of 81kph (or 50mph) for eastbound traffic and 91kph (or 57mph) for westbound traffic. This is similar to the estimated average speeds along this section of the A55 corridor, reported previously.

It should be noted that these figures are well below the national speed limit of 70mph for this road. Analysis of the AM, Inter and PM peak data shown shows that journey times are longer and speeds lower in the eastbound direction than for the westbound direction. This is due to the speed restrictions around the headlands in the eastbound direction and the westbound carriageway being accommodated in tunnels without significant speed restrictions in place.

Table 2-4: A55 between Junction 14 and Junction 17 – Peak Hour Modelled Speed and Journey Times (Baseline year 2016)

A55 between Junctions 14 and 17 – Peak Hour Modelled Speeds & Journey Times					
AM Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	84	08:13	Base 2016	91	07:39
Inter Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	85	08:07	Base 2016	92	07:33
PM Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	84	08:15	Base 2016	91	07:39

In order to understand the current traffic delays along the A55, a comparison of journey times and traffic speeds along the A55 between Junction 14 and Junction 17 has been undertaken using data from the validated SATURN model comparing the base year (2016) with future year 'do minimum' and 'do something' scenarios. This comparison has looked at the differences in the direction of travel and changes between different peak hours. The results of this analysis can be found in Section 2.3.5. The analysis predicted that there would be an average speed increase

along the mainline between Junctions 14 and 17, in the order of 6% eastbound and 11% westbound, if the roundabouts are removed (for the 2037 design year).
The reduction in journey times indicate that the roundabouts exacerbate delays along the A55 mainline, especially eastbound during peak morning traffic. Additionally, as noted in the A55/A494 Network Resilience Study [13], "during occurrences of heightened situations (i.e. road traffic collisions (RTCs) or seasonal flow variances), road users can be subject to severe delays (sometimes regardless of the incident magnitude/severity). This fragility is an indication that the A55 is approaching or at capacity."

Details of the modelling approach, the development of the SATURN model, trip assignment and the model's calibration and validation can be found in the Assignment Model Validation Report [15]. Further details of the traffic forecasting work, described below, can be found in the 'Traffic Forecasting Report' (TFR) [16].

Transport - Current issues associated with network resilience

During the 2008 stakeholder engagement, one of the key issues identified related to the poor network resilience and lack of alternative local routes. Operational issues, including those associated with the tunnel maintenance and network resilience, were examined in the 2009 Atkins Study Options Report and for the individual options within the 2011 Options Review Report.[22] The primary aim of this work was to determine the options' impact on the existing cross-over and diversion arrangements. This study did not specifically consider any existing shortcomings.

Traffic Network management is governed by the following road traffic orders (not exclusively). These cover details including maximum speed limits, contraflow positions and the limits to central reserve gaps.

- The A55 Trunk Road (Eastbound Carriageway from Junction 14 (Madryn), Gwynedd to Junction 15 (Llanfairfechan), Conwy) (Temporary Traffic Prohibitions & Restriction) Order 2017 No. 539 (W. 119)
- The A55 Trunk Road (Conwy Tunnel, Conwy County Borough) (Temporary Traffic Prohibitions and Restrictions) (No.2) Order 2017 No. 749 (W. 180)

Extracts of drawings indicating the current traffic management arrangements for a planned tunnel closure at Junctions 15 and 16 are shown in Figure 2-10 and Figure 2-11 respectively.

[22] See Section 10 Atkins 2009 Study Options Report [30] and Sections 3 & 4 Atkins 2011 Options Review Report [29]

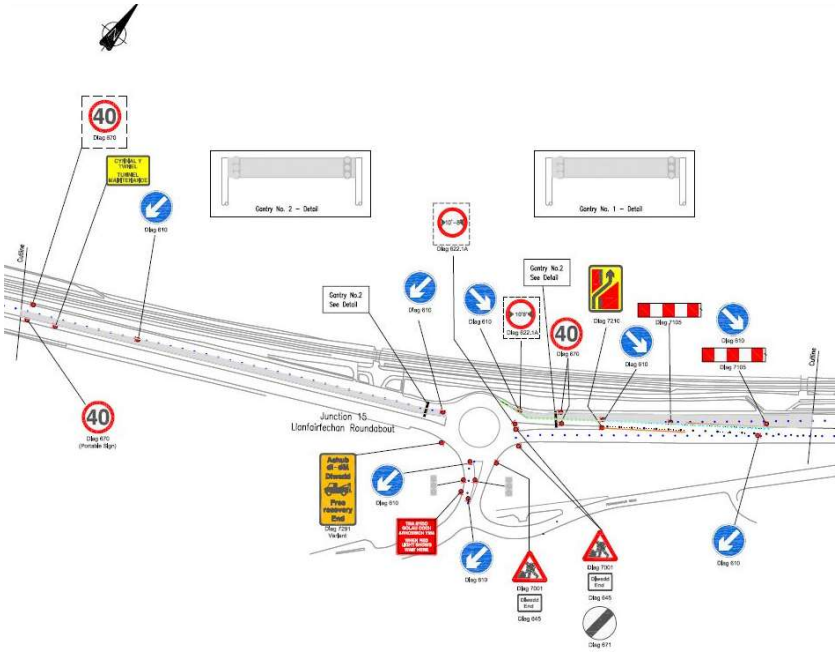

Figure 2-10: Junction 15 – Current Traffic Management

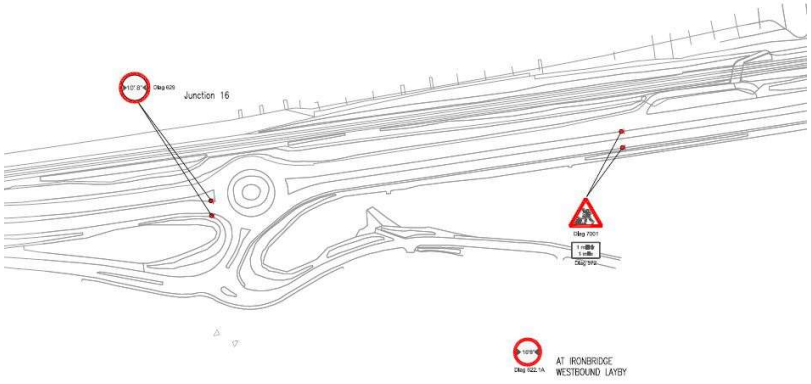

Figure 2-11: Junction 16 – Current Traffic Management

In April 2017, the Cabinet Secretary for Economy and Infrastructure announced a commission to investigate options to improve journey times, reliability and resilience on the A55 and part of the A494 corridor. The consultants WSP were commissioned by the Welsh Government to undertake a WelTAG Stage One Study, which was completed in October 2017. The WelTAG Stage One study concluded that the A55 currently; (1) performs well with some localised congestion during peak traffic flows, (2) runs at close to capacity during normal traffic flows and is above capacity at peak times, (3) is vulnerable during incidents or significant road work events.

Some of the current problems identified include:

- **Limited working hours for maintenance** – There was an embargo on reducing the number of lanes along the A55. Therefore, to minimise the impact of work on the public, the preference has been for night-time working.
- **Lack of hard shoulders** – Between A55 Junctions 14 and 16A there are no hard shoulders and minimal laybys that can be used in emergencies. Consequently breakdowns (as well as other incidents) have a greater impact on delays and potentially increase the severity of incidents.
- **Lack of viable diversion routes** – When the A55 dual carriageway was constructed in the 1980's it severed the local road network, meaning that local communities were entirely reliant on the A55 for connectivity to access services and employment out of the immediate area. There are no local diversion routes, with the exception of Sychnant Pass for access eastwards from Penmaenmawr and Dwygyfylchi to Conwy.
  Due to the topography, there are limited parallel routes either strategically or locally. Strategic traffic travelling to Holyhead could divert via the A5. This diversion under normal travelling conditions is estimated to result in an average estimated journey time increase of 17 minutes for someone travelling between Oswestry and Bangor or 49 minutes for someone travelling between Deeside and Bangor[23]. It should be noted that during an incident (or temporary lane closures) the time required for this diversion would increase considerably.
- **Poor mobile phone coverage** – It was noted that mobile phone coverage drops out in places and that this may impact on response times of emergency vehicle recovery.
- **CCTV coverage** – The report noted that CCTV coverage can speed up response times to broken down vehicles, other incidents and improve tactical decision making. Although the CCTV coverage in the vicinity is mainly concentrated on the traffic in the Conwy and Pen-y-Clip tunnels, it also provides coverage of Junctions 15, 15A, 16 and 16A[24].
- **Variable Messaging Sign (VMS) coverage** – The VMS coverage is understood to be inconsistent across the network, meaning that where there is reduced coverage incident management is more challenging. Between A55 Junctions 14 and 16A there is no VMS coverage[25].

At the time of writing, in September 2018, WSP were in the process of undertaking a WelTAG Stage Two study to further investigate issues with resilience along the A55 corridor.

Transport - Current situation regarding sustainable travel

The SOC Stage One report highlighted a lack of sustainable travel options within the A55 study area and identified improvements in sustainable travel options that could help achieve some of the project objectives such as reducing local and strategic journeys, reducing congestion and improving road safety along the A55. These options have been considered as part of an integrated transport review [17], which was carried out at the end of WelTAG Stage One. In addition, a Walking Cycling & Horse-Riding (WCHAR) Assessment [18] has been carried out during WelTAG Stage Two. The current situation regarding provision for sustainable travel is summarised below.

Rail provision

The railway stations located in Llanfairfechan[26] and Penmaenmawr[27] served by Arriva Trains Wales are request stop only. Eastbound services run to Chester via Colwyn Bay, Rhyl, Prestatyn and Flint. Westbound services run to Holyhead via Bangor. Passenger services run between Holyhead and Crewe approximately every 2 hours during the week and on Saturdays. There are around 4 services on a Sunday. Although both stations have free car parking facilities (with

[23] Source: Section 2 Integrated Transport Technical Note [17]
[24] http://www.traffic-wales.com/CCTV.aspx?lang=en-GB; https://trafficcameras.uk/map/
[25] http://www.traffic-wales.com/vms.aspx?lang=en-GB
[26] http://www.nationalrail.co.uk/stations/LLF/details.html
[27] http://www.nationalrail.co.uk/stations/PMW/details.html

spaces for a total of 10 and 40 cars respectively), there are no bus services to either train station or cycle storage facilities. Figure 2-12 shows the rail services in the study area (blue area).

Along with limited passenger train facilitates and services along the North Wales mainline, there is also a lack of rail freight infrastructure such as rail freight facilities and interchange facilities that could allow more rail freight journeys to be made which could help take HGV trips off the A55.

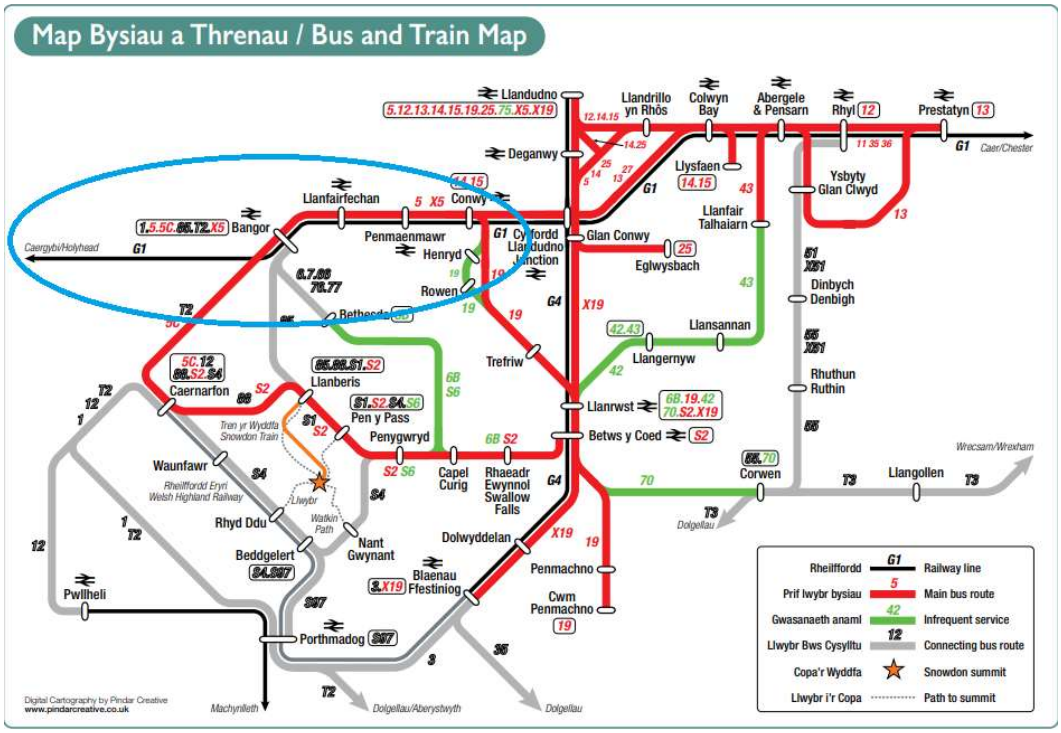

Figure 2-10: Rail and Bus map in the study area [28]

Local bus provision

Bus services around Penmaenmawr, Llanfairfechan and Dwygyfylchi only cater for local trips and therefore have limitations on reducing trips on the A55, while National coach services, which only serve a limited number of key national destinations, are not considered a viable alternative to reduce local car trips. Both local and national services also lack Real Time Information, SMART ticketing, bus stops and facilities which would help the user experience and could encourage increased patronage. The four bus services 5, 75, A55 and X5 that serve Llanfairfechan, Penmaenmawr and Dwygyfylchi are summarised in Appendix 1 (Table 1).

Currently the bus gate at Pendalar is used for bus journeys traveling westbound. However, it is understood from the recent meetings with bus companies, the Welsh Government representatives, and the Bus Users UK representative (during the WelTAG Stage Two Public Consultation) that the bus companies recognise that the bus gate off the A55 isn't ideal due to safety concerns and that an alternative solution should be identified. It should be noted that this would result in reduced standard of service for the ward of Pandy for westbound bus journeys.

Furthermore, no 'Park and Ride' services are provided in the study area and modes of travel such as walking and cycling which are ideal for local movements need improved infrastructure that

[28] Source:http://www.conwy.gov.uk/en/Resident/Parking-Roads-and-Travel/Public-Transport/Assets-Bus-pass/documents/Bus-Information/Conwy-Public-Transport-Guide-2018.PDF

could improve access to local facilities such as beaches, educational and recreational facilities, or even to public transport facilities.

Walking, Cycling and Equestrians

The WCHAR and the distributional impact assessments, carried out during WelTAG Stage Two, have identified that there are a wide variety of trip generators in the vicinity of Junctions 15 and 16 that could be attractive to pedestrians, cyclists and equestrians. These are summarised in Table 2-5 below, and include (not exclusively):

Table 2-5: Destinations that may be attractive to walkers, cyclists and equestrians

Junction 15	Junction 16
Hotels and Restaurants in Llanfairfechan.	Pubs, Hotels and Restaurants in Penmaenmawr and Dwygyfylchi, including the Gladstone, the Fairy Glen Hotel, The Village Bistro, Bron Eryri and the Alexandra Hotel. Penmaenmawr Golf Club. The Glyn Uchaf Stables near Capelulo.
Other tourist accommodation including Platt's Farm Bunkhouse and Hafod Holidays Caravan Park in Llanfairfechan.	Other tourist accommodation including Lyons Pendyffryn Hall Caravan Park & Country Club (near Junction 16A) and Tyddyn Du Touring Park in Dwygyfylchi, and Craiglwyd Hall Caravan Park in Penmaenmawr.
The promenade and beaches in Llanfairfechan, sailing club and play areas.	The promenade and beaches in Penmaenmawr and the section of shore to the north of the A55 adjacent to Junction 16A. Pen slip-road beach / sailing club.
Retail Units in Llanfairfechan.	Retail Units in Penmaenmawr.
Community facilities including the library, the Plas Menai doctors surgery, the Christian Fellowship Holidays Meeting Room, in addition to Llanfairfechan Community Centre and Llanfairfechan Town Council.	Community facilities including the library, the Penmaenmawr Community Centre and St Gwynan's Parish Hall.
Primary schools in Llanfairfechan, including Ysgol Pant y Rhedyn and Ysgol Babanod.	Primary schools in Penmaenmawr (Ysgol Pencae) and Dwygyfylchi (Ysgol Capelulo).
Churches including the Libanus Baptist Church, the Evangellical Fellowship and Saint Mary of the Angels in Llanfairfechan.	Churches including Saint Paul's Churches in Penmaenmawr and Saint Gwynan's Parish Church in Dwygyfylchi.
Sustrans National Cycle Route 5 and North Wales Coast Path.	Sustrans National Cycle Route 5 North Wales Coast Path.
The railway station in Llanfairfechan.	The railway station in Penmaenmawr.

In Llanfairfechan, footways are present along the entire length of Penmaenmawr Road, Promenade and Station Road. Pedestrian crossing facilities are provided on the Penmaenmawr Road/Station Road junction. Pedestrian access to the beach can be obtained via an underpass close to Llanfairfechan Station, connecting to the Beach Café and the NCN 5. The cycle route from the west runs along Aber Road and Penmaenmawr Road, prior to passing via Pendalar across the A55 along a section of raised ramps towards Penmaenmawr. The section through Pendalar is particularly steep and potentially unattractive to recreational cyclists.

In Penmaenmawr, footways are present along Bangor Road, Conway Road and Paradise Road, which leads to Penmaenmawr railway station. Pedestrian crossing facilities are provided on the Bangor Road/Paradise Road junction, while a zebra crossing is provided on Bangor Road between

Station Road West and Celyn Street. The cycleway runs parallel to the north of the railway track and the A55. The current route provides minimal connectivity or encouragement for cyclists to stop and visit Penmaenmawr or Dwygyfylchi.

In Dwygyfylchi, footways are present along Ysguborwen Road, while no pedestrian crossing facilities are provided. There is a public right of way providing access to the beach and NCN 5 from Ysguborwen Road, via a footbridge over the A55. The footbridge provides stepped access, with no ramps, across the A55 between Junction 16A and Junction 16 near the Puffin cafe.

Records of accidents and casualties for the study area for a five years period from 2012-2016 have been obtained from the STATS19 database[29]. The locations and the detailed descriptions of the accidents can be found in the WCHAR Report. In Llanfairfechan, Penmaenmawr and Dwygyfylchi, during the five years period, six pedestrians and two cyclists were involved in those accidents recorded.

Consultation with local cycling groups, Sustrans and Conway Active Travel officer have identified a number of issues and opportunities for enhancements which would be beneficial to improve accessibility and safety for pedestrians and cyclists. These are reported in the WCHAR Assessment Report, and summarised in Section 2.3.5.

Integrated Transport

The Integrated Transport technical note [17] has identified that rail services and infrastructure in the study area and North Wales would need to be significantly improved to support modal change from the car to sustainable travel options. Service improvements that could encourage mode transfer could be:

- Increase the frequency of rail services along the North Wales line
- Synchronization of train times with key local bus services
- Free local shuttle bus provision between places of work
- Real Time Passenger Information (RTPI) provision at all stations
- Improved quality of rail stations and infrastructure (i.e. improving waiting facilities, more car parking spaces etc.)
- Linked ticketing whereby moving between different transport modes is achieved with one ticket

Non-Transport – Current environmental and social issues

The WelTAG 2017 guidance on the Impacts Assessment Report requires that the following environmental impacts should be assessed as a minimum: Noise, Air quality, Greenhouse gases, Landscape, Townscape, Historic Environment, Biodiversity and Water Environment. The key environmental constraints, which include important designated sites for landscape, ecology and heritage conservation, are listed in Table 2-6 and shown in Appendix 1 (Figure 1).

[29] www.data.gov.uk

Table 2-6: Current Environmental issues and constraints

Noise
In accordance with the EU Environmental Noise Directive 2002/49/EC, Welsh Government Noise Action Planning Priority Areas have been identified. These are updated every 5 years. The most recent reports to the European Commission were prepared in 2012 and 2017 using noise data and the results of consultations with the local authorities and trunk road agents. Out of 212 in Wales, there are 8 along the A55 between Colwyn Bay and Bangor. Two areas lie either side of Junction 15 at Llanfairfechan, one area is at Junction 15A at Penmaen and one slightly east of Junction 16 at Dwygyfylchi. The mapping is used by Welsh Government to develop a noise action plan for Wales. The Statutory Consultation has demonstrated the importance of traffic noise on the settlements around the junctions. There is a perception that the general background of traffic noise is almost always present, with the roundabouts causing vehicles to brake and accelerate, and the rumble-strips causing a more intrusive noise.
Community and land use
Existing constraints include: Strategic footpaths e.g. the Wales Coastal Path and Number 5 National Cycle Network and areas designated as the Countryside and Rights of Way Act 2000 (CROW) Access Land; current issues with accessing community services facilities and the road network; and the effects of traffic on local communities.
Landscape, townscape and Heritage
The study area includes international and national designated sites including the Snowdonia National Park, the Conservation Areas and Listed Buildings and Listed Parks and Gardens and Scheduled Ancient Monuments on the surrounding hills (Hut circles near Wern Newydd south of the A55). Beaumaris Castle, one of the sites that makes up the Castles of King Edward in Gwynedd World Heritage Site, overlooks the study area from across the Menai Straits.
Conservation and Wildlife
The study area for the junction improvements includes national and internationally important sites designated for nature conservation. These are listed below and include marine, woodland and upland areas:
• Menai Strait and Conwy Bay Special Area of Conservation (SAC) to the north
• Coedydd Aber SAC, SSSI and National Nature Reserve (NNR), to the south
• Snowdonia SAC and Eryri SSSI to the south
• Liverpool Bay Special Protection Area (SPA) to the north
• Traeth Lafan Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR) to the north
• Sychnant Pass SSSI to the south east of Junction 16
• Cadnant SSSI
• Benarth Wood SSSI,
• Aber Afon Conwy SSSI, 6.22km the east
• Deganwy Quarries and Grassland SSSI to the east

Based on feedback from consultation both in December 2017 and June 2018, it is understood that the main issues in relation to the A55 (in the vicinity of Junctions 14 to 16A) relate to the impacts of the road and traffic:

- Noise seems to be a particular concern associated with the two roundabouts. In particular the WelTAG Stage Two Public Consultation in June 2018 identified that residents who live near to the junctions also experience noise arising from the rumble strips, accelerating/breaking vehicles and emergency sirens.
- Visual impact is also considered important by local residents; with views of the road, its structures and traffic considered to be intrusive. Views to the sea are considered important.

The area's position in relation to the Snowdonia National Park, the landscape in the area is currently considered to be of moderate scenic quality. Notwithstanding the A55's close proximity

to residential areas, air quality has not been identified as a major concern, with monitoring recording NO2 concentrations at Llanfairfechan which are well below the National Objective level.

Although there are no known current issues related with contaminated land, there is a potential risk if ground where there has been contaminating land uses, such as the former garage, gas works, and areas of landfilling is disturbed. Potential contamination features within the footprint of the options for A55 Junctions 15 and 16 include the following:

- Junction 15 - Former garage, railway lines
- Junction 16 - Former gas works and incinerator waste disposal area below the A55, former landfill to the south of the A55 towards the west of Junction 16; railway lines, and further towards Junction 16A the sewage treatment works and former 'brick field' which was located outside of the immediate site area, to the north of the A55.

In addition to the potentially contaminating land uses identified above, made ground or fill could also be present associated with existing or historical developments, including the A55 or as unrecorded areas of fill. For example, it would also be necessary to confirm if the existing road surfacing contains coal tar. The likelihood of any contamination being present would need to be confirmed by undertaking a ground investigation.

Social Issues

The Welsh Index of Multiple Deprivation (WIMD) is the Welsh Government's official measure of small area deprivation in Wales. It has been designed to identify small areas, known as Lower Super Output Areas (LSOAs), where there are the highest concentrations of deprivation. WIMD is made up of several types of deprivation, including: income, employment, health, education, access to services, community safety, physical environment and housing. For the purpose of WIMD, deprivation has been defined as where there is a lack of access to opportunities and resources which we might expect in our society. This can be in terms of material goods or the ability of an individual to participate in the normal social life of the community. The WIMD (2014 data) overall measures for the Lower Super Output Areas (LSOAs) located in the vicinity of the A55 Junctions 15 and 16 include Bryn, Pandy, Pant-yr-afon/Penmaenan 1 and 2, plus Capelulo, which are shown in Figure 2-13.

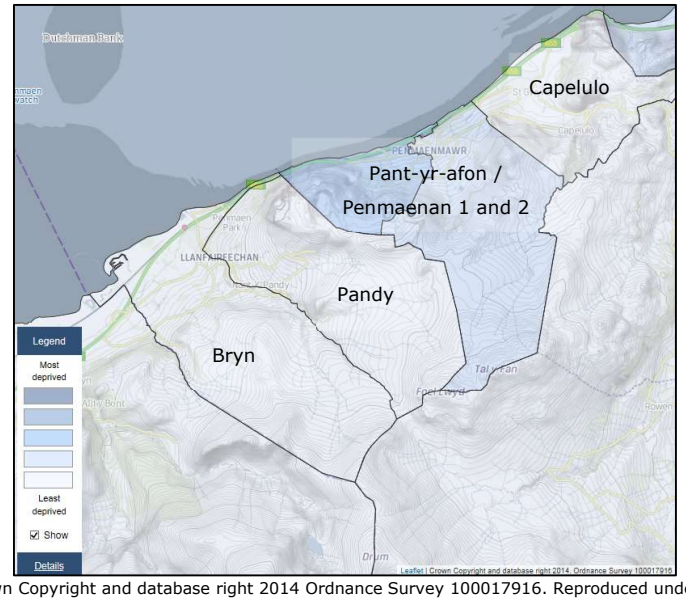

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Figure 2-11: Welsh Index of Multiple Deprivation (2014), by Lower Super Output Areas[30]

[30] http://wimd.wales.gov.uk/explore?lang=en#domain=overall&z=13&lat=53.252&lng=-3.943

Of these LSOA's, the most deprived are:

- Pant-yr-afon/Penmaenan 2 – which is ranked overall 498 out of the 1909 LSOAs in Wales, placing it among the 20-30% most deprived. Issues which place it at this ranking include housing (for which it is in among the 10-20% most deprived), income, employment, health, access to services and community safety; and
- Pant-yr-afon/Penmaenan 1 – which is ranked 912 out of 1909 LSOAs in Wales, which places it among the 30-50% most deprived. Although many of the issues are similar to those described above for Penmaenan 2, the most serious issue relates to community safety for which it is among the 20-30% most deprived.

For the wards of Bryn and Pandy (Junction 15) and Pant-yr-afon / Penmaenan and Capelulo (Junction 16), the main social factors behind the situation relate to issues associated with older population and higher rates of unemployment (compared with the Welsh average), with the associated health issues. Many of these social factors are exacerbated by the communities' reliance on the A55 plus the impact of the A55 severing the communities from themselves and the coast. A summary of the population profiles for the wards can be found in Appendix 1 (Table 2).

The current social factors for each of the junctions are summarised in Table 2-7 below.

Table 2-7: Current social factors for the communities at Junction 15 and 16.

Junction 15 (Llanfairfechan)	Junction 16 (Penmaenmawr and Dwygyfylchi)
Aging population with associated health issues. Both the wards of Bryn and Pandy have an older than average population; with the ward of Bryn having a higher than average percentage of people with limiting long term illnesses.	**Aging population with associated health issues**. The wards of Pant-yr-afon / Penmaenan and particularly Capelulo have an older than average population; with the ward of Capelulo having a notably higher than average percentage of people with limiting long term illnesses.
Number of children in families receiving tax credits. Both Bryn and Pandy have higher than average statistics for children in families receiving tax credits.	**Unemployment and the number of children in families receiving tax credits**. The ward of Pant-yr-afon / Penmaenan has a higher than average rate of unemployment. Consequently, there is a higher than average incidence of children in families receiving tax credits for out of work families. Notwithstanding, both the wards of Pant-yr-afon / Penmaenan and Capelulo have higher than average statistics for children in families receiving tax credits.
	Crime. The wards of Pant-yr-afon / Penmaenan suffer from a higher reported annual crime rate per 1000 population than the other wards in the area. However, it should be noted that the annual crime rate is lower than both that for Conwy CBC and Wales.

2.3.3 Likely 'do nothing' situation if no action is taken

The 'do nothing' situation is the baseline option against which all of the other options will be compared. For the purpose of the appraisal, it is taken as the situation where no action has been taken. Similarly, to the description of current situation which can be found in Section 2.3.2, the issues have been grouped into the following transport and non-transport related themes:

- Transport issues – Safety and Delays; Network Resilience; Sustainable Travel,

- Non-Transport issues: Including the environmental and social impact associated with the A55 corridor.

Transport issues – Likely 'do nothing' situation in relation to safety, delays and network resilience

The forecasting of travel demand for opening year (2022), design year (2037) and the horizon year (2051) for WelTAG Stage Two has been undertaken in accordance with the Department of Transport Transport Analysis Guidance WebTAG Unit 3.1 and TEMPro Guidance Note[31]. TEMPro traffic forecasting takes account of national projections of population, employment, housing, car ownership and trip rates and TEMPro version 7.2 was used to establish forecast rates for the North Wales Region for car growth and the National Transport Model (NTM) forecast for Light Goods Vehicles (LGV) and Heavy Goods Vehicle (HGV) growth.

As illustrated by Table 2-8 below, it is forecast that car growth will grow by approximately 1% per year to 21% by design year and by 30% by horizon year. HGV growth, like car growth will gradually grow by 17% by design year and 30% by horizon year and LGV growth will grow faster, growing by 54% by design year and 87% by horizon year.

Table 2-8: Forecast Traffic Growth – Cars, LGVs & HGVs

Traffic Growth	2016-2022	2016-2037	2016-2051
Car Growth	6.55%	20.66%	29.95%
LGV Growth	16.60%	54.14%	86.82%
HGV Growth	4.80%	17.27%	30.17%

To assess the traffic delay and safety situation at Junctions 15 and 16, the future year 'do nothing' data has been extracted from the validated A55 SATURN traffic model, which covers the A55 corridor between Junctions 14 and 17. Total queue, travel time and average speed data has been extracted from the model for the base year 2016, opening 2022, design year 2037 and horizon year 2051 to establish the differences in queues, travel times and speed across the study area. Table 2-9 presents the queue, travel time and average speed modelled data for the A55 traffic model study areas.

Table 2-9: 'Do Nothing' Queue, Journey Time, Speed Comparisons – 2016, 2022, 2037 & 2051 (AM, INTER, PM Peak)

	2016 Base Year	2022 Opening Year	2037 Design Year	2051 Horizon Year
AM PEAK				
Queues (pcu/hrs)	29.9	47.1	75.0	100.9
Travel Time (pcu/hrs)	551.2	618.1	775.1	895.7
Average Speed (kph)	84.3	81.3	75.1	71.7
INTER PEAK				
Queues (pcu/hrs)	26.4	29.2	37.2	45.6
Travel Time (pcu/hrs)	478.1	517.5	606.2	676.7

[31] See Section 4 of the 'Traffic Forecasting Report' (TFR) [16]

	2016 Base Year	2022 Opening Year	2037 Design Year	2051 Horizon Year
Average Speed (kph)	84.5	84.4	83.1	81.7
PM PEAK				
Queues (pcu/hrs)	36.4	37.9	52.6	75.7
Travel Time (pcu/hrs)	566.4	613.8	728.0	829.7
Average Speed (kph)	83.6	83.3	81.0	78.1

The summary data shown relates to "all vehicles" using the study area modelled network and presents a global view of queues, travel time and average speed on the A55 and all local roads within the study area network.

During the AM peak, the A55 network experiences the largest queue and time increase and largest speed reduction over the horizon life of the project from 2016 to 2051 if no action is taken. Network queues more than double, travel times increase by 63% and speeds reduce by 15%. This shows that if nothing is done the current situation will get a lot worse with long delays and travel times and slow network speeds due to the Junction 15 and Junction 16 roundabouts.

Like the AM peak, the PM peak situation will deteriorate over time with queues and travel times throughout the network doubling with speed reductions of 7%. The pace of deterioration is not as sharp as the AM peak, but the current situation will get a lot worse if no action is taken to help increase average speeds and reduce delays and journey times throughout the network.

The inter-peak situation like the AM and PM peaks will worsen over time but to a lesser extent. Due to the reduced amount of traffic on the network the effects of doing nothing during the horizon life of the project won't be as great. The analysis presented above suggests that travel times and queues will more than double across the network during this time period from the base year to horizon year and speeds will reduce by 3%.

It is forecast that if no action is taken, the increase in travel times and queues will increase delay and congestion over the years causing speeds to drop as vehicles queue at Junction 15 and Junction 16 along the A55 and on the local roads trying to join the A55. Although this drop in speed and increase in delay might reduce some accidents due to the congestion, it may also cause further accidents as drivers accelerate quickly out of the congested roundabouts to make up journey times which in turn could exacerbate the safety issues for road users trying to enter the A55 via on-slips as discussed in Section 2.3.2. Thus, the forecast growth in traffic will lead to greater delays and a greater likelihood of accidents occurring. This increase in traffic and accidents will increase the negative perception of safety and severance along the aforementioned A55 junctions resulting in a negative driving experience for all road users especially locals who live and work in Penmaenmawr, Llanfairfechan and Dwygyfylchi.

The consequence of the vehicle growth along the A55 and the A55 study area is that it will lead to increased queues and delays at the Junction 15 and Junction 16 roundabouts and throughout the A55 study area. The estimated growth will make existing queues and delays at these junctions worse and will reduce average speeds along this section of the A55. During busy periods journey times will increase and, as there are no good alternative journey time saving routes around the

A55 when busy, delays and congestion will worsen as shown by the 'Do Minimum' queue and delay results shown in Tables 2-14.

With increased traffic over the future forecast years, it is estimated more accidents may occur at the Junction 15 and Junction 16 roundabouts as more vehicles try to negotiate the junctions as there will be a greater amount of conflicts which may result in a greater number of accidents. If the speeds were to lower as a result of the increased congestion, then accidents may fall to be replaced by increased delay and severance for local users.

It is envisaged that without intervention the worsening traffic conditions described in Section 2.3.3.1 would detrimentally impact on operational issues related to tunnel maintenance, network resilience and diversion routes; placing a greater burden on existing provisions and the emergency services. These issues are discussed further in the WSP A55/A494 Network Resilience WelTAG Studies [13].

Transport issues - Likely 'do nothing' situation for sustainable travel

Without intervention, the issues associated with sustainable travel options for the Do-Nothing scenario described in Section 2.3.2 will not improve. Instead, as identified in the WCHAR report, the problems will be exacerbated by the completion of new residential developments in the vicinity of Junctions 15 and 16 (which are expected to be likely to be completed by 2022). These include:

- Residential development for 17 units (8 apartments and 9 dwellings with associated access) located on Penmaenmawr Road to the north of Llanfairfechan. The main access for pedestrians and cyclists to the development would be expected to be from Penmaenmawr Road, providing good connectivity to the existing Sustrans Route 5;
- A residential development located on Conway Road in Penmaenmawr. The development has planning permission for 23 units across two blocks (1 block of 16 apartments and 1 block of 7 apartments) and the main access for pedestrians and cyclists to the development would be expected to be from Conway Road, while the railway station is accessible off Station Road East; cyclists and pedestrians have access to the Sustrans Route 5 via the subway located on Station Road East.
- A residential development located on Penmaenmawr Road in Llanfairfechan and has planning permission for 28 units. The main access to the development would be expected to be from Penmaenmawr Road which forms part of Sustrans Route 5, while footways are presented on both sides of the road.
- A residential development located on Ysguborwen Road in Dwygyfylchi. The development has planning permission for 46 units and is accessible for pedestrians off Ysguborwen Road where footways are provided on both sides of the road. Cyclists have access to the Sustrans Route 5 at approximately 250m from the development site via the bridge to the north east of the development.

Non-transport issues – Likely 'do nothing' situation for environmental and social problems

The assessment of the likely 'do nothing' situation for environmental and social problems is outside the scope of the study.

2.3.4 The key factors behind the current situation

A number of key factors behind the current situation have been identified, which are described below. These include trends in transport and non-transport areas, such as:

- Transport issues – Safety and Delays; Network Resilience; Sustainable Travel

- Non-Transport issues: Including the environmental and social impact associated with the A55 corridor, including deprivation and access to employment.

Key factors behind transport issues related to safety, delays and resilience

Much of the A55 between Junction 14 and Junction 16A does not comply with current design standards (discussed in A55/A494 Network Resilience Study) and this is understood to affect safety and capacity[32]. The A55 has a speed limit of 70 mph meaning approach speeds to the roundabouts can be high for through traffic negotiating these junctions. The speed and volume of these vehicles can lead to accidents and act as a barrier for vehicles trying to enter the A55 from local roads and slips roads which can result in an increased likelihood of queues, delays and accidents on the concerned on-slips.

Many of the current transport issues, described in Section 2.3.2, are exacerbated during peak periods (for example due to ferry flows)[33] and there is the general local opinion, as described above and identified during the public consultation that the junctions are perceived as unsafe and congested during peak periods. During these busy periods delays can be long at the roundabouts reducing speeds on the A55 and increasing journey times. As a result of approach delays, vehicles accelerate out of the junctions which can act as a barrier for vehicles entering the A55.

Moreover, due to the local topography and its position between the Pen-y-Clip and the Penmaenbach tunnels, it is particularly vulnerable from the perspective of resilience. Consequently, as raised during the 2008 Stakeholder engagement and more recently in the WelTAG Stage Two Public Consultation, there is a need to reduce the number of incidents and deal with issues associated with the lack of local and strategic diversion routes in case of incidents or planned works. There is a need to address operational issues associated with the tunnel maintenance. In addition to the above, the 2008 stakeholder workshop also identified a number of other factors behind the existing situation that have been highlighted including the lack of HGV facilities along the A55[34].

A detailed description of the issues that affect resilience can be found in the WSP A55/A494 WelTAG Stage One Network Resilience Study [13]. However, in summary the 33 key problems identified were split into the following eight key themes in the study report:

- Communications,
- Network Asset management,
- Network Capacity and Demand,
- Network Incident management,
- Diversion Routes,
- Environment,
- Sustainable Travel,
- Future Proofing.

Key factors behind transport issues related to sustainable travel

Poor rail infrastructure and facilities (i.e. low parking provision) along with inadequate provision of cycle and walking routes to local rail stations are some of the key factors for the low demand for rail services.

With regards to bus services, even when the services (e.g. SMART ticketing, increased number of bus stops and improved facilities) and access to these services are improved, the journey times

[32] For details see Section 7 [19] and Section 4 [30]

[33] See pg. 21 WSP 2017 Network Resilience Study [13]

[34] See Section 7 [19] and the AECOM 2014 North West & Mid Wales Integrated Transport Network Report [25]

are likely to remain the same as the current situation. So, although the traveller experience will have improved, journey times will not improve. These longer and often indirect journeys create a barrier for use when deciding mode choice.

For coach services, the low demand can be attributed to lack of journey destination, number of services as well as the high cost of tickets when purchasing tickets close to departure date/time, making these services a less attractive alternative to car use. As the national express coach stop locations are only found in Bangor and Llandudno, this mode of travel is used for more for long and infrequent journeys and wouldn't have any impact taking trips off the A55.

There are no Park and Ride facilities within the study area and parking facilities at stations such as Penmaenmawr, Llanfairfechan and Conwy would need to be significantly enhanced. The North East Wales Integrated Transport Technical Report[35], identified the need for a network of integrated transport hubs to provide connectivity between transport modes, with Park & Share/Ride sites providing a strategic contribution to the regional network. Park & Share/Ride sites were recognised as ideal for people traveling longer distances or on the rural fringes where traditional public transport services are less frequent. These facilities would have a limited impact on local trips on the A55.

Key factors behind non-transport related environmental and social issues

One of the key factors behind both the environmental and social issues relates to the fact that the A55 was constructed parallel to the railway in extremely close proximity to the centres of Llanfairfechan, Penmaenmawr and Dwygyfylchi. Consequently, the population has been severed from the coastline and is to a greater extent reliant on the A55 to access services or employment located out of the immediate area, with the only other routes out the towns are either on foot or bike, via an infrequent railway service or (in the case of Penmaenmawr and Dwygyfylchi) via the Sychnant Pass to Conway.

Following the closure of the doctors surgery in Penmaenmawr, the only way for residents to access the closest doctor is to travel 5 km to Llanfairfechan. Although it is feasible to do this on foot or by train, as supported by the WelTAG Stage Two Public Consultation findings the majority of people are likely to make the journey either by car or bus, which requires them travel along the A55.

2.3.5 How Problems Might be Prevented from Getting Worse or Avoided

Several studies carried out to date, have suggested that the removal of the roundabouts would resolve many of the issues related to resilience, delays and safety problems. Further work has been carried out in WelTAG Stage to evaluate the robustness of this argument, which is detailed below.

Measures to avoid or prevent transport safety issues getting worse

A qualitative assessment based on the savings associated with the reduction in accidents for each option, derived from the Cost and Benefit to Accidents – Light Touch (COBA-LT) has been carried out for each of the options. The assessment is based on a comparison of accidents by severity and associated costs across an identified network in 'Without-Scheme' (Do-Minimum) and 'With-Scheme' (Do Something – Option) scenario forecasts, using details of link and junction characteristics, relevant accident rates and costs and forecast traffic volumes by link and

[35] See Page 3 AECOM 2013 Transport Task Force, Technical Report [38]

junction[36]. The appraisal also included a review of options' design characteristics to ensure no significant accident risk was introduced. This was covered by the Technical Objective to minimise technical departures in standards.

As illustrated in Table 2-10 and Table 2-11 for Junctions 15 and 16 respectively, the outcome of this assessment has highlighted that for options with four-way movement the number of predicted accidents (over a 60-year period) will be lower than compared to the existing situation. Whereas, conversely for options without four-way movement, it is predicted that the accident rate over a 60-year period will deteriorate.

The primary reason is related to the additional length of local journey required to access the A55.

Table 2-10: Junction 15 accident savings (over a 60 year period) – compared to the Do-Minimum Option

	Option A	Option B	Option C	Option D	Mitigated Option D	Option E
Number of movements	2-way	4-way	2-way	4-way	4-way	4-way
Predicted accident savings	**-41**	**18**	**-50**	**8**	**8**	**14**

Table 2-11: Junction 16 accident savings (over a 60 year period) – compared to the Do-Minimum Option

	Option A	Mitigated Option A	Option B	Option C	Option D
Number of movements	4-way (Junction 16A) & 2-way (Junction 16)	4-way (Junction 16A) & 2-way (Junction 16)	4-way	3-way	3-way
Predicted accident savings	**9**[37]	**9**	**10**	**13**	**13**

The results of the COBA-LT analysis substantiate both the opinions put forward in previous studies and by the North Wales Police during the WelTAG Stage Two consultation, that the replacement of the roundabouts with junctions constructed to modern design standards would reduce the number of accidents. The output of this assessment has been incorporated into the impact assessment discussed in Section 3, the Transport Case.

Measures to avoid or prevent transport delays getting worse

A qualitative assessment of changes to the end to end journey experience of transport users, based on the delay savings derived from the SATURN outputs, has been carried out for each of the options. Delay savings are quoted per passenger car unit per hour (pcu.hrs) for the am peak (AMP), inter peak between the am and pm peaks (IP) and pm peak (PMP). Buses were factored as 2x pcu's and HGV's were factored as 2.4x pcu's as per SATURN for the 2037 design year. As illustrated in Table 2-12 and Table 2-13 below, the removal of the roundabouts provides a delay

[36] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/488064/cobalt-user-manual.pdf

[37] Predicted accident savings updated from those presented at the Public Consultation – further information can be found in the Stage 2 Economics Assessment Report [A55J15J16-RAM-60-XX-RP-T-0006 P05]

saving at Junction 15 in the order of 21 pcu.hrs and at Junction 16 of 23 pcu.hrs. There is no marked differentiation between the options.

Table 2-12: Junction 15 delay savings (for the 2037 design year) – compared to the Do-Minimum Option

	Option A	**Option B**	**Option C**	**Option D / Mitigated Option D**	**Option E**
Number of movements	2-way	4-way	2-way	4-way	4-way
Max predicted delay savings (pcu.hrs)	19+	21+	20+	21+	21+

Note: + AMP, ++ IP, +++ PMP

Table 2-13: Junction 16 delay savings (for the 2037 design year) – compared to the Do-Minimum Option

	Option A / Mitigated Option A	**Option B**	**Option C**	**Option D**
Number of movements	4-way (Junction 16A) 2-way (Junction 16)	4-way	3-way	3-way
Max predicted delay savings (pcu.hrs)	22+	22+	23+	23+

Note: + AMP, ++ IP, +++ PMP

Although the industry standard when discussing delays is to report them as pcu.hrs, the delays have also been presented in the following Table 2-14 in minutes and seconds.

When comparing the average traffic speeds during the AM peak in the design year 2037 between the improved infrastructure at both Junction 15 and Junction 16 and the 'do nothing' situation with no infrastructure improvements at either junction, there is a 5 kph increase in speed eastbound and a 10 kph increase in speed westbound due to the improved infrastructure with end to end travel times reducing by 36 seconds eastbound and 51 seconds westbound.

During the PM peak there is a 5 kph increase in speed eastbound and a 4 kph increase in speed westbound due to the improved infrastructure with end to end travel times reducing by 17 seconds eastbound and 20 seconds westbound.

During the inter-peak there is a 2 kph increase in speed eastbound and a 3 kph increase in speed westbound due to the improved infrastructure with end to end travel times reducing by 15 seconds eastbound and 17 seconds westbound. During the inter-peak traffic flows are lower than during the AM and PM peak and delays at the existing roundabouts also lower, therefore when the route is improved, and the roundabouts removed, the difference in journey times is less than during the AM and PM peak.

Table 2-14: A55 between Junction 14 and Junction 17 – Peak Hour Modelled Speed and Journey Times

A55 between Junctions 14 and 17 – Peak Hour Modelled Speeds & Journey Times					
AM Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	84	08:13	Base 2016	91	07:39
DM 2037	80	08:36	DM 2037	87	07:58
DS 2037	85	08:00	DS 2037	97	07:07
Difference DM-DS	5	00:36	Difference DM-DS	10	00:51
Inter Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	85	8:07	Base 2016	92	07:33
DM 2037	83	8:17	DM 2037	92	07:34
DS 2037	85	8:02	DS 2037	95	07:17
Difference DM-DS	2	0:15	Difference DM-DS	3	00:17
PM Peak					
Eastbound	**Speed (kph)**	**Travel Time (mm:ss)**	**Westbound**	**Speed (kph)**	**Travel Time (mm:ss)**
Base 2016	84	08:15	Base 2016	91	07:39
DM 2037	80	08:29	DM 2037	90	07:43
DS 2037	85	08:12	DS 2037	94	07:23
Difference DM-DS	5	00:17	Difference DM-DS	4	00:20

The traffic modelling identifies that journey times would be reduced, and speeds increased for all peak periods between Junction 14 and Junction 17 in both directions if the roundabouts at Junction 15 and Junction 16 were removed and replaced with grade separated junctions. The AM peak sees the greatest journey time saving and speed increase and the inter-peak the least journey time saving and lowest speed increase as this period is quieter than the two morning and evening peaks.

The improvement exhibited is, as described in the DMRB[38], because the main line flow which had previously been interrupted at an at grade junction will be able to negotiate the grade separated junction uninterrupted. Furthermore, the removal of the roundabouts will also benefit the local community since "joining traffic will not be required to stop and give way; instead it merges, between gaps, with the mainline traffic."

[38] See TD40 Para 2.21 c

The removal of the roundabout is forecast to result in an average speed increase along the mainline between Junctions 14 and 17, in the order of 6% eastbound (for the AM and PM peaks) and 11% westbound (for the AM peak), for the scenario where the roundabouts are removed compared to the do minimum option for the 2037 design year.

The benefits shown support the argument that problems associated with delays due to the roundabouts, would be improved by removal of the roundabouts and replacing them with improved slip roads, allowing free flow of traffic along the A55 main line. Improved traffic management, signing and public transport options might have a slight impact in improving the current situation; but it's not envisioned that these measures could make the significant impact required to improve local safety concerns and delay and congestion at the roundabouts. Therefore, it is envisaged that the situation will get worse if the roundabouts are not removed.

Measures to avoid or prevent transport resilience getting worse

A potential 184 improvement options were identified during the A55/A494 WelTAG Stage One Network Resilience Study, that was published in 2017 [13]. These have been grouped under one of the eight key themes: Communications, Network Asset management, Network Capacity and Demand, Network Incident management, Diversion Routes, Environment, Sustainable Travel and Future Proofing. The improvement options have been further broken down into differing implementation periods. The options identified as having a quick implementation period (ie 0 – 6 months) have been prioritised for immediate development. These include: Wireless CCTV; Incident Detection Software; Traffic Officer coverage extended hours; additional Traffic Officer Unit; Roads Timetable; Free Vehicle Recovery; additional mobile VMS; Communications Manager; Performance Analysis; and average speed enforcement on Rhuallt Hill.

The remaining options that are considered viable that have a benefit to resilience along the A55 and A494 have been taken forward for consideration in the WelTAG Stage 2 process, which at the time of writing was being undertaken by WSP and was due to be completed by Christmas 2018. This follows on from the WelTAG Stage One study. The conclusion of the study will be a list of improvement options to take forward to a full business case and subsequently implementation. At the time of writing it was expected that there would be many improvement options to take forward which might include (but not be limited to) the following: improved diversion route operational procedures; additional traffic officer teams; vehicle restrictions (ie prohibit slow vehicles); high tech asset monitoring (ie drones); additional emergency refuge areas; consideration of a hard shoulder / third lane; reduce number of junctions; futureproofing (ie electric charge points); and improved rail / bus provision.

Although the geographical extent of the WSP study is considerably larger than the A55 Junctions 15 and 16 Improvements project, the implementation of 'network resilience' options being developed as part of the A55/A494 Network Resilience Study would support the projects objectives. Therefore, the coordination between the outputs from the two projects is key.

Measures to avoid or prevent the situation in relation to sustainable transport getting worse

The problems with regards to sustainable transport could be prevented from getting worse or, in part, resolved with the development and implementation of measures as part of an integrated transport plan for North West Wales. Although the development of an integrated transport plan is beyond the scope of this project, the 'National Transport Finance Plan 2015' [10] identified and set out the investment priority for several 'schemes' related to sustainable travel including:

BCT12 Work with local authorities and bus operators to identify congestion and pinch points on the network that impact on bus reliability and punctuality and ensure that solutions are integrated into wider highway improvements programme.

F2 Keep opportunities to enable uptake of rail freight and short sea shipping under review

RI12a North Wales rail modernisation including electrification

IT6 Working with local authorities and Network Rail, identify a network of multi modal transport interchanges, park and ride and park and share hubs and develop programme to implement.

IT6 Working with local authorities and Network Rail, identify a network of multi modal transport interchanges, park and ride and park and share hubs and develop programme to implement.

Many of these issues have also been identified in the WSP Network Resilience Study referred to above.

In addition, the consultation carried out during WelTAG Stage Two has highlighted a number of opportunities for improvements which could either where appropriate be implemented in parallel with the junction improvements or by collaboration with others (for example Sustrans or Conwy CBC). These include both scheme specific opportunities and active travel opportunities, examples of which are listed below in Table 2-15 and Table 2-16 respectively.

Table 2-15: Scheme specific opportunities in relation to encouraging walking and cycling

Description
Improvements to overbridges to accommodate cyclists, specifically A55 overbridge at Shell garage and existing overbridge at Pendalar.
Cyclists on Penmaenmawr Road, which forms a section of the NCN 5, are exposed to traffic and thus dedicated/shared cycleway are recommended to be provided.
Ensure continuity of NCN 5 through Penmaenmawr Road/Junction 15.
Provision of pedestrian crossing on Penmaenmawr Road (to the north of Junction 15).
Provision of pedestrian crossing on Penmaenmawr Road (to the south of Junction 15).
Repositioning of bus stops on Glan Yr Afon Road.
Improvements to footway surfacing/dropped kerb provision along NCN 5 (in proximity to scheme design).
Seek to incorporate footway/cycleway provision on any new highway/infrastructure (where permitted) to improve access to coastline.

Active Travel journeys are those made to or from a workplace or educational establishment or in order to access health, leisure or other services or facilities. As such, many of the improvements identified to walking, cycling and horse-riding routes could potentially be classed as Active Travel improvements and are described in the following table. Further details of the opportunities can be found in the WCAR Report.

Table 2-16: Active Travel opportunities

Description
Llanfairfechan
Improvement to the unpaved sections of the Coastal Path to the West of the Llanfairfechan promenade.
Improved links to Llanfairfechan station from the Coastal Path, including the provision of signage and cycle storage.
Improvement to access from Shore Road East and the Promenade to the Beach Front Path, which is currently unsuitable for cyclists and disabled users due to the kerb and steps through the sea wall.
Improvements through the footprint of the scheme, to improve links onto the sea front from the Sustrans Route 5, including signing, markings and landscaping.
An improved Cycling and walking link from the Promenade to the railway underpass (adjacent to the Pendalar footbridge), consisting of coastal protection works and a short 150m footway link. A replacement footbridge, to link Pendalar to the coast.
Penmaenmawr & Dwygyfylchi
Penmaenmawr Station improvements, including the provision of cycle storage.
Improved signage, road and footpath markings to create a Beach Front to Station to Town Link.
Provision of a cycleway ramp down to Sustrans Route 5 from the existing Puffin Footbridge.
A circular walking link via Darbyshire's Bridge, via the beach and dunes and Puffin Footbridge, by providing a new footbridge crossing the A55.
Advanced Stop Lines on Penmaenmawr Road/Station Road junction to allow cyclists to be positioned ahead of the traffic.

Measures to avoid or prevent environmental issues getting worse

The main existing environmental issues associated with the A55 corridor in the vicinity of Junctions 15 and 16 relate to noise and the visual impact.

Although due to the existing tight physical constraints it would be difficult eliminate the problem it may be possible to minimise the environmental impact with the following measures:

- **Visual impact** – the provision of screening and planting would reduce the visual impact caused by the A55. However, it is necessary to strike a balance between hiding the road and obstructing the views to and from the coast.
- **Noise impact** – the existing issues with noise may be improved with the provision of measures, such as low noise surfacing, removal of the rumble strips, removal of the need for emergency services to use their sirens at the junctions and noise barriers. It should be noted that rumble strips and the use of sirens are currently required for safety reasons, their removal is reliant on improvements at the roundabout.

Carrying out improvements to the roundabouts at A55 Junctions 15 and 16 would create opportunities to reduce the impact of existing environmental issues, in particularly in relation to noise.

Measures to avoid or prevent social issues getting worse

Many of the current social issues, identified in Section 2.3.2, that currently exist in the wards near Junction 15 (Bryn and Pandy) and Junction 16 (Pant-yr-afon / Penmaenan and Capelulo) have links to transport related impacts including:

- **User benefits** by improving accessibility outside of the immediate area and making the area more appealing to new businesses, thus reducing unemployment and making it easier for people to access services such as education or health care.

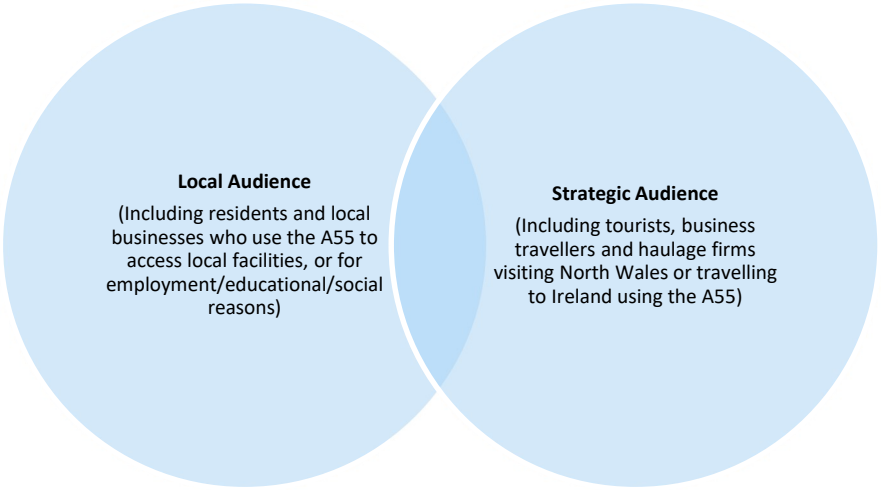
- **Noise** is both an environmental and a social issue. By reducing the noise levels, depending on current levels, it has the potential to reduce stress and other health related issues that are caused by noise. As described above, noise can be mitigated using a number of measures.
- Currently **air quality** has not been identified as being an existing problem. However the impact of the improvement options on air quality should be taken into account, from the perspective of traffic emissions and the resulting health impacts especially to children.
- **Accidents** by making the road network and junctions safer, it will reduce the health and social impact associated with limiting long term illnesses.
- By making improvements to pedestrian access to public transport and other community amenities, **personal security** can be improved (for example by the removal of blind spots or poorly lit paths).
- **Severance** between the communities and coast can be improved by the removal of barriers to pedestrian movement, such as by making changes to road crossing provision, or through the introduction of new pedestrian or road links (for example new footbridges or bridges across the A55).
- Improving **accessibility** to public transport. For example by reducing the length of bus routes without impacting on the standard of service provided, it will make them more commercially viable for the bus companies.
- By reducing journey times and delays, it will reduce fuel costs both for individuals and businesses making accessing employment and services outside of the immediate area such as education or health care more **affordable**.

The improvement works could also provide opportunities to help alleviate some of the social issues that currently exist in the area; especially those related to improving the safety and affordability of accessing employment and services outside of the immediate vicinity of the junctions. By reducing delays and improving the design and signage at the junctions, it also provides opportunities to encourage additional tourism and business (and therefore increase employment) in Llanfairfechan, Penmaenmawr and Dwygyfylchi.

In addition, the scheme also provides opportunities for collaboration with organisations such as Conwy CBC and Sustrans to access funding and implement enhancements with respect to Active Travel and recreational routes. This will have the potential to again encourage tourism and improve the health of the local residents.

2.4 Stakeholder Engagement

The target audience for the proposed improvements can be split into the following key groups:



The stakeholder engagement that has been carried out to date includes consultation with both key stakeholders and the public, in order to collate views regarding the proposed options. The consultation at WelTAG Stage One and Two is summarised below.

The public consultation has been undertaken by applying the following principles of stakeholder engagement:

- Identifying opportunities for engagement and ensure the level of engagement is proportionate and appropriate.
- Consulting, early and often. Ensuring that communication channels remain open with both key stakeholders and members of the public to ask questions or request information via the public liaison officer.
- Creating an open, inclusive and transparent environment, where we are able to provide a consistent approach and build trust with stakeholders.
- Providing sufficient information to enable stakeholders participating in the consultation process to give informed opinions on the proposals.
- Ensuring that not only those who have the greatest influence but also those who are most affected by the proposals have a voice.
- Valuing and respecting different stakeholder's perspectives. Ensuring that their opinions and concerns are listened to and taken on board, by making changes to proposals and or information provided, where appropriate.
- Providing feedback to stakeholder regarding how we have listened, with the aim of building trust and relationships.
- Promoting advocacy for the proposals from key external stakeholders by engaging on an ongoing basis as the proposals develop.
- Identifying opportunities to support 'The 5 ways of working' the local and Welsh Governments national well-being objectives and the *Well-being of Further Generations (Wales) Act* 2015.

WelTAG Stage One (Strategic Outline Case) Consultation

The WelTAG Stage One consultation, was originally carried out in 2008 and is reported in the Atkins 2008 Workshop Report [19]. It comprised of:

- A Stakeholder Workshop which was held in July 2008 and Councillor meetings were held in August 2011[39]. Although a wide range of both statutory and non-statutory stakeholders attended the workshop, it was an invite only event; and
- A liaison meeting with the North Wales Trunk Road Agent (NWTRA) in March 2011[40];

A wider public consultation exercise was then carried out as part of the December 2017 Public Information Exhibitions[41]. As part of this exercise, the transport objectives and options developed in the 2011 Atkins Report for Junctions 15 and 16 were presented to stakeholders, at three public exhibitions at Llanfairfechan, Penmaenmawr and Dwygyfylchi. These exhibitions were attended by 762 people, of which 281 people completed questionnaires.

Both the consultation material and questionnaire were uploaded onto the Welsh Government's website shortly following the event. Views were received from a wide range of consultees including both local and strategic audience members. The WelTAG 2017 Technical Working Group was then held in February 2018. During this workshop, key representatives from the Welsh Government discussed revisions to the project objectives and carried out a preliminary appraisal of the options performance against these objectives. As a result of the findings from the consultation and the following review, both the objectives and options have been reviewed and updated. Parties that were consulted during WelTAG Stage One are listed in Table 2-17.

Table 2-17: Engagement with Statutory Stakeholder organisations during WelTAG Stage One

Statutory Consultees	Non-Statutory Consultees
Natural Resources Wales (NRW)	Local residents and commuters
CADW Office, Welsh Government	Local businesses
Councils (Councillors & Officers)	Local Action Groups
Conwy County Borough Council	Town Clerks
Gwynedd Council	Bus and train companies
Denbighshire County Council	Cycling groups
Ynys Môn/Anglesey Council	Ramblers Association
North and Mid-Wales Trunk Road Agent (NMWTRA – previously known as NWTRA)	Gwynedd Archaeological Trust
Emergency service providers, including the North Wales Police, North Wales Fire and Rescue Service and Welsh Ambulance Services NHS Trust (North Region)	Local Wildlife Trust
Public Utilities	Holyhead Port Authority
Network Rail	Freight Transport Association
	Road Haulage Association
	Federation of small businesses

[39] Atkins Stakeholder Workshop Report, 2008 [19]
[40] See Section 6, Atkins Options Review Report, 2011 [29]
[41] Ramboll December 2017 Public Information Exhibition Report, 2018 [11]

WelTAG Stage Two (Outline Business Case) Consultation

The 12-week public consultation period commenced on the 4 June 2018 for WelTAG Stage Two. A part of this consultation, exhibitions were held at three venues at Llanfairfechan, Penmaenmawr and Dwygyfylchi. As part of this, a preview was also held for local council officers and councillors in Llandudno Junction.

The consultation material describing the procedures to be followed in the development of the scheme, the updated objectives and options, in addition to the traffic flows and the appraisal summary and economic tables for each options were uploaded onto the Welsh Government website along with copies of the questionnaires prior to the commencement of the consultation period. Hard copies of the consultation material were also available at the venues and a number of deposit points in the area.

As per the Public Information exhibitions held in December 2017, a letter drop was carried out to local properties advertising the consultation, advertisements were placed in the local papers and press releases were made by the Welsh Government. Overall 738 people attended the exhibitions and 362 questionnaires were received. The geographic area of interest extended from St Helens to the North East, Stoke on Trent to the South East and Abermawr (Barmouth) to the West.

In addition to local residents, as part of the consultation for WelTAG Stage Two, the organisations detailed in Table 2-18 and Table 2-19 were contacted to provide their opinions regarding the options being presented. At the request of the organisations, meetings have been held with the parties highlighted in bold either during the formal consultation period or in the run up to or after the end of the period. In addition, meetings were held with local town councillors and residents to allow them to view additional visualisations and help them understand the impact of the options on their views towards the end of the consultation period.

In addition to requesting feedback on the preferred options for Junction 15 and 16, the public consultation provided the opportunity to collate further information regarding how the junctions and the existing active travel provisions are used, in addition to identifying opportunities for collaboration. Further details and the findings from the stakeholder engagement are detailed in the WelTAG Stage Two Public Consultation Report [12]. The findings from the consultation are also discussed in respect to the impact assessment in Section 3.2.

Table 2-18: Engagement with Statutory Stakeholder organisations during WelTAG Stage Two

Statutory Stakeholder Organisations	
Cable & Wireless UK	**North Wales Fire & Rescue Service**
CADW	**North Wales Police**
Conwy County Borough Council (CBC)	NTL: Telewest
Conwy Town Council	Openreach
Denbighshire County Council	Penmaenmawr Town Council
Dwr Cymru Welsh Water	Powergen
Fibrespeed, JSM Group Ltd	SP Energy / Manweb
Gwynedd Council	Virgin Media
Llanfairfechan Town Council	Wales & West Utilities
Magnox Electric PLC	Welsh Ambulance Service NHS Trust
National Grid	**Welsh Government (WG)**

Statutory Stakeholder Organisations	
National Power Plc	Western Power Distribution
Natural Resources Wales	Ynys Môn / Isle of Anglesey Council
NMWTRA	Zayo Fibrespeed

Table 2-19: Engagement with Key Stakeholder organisations during WelTAG Stage Two.

Key Stakeholder Organisations	
A55 Puffin Services	NAVTEQ
Alpine Coaches	**Network Rail**
Arriva Buses	NHS Wales Shared Services Partnership
Arriva Trains Wales	North Wales Conservancy
British Horse Society	North West Wales NHS Trust
Bus Users Cymru	Oasis Christian Centre
Campaign for Protection of Rural Wales	Open Spaces Society
CBI Wales	Pals of Pen Prom
Chester & North Wales CTC	Ramblers Association
Clwydian Range ANOB Joint Advisory Committee	Ramblers Cymru
Conwy Powys Archaeological Trust	**Right to Ride Network**
Council for National Parks	Road Haulage Association
Cycling UK	Royal Society Prevention of Accidents (RoSPA)
Farmers' Union of Wales, Land Use Officer	Snowdonia National Park Authority
Federation of Small Businesses	Snowdonia Society-Cymdeithas Eryri
Freight Transport Association	**Sustrans**
Friends of the Earth Cymru	The British Horse Society
Glasfryn Parc	The Clwyd-Powys Archaeological Trust
Gwynedd Archaeological Trust	The Coal Authority
HERE Maps	The Gladstone
Highways England	The Sports Council for Wales
Holyhead Port Authority	Tourism partnership, North Wales
Interoute (Ringway/Beach/51 deg's)	Traffic Master Plc
Llew Jones Bus	Traffic Wales
Local Wildlife Trust	Wales Social Partners Unit Limited
Lyons Pendyffryn Hall Caravan Park & Country Club	Welsh Cycling
National Trust	Welsh Slate
	WTRA Ltd

2.5 Links to Other Policy Areas

As described in the statutory guidance for the FGA 2015, all transport interventions in Wales must now consider the needs of future generations as well as the present in line with the FGA 2015, adhering to the following principles:

- Look to the long term so that we do not compromise the ability of future generations to meet their own needs;
- Understand the root causes of issues to prevent them from occurring or getting worse;
- Take an integrated approach so that public bodies look at all the well-being goals in deciding on their well-being objectives;
- Involve a diversity of the population in the decisions that affect them;
- Working with others in a collaborative way to find shared sustainable solutions; and
- Imperatively, as noted in the Works Information Clause 1.57, the Welsh Government is a "named public body in the [FGA] and as such, the contractor must deliver the goals in line with goals of FGA".

Part 2 of the FGA places a well-being duty on specified public bodies. This is described in the Statutory Guidance SPSF2, Paragraph 17, which states that "Public bodies are required to take all reasonable steps (in the exercise of their functions) to meet the well-being objectives they set. There will always be a limit to the amount of finance, people, time and assets that are available to take the necessary action. But the consideration of these factors needs to be reviewed through the five ways of working provided by the sustainable development principle balanced with the contribution made by the well-being objectives." How the five ways of working apply to the project are described in Section 1.2.

It has therefore been necessary to ensure that the project objectives contribute to the well-being objectives at both a national and local level. To do this each of the objectives have been mapped against the National Well-being Goals and Objectives, in addition to the following local Well-being Objectives for other public bodies (where relevant to the project):

- The Conwy and Denbighshire Local Service Board
- Gwynedd & Anglesey
- Betsi Cadwaladr University Health Board
- Public Health Wales NHS Trust
- North Wales Fire and Rescue Authorities
- Natural Resources Wales
- Higher Education Funding Council for Wales
- Sports Council for Wales (Sport Wales)
- National Museum of Wales
- Snowdonia National Park

Additionally, there are a number of further pieces of legislation that the Welsh Government has put in place to support sustainable development, including the *Planning (Wales) Act* 2015 and the *Environment (Wales) Act* 2016. Also under the *Active Travel (Wales) Act* 2013, a statutory duty is placed on the Welsh Ministers, where they are carrying out certain of their powers under the *Highways Act* 1980, to ensure "reasonable steps are taken to enhance the provision made for walkers and cyclists".

To meet the FGA objectives, it is necessary to identify **long-term** trends and how the project objectives might **integrate** with those of other public bodies. In particular it is essential that we

involve people who can help us understand how the **problems can be prevented** and identify opportunities for **collaboration** with other public bodies and interested parties/groups.

During the WelTAG Stage Two consultation opportunities were identified for collaborative working with the Conwy County Borough Active Travel team. Potential benefits identified, include enhancement to both routes crossing the A55 as well as those that run parallel to the A55 corridor (such as those along the coast). Additionally, organisations such as SUSTRANS have expressed an interest in being involved as the project develops.

The project also has links to the Welsh Government Strategy for Tourism 2013 – 2020[42] and 'The Wales Way'[43], which is an initiative to encourage international tourism in Wales along three iconic routes. The A55 has been identified as the 'North Wales Way' following the old trading route along the northern coast into Anglesey. The interactive website includes links so that visitors can identify tourist attractions along the length of the route. Therefore, collaboration with the initiative could provide an opportunity to encourage tourists to stop and visit the area. Notwithstanding it reinforces the need to reduce delays during the peak tourist season which might dissuade international tourists from visiting.

2.6 Objectives

The objectives for the project (intervention) have evolved over time, primarily to address the need for change, in addition to address specific issues identified (for example) during the 2008 Stakeholder Workshop [19] and more recently the December 2017 PIE [11]. In addition, the most recent set of project objectives was updated to address the need to deliver the scheme in line with the goals of the *Well-Being of Future Generations Act (FGA)* 2015 and the *Active Travel Act* 2013. Details of the work carried out to review the Transport Objectives can be found in the WelTAG 2017 Review report [15] and is summarised in the Impact Assessment Report [2].

The objectives against which the options have been assessed against are as follows:

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
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

Also, each of the options have been assessed against the technical objectives with the aim of:

TECH OBJ9	Minimising technical departures from standard (to improve safety)
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)

[42] https://gov.wales/docs/drah/publications/130613-partnership-for-growth-en.pdf
[43] http://www.thewalesway.com/

The WelTAG 2017 guidance "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, as set out in the *Well-being of Future Generations (Wales) Act* 2015 and to deliver the Act's vision of the Wales we want: a more prosperous Wales, a resilient Wales, which supports healthy, functioning ecosystems and recognises the limits of the global environment, a healthier Wales, a more equal Wales, a Wales of more cohesive communities, a Wales of vibrant culture and a globally responsible Wales".

As demonstrated in Table 2-20, the project objectives support the Welsh Government well-being goals. Notwithstanding throughout the appraisal process, opportunities to maximise the schemes contribution to the Welsh Government's well-being goals have been identified. Typical examples of how opportunities to maximise the schemes' contribution to the well-being goals have been summarised.

Table 2-20: Potential Opportunities to maximise contributions to the Welsh Government Well-Being Goals

Well-being goal	Description of well-being goal	Links to Project Objectives										Potential Opportunities to maximise contribution to well-being goal
		OBJ1	OBJ2	OBJ3	OBJ4	OBJ5	OBJ6	OBJ7	OBJ8	TECH OBJ 9	TECH OBJ 10	TECH OBJ 11	
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	By improving the resilience, safety, accessibility and reliability of the A55 corridor; thus improving access to services and employment, and potentially creating new employment opportunities (especially during construction). Through collaboration with local schools and colleges encourage young people to enter the construction industry (or study STEM subjects). By promoting the aspiration and ambition for good, sustainable design[44], that: • Maximises efficiency and value for money. • Focuses on users, maximising ease of use, accessibility and inclusiveness. • Uses resources and energy efficiently, contributing to carbon reduction. • Reduces maintenance, costly refurbishments and running costs. • Makes places more attractive. • Adds value and enhances public well-being. For example, by giving consideration to the potential to accommodate space for gateway features, measures to encourage sustainable/active

[44] https://dcfw.org/about/

Well-being goal	Description of well-being goal	Links to Project Objectives										Potential Opportunities to maximise contribution to well-being goal
		OBJ1	OBJ2	OBJ3	OBJ4	OBJ5	OBJ6	OBJ7	OBJ8	TECH OBJ 9	TECH OBJ 10	TECH OBJ 11	
													travel, and to encourage tourism/employment in the local area.
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)							✓	✓				By promoting sustainable travel, maximising opportunities to create habitat corridors and promote eco-tourism. For example, the creation of wildlife corridors, in addition the enhancement of local habitats and biodiversity. The scheme could provide an opportunity to increase awareness of issues such as sustainable development and climate change.
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	By recognising the importance of the resilience, safety, accessibility and reliability of the A55 corridor for people to access services and employment. By promoting the use of sustainable travel and healthy lifestyles (for example by improving footpaths, access to the coast, and links to the National Coastal Cycle Route). These could be progressed either as part of the project, other transport schemes or, for example in the case of Active Travel, in collaboration with other public bodies. By ensuring that stakeholders are involved, and their views are taken into account, in the decision-making process. By encouraging collaboration, to ensure that opportunities to obtain funding (eg for

Well-being goal	Description of well-being goal	Links to Project Objectives										Potential Opportunities to maximise contribution to well-being goal
		OBJ1	OBJ2	OBJ3	OBJ4	OBJ5	OBJ6	OBJ7	OBJ8	TECH OBJ 9	TECH OBJ 10	TECH OBJ 11	
													active travel or environmental enhancements) are maximised.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances including their socio economic circumstances	✓		✓	✓	✓			✓				By ensuring that information is accessible and that everyone's views can be heard, whatever their circumstances. By having regard to the distributional impact of the proposals, people will have access to services and or employment, whatever their circumstances. Similarly, by increasing opportunities for integrated transport, the scheme would improve access to services and employment for a greater cross-section of the population.
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	By improving the resilience, safety, accessibility and reliability of the A55 corridor (both during and after construction). By effectively balancing the needs and impacts on the local communities affected by the works against the wider regional, national and international drivers.
A Wales of vibrant culture and Welsh language	A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, sports and recreation	✓					✓	✓	✓				By promoting pride in the local area, making services and amenities more accessibility. For example by the: • Creation of open public spaces – to encourage the health benefits of sports; • Additional links onto the Sustrans National Creation of new links to existing cycleway and

Well-being goal	Description of well-being goal	Links to Project Objectives											Potential Opportunities to maximise contribution to well-being goal
		OBJ1	OBJ2	OBJ3	OBJ4	OBJ5	OBJ6	OBJ7	OBJ8	TECH OBJ 9	TECH OBJ 10	TECH OBJ 11	
													footpath routes; to encourage and promote the healthy benefits of walking and cycling.
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	✓					✓	✓	✓				As an outstanding example of design, where the well-being of the both the local community and nation are placed at the heart of the scheme, act as a best practice example.

2.7 The Short-List of Options

2.7.1 The Long-List of Options at Strategic Outline Case

During WelTAG Stage One, Strategic Outline Case (SOC), a long-list of options was developed to address the need for intervention, based on a series of studies that had been carried out over the period between 2005 and 2018. The sources of the options ranged from studies to investigate the feasibility of improving the highway geometry and resilience studies, in addition to a review of potential integrated transport and active travel options. Throughout the process, options were sifted and dropped from the long list of options, so that better performing options were taken forward onto WelTAG Stage Two. In particular, options were discarded where it was considered that they would fail to address objectives, were unlikely to pass key viability and acceptability criteria. A summary of the long list of options reviewed during Stage One and the reasons why the options were sifted, is presented in the 'WelTAG Stage One – Strategic Outline (SOC) Report' [20].

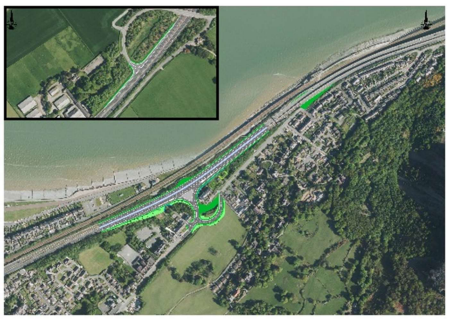
2.7.2 The Short-List of Options

The short-list of options for A55 Junctions 15 and 16 detailed below, was developed from the long-list of options appraised as part of WelTAG Stage One (Strategic Outline Case). Further information regarding how the long-list was derived and the sifting process can be found in the SOC Report.

The following options were presented as part of the WelTAG Public Consultation, which commenced on the 4th June 2018. The appraisal of these options is presented in Section 3.

Junction 15

Option A	Two-way movement at Junction 15. Improvements to eastbound slips at Junction 14 (based on December 2017 PIE Junction 15 Option 1)

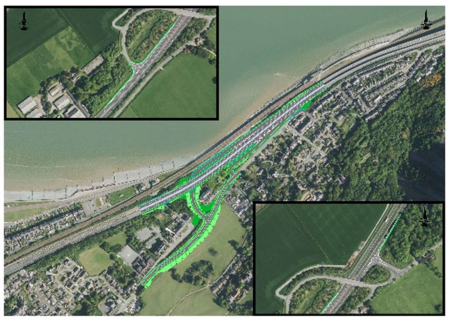


Map data © 2018 Google

Option B	Four-way movement at Junction 15, with an overbridge between Penmaenmawr Road and the Promenade (based on December 2017 PIE Junction 15 Option 2)

Map data © 2018 Google

Option C	Two-way movement at Junction 15, with east facing slips. Improvements to both Option eastbound and westbound slips at Junction 14 (based on December 2017 PIE Junction 15 Option 3)



Map data © 2018 Google

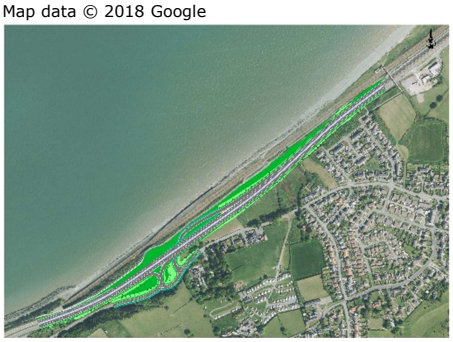
Option D	Four-way movement, with a new overbridge, link road and roundabouts (based on December 2017 PIE Junction 15 Option 5)

Map data © 2018 Google

Option E	Four-way movement, with a new overbridge, link road and roundabouts. Similar to Option 5 above, however junction located at the site of the Heath building (New Option 6)

Map data © 2018 Google

Junction 16

Option A	Four-way movement. Roundabout replaced with westbound slip. New junction at 16A with a link road running parallel to the A55 back to Penmaenmawr Road (based on December 2017 PIE Option 3)	Map data © 2018 Google
Option B	Four-way movement, with an overbridge located to the East of the Gladstone Hotel (based on December 2017 PIE Option 3)	Map data © 2018 Google
Option C	Three-way movement, with an underbridge to eastbound slip immediately to the west of the existing junction. Roundabout replaced with westbound slips (New option 5, developed in response to feedback from the local community)	 Map data © 2018 Google
Option D	Three-way movement, with an overbridge to eastbound slip immediately to the west of the existing junction. Roundabout replaced with westbound slips. (New option 7, developed in response to feedback from the local community)	Map data © 2018 Google

A copy of the Option plans for Junctions 15 and 16, complete with the annotations presented at the WelTAG Stage Two Public Consultation, can be found in Appendix 1.

3. THE TRANSPORT CASE

3.1 Introduction

The purpose of the transport case is to determine whether the proposals offer good public value for money and maximise contribution to the well-being goals. The transport case for WelTAG Stage Two has been developed from that presented in the 'WelTAG Stage One – Strategic Outline Case Report' (SOC) [20], and is based on information from the most recently available versions (at the time of writing) of the following key documents:

- Traffic and Accident Data Report [14]
- Traffic Forecasting Report [16]
- Economic Assessment Report [21]
- Integrated Transport Technical Note [17]
- Environmental Appraisal Report [22]
- Live Impact Assessment Report – including information relating to the construction phasing assessment and the technical feasibility assessment for the options.
- A55 Junction 15 Assessment of Implications for European Site (AIES) Initial Screening Assessment [23]*
- A55 Junction 16 AIES Initial Screening Assessment [24]*
- Walking, Cycling and Horseriding Assessment Report [18]*
- WelTAG Stage Two Public Consultation Report [12]*

Where work has been either been carried out since the commencement of the WelTAG Stage Two Public Consultation (which ran from the 4 June to 28 September 2018), it has been highlighted with an asterisk (*).

3.2 Methodology

The Impact Assessment carried out under WelTAG Stage Two has been undertaken in line with the WelTAG 2017 guidance, applying the DfT WebTAG for the transport appraisal process in a proportionate manner. Each option on the short-list has been assessed either qualitatively or quantitively, as appropriate for the stage of the process, against the criteria to allow the social and cultural, environmental and economic impacts to be compared.

The main areas that have been assessed are:

- Objectives
- Economic impacts
- Environmental, social and cultural impacts
- Key viability and acceptability criteria (and risk)
- Value for money

During WelTAG Stage Two further appraisal has been carried out for a short list of options that had been found to perform better during WelTAG Stage One. Each of the options have been appraised against the project objectives and additional technical objectives, in addition to environmental, social and cultural, and economic criteria. The significance and scale of the impacts due to each option is presented using a seven-point scale ranging from a large beneficial (**+++**) impact through neutral (**O**) to a large adverse (**---**) impact.

The outcome of the economic appraisal is presented as a Benefit Cost Ratio (BCR). This BCR provides a consistent means of describing the 'value for money' that each option provides. Whereas, the potential impacts and key outcomes are recorded in the Appraisal Summary Table, which can be found in Section 3.4.

When determining whether the options would have a beneficial or adverse impact in relation to each of the criteria, a neutral impact has been defined. Typically for the neutral impact, it has been assumed that the option will not result in a change from the current situation, taking into account the overall impact of all the factors and potential mitigation. The assumptions made when assessing each of the options are detailed below. Further details can be found in the Live Impact Assessment Report.

3.2.1 Objectives

Each of the options have been assessed qualitatively against the project objectives and technical objectives, with respect to whether they have met them, using the same criterion. The basis of the appraisal is summarised in Table 3-1 below.

Table 3-1: Methodology for appraising the project and technical objectives

Objective	Description of objective	Appraisal summary	Description of neural impacts
OBJ1	Improve access to regional, national and international markets and improve access to employment opportunities	The reduction in delays will result in benefits to the local community and wider economic benefits (for example by making development along the A55 corridor more appealing for existing and new businesses).	The option does not change 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	Qualitative assessment based on the savings due associated with the reduction in accidents for each option, based on the assumption that all options will improve the design standards and safety along mainline A55.	The option does not change 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	Qualitative assessment based on the number of movements retained under normal conditions compared with the existing situation, and the potential impact on the resilience of the network.	The option does not change journey times and/or journey time reliability on the A55 from Junction 14 to Junction 16A.
OBJ4	Improve resilience on the A55 for strategic and local traffic.	Qualitative assessment based on the number of movements, on the basis that providing three movements would have a slight adverse and two movements would have a moderate adverse impact on the resilience of the network. The degree of impact has been reviewed following meetings with NMWTRA.	The option does not change the standard of service provided, from the perspective of resilience, compared with the existing situation.

Objective	Description of objective	Appraisal summary	Description of neural impacts
OBJ5	Improve journey times, journey time reliability and safety for access onto the A55	Qualitative assessment based on the traffic model outputs and the accident benefits associated with traffic accessing the A55 at Junctions 15 and 16.	The option does not change the journey times, reliability and safety for access onto the A55.
OBJ6	Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	Qualitative assessment of the types and locations where Non-Motorised Users can currently cross the A55 to get access to the coast compared with the proposed options, and opportunities to improve access to footpaths and cycleways. For all options it is assumed that the existing footbridge near Junction 15 is to be removed.	The option does not change the amount of severance with coastal areas for NMU's or reduce the provision made for walkers and cyclists compared with the current situation.
OBJ7	To take reasonable steps to build healthier communities and better environments	Qualitative assessment whether there are opportunities to provide mitigation and/or enhancement measures for each of the options to build healthier communities and better environments. For each of the options being considered there are differing potential to provide enhancements and benefits.	The option does not change the health of the local communities or the environment.
OBJ8	Opportunities to provide integrated transport are increased	Qualitative assessment whether the option provides opportunities to improve integrated transport (for example by creating open public spaces that might accommodate parking or improving public transport access)	The option does not change opportunities to provide integrated transport.
TECH OBJ9	Minimising technical departures from standard (to improve safety)	A technical appraisal of the geometry has been carried out for each of the options.	The option meets the appropriate design standards for grade separated junctions, TD 40/94 or TD22/06 where the junction is a compact arrangement (in accordance with the Design Manual for Roads and Bridges: Volume 6).

Objective	Description of objective	Appraisal summary	Description of neural impacts
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)	Based on technical review, assessment whether the option requires for the speed limit to be reduced, for example due to a departure from standard that may be required due to the proposed arrangement.	The option does not need for the speed limit to be reduced below 70mph (120kph) along the mainline.
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)	Based on the potential construction phasing, assessment of the potential disruption in relation to the length of time it may be necessary to reduce the number of lanes, the speed limit or access to Llanfairfechan, Penmaenmawr and Dwygyfylchi during the construction works.	Two lanes of traffic are maintained (with a speed limit of 50mph) at all time during construction. Access to Llanfairfechan, Penmaenmawr and Dwygyfylchi are maintained at all times during construction.

3.2.2 Social and cultural impacts

The following table details the approach that has been followed in the assessment of the social and cultural impacts, and the assumption with regards to determining the neutral impacts when determining whether the options would have a beneficial or adverse impact in relation to each of the criteria. The baseline applied is the current situation.

Table 3-2: Methodology for appraising social and cultural impacts

Social and Cultural Impacts	Determining Neutral Impacts
Physical Activity: Whether the intervention is likely to generate significant additional numbers walking or cycling? For example, whether an option makes public footpaths and the Sustrans Route 5 cycleway more or less accessible.	There is no change to the length and number of walking and cycling trips made.
Journey quality: Qualitative assessment of changes to the end to end journey experience of transport users, based on the delay savings. The other factors which might affect a travellers' stress such as the fear of potential accidents or route uncertainty have not been considered, as each of the options in the short list have an equivalent impact.	There is no change to the factors affecting traveller stress (such as frustration or delays)
Accident Savings (No. accidents): Qualitative assessment of changes to the number of accidents over 60 years between the Do Minimum (DM) and Do Something (Option) scenarios. The appraisal has included a review of options' design/ characteristics to ensure no significant accident risk is introduced, which	There is no change in accident numbers.

Social and Cultural Impacts	Determining Neutral Impacts
has been covered by the Technical Objective OBJ7 to minimise technical departures in standards.	
Personal security: As security has not been identified as a problem/challenge driving the intervention, the analysis has been limited to reviewing the design/characteristics to ensure that no significant security risk will be introduced.	There is no change to the likely incidence of crime or fear of crime related to road users (including non-motorised).
Accessibility to employment and services: Changes in journey speed across the network between the DM and Do Something scenarios.	No change in journey speed across the network.
Severance: Evidence-based judgmental assessment of the impact of the transport intervention on severance of communities from local services (eg. doctors or schools), due to increased traffic flows.	No change to the severance of communities from local services compared with the existing situation.
Permeability (walking cycling): Qualitative assessment of the options impact on walking and cycling.	There will be no change to the routes used by pedestrians, equestrians or cyclists; or to the standard and quality of the routes which might result in a change of patronage.
Equality, diversity & Human Rights: A preliminary qualitative assessment has been carried out to assess whether the options could have an impact on equality (for example in relation to protected characteristics, such as disability, religion or belief), diversity and human rights. The most relevant human rights in relation the appraisal under the *European Convention of Human Rights* (ECHR) include Article 8 (Right to respect to private and family life) and the first protocol, Article 1 (Protection of property). These have not been considered in detail at this stage, as they are all qualified rights.	There will be no change with respect to equality (for example in relation to protected characteristics, such as disability), diversity and human rights.

Although the scoring presented in the AST is for each option overall, as part of the appraisal a light touch distributional impact assessment has been carried out (applying TAG Unit A4.2 guidance proportionately). The aim of this appraisal is to assess how these impact on the communities might vary, at key locations where the screening has identified that there are the most significant changes in localised traffic flows. As part of this process, the concerns raised by the public and the potential health impacts which have been identified during a rapid Health Impact Assessment have been taken into account. The outcome from this appraisal is discussed further in Section 3.3 and 3.4.

3.2.3 Environmental impacts

Based on the public consultation the main concerns raised regarding environmental impacts included:

- Landscape and visual impacts
- Noise impacts
- Nature Conservation and Biodiversity
- Air Quality and Greenhouse gases
- Historic Environment
- Water Environment

Landscape and visual impacts

The primary concern to local residents is the visual impact of the options and the potential for current adverse impacts of the road and traffic upon it to be reduced; and for new adverse impacts to be avoided or mitigated. New visually prominent structures and elevated carriageways as well as visually intrusive traffic are of particular concern. Located in the coast, the settlements around the junctions provide open views to the sea for many elevated properties and public spaces. Loss of those views is considered to be a loss of amenity and to be detrimental to landscape and townscape character. The Conservation Areas in Penmaenmawr and Llanfairfechan were designated to conserve the character of these coastal resorts. Snowdonia National Park (SNP) lies in close proximity to both junctions and the options could have an adverse impact on the setting of the park

Noise impacts

In accordance with the EU *Environmental Noise Directive* 2002/49/EC, Welsh Government Noise Action Planning Priority Areas have been identified. These are updated every 5 years. The most recent reports to the European Commission were prepared in 2012 and 2017 using noise data and the results of consultations with the local authorities and trunk road agents. Out of 212 in Wales, there are 8 along the A55 between Colwyn Bay and Bangor. Two areas lie either side of Junction 15 at Llanfairfechan, one area is at Junction 15A at Penmaen and one slightly east of Junction 16 at Dwygyfylchi. The mapping is used by Welsh Government to develop a noise action plan for Wales. The Statutory Consultation has demonstrated the importance of traffic noise on the settlements around the junctions. There is a perception that the general background of traffic noise is almost always present, with the roundabouts causing vehicles to brake and accelerate, and the rumble-strips causing a more intrusive noise.

Nature Conservation and Biodiversity

The study area for the junction improvements includes nationally and internationally important sites designated for nature conservation. These are listed in Section 2.3.4 and include marine, woodland and upland areas.

The main potential impacts would be physical loss of terrestrial habitat and beneficial impacts of new habitat created within the scheme footprint; noise, visual and direct physical impact of engineering works and pollution in the marine environment; impact of new river crossings and new roads on European Protected Species, including otter and several species of bat are known to use the low-lying land around the junctions. For each of the options being considered there are differing potential to provide enhancements and benefits, which can be found in Appendix 2.

Air Quality and Greenhouse gases

The environmental appraisal of the options demonstrated that although replacing the roundabouts with alternative junction arrangements would change the nature of emissions, there is little to differentiate between the options. On that basis, the appraisal of local air quality and greenhouse

gases is not reported here but is included in full in the Environmental Appraisal Report [22]. Notwithstanding, concerns have been raised with regards to localised air quality issues, in particular in relation to queuing traffic at times of the day where engines are running cold and the catalytic converters are not effective.

The main receptors of local air quality impacts are local residents, users of open space and species in the designated marine SPA, SAC and SSSI. In particular the short-term construction impacts could include windborne dust affecting the receptors close to the scheme.

Historic Environment

The study area includes international and national designated sites including the SNP, the Conservation Areas and Listed Buildings and Listed Parks and Gardens and Scheduled Ancient Monuments on the surrounding hills. Beaumaris Castle, one of the sites that makes up the Castles of King Edward in Gwynedd World Heritage Site, overlooks the study area from across the Menai Straits. These designations are listed in Section 2.3.4.

Water Environment

The main receptors are the marine environment, watercourses which could be impacted directly by engineering works, by the consequences of construction pollution or accidental spillage during operation. The close proximity of the designated marine SAC and SPA and the presence of watercourses and groundwater, mean that there is potential for adverse effects to arise during construction and operation of the road. Effective mitigation during construction and operation should reduce adverse impacts, but the differing effects of the options on the environment could influence the choice.

Approach to the assessment of environmental impacts

The method of appraisal of the environmental impacts is in accordance wih the Department of Transport in their Transport Appraisal Guidance (WebTAG) and covers the assessment areas detailed in Appendix A of the DfT Transport Analysis Guidance for the Transport Appraisal Process.

The following table details the approach that has been followed in the assessment of the environmental impacts, and the assumption with regards to determining the neutral impacts when determining whether the options would have a beneficial or adverse impact in relation to each of the criteria. Further information regarding each of the environmental impacts can be found in the WelTAG 2017 Environmental Appraisal Report [22]. The baseline applied is the current situation. When reviewing the output from this appraisal, the findings from the Initial Screening Assessment have been taken into account [23].

Table 3-3: Methodology for appraising Environmental Impacts

Environmental Impacts	Determining Neutral Impacts
Noise: A qualitative assessment of potential changes in road traffic noise has been carried out, taking into account factors such as changes in road traffic speed, traffic flow, the distance between the carriageway and receptors due to realignment, and introduction of new road links or removal of exiting road link. Options that either avoid increasing or provide improvement on existing adverse effects of noise impacts	There is no change in noise level compared to the current situation, in the proximity of the road averaged across the sensitive receptor areas (for example due to change in traffic speed).

Environmental Impacts	Determining Neutral Impacts
would be placed higher on the 7-point scale. The main receptors for noise impacts are local residents, users of public open space and avian species in the designated marine SPA, SAC and SSSI.	
Air quality: A qualitative assessment has been carried out, to determine the impact on sensitive receptors including residential properties, public open spaces where members of the public would spend 1 hour, and sensitive areas (such as ecological habitats) to dust and nitrogen.	There is no change in air quality compared to the current situation at the sensitive receptors.
Greenhouse gases: The Transport Users Benefit Appraisal (TUBA) data has been used as the basis of the greenhouse gas assessment.	There is no change in greenhouse gases compared to the current situation at the key receptor.
Landscape and townscape: A visual baseline has been applied in relation to the visual receptors. Receptors with long distant views are predicted to suffer a neutral visual effect and therefore have been excluded from the assessment. Options that either avoid or improve on existing adverse visual and landscape impacts would be placed higher on the 7-point scale. The main receptors for visual impacts are local residents, users of public open space and travellers.	No change in relation to the impact on visual receptors, landscape and townscape.
Historic environment: The impact of each option on the Key Receptor depends on the significance of the receptor, with sites being valued from 'Very High Value' to 'Negligible', from the perspective of local, regional and national importance. Some options have the potential to cause direct physical impact from engineering works and indirect impacts such as noise and visual impact on sites, some of which are designated. Options have differential adverse impacts on the 7-point scale.	There is no change in relation to the impact on key receptors.
Biodiversity: An ecological impact assessment has been carried out with respect to each of the options. The marine sites are those in closest proximity to the junctions and any option that could have direct, adverse impact on these areas or the species present would be placed lower on the 7-point scale. Other sites are at greater distance and are considered unlikely to be directly or indirectly affected. Options that have a lesser adverse impact, or a beneficial impact on these sites and species, compared to the existing situation would be placed higher on the 7-point scale. The main potential impacts would be physical loss of terrestrial habitat and beneficial impacts of new habitat created within the scheme footprint; noise, visual and	The impact is assessed to be not-significant for all geographical scales of reference including local, County, Regional, National and International.

Environmental Impacts	Determining Neutral Impacts
direct physical impact of engineering works and pollution in the marine environment; impact of new river crossings and new roads on European Protected Species, including otter and several species of bat are known to use the low-lying land around the junctions.	
Water environment: An early-stage assessment of potential impacts on the water environment, including flooding has been carried out.	There is no change on the sensitive water receptors compared to the current situation.

3.2.4 Economic Appraisal and Value for Money assessment

3.2.4.1 Methodology for the Economic Appraisal

The benefit cost ratio informs the value for money assessment which is one of many criteria used to inform the decision on whether to proceed with the proposed intervention. As described in the 2015 Dft 'Value for Money Framework', the aim of the assessment is to "help decision-makers judge whether the expected costs of a proposal are justified by its expected benefits to the UK public as a whole…". Consideration of these impacts has been combined with an understanding of how these impacts are expected to vary across social groups, by carrying out a light touch distributional impact appraisal.

The economic appraisal has been undertaken for the Do Something improvement options, applying the guidance in WebTAG Unit 1.1. TUBA has been used to compare the potential options against the Do Minimum Option over a 60-year appraisal period. The following impacts were monetised with respect to the proposed improvements:

- Travel times
- Vehicle operating costs.

The economic appraisal considers the benefits to all road users. It should be noted that periods of high flow are observed on weekends and public holidays, particularly during the summer season, with holiday traffic passing through A55 Junctions 15 and 16. As the impact from these flows have not specifically been taken into account, the benefits are likely to be understated.

A summary of the methods used to assemble the evidence used in the strategic and transport case are detailed in Table 3-4. Further information can be found in the WelTAG Impact Assessment Report.

Table 3-4: Methodology for appraising economic impacts

Economic
Journey time changes: The economic impact of each option on journey times (in £ thousands) has been assessed quantitively using the DfT TUBA software.
Journey time reliability savings (seconds per vehicle - AMP, IP, PMP): The journey time reliability savings per vehicle has been assessed quantitively using SATURN. This is based on journey time savings for individual vehicles, as an average for all vehicles.

Vehicle Operating Costs: The vehicle operating costs (in £ thousands) have been assessed quantitively using TUBA.
Accident Benefits: The accident benefits (in £ thousands) have been assessed quantitively using COBA-LT.
Local economy (Wider Economic Benefits): The local economy (and wider economic benefits) have been assessed quantitively using TUBA. These figures represent 10% of business user benefits, and have been calculated in accordance with the TAG Unit A2.1. For the purpose of the appraisal, the only element that has been considered is WI2 for output changes in imperfectly competitive markets, which takes into account the benefits to firms due to the time savings for travel undertaken in the course of their work and the additional effects on welfare.
Land: An estimate has been allowed for the compulsory purchase of land and compensation payments to land and property owners, using market prices.
Capital costs: The build-up of the capital costs includes the main construction costs, works by other authorities (eg. utility diversions), land costs to allow for the compulsory purchase of land and compensation payments, Preparation and Supervision costs, a risk allowance of 12.5% of construction costs and an Optimism bias of 15%, which is in line with the HM Treasury Green Book supplementary guidance[45]. With the exception of land, a VAT amount has been applied at a rate of 20%.
Revenue cost (Indirect Tax benefits): These costs (in £ thousands) were generated by TUBA over 60 years.

The construction costs have been calculated by experienced cost consultants and are based on prices in early 2018. All costs/benefits quoted have been discounted to 2010 prices. These figures have been used to appraise each option with respect to its value for money.

The construction costs and benefits for the mitigated options have been updated as follows:

Junction 15 – Mitigated Option D: The construction costs for the structures were increased to allow for two bridge spans and the length of retaining wall. The land costs were also adjusted to recognise that the Fernbank properties will not require demolition under this option. This resulted in a reduction in costs in the order of £0.46 million at 2018 prices.

No changes have been made with respect to benefits.

Junction 16 – Mitigated Option A: The construction costs for the structures at Junction 16A have been reduced to recognise that the option does not need a bridge to be constructed over the Network Rail north coast railway line. Due to the simpler structure at Junction 16A, the cost of the preliminaries has been based on a similar construction period as Option B. Additionally, the length of the traffic management assumed has been reduced. However this reduction in cost has been offset by the cost of the extended link road. Overall this results in a reduction in costs in the order of £0.46 million.

The benefits have been updated, to take account of the reduced construction period and corresponding delays described above.

3.2.4.2 Methodology for the 'value for money' assessment

The value for money assessment carried out for the purpose of WelTAG Stage Two includes an allowance for maintenance costs for the highway and structural works, as part of the QUADRO assessment of the construction costs.

[45] https://www.gov.uk/government/publications/green-book-supplementary-guidance-transport

It also does not include monetised benefits associated with Active Travel (using the WHO Health Economic Assessment Tool, HEAT) or the value of any benefits of improvements on the landscape[46] (WebTAG Unit A3). The appropriateness of including these benefits will be considered at WelTAG Stage Three, as it will depend on the preferred option chosen for each junction. Otherwise, the non-monetised costs/impacts and benefits of options have been considered using a seven-point scale; as part of the environmental, social and cultural appraisal of the options and in particular in the appraisal of the options performance against the project objective OBJ7 (To take reasonable steps to build healthier communities and better environments).

A summary of the economic appraisal for Junction 15 and 16, presented at the WelTAG Stage Two public consultation, can be found in Appendix 2 – Table 3.

The value for money band bands applied for the options are as summarised below:

Very High	BCR greater than or equal to 4
High	BCR between 2 and 4
Medium	BCR between 1.5 and 2
Low	BCR between 1 and 1.5
Poor	BCR between 0 and 1
Very Poor	Less than or equal to 0

A sensitivity analysis has been carried out, comparing the best performing option for each junction (from the perspective of value for money) against the other options considered. This is described below.

3.2.5 Key viability, acceptability and risk

The final stage in the appraisal process is to re-assess based on updated appraisal whether the short-list options would pass key viability and acceptability criteria[47], including whether the scheme would be deliverable from the perspective of:

a) Business risks which relate to the risk that the Welsh Government cannot meet its business and/or transport objectives and any resultant reputational risk. It also includes the risk that the scheme would not be acceptable to stakeholders and the public. These risks remain with the Welsh Government.
b) Service risks are those related to the risk that the intervention is not fit for purpose. These include: design risks, planning risks, build risk (eg. Constructability), the quality of the initial site investigation and surveys, environmental risks, procurement risk, in addition to risks related to the whole life of the asset including funding, maintenance, technological obsolescence and the level of demand.
c) External systematic and catastrophe risks which by their nature are unpredictable. These are risks that affect all of society and are not necessarily directly connected to the project. They are accounted for in the discount rate and include, for example, risk associated with changes in direction of policy leading to an unforeseen change.

The main business and services risks are identified in the 'Strategic case' (Section 2) of the report, and further quantified in the following sections of the 'Transport case' (Section 3) and the 'Financial case' (Section 4). How the risks are managed is then discussed in the 'Commercial case' (Section 5) of the report.

[46] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627487/value-for-money-supplementary-guidance-on-landscape.pdf

[47] Section 2.9.2 Transport Analysis Guidance, The Transport Appraisal Process, May 2018 DfT

Of particular relevance to this final stage is the feedback from Conwy CBC, whose preference was that any options for either junctions should satisfy the following criteria, as well as considering the views of the elected members for the wards of Bryn, Pandy, Pant-y-afon / Penmaenan and Capelulo:

- "Any increase in traffic flows and speeds on county road network is minimised and measures taken to mitigate its impact.
- Any increase in the maintenance costs of the county road network resulting from the proposals are mitigated through additional road maintenance funding.
- The level and speed of traffic diverting off the A55 due to incidents is minimised and measures taken to mitigate its impact.
- The impact on connectivity and journey times between the A55 and the county road network is minimised.
- Connectivity by active travel modes along the A55 corridor and between the towns/villages and the coast between Junctions 14 and 16A is improved.
- The impact on the local environment, including traffic noise, is minimised.
- The impact on local amenity areas is minimised."

3.3 Junction 15 Appraisal of Options

For the purpose of the WelTAG Stage Two report, the appraisal of the options has been provided separately for the A55 Junctions 15 and 16, in Section 3.3 and Section 3.4 respectively. A copy of the Appraisal Summary Table (AST) presented at the public consultation can be found in Appendix 2 – Table 3.

3.3.1 Appraisal of options presented at Public Consultation

The output from this appraisal for each Junction 15 short-list option can be found in Tables 3-5 to 3-9 below. A copy of the traffic forecast drawings can be found in Appendix 1. Each option's relative performance against the Project Objectives and the WelTAG criteria, as presented at the Public Consultation, is detailed in Appendix 2 – Table 3.

Table 3-5: Junction 15 - Summary of WelTAG Stage Two Appraisal for Option A

Map data © 2018 Google

Of all the options being proposed at Junction 15, this option has the smallest footprint and would have the least immediate impact on the surrounding land. However, the option only allows two-way movement, providing slip roads serving westbound traffic. Eastbound traffic would need to enter and exit the A55 at Junction 14. To accommodate the associated increased traffic flows, it is proposed that minor improvements will be made to Junction 14.

It is proposed that a shared cycleway / pedestrian path would be provided to maintain continuity. It is expected that the existing bus-stops will not be affected.

J15 - Option A	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. A strength of Option A relates to the slight beneficial impact (OBJ7) that improved landscaping could have on the townscape and landscape, and on the community as no properties would need to be demolished. Notwithstanding the option has a neutral impact with respect to active travel (OBJ8).	By reducing the number of movements at Junction 15 to two, Option A will reduce the standard of service provided with regards to resilience. Therefore, the option was assessed to have moderate adverse impact for OBJ4. This reduction of movements is forecast to result in a slight adverse effect with respect to access onto the A55 (OBJ5) and a moderate adverse impact on opportunities to provide integrated transport services (OBJ6).
Technical Objectives	Although departures to standards will be required, they are not considered to be a risk to technical acceptability. The option has been assessed as having a slight beneficial impact for departures compared to the current situation, and a neutral impact with respect to the need to reduce speed limits. Although the option has been assessed as having a slight adverse impact with respect to minimising disruption, it compares well compared to the others.	Based on the traffic management phasing used during the assessment, the option has been assessed as having a slight adverse impact with respect to minimising disruption.
WelTAG Social & Cultural Impact	Overall, due to the minimal immediate impact Option A has been assessed to have a neutral impact.	The main issues identified, relate to the increased traffic along Aber Road and potentially the junction with Penmaenmawr Road creating issues related to severance. It will also impact on the accessibility to services and employment outside of the immediate area, and increase the risk of accidents, for residents of the wards of Bryn and particularly Pandy. Similarly, there would be an impact on eastbound bus services and residents of Penmaenmawr / Dwygyfylchi who would have a longer journey returning home from Llanfairfechan (for example after visiting the doctors surgery).
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral.	The option has been assessed to have a slight adverse impact for noise plus the impact on the landscape and townscape, due to the increased speed along the A55. There are less opportunities for

J15 - Option A	Strengths	Weaknesses
		landscaping or other enhancements than the other options.
Economic Impact	Option A has the least capital cost out of all the options.	Due to the need for vehicles travelling eastbound to divert through Llanfairfechan, via Junction 14, the option results in the greatest increase in vehicle operating costs out of all of the options. It also forecast to results in the greatest accident disbenefit and a negative impact on the local economy. As a consequence of these, and other factors, the option has been assessed to have the lowest benefit cost ratio (0.06) and therefore the least value for money.
Key viability, acceptability and risk	Overall, Option A carries the least risk of all the options. It was the preferred option from the perspective of the public, in part due to it being the lowest cost and least physical intrusive option, but also as it requires improvements to Junction 14. A particular advantage is that it does not require for residential properties to be demolished or a concrete structure to be built. The public also appeared to have a perception that the money could be spend elsewhere (eg the NHS). Many of these advantages provided by Option A address the key issues raised by Llanfairfechan Town Council and the local councillors, including minimising the demolition of the houses and the impact on Penmaenmawr Road.	The main business risk is related to key stakeholder acceptability as it was one of the least favoured options with respect to the bodies such as the emergency services and NMWTRA due to the reduced resilience. The long-term viability of the option was a concern raised during the public consultation. The option also does not address the final key issue raised by Llanfairfechan Town Council related to safety, as it is forecast that the option would result in an increased risk of accidents. Notwithstanding it may be possible to mitigate against the risk of accidents to some extent with traffic calming measures along Aber Road. The issue with respect to resilience is not considered to be tenable in the long term.
Overall Performance	Although the overall social and environmental impact on Llanfairfechan is minimal, Option A performs worse compared to the other options from the perspective of the project objectives. It performs particularly poorly with respect to the impact on the level of resilience, access onto the A55 for local residents and the increased risk of accidents. The option also does not maximise opportunities towards the 'well-being goals'. As these issues are not considered to be tenable in the long-term, it is proposed that Option A should be dropped.	

Table 3-6: Junction 15 - Summary of WelTAG Stage Two Appraisal for Option B

Map data © 2018 Google

This option provides four-way movement by utilising an overbridge. The slip roads would be raised locally to allow the bridge to pass over the A55 and railway. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops.

In addition to providing access to the Parade for larger vehicles, it is proposed that access would be retained for Non-Motorised Users via Shore Road East. It is also proposed that there will be a shared cycleway / pedestrian path to maintain continuity.

J15 - Option B	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. As Option B provided four-way movement with a link to the promenade, Option B performed best in relation to improving access onto the A55. It was consequently assessed to have a moderate beneficial impact for OBJ5. Also, due to the new link to the promenade it was assessed to provide a slight beneficial impact with respect to reducing severance across the A55 for non-motorised users and improving opportunities to provide integrated transport (OBJ6).	The key weakness with respect to Option B relates to the impact that the bridge structure and associated link roads would have on the community (as a number of residential properties would need to be demolished), as well as the townscape and landscape. Therefore, the option was assessed to have a moderately adverse impact for OBJ7.
Technical Objectives	The option has been assessed as having a slight beneficial impact for departures for standards compared to the current situation, and a neutral impact with respect to the need to reduce speed limits.	For Option B the construction traffic management will have an impact on eastbound traffic access to the A55. The option has been assessed as having a moderate adverse impact with respect to minimising disruption.
WelTAG Social & Cultural Impact	Overall option B scored well with respect to the majority of the social and cultural impacts. In particular, the option performed best with respect to greatest accident savings and improving resilience not just along the A55 but also as it allows improved access for the	Although the option scored well overall, the option will result in a notable increase in traffic using the Promenade and Station Road. This will have a result in a disproportionate impact on the residents and users (especially younger and older people). There are also

J15 - Option B	Strengths	Weaknesses
	emergency services. It was also the only option that means that people would not need to walk through an underbridge (or along a footpath) to access the promenade, therefore it was assessed as having a slight beneficial impact for personal security.	concerns regarding large vehicles accessing the promenade and being able to turn.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. However, it is one of the options which provides the greatest opportunities for environmental enhancements.	The option has been assessed to have a slight adverse impact for noise plus the impact on the landscape and townscape, due to the increased speed along the A55. It also has been assessed to have a moderate adverse impact on the historic environment.
Economic Impact	The option provides the greatest accident benefits compared with the other options. It also has a positive benefit cost ratio (1.08), however not as high as Options D and E.	The option is forecast to have the second highest negative impact on vehicle operating costs. It is also the option which has the greatest capital cost compared with the other options.
Key viability, acceptability and risk	The key strength for Option B is that it is the overall preferred option from the perspective of key stakeholders, including the emergency services, NMWTRA and the bus companies. Although not a preferred option from the public consultation, it took a median position, with a number of respondents noting the benefits provided by the improved access to the promenade and for resilience and the potential for increased visitor numbers. They also highlighted that it provided a compact four-way junction arrangement that may be easier for motorists to understand.	A key risk for Option B relates to local public acceptability. In particular, concerns regarding the impact of the demolition of residential properties, the visual impact of the structures and the impact on village life and the promenade (which is currently valued as a safe place for children to play, people to walk and to attract tourists). It may be possible to mitigate these impacts, to some extent, with traffic calming. Service risks include those associated with the need for an interface with Network Rail, statutory risks and environmental risks due to the options' close vicinity to the SAC.
Overall Performance	The option performed well against the project objectives and the WelTAG social and environmental criteria, as the option retained four-way movement and was the only option that improved access to the promenade. However, these benefits need to be balanced against the social and environmental impact; including the impact of the demolition of residential properties, the visual impact of the structures and the resultant impact on village life and the promenade. Additionally, the option carries notable risks from the perspective of public acceptability and significant service risks associated with the interface with Network Rail and the SAC.	

Table 3-7: Junction 15 - Summary of WelTAG Stage Two Appraisal for Option C

Map data © 2018 Google

This option provides two-way movement, with slip roads on and off the A55 for traffic travelling towards and from the east. Traffic travelling to and from the west would need to be diverted to Junction 14. To accommodate the associated increased traffic flows, it is proposed that improvements will be made to Junction 14. Access to the Parade via Shore Road East would be retained for local traffic. This option would take the longest to construct and cause maximum disruption during construction.

This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. There is no proposal for a shared cycleway / footpath for this option.

J15 - Option C	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Option C was the only option which improved continuity for the Sustrans cycle route, which was assessed to have a slight beneficial impact for OBJ6. The option also provided opportunities to improve provision for integrated transport, which was again assessed to have a slight beneficial impact for OBJ8.	By reducing the number of movements at Junction 15 to two, Option C will reduce the standard of service provided with regards to resilience. Therefore, the option was assessed to have moderate adverse impact for OBJ4. This reduction of movements is forecast to result in a slight adverse effect with respect to access onto the A55 (OBJ5).
Technical Objectives	The option will provide an arrangement at Junction 14 which will have minimal design issues.	There will be departures at Junction 15, which are considered to be a risk to the technical acceptability of the option. Significantly, the construction traffic management will have a notable impact on local access to the A55, meaning that the impact would be largely adverse with respect to minimising disruption.
WelTAG Social & Cultural Impact	Option C provides the advantage that it reduces the need to demolish properties. It has also been assessed as having a slight beneficial impact from the perspective from permeability (walking and cycling), as it separates users of	Although the option minimises the need to demolish property, it will result in an 'island effect', which will sever the properties from the community. Additionally, due to the increased traffic flows along Aber Road, the option has

J15 - Option C	Strengths	Weaknesses
	Shore Road East from Penmaenmawr Road. It also improves continuity for cyclists.	been assessed as being slight adverse for severance. In comparison with the other options, Option C performs worst from the perspective of reducing accidents. It also has been assessed as having a slight adverse impact for personal security, as placing the realigned Penmaenmawr Road in a cutting could make the route feel more enclosed for pedestrians.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. Notwithstanding Option C provides opportunities to create habitat through enhancement and mitigation, therefore it has been assessed to have a slight beneficial impact.	The option has been assessed to have a slight adverse impact for noise plus the impact on the landscape and townscape, due to the increased speed along the A55. The option has also been assessed to have a moderate adverse impact on the historical environment.
Economic Impact	Option C provides a median performance from the perspective of economic impacts such as capital costs. It has a positive benefit to the local economy, which is £100k less than Options B and E.	The option is forecast to have a negative impact on both vehicle operating costs and accident benefits; the later of which are similar to those for Option A as Option C only provides three way movement. This Option has a low benefit cost ratio (0.67), therefore a low value for money, however not as low as Option A.
Key viability, acceptability and risk	Option C is the second favoured option from perspective of the public consultation, primarily as it was felt to be less obtrusive on the townscape and landscape. Consequently, it was thought by respondents to the public consultation that it would have less of an impact on tourism and the local community. Another key reason given was that it would have less of an impact on the school that other options. It also meets two out of three of the concerns raised by Llanfairfechan Town Council.	A key risk for Option B relates to services risks and the options' acceptability, with respect to the technical departures from standards. It also carried risks related to acceptability from key stakeholders due to the reduced level of resilience. In addition, it does not address Llanfairfechan Town Council's concern that the option chosen should provide the greatest safety benefits. It also does not improve Junction 14. The option also performs worst for disruption during construction.
Overall Performance	Option C performed reasonably well against the project objectives and provides the advantage that it is favoured by the public locally as it is expected to have less of an impact on the community. In particular, it minimised the number of residential properties that would require demolition.	

J15 - Option C	Strengths	Weaknesses
	However, the option creates an 'island' which brings its own social impacts. It also performs the worst with respect to the number of accidents compared with the other options, and carries the greatest risks with respect to key stakeholder acceptability for technical departures standards. Therefore, especially as the option reduces the level of resilience below the current level, it is proposed that it should be discarded.	

Table 3-8: Junction 15 - Summary of WelTAG Stage Two Appraisal for Option D

Map data © 2018 Google

This option provides four-way movement 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 would be raised locally to allow the bridge to pass over the A55. Access to the Parade via Shore Road East would be retained. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops.

J15 - Option D	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Otherwise, Option D has been assessed to have either a slight beneficial or a neutral impact.	Although this Option includes the demolition of two properties, OBJ7 has been scored as having a slight beneficial impact due to benefits associated with the diversion of traffic and creation of public open space. Overall Option D has not been assessed to have any adverse impacts in relation to the project objectives.
Technical Objectives	Due to the tight space, the option uses a configuration that is a departure from standard. However, based on a meeting with a representative from the departures panel, this is expected to be acceptable. Therefore, it has been assessed to have a neutral impact for departures for standards and the need to reduce speed limits.	The option has been assessed to have a moderate adverse impact from the perspective of minimising disruption during construction.
WelTAG Social &	The option has been assessed to have a neutral impact for the majority of the	The key disadvantage of Option D is that although the impact is less than Option

J15 - Option D	Strengths	Weaknesses
Cultural Impact	social and cultural criterion. It is the option that has the least changes in traffic flow and resulting distributional impact on the community.	B, it will require the demolition of some residential properties. However, it may be possible to mitigate against this, to some extent, for example by using retaining walls instead of embankments. Although this could result in other social issues. In addition, the option has been assessed as having a slight adverse impact for personal security, as by placing the realigned Penmaenmawr Road in a cutting it could make the route feel more enclosed for pedestrians.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. Although, from the perspective of noise, it has been assessed to the least impact for noise compared with the other options. Overall it is the option that provides the greatest opportunities to create habitat through enhancement and mitigation, therefore it has been assessed to have a slight beneficial impact.	The main weakness for Option D relates to the impact on the historical environment.
Economic Impact	The option is not forecast to have any negative economic impacts. It was forecast to have the greatest beneficial impact with respect to journey time changes and the local economy, compared with the other options. This option has the second highest benefit cost ratio (1.27) after the mitigated Option D.	Option D has the second highest capital costs.
Key viability, acceptability and risk	Although not the favoured options for the key stakeholders, as Option D provides four-way movement it is unlikely to receive objections from key stakeholders such as the emergency services and NMWTRA. For example, it is understood from the consultation that the North Wales Police preferred Options D or E after Option B. Option D is also the option that overall performs best when compared against Conwy CBC's desired local outcomes.	The main business risk for Option D relates to local public acceptability, as it was the second least favoured option. However, it was recognised during the consultation that it would have less of an impact than some of the other options, as it does not increase traffic along the Promenade or Aber Road. The option also does not address all the issues raised by Llanfairfechan Town Council or the local councillors. Also, Option D does not make improvements to Junction 14. However it does provide

J15 - Option D	Strengths	Weaknesses
	Although there are service risks associated with Option D, these are considered to be less than the other options.	opportunities to mitigate many of these issues.
Overall Performance	Option D performs the most consistently well out of the options. Overall it has either a neutral or a beneficial impact for the project objectives. It is also the option that has the least changes in traffic flow and resulting distributional impact on the community. Similarly, taking into account the opportunities for enhancements, it is the option which performs the best in relation to environmental impact at Junction 15. From the perspective of business risks, although it may not be the favoured option for key stakeholders it meets their desired outcomes. However although it was the second least favoured option for the public, the option addresses many of the concerns raised either directly or through its potential to provide opportunities for mitigation. In particular the option provides the opportunity to minimise the need to demolish properties, to improve the visual impact of the structures within the setting with landscaping, and the fact that it is set away from the primary school. It also and has the least impact on Penmaenmawr Road and the Promenade due to changes in traffic pattern.	

Table 3-9: Junction 15 - Summary of WelTAG Stage Two Appraisal for Option E

Map data © 2018 Google

This option is similar to Option D, in that it provides four-way movement by utilising an overbridge with a T-junction to the north of the A55. However, for this option a compact roundabout and slip roads for west-bound traffic would be located at the site of the Heath building.

The slip roads would be raised locally to allow the bridge to pass over the A55. Due to headroom restrictions, access to the Parade along Shore Road East may need to be limited to Non-Motorised Users.

This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path.

J15 - Option E	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. As Option E improves access to the A55 and increases opportunities to provide	Due to the junction arrangement, and the vicinity of the new roundabout to the school, Option E has been assessed overall as having a slight adverse impact for OBJ6 and OBJ7, with respect to non-

J15 - Option E	Strengths	Weaknesses
	integrated transport, OBJ4 and OBJ8 have been assessed as having a slight beneficial impact.	motorised users and taking reasonable steps to build a healthier environment.
Technical Objectives	Similarly to Option D, the option uses a configuration that is a departure from standard. As there are potential mitigations measures, the option is considered to be neutral from the perspective of minimising technical departures from standards and the need to reduce speed limits.	The option has been assessed to have a moderate adverse impact from the perspective of minimising disruption during construction.
WelTAG Social & Cultural Impact	The main positive benefit provided by Option E relates to accident savings. It also minimises the need to demolish private residential properties.	Although the majority of the criterion have been assessed to be neutral overall, the distributional impact appraisal has indicated that Option E could disproportionately impact the local community (including younger children and older people) in Llanfairfechan and Pendala. Issues identified include the risk of increased localised emissions if vehicle queue at the roundabout, the layout creation of an islands and the increased severance.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for a number of the environmental indicators have been assessed to be neutral.	Overall Option E performs the worst. This is due to the option not only having been assessed to have a slight adverse impact for noise but also a moderate adverse impact for on the landscape and townscape, plus the historical environmental. Since the public consultation was carried out, bat surveys have confirmed their existence in the Heath building which means that its demolition would adversely impact on biodiversity.
Economic Impact	Option E provides a median performance from the perspective of economic impacts such as capital costs and benefits. This Option has a positive benefit cost ratio (1.18), however not as high as Option D.	The option is forecast to have a negative impact on vehicle operating costs.
Key viability, acceptability and risk	The Option scored well against the desired outcomes described by Llanfairfechan Town Council for two of the three factors. It was also a preferred option for the North Wales Police.	One of the main risks is the lack of public acceptability for the option, as although it provides four-way movement it was not the preferred option for the majority of the key stakeholders and

J15 - Option E	Strengths	Weaknesses
	Although it did not perform well in the public consultation, a number of respondents noted that it would provide benefits, including minimising demolition of private properties, allow free movement of traffic, take up less green space and provide quick and easier access to Penmaenmawr.	was the least preferred option for the public. A number of concerns were raised including that the roundabout is too close to the school, the need to demolish the Heath building and concerns that the junction arrangement would be confusing to the elderly. The option also carries service risks associated with its location within the conservation area and the need for licenses related to the removal of the bats at the Heath building.
Overall Performance	Out of the options, Option E layout provided a median performing option from the perspective of the project and technical objectives. And overall it has a neutral impact from a social impact; as notably, it provides an opportunity to minimise the number of residential properties that might need to be demolished. However, by relocating the roundabout adjacent to the school it has introduced the potential for long term social and health impacts. It has also created an 'island' which brings its own social impacts. Moreover, Option E performs the worst from the perspective of the environmental impact due to its location within the conservation area (and also the impact on biodiversity). Since the option does not maximise opportunities towards the 'well-being goals', and the social issues are not considered to be tenable in the long-term, it is proposed that Option E should be dropped.	

3.3.2 Comparative appraisal of options presented at Public Consultation

To understand the relative benefits and impacts of the options, a comparative appraisal of the options has been carried out. This appraisal takes into account the feedback provided during the public consultation.

3.3.2.1 Options performance against project objectives

As illustrated by Table 3-10 **the option that performs the best overall** against the project objectives is **Option B,** which provides four-way movement and access to the Promenade. However due to its physical scale, and its impact on the community both from a social and visual perspective it did not score as well against OBJ7 (To take reasonable steps to build healthier communities and better environments) for which it was assessed to have a moderate adverse impact.

The **next best performing option** against the objectives overall is **Option D**. Although this option provides four-way movement, due to its less conventional design and the lack of the link to the promenade it did not score as well for OBJ5 (Improve journey times, journey time reliability and safety for access onto the A55) compared to Option B. Notwithstanding, with the exception of the technical objective to minimise disruption during construction (which both B and D were assessed to have a moderate adverse impact), Option D was assessed to have either a neutral or beneficial impact against all of the objectives.

From the perspective of performance of options at Junction 15 against the project objectives, the options that performed the best are Options B and D.

Table 3-10: Comparison of option performance with respect to the appraisal of the objectives

Objective	Description of objective	Appraisal summary
OBJ1	Improve access to regional, national and international markets and improve access to employment opportunities	By replacing the roundabout at Junction 15 with a more conventional junction arrangement, it will result in a reduction in delays and associated benefits to the local community as well as wider economic benefits (for example by making development along the A55 corridor more appealing for existing and new businesses). Consequently, all of the options have received a moderate beneficial scoring.
OBJ2	Improve road safety on the A55 from Junction 14 to Junction 16A	Similarly, as all of the options will improve the design standards and safety along mainline A55, they have all received the same scoring. Due to the constraints provided by the existing geometry of the A55, the improvements have been assessed to have a slight beneficial impact.
OBJ3	Improve journey times and journey time reliability on the A55 from Junction 14 to Junction 16A	Since based on the traffic modelling all of the options will provide a similar improvement to journey times and journey time reliability, they have all been assessed to have a moderate beneficial impact.
OBJ4	Improve resilience on the A55 for strategic and local traffic.	From the perspective of resilience, as both **Options B, D and E** retain four-way movement they **performed the best**. Options A and C performed poorly, due to the reduced number of movements, resulting in the need for traffic to be diverted through Llanfairfechan and Junction 14 as well as concerns regarding flooding in the underpass (for C).
OBJ5	Improve journey times, journey time reliability and safety for access onto the A55	Although options B, D and E all provide four-way movement via slip roads onto the A55, the option that **performed the best is Option B** which was assessed to have a moderate beneficial impact. This was mainly because it has the most conventional arrangement, but also because it provides significantly improved access for the Promenade. Options A and C were assessed to have a slight adverse impact due to the need to divert traffic via Junction 14, and the resultant increased risk of accidents.

Objective	Description of objective	Appraisal summary
OBJ6	Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	For this objective, **Options B and C performed the best, and were** assessed to have a slight beneficial impact. For Option B although it provides the advantage of a new link across to the promenade, it requires for cyclists using the Sustrans Route 5 to cross the path of traffic which has recently left a high-speed road. Although this situation already exists with the current roundabout, traffic calming measures would be required to avoid creating an adverse impact for cyclists for Options A, D and particularly E. Based on the distributional impact assessment Option E scored particularly poorly overall, due to the potential impact of the new link road roundabout adjacent to the school and bus stops on both pedestrians and cyclists. To ensure consistency of approach (and to avoid a situation where people chose an option in the public consultation to save the footbridge), it has assumed that the existing footbridge near Junction 15 is to be removed. However, **there may be the potential to retain the footbridge for Options A and D**. It is likely however that a new footbridge could be provided for the other options.
OBJ7	To take reasonable steps to build healthier communities and better environments	Qualitative assessment whether there are opportunities to provide mitigation and/or enhancement measures for each of the options to build healthier communities and better environments. For each of the options being considered there are differing potential to provide enhancements and benefits, with **Options A and D** performed the best overall.
OBJ8	Opportunities to provide integrated transport are increased	Qualitative assessment whether the option provides opportunities to improve integrated transport (for example by creating open public spaces that might accommodate parking or improving public transport access). All of the option performed similarly, with the exception of Option A due to its small footprint.
TECH OBJ9	Minimising technical departures from standard (to improve safety)	A technical appraisal of the geometry has been carried out for each of the options. The outcome of this appraisal is that the two options that performed the best with respect to minimising technical departures from standards are **Options A and B**.
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)	Based on technical review, assessment whether the option requires for the speed limit to be reduced, for example due to a departure from standard that may be required due to the proposed arrangement. All of the option performed similarly, with the exception of Option C due to the technical departures from standard related to the eastbound slip road.
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)	Based on the potential construction phasing, assessment of the potential disruption in relation to the length of time it may be necessary to reduce the number of lanes, the speed limit or access to Llanfairfechan during the construction works. The option that performed best was Option A due to its small footprint. The option that performed worst was Option C.

3.3.2.2 Options performance against social and cultural impacts

The appraisal of the social and cultural impacts is summarised in the AST table which can be found in Appendix 2. The main links between social impacts and transport interventions relate to the impact on:

- Physical activity
- Journey quality
- Accident savings
- Personal security
- Accessibility to employment and services
- Severance
- Permeability in relation to walking and cycling, and
- The impact on equality, diversity and human rights.

As part of the appraisal a light touch distributional impact appraisal and a rapid health impact assessment has been carried out. During this process the impact of other indicators have also been considered in relation to how it might affect the population and amenities in the Llanfairfechan area, including the health issues associated with noise and air quality.

Overall, it has been identified that Option B performs well from the perspective that it opens up access to the promenade meaning that pedestrians and cyclists have an alternative circular route that does not require them to walk through an underpass and improves access for emergency services (for example reducing the call out time for the fire services) and local deliveries. However, the increased access will inevitably attract additional traffic, which will result in a localised impact that may have an adverse effect socially. It may also attract anti-social behaviour or people parking up overnight along the promenade.

Although some of the impacts such as severance can be mitigated by providing pedestrian crossings or by traffic calming, noise may be more of a problem for vulnerable groups such as older people who live at Sefton House located off Station Road. Similarly, the increased traffic would have an impact on people trying to cross Penmaenmawr Road, for example to access the Plas Menai Surgery after parking near to the Town Council or taking advantage of other community services such as the library or church. Although there is an existing signalised pedestrian crossing at the junction of Village Road and Penmaenmawr Road, this would not be located suitably for children crossing to the attend Ysgol Babanod primary school.

One of the main localised social impact in Llanfairfechan relates to the impact of increased traffic volumes along Penmaenmawr Road, Station Road, the Promenade and Shore Road East due to Options B and E. The option that has the least change in traffic flow, and resulting distributional impact on the community is Option D.

Option B, along with Option D to a lesser extent, would require the demolition of residential properties; some of which is new low-cost or social housing. This is an extremely emotive issue, which has attracted a lot of concern locally, and it is recognised that it could have a notable short-term social impact both in relation to the health of the occupiers and the surrounding community. Notwithstanding the community's desire to retain this housing, questionnaires were received from postcodes which would be most affected by these options that indicated a preference for options that requiring for the properties to be demolished. One of the reasons given for this choice was to

avoid having properties adjacent to the slip roads – by removing the receptor, it removes the potential health issues with them to residents.

An option that would avoid needing the demolition of residential properties is Option E, by demolishing the Conwy CBC Heath Building. However this is an option that performs worst with regards to the localised impacts. The main reason for this is due to the location of the proposed new roundabout adjacent to Ysgol Babanod primary school, and concerns regarding vehicular emissions from starting and stopping vehicles at the roundabout, especially when the engines are running cold and the catalytic converters are not effective; something which could result in a health impact that is likely to disproportionately impact children and parents/grandparents. In addition, even with the provision of a pedestrian crossing, there is an increased risk of accidents associated with children crossing the road in the immediate vicinity of the junction. These are long term issues that will affect generations for a long time in the future.

> Applying the principles of sustainable development, which is defined as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs…" (Brundtland Commission, 'Our Common Future' 1987), it would be preferable to avoid choosing an option which results in the risk of creating long term health issues.

Another option which would avoid the need to demolish houses is Option A. However, this option results in substantial increased operating costs, vehicle costs and increased accident dis-benefits. These added together have a negative benefit which is greater than the capital cost of the scheme. It should be noted that the social impact of these increased vehicle operating costs and accident frequency will be borne by the communities of Llanfairfechan and Pendalar.

3.3.2.3 Options performance against environmental impacts

Overall, due to the nature of the project all of the options performed similarly with respect to the impact on the environment, with the main differences relating to either how the option sits within the landscape and townscape (ie the visual impact) or what opportunities the option might present with regards to environmental enhancements. As shown in Appendix 2 – Table 1, the options that provide the **greatest opportunities for enhancement are Options B and D**. Overall, the options that perform the best are:

- Noise – **Option D**
- Visual and biodiversity – **Options C and D**.
- Historic environment – **Option A**. Notably, the worst options are C and D.

Although the impact in relation to air quality is neutral overall, as discussed above, the configuration of Option E creates a risk of a localised impact due to the new roundabout being sited outside the Ysgol Babanod primary school on Penmaenmawr Road (especially first thing in the morning when engines are running cold and the catalytic convertors are not effective). It also, due to the need to demolish the Health building, which has a known bat population, would have an adverse effect on biodiversity (as a European protected species) and also increase the risk of delays to programme due to the license requirements.

Taking into account the opportunities for enhancements, the option which performs the best in relation to environmental impact at Junction 15 is Option D.

3.3.2.4 Key viability criteria, acceptability and risk

Although inevitably criticism has been received regarding the public consultation, as illustrated by the general levels of engagement with the public, the consultation has allowed the public to be involved in the decision-making process and for the most affected people to receive the information that they needed. Based on the questionnaire responses, the favoured option for Junction 15 for the public was Option A. Whereas the overall preferred option from the perspective of the key stakeholders, including the emergency services, NMWTRA and the bus companies was Option B (followed by Options D/E as they provide four-way movement), with Option A being the least favoured option.

Representations have been received not only from the public, but also key stakeholders and the local councils / councillors.

Conwy CBC in their formal response stated that when deciding on the preferred options, the Welsh Government should have regard to the following overall desired local outcomes, as well as considering the views of the elected members for the wards of Bryn and Pandy. As illustrated by Table 3-11, the best performing option against the majority of the Conwy CBC's desired local outcomes is Option D.

However, as highlighted by the councillor for the Pandy Ward (Cllr Penny Andow) no consensus has been reached between the councillors or Llanfairfechan Town Council. Based on the councillor's and Llanfairfechan Town Council representations, it would appear that the preferred option would be the one that has

(i) the least visual impact,
(ii) the fewest number of properties needing to be demolished AND
(iii) the greatest safety benefits.

Unfortunately, it is not possible to satisfy all of these criteria as the options which perform well for (i) and (ii), which are Options A and C, in comparison perform particularly poorly from the perspective of safety. Therefore there is a risk that whichever option is chosen will not meet the acceptability criteria at Junction 15.

Table 3-11: Assessment of options against Conwy CBC Desired Local Outcomes

	Desired Local Outcomes	**Performance of options against desired local outcomes**
(i)	Any **increase** in traffic flows and speeds on county road network is minimised and measures taken to mitigate its impact.	This outcome links to the distributional impact of changes in traffic flow. The options with the minimal changes in traffic flow <5% are for: • The Promenade – Option A, C and D • Aber Road – Options B, D and E • Penmaenmawr Road – A, B, C, D and E • Shore Road East – Options A, B, C and D For this outcome, **Option D performs the best**, followed by Options B and C.

	Desired Local Outcomes	Performance of options against desired local outcomes
(ii)	Any increase in the maintenance costs of the county road network resulting from the proposals are mitigated through additional road maintenance funding.	This outcome links to the length of any additional county roads. For Junction 15 all of the options would have a similar impact on the county road network.
(iii)	The level and speed of traffic diverting off the A55 due to incidents is minimised and measures taken to mitigate its impact.	For all options, traffic calming measures will be designed. Therefore again, all options would perform similarly.
(iv)	The impact on connectivity and journey times between the A55 and the county road network is minimised.	The impact on connectivity and journey times is directly linked to the vehicle operating costs. As illustrated by the negative vehicle operating costs for Option A (of -£9,271,000), compared to the vehicle operating costs for Option D (of £225,000), Option A performed especially poorly due to the increased journey lengths for much of the community. For this outcome, **the best performing option is Option D**.
(v)	Connectivity by active travel modes along the A55 corridor and between the towns/villages and the coast between Junctions 14 and 16A is improved.	This outcome is directly related to Objective OBJ6 (Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists). For OBJ6, **Options B and C performed the best**. Also, although the options presented at public consultation indicated that the footbridge at Pendalar would be removed, there may be the potential to either retain or provide a replacement footbridge for all options.
(vi)	The impact on the local environment, including traffic noise, is minimised.	Overall, due to the nature of the project all of the options performed similarly with respect to the impact on the environment, with the main differences relating to either how the option sits within the landscape and townscape (ie the visual impact) or what opportunities the option might present with regards to environmental enhancements. The options that perform the best are: • Noise – **Option D** • Visual and biodiversity – **Options C and D** • Historic environment – **Option A** The outcome is also closely linked to the objective OBJ7 (To take reasonable steps to build healthier communities and better environments) for which **Options A and D** performed the best overall. Notably, although the impact in relation to air quality is neutral overall, the configuration of Option E creates a risk of a localised impact due to the location the new roundabout outside the Ysgol Babanod primary school on Penmaenmawr Road (especially first thing in the morning when engines are running cold and the catalytic convertors are not effective). It also would have a detrimental impact on biodiversity, due to the need to demolish the Heath Building where there is a known bat population.
(vii)	The impact on local amenity areas is minimised.	The main local amenity areas for Llanfairfechan are the beach, promenade and play areas. This outcome again is linked to the distributional impact of changes in traffic flow, which could affect not only the increases in noise level but also accidents and severance (ie making it harder for people to cross the road). The **best**

	Desired Local Outcomes	Performance of options against desired local outcomes
		performing option for this outcome is **Option D**, as it forecast to result in no change in traffic flow along the Promenade. Whereas the worst performing options are Options B and E.
Bryn Ward		
Cllr Andrew Hinchliff raised the following points in his representation to the public consultation, with regards to the desired outcomes: • Houses to be retained if possible (better to demolish the Heath). • Provisions for traffic calming measures and pedestrian crossings to be made. • Shore Road East access to be retained and improved if possible.		How each option performs with regards to addressing the outcomes is summarised below: • Demolition of properties: **Options A, C and E perform the best**, followed by D. B performs the worst. • Traffic calming and pedestrian crossings: all options have the potential to perform equally. • Retaining Shore Road East – The majority of the options perform equally, with the exception of Option B which performs poorly as it only provides restricted access.
Pandy Ward		
In summary, Cllr Penny Andow noted that no consensus had been reached with regards to a preferred option. However, the following concerns were raised: • Demolition of houses • Impact on views and house prices • Safety both during and after construction is completed		How each option performs with regards to addressing public concerns is summarised below: • Demolition of properties: **Options A, C and E perform the best**, followed by D. B performs the worst. • Impact on views: How each option affects views depends on the viewpoint. Inevitably some options would impact some people more than others. **The option that performs the best is Option A** followed by Options C. Option B would have the worst overall impact. Whereas Option E would have a greater impact in Llanfairfechan itself and Option D would have a greater impact for the properties on the edge of Pendalar. • Safety: **The options that provide the greatest accident benefits are options B**, followed by E and then D. Options A and C performed particularly poorly. It is not feasible to assess the potential impact on house prices, as it is outside the scope of the project.
Llanfairfechan Town Council		
In addition to Conwy CBC and the local councillors, a collective statement was received from Llanfairfechan Town Council. This requested the following: • Measures to ensure that housing, and particularly social housing is not lost. • Safety both for drivers and pedestrians to 'protect residents using the schools, GP surgery, churches and other services along Penmaenmawr Road'. especially		How each option performs with regards to addressing Llanfairfechan Town Council's concerns is summarised below: • Measures to ensure housing not lost – Although, **Options A, C and E perform the best**. B and then D perform the worst from the perspective of demolishing housing; this outcome could be met by working in collaboration with Conwy CBC to identify other alternative housing locations (for example at the Heath Building site). • Safety for drivers - **The options that provide the greatest accident benefits are options B**, followed by E and then D. Options A and C performed particularly poorly. • Safety for pedestrians – There is a differing level of performance for each of the options with respect to the

	Desired Local Outcomes	Performance of options against desired local outcomes
	along Penmaenmawr Road and through the town centre.	distributional impact associated with localised changes in forecast traffic flow and severance (i.e. how difficult is it to cross the road). Overall, the greatest changes in traffic flow are along Aber Road, and interconnecting links with the Promenade for Options B and E. **The option that it is forecast would have the least overall impact on pedestrians is Option D, as it has the least forecast changes in traffic flows and severance.** In addition, this concern could in part be addressed by the provision of traffic calming and pedestrian crossings: for which all options have the potential to perform equally.

From the perspective of service risks (which include design risks, planning risks, build risk, the quality of the initial site investigation and surveys, environmental risks, procurement risk, in addition to risks related to the whole life of the asset), the option that perform **the best is Option A** as it has the smallest footprint and thus impact and the greatest certainty of design.

The next best performing option is Option D, followed by Option E where there are risks associated by the known existence of a bat population at the Heath. The option with the greatest level of risk is Option B, due to its interface with Network Rail and its proximity to the SAC.

The greatest risk with respect to the key viability criteria for Junction 15 relates to the following issues:

- Business risks associated with the stakeholder acceptability due to the lack of consensus in relation to the preferred option; and
- Service risks associated with Option B, including the interface with Network Rail and its proximity to the SAC.

3.3.3 Mitigation of concerns raised during the public consultation

One of the key concerns raised during the public consultation for Junction 15 (Llanfairfechan) relates to the need to demolish properties because of the scheme. As highlighted by Llanfairfechan Town Council, this needs to be balanced against the consider the safety of both drivers and pedestrians. To address these concerns further highway geometric design work has been carried out following the public consultation to determine the technical feasibility of negating the need to demolish residential properties comprising of the new Fernbank development (of 8 apartments and 9 dwellings) and the 'Sunnybank' terrace of 15 properties, in Llanfairfechan.

The junction arrangements presented at the public consultation, which either require the demolition of properties, or put them at risk of demolition are Options B, C and D. For Option B, due to the type of junction it is not considered viable to negate the need to demolish properties. Similarly, due to the compact nature of the off-slip road for Option C, it is not considered feasible to reduce the impact of the junction arrangement on the properties. Therefore, mitigation of the Options B and C on the properties has not been considered further.

However, further highway geometric design work has been carried out to assess the technical feasibility of negating the need to demolish residential properties at Fernbank and Sunnybank, for

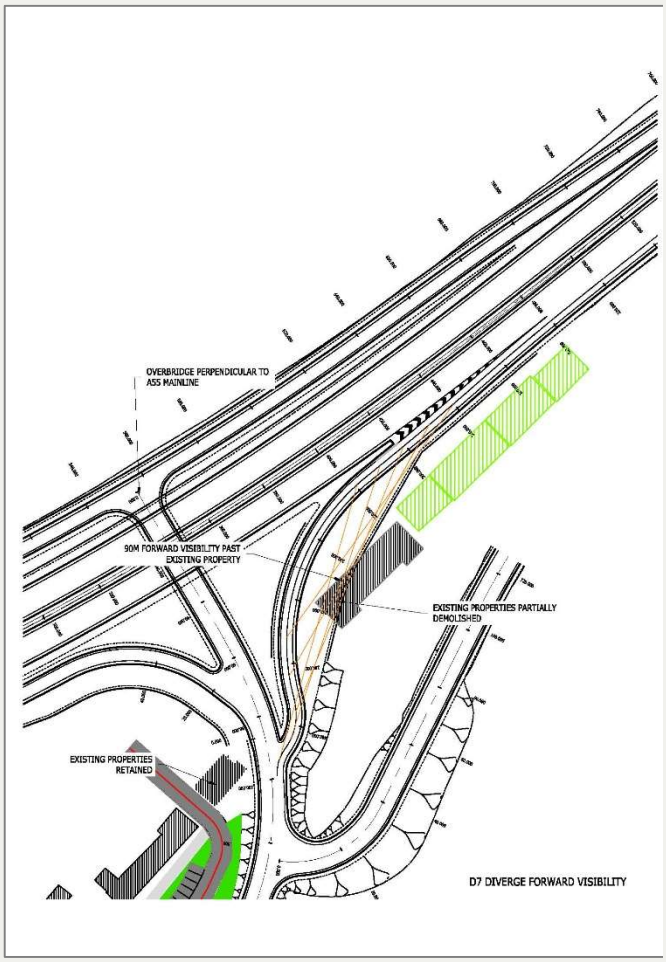
Option D. Additionally, further work was also carried out for Option E, to consider how relocating the junior school from its current location might change the WelTAG assessment for the options.

3.3.3.1 Mitigation for Junction 15 Option D

The further highway geometric design work identified it would be possible to avoid the need to demolish some or all of the properties, located between the A55 and Penmaenmawr Road to the south east of Junction 15. However, to achieve this outcome, different variations of the design options considered were found to have varying levels of additional cost, benefits and impacts. The impacts included the loss lengths of gardens or views, due to the need to construct the retaining walls required to support the westbound off slip road.

Of the variations considered, the mitigated Option D taken forward provided an arrangement where instead of the westbound slip road connecting onto Penmaenmawr Road, a priority junction was provided on the overbridge slip road to the south of the westbound on-slip. This allowed a greater stopping sight distance and thus an improvement from the perspective of TECH OBJ9 (minimising technical departures from standards) in comparison the option presented at the Public Consultation. The option variation also potentially allowed for a partial demolition of the existing property (thus minimising the impact), dependant on the findings of structural surveys. Consequently, a key area where the mitigated version of Option D had a beneficial impact on the project objectives was OBJ7 (To take reasonable steps to build healthier communities and better environments).

Table 3-12: Junction 15 - Summary of WelTAG Stage Two Appraisal for Mitigated Option D



This option provides four-way movement 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 would be raised locally to allow the bridge to pass over the A55. The westbound on and off-slip roads would join with this raised road. Access to the Parade via Shore Road East would be retained. This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops.

Summary of Junction 15 Mitigated Option D	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Otherwise, Mitigated Option D has been assessed to have either a slight beneficial or a neutral impact.	Overall the Mitigated Option D has not been assessed to have any adverse impacts in relation to the project objectives.
Technical Objectives	The Mitigated D has been assessed to perform similarly to Options A and B, with an improvement over the Option D presented at Public Consultation. The option has been assessed to have a neutral impact for the need to reduce speed limits.	The option has been assessed to have a moderate adverse impact from the perspective of minimising disruption during construction.
WelTAG Social & Cultural Impact	The option has been assessed to have a neutral impact for the majority of the social and cultural criterion. It is the option that has the least changes in traffic flow and resulting distributional impact on the community.	The key disadvantage of Mitigated Option D is that, although the impact is less than Option B, it will require the demolition of some residential properties. However, it may be possible to provide further mitigation by only partially demolishing buildings (subject to satisfactory internal inspections). Social issues associated with demolition remain.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. Although, from the perspective of noise, it has been assessed to the least impact for noise compared with the other options. Overall it is the option that provides the greatest opportunities to create habitat through enhancement and mitigation, therefore it has been assessed to have a slight beneficial impact.	The main weakness for Mitigated Option D relates to the impact on the historical environment.
Economic Impact	With the exception of Vehicle Operating Costs, the Mitigated Option D is not forecast to have any negative economic impacts. It was forecast to have the greatest beneficial impact with respect to journey time changes and the local economy, compared with the other	Due to the sensitivity of the traffic model, in relation to how the most economic route is dependent on the junction arrangement, the Vehicle Operating cost is less than the variation of the model presented at Public Consultation. However it should be

Summary of Junction 15 Mitigated Option D	Strengths	Weaknesses
	options. The Mitigated Option D has the median capital costs.	noted that the options still has the lowest Vehicle Operating Costs.
Key viability, acceptability and risk	Although not the favoured options for the key stakeholders, as mitigated Option D provides four-way movement it is unlikely to receive objections from key stakeholders such as the emergency services and NMWTRA. For example, it is understood from the consultation that the North Wales Police preferred Options D or E after Option B. As per Option D, the Mitigated Option D is the option that overall performs best when compared against Conwy CBC's desired local outcomes. Although there are service risks associated with Mitigated Option D, these are considered to be less than the other options.	The main business risk relates to local public acceptability, as for Option D was the second least favoured option at Public Consultation. However, it was recognised during the consultation that it would have less of an impact than some of the other options, as it does not increase traffic along the Promenade or Aber Road. The option also does not address all the issues raised by Llanfairfechan Town Council or the local councillors. Also, Mitigated Option D does not make improvements to Junction 14. However it does provide opportunities to mitigate many of these issues.
Overall Performance	Mitigated Option D performs the most consistently well out of the options. Overall it has either a neutral or a beneficial impact for the project objectives. It is also the option that has the least changes in traffic flow and resulting distributional impact on the community. Similarly, taking into account the opportunities for enhancements, it is the option which performs the best in relation to environmental impact at Junction 15. From the perspective of business risks, although it may not be the favoured option for key stakeholders it meets their desired outcomes. However although it was the second least favoured option for the public, the option addresses many of the concerns raised either directly or through its potential to provide opportunities for mitigation. In particular the Mitigated Option D provides additional opportunities to minimise the need to demolish properties, to improve the visual impact of the structures within the setting with landscaping, and the fact that it is set away from the primary school. It also and has the least impact on Penmaenmawr Road and the Promenade due to changes in traffic pattern.	

3.3.3.2 Mitigation for Junction 15 Option E

A further assessment was carried out to consider whether the preferred option might change if the junior school were relocated away from its current location. This would remove the receptor and the impacts associated with the school and its community.

As described in the table below, consequently, the scoring associated with the Project Objective OBJ7 (To take reasonable steps to build healthier communities and better environments) and impacts such as 'Equality, diversity & Human Rights' would improve compared with the Option E presented at public consultation. Additionally, the option variant would not have required the demolition of the Heath building, providing a benefit from the perspective of the 'Landscape and townscape' and the 'Historic Environment'.

However notably these benefits are only theoretically. Therefore, following informal discussions with Conwy CBC, during which it was confirmed that there were no plans to relocate the junior school during the time scale of the project, the option was not progressed any further.

Table 3-13: Junction 15 - Summary of WelTAG Stage Two Appraisal for Mitigated Option E

Map data © 2018 Google

The layout for Mitigated Option E is the same as Option E. The primary difference is that the school would theoretically be relocated by Conwy CBC.

This option is similar to Option D and E, in that it provides four-way movement by utilising an overbridge with a T-junction to the north of the A55. However, for this option a compact roundabout and slip roads for west-bound traffic would be located at the site of the Heath building.

The slip roads would be raised locally to allow the bridge to pass over the A55. Due to headroom restrictions, access to the Parade along Shore Road East may need to be limited to Non-Motorised Users.

This option would require the realignment of Penmaenmawr Road and consequently the repositioning of the bus stops. It is also proposed that there will be a shared cycleway / pedestrian path.

J15 - Option E	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Similarly to Option E, Mitigated Option E improves access to the A55 and increases opportunities to provide integrated transport, OBJ4 and OBJ8 have been assessed as having a slight beneficial impact.	Due to the junction arrangement, and the vicinity of the new roundabout to the school, Option E and Mitigated Option E have been assessed overall as having a slight adverse impact for OBJ6 and OBJ7, with respect to non-motorised users and taking reasonable steps to build a healthier environment.
Technical Objectives	Similarly to Option D and Option E, the option uses a configuration that is a departure from standard. As there are potential mitigations measures, the option is considered to be neutral from the perspective of minimising technical departures from standards and the need to reduce speed limits.	The option has been assessed to have a moderate adverse impact from the perspective of minimising disruption during construction.

J15 - Option E	Strengths	Weaknesses
WelTAG Social & Cultural Impact	Similarly to Option E, the main positive benefit provided by Mitigated Option E relates to accident savings. It also minimises the need to demolish private residential properties. In comparison to Option E, the social impacts would be reduced for Mitigated Option E as if the school is relocated a highly sensitive receptor would be removed. However, this improvement is theoretical as there is no commitment by Conwy CBC for this to occur.	Although the majority of the criterion have been assessed to be neutral overall, the distributional impact appraisal has indicated that similarly to Option E, Mitigated Option E could disproportionately impact the local community (including younger children and older people) in Llanfairfechan and Pendala Issues identified include the risk of increased localised emissions if vehicle queue at the roundabout, the layout creation of an islands and the increased severance.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for a number of the environmental indicators have been assessed to be neutral. In comparison to Option E, Mitigated Option E provides the advantage that the Heath would not need to be demolished.	Overall Option E and Mitigated Option E perform the worst. This is due to the option not only having been assessed to have a slight adverse impact for noise but also a slight adverse impact for on the landscape and townscape, plus the historical environmental.
Economic Impact	Mitigated Option E provides a median performance from the perspective of economic impacts such as capital costs and benefits. This Option has a positive benefit cost ratio (1.18), however not as high as Option D.	The option is forecast to have a negative impact on vehicle operating costs.
Key viability, acceptability and risk	The Option scored well against the desired outcomes described by Llanfairfechan Town Council for two of the three factors. It was also a preferred option for the North Wales Police. Although it did not perform well in the public consultation, a number of respondents noted that it would provide benefits, including minimising demolition of private properties, allow free movement of traffic, take up less green space and provide quick and easier access to Penmaenmawr.	One of the main risks is the lack of public acceptability for the option, as although it provides four-way movement it was not the preferred option for the majority of the key stakeholders and was the least preferred option for the public. Although the concern regarding the roundabout being too close to the school would be addressed, the residual concerns remain. These concerns included the need to demolish the Heath building and concerns that the junction arrangement would be confusing to the elderly. The option also carries service risks associated with its location within the conservation area and the need for

J15 - Option E	Strengths	Weaknesses
		licenses related to the removal of the bats at the Heath building.
Overall Performance	Out of the options, similarly to Option E, the Mitigated Option E layout provided a median performing option from the perspective of the project and technical objectives. Overall it has a neutral impact from a social impact; as notably, it provides an opportunity to minimise the number of residential properties that might need to be demolished. The Mitigated Option E does however address the concerns associated with relocating the roundabout adjacent to the school; which introduced the potential for long term social and health impacts. Notwithstanding, the issues associated with the creation an 'island' remain. Moreover, similarly to Option E, Mitigated Option E performs the worst from the perspective of the environmental impact due to its location within the conservation area (and also the impact on biodiversity). Since the option relies on a theoretical construction of a new school (which is unlikely to occur during the life of the project), it does not maximise opportunities towards the 'well-being goals', and the social issues are not considered to be tenable in the long-term, it is proposed that Mitigated Option E should be dropped.	

3.3.4 Value for Money Statement

As illustrated by the figures in Table 3-14, the option that presents the **best value for money** for Junction 15 **is Option D**. This option is one of five options that have been sifted from a long list of options considered under WelTAG Stage One which considered a broad range of interventions ranging from integrated transport options to improvements to the junction itself.

Although not the lowest cost option (which is Option A), Option D is also not the most expensive intervention with a **Present Value Capital (PVC) cost in the order of £28million**. Of all of the options, it is the only option that doesn't result in either negative vehicle operating costs. Of all of the options Option D provides the most significant monetised impact for the local economy (including wider economic benefits) of £1.1million.

As the BCR for Option D is 1.26 it places it in the Low 'Value for Money' band. However, it should be noted that as summer peak flows have not been taken into account during the economic appraisal it is expected that the benefits are currently understated.

The main area of uncertainty relates to the extent of the economic growth and how the economic benefits might be uplifted for summer traffic peak flows. No sensitivity test has been carried out to ascertain the extent of this impact. No issues have been identified with regards to the robustness of data sources.

To understand the sensitivity to each option to the factors making up the benefits, a light touch sensitivity test has been carried out comparing the best performing option (from a perspective of value for money) against each of the options. This has identified that for Junction 15, the options BCR's would be sensitive to a wide variety of factors, including: construction delay, travel time, vehicle operating costs and carbon emissions.

Table 3-14: Summary of the Economic Appraisal for Junction 15

	Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E*
Present Value Capital Costs, Excluding VAT (at 2018 prices) in thousands	**£17,042**	**£30,303**	**£26,504**	**£27,949**	**£24,578**	**£27,171**	**£27,171**
Present Value Benefits (PVB) (discounted to 2010 prices) in thousands	£730	£23,530	£12,635	£25,521	£22,673	£23,096	£23,096
Present Value Costs (PVC) (discounted to 2010 prices) in thousands	£12,289	£21,863	£18,999	£20,153	£17,561	£19,533	£19,533
Net Present Value (NPV) (discounted to 2010 prices) in thousands	-£11,557	£1,667	-£6,364	£5,368	£5,112	£3,563	£3,563
Benefit Cost Ratio (BCR)	**0.06**	**1.08**	**0.67**	**1.27**	**1.29**	**1.18**	**1.18**
Value for money band	**Poor**	**Low**	**Poor**	**Low**	**Low**	**Low**	**Low**

*Additional cost for relocating the school would be covered by Conwy CBC educational budget

3.3.5 Summary of Option Appraisal

A comparison of the mitigated options performance against the Option presented at public consultation can be found in Table 3-15.

Table 3-15: Summary of WelTAG 2 Appraisal of Junction 15 Options

Criteria	Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E
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	--	0	--	0	0	0	0
OBJ5 – Improve journey times, journey time reliability and safety for access onto the A55	-	++	-	+	+	+	+
OBJ6 – Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	0	+	+	0	0	-	-
OBJ7 – To take reasonable steps to build healthier communities and better environments	+	--	0	+	+	-	0
OBJ8 – Opportunities to provide integrated	--	+	+	+	+	+	+

Criteria	Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E
transport are increased							
OBJ9 Minimising technical departures from standards	+	+	---	0	+	0	0
OBJ10 Minimising need to reduce speed limits	0	0	-	0	0	0	0
OBJ11 Minimising disruption during construction	-	--	---	--	--	--	--
Social and Cultural Impacts							
Physical Activity	0	+	0	0	0	0	0
Journey quality (Delay savings pcu.hrs - AMP, IP, PMP)	+	+	+	+	+	+	+
Accident Savings	**-41**	**18**	**-50**	**8**	**8**	**14**	**14**
Personal security[48]	0	+	-	-	0	0	0
Accessibility to employment and services (Journey speed increase kph - AMP, IP, PMP)	0	+	+	+	+	+	+
Severance	-	+	-	0	0	-	-
Permeability (walking cycling)	0	+	+	0	0	0	0
Equality, diversity & Human Rights[49]	0	0	0	0	0	-	0
Environment							
Noise	-	-	-	0	0	-	-
Air quality	0	0	0	0	0	0	0
Greenhouse gases	0	0	0	0	0	0	0

[48] The Mitigated Option D opens up Penmaenmawr Road, improving pedestrian visibility and would provide a feeling that is closer to the existing.

[49] Initially Option E was assessed as having no change in respect to equality, diversity or human rights (and a neutral impact). However based on the feedback from the public consultation in relation to the impact on the school community, the option was reassessed as having a slight adverse impact.

Criteria	Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E
Landscape and townscape	-	-	0	0	0	--	-
Historic environment	-	--	---	---	---	--	-
Biodiversity	0	0	+	+	+	0	0
Water environment	0	0	0	0	0	0	0
Economic Impacts (£ thousands)							
Journey time changes (discounted to 2010 prices)	£10,520	£24,155	£19,403	£24,472	£22,400	£23,250	£23,250
Journey time reliability savings (seconds per vehicle - AMP, IP, PMP)	6, -2, 6	17, 11, 17	16, 8, 13	17, 11, 17	17, 11, 17	17, 10, 16	17, 10, 16
Vehicle Operating Costs (discounted to 2010 prices)	-£9,271	-£1,821	-£869	£255	-£686	-£1,285	-£1,285
Accident Benefits (discounted to 2010 prices)	-£2,004	£850	-£1,969	£511	£689	£710	£710
Economic Appraisal (£ thousands)							
Local economy (Wider Economic Benefits, discounted to 2010 prices)	-£35	£1,026	£913	£1,186	£1,015	£1,029	£1,029
Present Value Capital Costs, Excluding VAT (at 2018 prices)	£17,042	£30,303	£26,504	£27,949	£24,578	£27,171	£27,171
Present Value Benefits (PVB) (discounted to 2010 prices)	£730	£23,530	£12,635	£25,521	£22,673	£23,096	£23,096
Present Value Costs (PVC) (discounted to 2010 prices)	£12,289	£21,863	£18,999	£20,153	£17,561	£19,533	£19,533
Net Present Value (NPV) (discounted to 2010 prices)	-£11,557	£1,667	-£6,364	£5,368	£5,112	£3,563	£3,563
Benefit Cost Ratio (BCR)	**0.06**	**1.08**	**0.67**	**1.27**	**1.29**	**1.18**	**1.18**
Value for Money	**Poor**	**Low**	**Poor**	**Low**	**Low**	**Low**	**Low**

3.4 Junction 16 Appraisal of Options

For the purpose of the WelTAG Stage Two report, the appraisal of the options has been provided separately for the A55 Junctions 15 and 16, in Section 3.3 and Section 3.4 respectively. A copy of the Appraisal Summary Table (AST) presented at the public consultation can be found in Appendix 2.

3.4.1 Appraisal of options presented at Public Consultation

The appraisal of each of the short-list options for Junction 15 has been carried out applying the methodology described in Section 3.2. The output from this appraisal for each option can be found in Tables 3-16 to 3-19 and a copy of the traffic forecast drawings can be found in Appendix 1.

Table 3-16: Junction 16 - Summary of WelTAG Stage Two Appraisal for Option A

Map data © 2018 Google

The option comprises of a four-way movement junction, replacing junction 16A. The roundabout at Junction 16 would be removed and replaced by westbound on and off slip roads. The Junction 16A arrangement would consist of an overbridge, located to the north-east of existing roundabout. The slip roads would be constructed on raised embankments. A new link road would be constructed, running roughly parallel to the A55, behind the Puffin Café linking back into Ysguborwen Road near the Gladstone Hotel.

Provision would be made to retain the existing SUSTRANS Route 5, which runs parallel to the north of the A55.

J16 - Option A	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Overall option A performs the best from the perspective of the project objectives.	None of the project objectives have been assessed as having an overall adverse impact. The only objective that the option was assessed as not having a beneficial impact for is OBJ4 improving resilience
Technical Objectives	There are still opportunities to improve the arrangement over and above that shown on the option drawings, which would improve the assessment from moderate to slight adverse impact. The option does not require for the speed along the main line to be reduced.	Due to the tight space, the option uses a configuration that is a departure from standard. The option has been assessed to have a moderate adverse impact from the perspective of minimising disruption during construction.
WelTAG Social &	Option A provides the greatest potential social benefits of all of the options. In	The main social impact, based on the distributional impact appraisal, relates to

J16 - Option A	Strengths	Weaknesses
Cultural Impact	particular, it has been assessed as having a slight beneficial impact for physical activity, personal security and permeability due to the opportunities to improve access to the coast and create circular cycling and walking routes. In addition, it will shorten the bus route serving Penmaenmawr and Dwygyfylchi.	the increased traffic forecast through Dwygyfylchi, which without mitigation could cause social issues such as those related to severance.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. However, option A provides the greatest enhancement opportunities; with a slight beneficial impact.	The option has been assessed to have a slight adverse impact for noise, due to the increased speed along the A55. However there would be an adverse localised impact due to the increased eastbound quarry vehicles using Ysguborwen Road.
Economic Impact	Option A has the lowest vehicle operating costs. The option has median accident benefits and local economy benefits.	Option A has the highest capital costs, and the lowest Present Value Benefits. This Option also has the second lowest benefit cost ratio (1.2) of all the Options, therefore a lower value for money than other Options.
Key viability, acceptability and risk	A benefit of Option A is that it was the preferred option for a number of key stakeholders, including the North Wales Police, NMWTRA and the bus companies. The best performing option against the majority of the Conwy CBC local outcomes is split between Options A and B. However, A would perform better if their concerns regarding the additional road maintenance funding needed for Option A is addressed. Similarly, Option A is the only option which would address many of the issues raised by Cllr Anne McCaffrey (notwithstanding that her preference is for Option C). Option A provides a number of benefits, with respect to service risk, including the fact that with the exception of the pinch point at Maes-y-Llan the options' layout provides greater flexibility to design and construct the works. There is also less risk with respect to contaminated land.	A key business risk for Option A relates to public acceptability. Although its benefits were recognised by many respondents, the option performed the second worst during the public consultation. Although potential mitigation measures have been identified, a number of concerns raised during the public consultation would need to be addressed to improve the public perception of the option. These include the concerns about the amount of additional traffic through Dwygyfylchi, its visual impact, the impact on properties in Maes-y-Llan and the loss of public spaces. Significant service risks for Option A relate to the interface with Network Rail, issues related to the departures from standards. The greatest risk relates to the delivery of the option to programme.
Overall Performance	Overall Option A performs the best in relation to the project objectives. Moreover, Option A provides the greatest benefits compared to the other options both with respect to social and environmental impacts. However it would also, without	

J16 - Option A	Strengths	Weaknesses
	mitigation, result in the greatest impact locally on Dwygyfylchi and St Gwynan's, due to the increased traffic through the village. A key benefit is that it was a preferred option for the majority of key stakeholders, performed well against the Conwy CBC local outcomes and addressed many of the issues raised by Cllr Anne McCaffrey's (notwithstanding that her preference is for Option C). Although it was not a favoured public option, many of their concerns can be also be mitigated through the design. The main service risk for Option A relates to the risk associated with its delivery to programme. However, the option also has the advantage that it provides greater flexibility to design and construct the works. It also provides the greatest opportunities to address concerns raised during the public consultation.	

Table 3-17: Junction 16 - Summary of WelTAG Stage Two Appraisal for Option B

Map data © 2018 Google

The proposed junction arrangement provides four-way movement. Movement on and off the A55 eastbound carriageway is facilitated by an overbridge located to the north-east of the existing roundabout, with slip roads constructed on raised embankments. Movement on and off the A55 westbound carriageway would be via slip roads replacing the existing roundabout.

The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.

J16 - Option B	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Option B was the second best performing option with respect to project objectives, after Option A.	None of the project objectives have been assessed as having an overall adverse impact. Objectives that it was not assessed as having a beneficial impact for include OBJ4 improving resilience, OBJ7 reducing severance and enhancing provision for non-motorised users, and OBJ8 increasing opportunities for integrated transport.
Technical Objectives	Option B performed the best with respect to technical objectives.	Option B was assessed to have a slight adverse impact with respect to departures from standards and minimising disruption during construction.

J16 - Option B	Strengths	Weaknesses
WelTAG Social & Cultural Impact	Option B had a median performance with respect to accident savings. Otherwise, all of the other social and cultural indicators were assessed to be neutral.	Option B does not maximise opportunities with respect to the well-being goals.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. Notably it is the best performing option overall for noise. Similarly to the other options, the impact on biodiversity was assessed to have a slight beneficial impact, due to enhancement opportunities.	Option B has been assessed to have the greatest impact from the perspective of the environmental impact, in particularly in relation to the impact on the townscape and landscape which has been assessed to have a moderate adverse impact. Out of the options, it is expected to have the worst visual impact, especially from the Gladstone and properties between along Ysguborwen Road between the new bridge and Junction 16; where any screening would obscure the views out to sea. The option has been assessed overall to have a slight adverse impact for noise, due to the increased speed along the A55. However again there would be a localised impact with the increased eastbound quarry vehicles using Ysguborwen Road.
Economic Impact	Option B has the lowest capital costs and the greatest benefit cost ratio (1.7), therefore gives the greatest value for money.	The option has the lowest vehicle operating costs, accident benefits and local economy benefits.
Key viability, acceptability and risk	Option B was the second preferred option with respect to responses at the public consultation. It is also not likely to be objected to by the key stakeholders, with it being the favoured option by the North Wales Fire Services and performing well against the Conwy CBC local outcomes. It also performs the best of all of the options against the ideal solution described by Cllr Ken Stevens.	Although the option performed well in public consultation, a key risk for Option B relates to public acceptability. Public concerns raised during the consultation include the visual impact of the bridge and the loss of mature trees, the impact due to the quarry lorries, the impact on the properties near to Maes-Y-Llan and the loss of the 'biodiversity field'. All of these issues will be harder to mitigate against than for other options. There is also a significant service risk associated with the potential for contamination within the site area.
Overall Performance	Overall, Option B is the second best performing option against the project objectives, and the best performing option with respect to the technical objectives. Similarly, for the majority of the social criterion, it has been assessed to have a neutral impact.	

J16 - Option B	Strengths	Weaknesses
	However, it should be noted that Option B does not maximise opportunities with respect to the well-being goals. Moreover, Option B has been assessed to have the greatest detrimental impact compared to the other options from the perspective of the environmental impact, in particularly in relation to the impact on the townscape and landscape, for which it has been assessed to have a moderate adverse impact. Although the option performed well from the perspective of responses from key stakeholders and the public consultation, feedback has been that it is not necessarily supported locally. Consequently, the business risk associated with public acceptability remains. Otherwise the option performs relatively well in relation to service risks; with the main significant risk being associated with the potential for contamination within the site area.	

Table 3-18: Junction 16 - Summary of WelTAG Stage Two Appraisal for Option C

Map data © 2018 Google

This option would provide a three-way movement junction. Movement on and off the A55 westbound carriageway would be via slip roads located at the existing roundabout. Traffic joining the A55 in an eastbound direction would pass under the A55 via an underbridge. To facilitate this, the A55 would need to be raised on a substantial embankment. Traffic travelling in an eastbound direction, wishing to leave the A55 would need to leave the A55 earlier at Junction 15A; resulting in increased traffic through Penmaenmawr.

The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.

J16 - Option C	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Generally, the remainder of the other objectives have been assessed to have a neutral impact, with the only other benefit being that they provide opportunities to improve integrated transport OBJ8.	Both options C and D reduce the level of resilience along the A55 and locally; and have been assessed to have a slight adverse impact for OBJ4. They both perform the worst out of the options from the perspective of project objectives.
Technical Objectives	None of the technical objectives are met.	Option C performs the worst out of the technical objectives. Departures will be required. Although mitigation is feasible

J16 - Option C	Strengths	Weaknesses
		by reducing the speed limit, the areas of non-compliance are considered to potentially put the scheme at risk of not being accepted. Therefore the technical objective to minimise technical departures from standards has been assessed as having a large adverse impact.
WelTAG Social & Cultural Impact	Options C and D performed best from the perspective of accident savings. Although the majority of the social and cultural indicators were assessed overall to be neutral, it is forecast that both Options C and D will result in an increased traffic flow through Penmaenmawr; with the associated social issues such a severance.	Neither of the options maximise opportunities with respect to the well-being goals.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been assessed to be neutral. Similarly to the other options, the impact on biodiversity was assessed to have a slight beneficial impact, due to enhancement opportunities.	Options C and D have both been assessed to have a slight adverse impact on the landscape and townscape overall. However Option C is the best performing option with respect from the local views from Maes-y-Llan and Ysgurbowen Road.
Economic Impact	Along with Option D, Options C has the highest accident benefits. It also has the second highest local economy benefits and Present Value Benefits.	Option C has the second highest vehicle operating costs and capital costs. It also has the second lowest benefit cost ratio (1.3).
Key viability, acceptability and risk	Option C was the preferred option with respect to the public consultation and support from the local Cllr Anne McCaffrey.	A business key risk for Option C relates to acceptability of the option, in relation to the key stakeholders such as NMWTRA as it does provide four-way movement and therefore reduces resilience. Also, although it was the preferred option with regards to the public consultation a number of issues related to the option were raised, including the need for residents to have to travel westbound via Conwy if Junction 15A is closed (for example if work is being carried out on the headland). Overall Option C has the greatest number of services risks, including those related to the potential risk of contamination, constructability, and the

J16 - Option C	Strengths	Weaknesses
		impact on the delivery of the programme due to risk of an impact on the departures from standards approval process and the need to agree an alternative access location with Network Rail, NRW and DCWW.
Overall Performance	Both Options C and D provide a three-way movement solution. However, whereas Option D utilises an overbridge, Option C eastbound slip joins the A55 via an underpass. Consequently, both options perform the same with respect to the project objectives, and the WelTAG social and environmental criterion. The main difference relates to the lower standard provided by Option C with respect to departures from standards, due to the physical constraints. Additionally, Option C performed worse environmentally, as it was assessed to have a moderate adverse impact for noise; since the A55 will be located on a raised embankment. Of the options, Option C has the greatest number of service risks associated with the delivery of the scheme, which could impact on the programme. It should be noted that neither Options C or D maximise opportunities with respect to the well-being goals.	

Table 3-19: Junction 16 - Summary of WelTAG Stage Two Appraisal for Option D

Map data © 2018 Google

This option would provide a three-way movement junction. Movement on and off the A55 westbound carriageway would be via slip roads located at the existing roundabout. Traffic joining the A55 in an eastbound direction would pass under the A55 via an underbridge. To facilitate this, the A55 would need to be raised on a substantial embankment. Traffic travelling in an eastbound direction, wishing to leave the A55 would need to leave the A55 earlier at Junction 15A; resulting in increased traffic through Penmaenmawr.

The existing SUSTRANS Route 5, which runs parallel to the north of the A55 will be retained.

J16 - Option D	Strengths	Weaknesses
Project Objectives	All options will perform similarly with respect to OBJ1, OBJ2 and OBJ3, as they will all improve access, safety and reliability along the A55. Generally, the remainder of the other objectives have been assessed to have a neutral impact, with the only other benefit being that they provide opportunities to improve integrated transport OBJ8.	Both options C and D reduce the level of resilience along the A55 and locally; and have been assessed to have a slight adverse impact for OBJ4. They both perform the worst out of the options from the perspective of project objectives.
Technical Objectives	None of the technical objectives are met.	Option D is the second worst performing option with respect to the technical objectives. Departures will be required. Although there are none that are considered to be a risk to technical acceptability of option, there are issues that might have an impact on the objective to minimise the need to reduce speed limits.
WelTAG Social & Cultural Impact	Although the majority of the social and cultural indicators were assessed overall to be neutral, it is forecast that both Options C and D will result in an increased traffic flow through Penmaenmawr; with the associated social issues such a severance.	Both Option C and D result in a negative accident saving. Also neither of the options maximise opportunities with respect to the well-being goals.
WelTAG Environmental Impact	In general, due to the nature of the project, the impact for the majority of the environmental indicators has been	Options C and D have both been assessed to have a slight adverse impact on the landscape and townscape overall.

J16 - Option D	Strengths	Weaknesses
	assessed to be neutral. Similarly to the other options, the impact on biodiversity was assessed to have a slight beneficial impact, due to enhancement opportunities.	However Option D will have a greater impact on the the local views from Maes-y-Llan and Ysgurbowen Road (compared to Option C).
Economic Impact	Option D has the second from lowest capital costs. The option also, along with Option C, has the highest accident benefits and the second highest local economy benefits. Option D has the highest Present Value Benefits and the second highest benefit cost ratio (1.6).	Option D, along with Option C, has the second highest vehicle operating costs.
Key viability, acceptability and risk	Option D was the least favoured option during the public consultation.	A business key risk for Option D relates to acceptability of the option, both in relation to the key stakeholders such as NMWTRA (as it does provide four-way movement and therefore reduces resilience) but also with respect to the public. The same issues related to the option raised during the public consultation apply, including the need for residents to have to travel westbound via Conwy if Junction 15A is closed (for example if work is being carried out on the headland). However it does not have the benefit of the lesser visual impact. Option D has fewer service risks compared to Option C. However risks such as those related to the potential risk of contamination, and the need to agree an alternative access location with Network Rail, NRW and DCWW, remain.
Overall Performance	Option C and D provide a similar three-way movement solution. However, whereas Option D utilises an overbridge, Option C eastbound slip joins the A55 via an underpass. Consequently, both options performed the same with respect to the project objectives. The main difference relates to the higher standard provided by Option D (compared to C) with respect to departures from standards. Similarly, Option C and D perform the same from the perspective of social and environmental impacts. However, Option D will have a worse visual impact compared to Option C. It should be noted that neither Options C or D maximise opportunities with respect to the well-being goals. A key business risk relates to the acceptability of Option D, as it is the least favoured public option and it is less likely to have the support of key stakeholders as it only has three-way movement. However with respect to service risk, Option D performs better than Option C, as it has fewer risks associated with the delivery of the scheme.	

J16 - Option D	Strengths	Weaknesses
	It is proposed that Option D should be discarded as the worst performing option from the perspective of project objectives, the WelTAG social, cultural and environmental criterion, and business risks related to the acceptability of the option.	

3.4.2 Comparative appraisal of options presented at Public Consultation

3.4.2.1 Options performance against project objectives

As illustrated by Table 3-20 overall both **Options A and B** performed the best.

Option A provides the advantage that it scored particularly well with respect to the objectives OBJ6 (Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists) and OBJ7 (To take reasonable steps to build healthier communities and better environments), as it creates a loop using the existing Sustrans cycle way and a new link road. However, as illustrated by the traffic forecast flow drawings that can be found in Appendix 1, it also resulted in a disproportionate increase in the volume of traffic through Dwygyfylchi and along Glan-Yr-Afon Road to Junction 16A.

In comparison, Option B was forecast to result a minimal increase of traffic through Dwygyfylchi, and was assessed to have a moderate beneficial impact for OBJ5 (Improve journey times, journey time reliability and safety for access onto the A55). This option however as illustrated by Appendix 2 - Table 1 Option B does not provide as many opportunities for enhancements to the environment or to build healthier communities.

From the perspective of performance of options at Junction 16 against the project objectives, the options that performed the best are Options A and B.

Table 3-20: Comparison of option performance with respect to the appraisal of the objectives

Objective	Description of objective	Appraisal summary
OBJ1	Improve access to regional, national and international markets and improve access to employment opportunities	By replacing the roundabout at Junction 16 with a more conventional junction arrangement, it will result in a reduction in delays and associated benefits to the local community as well as wider economic benefits (for example by making development along the A55 corridor more appealing for existing and new businesses). Consequently, all of the options have received a moderate beneficial scoring.
OBJ2	Improve road safety on the A55 from Junction 14 to Junction 16A	Similarly, as all of the options will improve the design standards and safety along mainline A55, they have all received the same scoring. Due to the constraints provided by the existing geometry of the A55, the improvements have been assessed to have a slight beneficial impact.
OBJ3	Improve journey times and journey time reliability on the A55 from Junction 14 to Junction 16A	Since based on the traffic modelling all of the options will provide a similar improvement to journey times and journey time reliability, they have all been assessed to have a moderate beneficial impact.

Objective	Description of objective	Appraisal summary
OBJ4	Improve resilience on the A55 for strategic and local traffic.	Both Options A and B retain four-way movement. However **Option A performs the best** as it maximises resilience as it provides a parallel road which can be used as a local diversionary route in the event of accidents, increasing the level of resilience for the A55 corridor. Options C and D performed poorly, due to the reduced number of movements, resulting in the need for traffic to be diverted through Penmaenmawr and Junction 15A as well as concerns regarding flooding in the underpass (for C).
OBJ5	Improve journey times, journey time reliability and safety for access onto the A55	Although options A and B provide four-way movement via slip roads onto the A55, the option that **performed the best is Option B** which was assessed to have a moderate beneficial impact. This was due to the increased amount of traffic being diverted through Dwygyfylchi for Option A, and the resultant increased risk of accidents.
OBJ6	Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	For this objective, **Options A** was the only option that provided any significant benefit with regards to providing enhanced provision, as it creates a new circular route to the coast at Junction 16A. Notwithstanding, although not currently included in the option layouts, the provision of a footbridge at this location would be beneficial for the other options.
OBJ7	To take reasonable steps to build healthier communities and better environments	Qualitative assessment whether there are opportunities to provide mitigation and/or enhancement measures for each of the options to build healthier communities and better environments. For each of the options being considered there are differing potential to provide enhancements and benefit. **Option A performs particularly well overall**, due to a number of opportunities that have been identified (as detailed in Appendix 2 - Table 1).
OBJ8	Opportunities to provide integrated transport are increased	Qualitative assessment whether the option provides opportunities to improve integrated transport (for example by creating open public spaces that might accommodate parking or improving public transport access). Overall all of options performed similarly, with the exception of Option A which will potentially increase bus use due to shorter journey times eastbound. Otherwise, the main opportunities are provided by improvements to the bus stops as part of the works. Option B was shown as being neutral as the existing bus stop is outside the footprint of the option.
TECH OBJ9	Minimising technical departures from standard (to improve safety)	A technical appraisal of the geometry has been carried out for each of the options. The outcome of this appraisal is that the option that performed the best with respect to minimising technical departures from standards is **Options B**, followed by Options A and D. The option that performed worst was Option C.

Objective	Description of objective	Appraisal summary
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)	Based on technical review, assessment whether the option requires for the speed limit to be reduced, for example due to a departure from standard that may be required due to the proposed arrangement. The two Options that performed the best were **Options A and B** which were scored as being neutral. Both Options C and D performed worst, due to the potential impact of the technical departures from standard related to the existing vertical alignment crest curve in this location.
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)	Based on the potential construction phasing, assessment of the potential disruption in relation to the length of time it may be necessary to reduce the number of lanes, the speed limit or access to Penmaenmawr and Dwygyfylchi during the construction works. The option that performed best was **Option B**, in part due to the fact that much of the work can be constructed off-line.

3.4.2.2 Options performance against social and cultural impacts

The appraisal of the social and cultural impacts is summarised in the AST table which can be found in Appendix 2. The main links between social impacts and transport interventions relate to the impact on:

- Physical activity
- Journey quality
- Accident savings
- Personal security
- Accessibility to employment and services
- Severance
- Permeability in relation to walking and cycling, and
- The impact on equality, diversity and human rights.

As part of the appraisal a light touch distributional impact appraisal and a rapid health impact assessment has been carried out. During this process the impact of other indicators have also been considered in relation to how it might affect the population and amenities in the Penmaenmawr area, including the health issues associated with noise and air quality.

The distributional impact appraisal screening has identified that the location that will be impacted the most by all of the interventions is the length of Ysguborwen Road from Junction 16 to the point where the new junction would be constructed. Although none of the options require properties to be demolished it will have a particularly detrimental impact on both the residential and the commercial properties, including the Gladstone and the Oasis Christian Centre.

This section of road may need improvements, to accommodate all of the traffic flow from Penmaenmawr, including the quarry lorries. This is an issue which has been raised as a particular concern by the local community both from the perspective of noise and the visual impact. However, this impact, depending on the option chosen is relatively concentrated and would affect fewer people directly. This problem will also be an issue for Option A, where the link road passes through a pinch point between houses and the A55. However the effects on Maes-y-Llan can be mitigated by locating link road at the existing A55 level and by either hard or soft screening.

The option that would have the greatest social impact is Option A, both from the perspective of beneficial and adverse localised impacts.

Option A would provide a number of beneficial impacts to the community of Dwygyfylchi (over and above those provided by the other options), such as encouraging physical activity for example by walking, cycling and providing improved access to the coast and beach. It would also improve the bus route through Dwygyfylchi, as it would no longer have to double back to Junction 16 adding in the order of 1.5 km onto the journey in either direction. This is something that will make the bus route more commercially viable for the bus companies and would potentially make it easier for people to access services and employment. The improvement to the bus service will also provide a benefit to residents of Penmaenmawr (and the ward of Pant-yr-afon/Penmaenan), which as illustrated by the population profile in Appendix 2, in September 2017 had an unemployment rate of 3.5% which is higher than the Welsh average of 2%.

Notwithstanding, it is forecast that Option A will result in a disproportionate increase in the volume of traffic through Dwygyfylchi, as the new Junction 16A is forecast to attract cars along Old Conwy Road. They will then travel along Treforris Road, past Capelulo primary school and onto Glan-Yr-Afon Road. This results in increased social and health impacts associated with traffic in these areas, such as noise and severance (ie being able to cross the road). However, conversely it is forecast that the noise levels and the risk of accidents would be reduced along the eastern end of Ysguborwen Road.

It may be feasible to mitigate against these impacts, for example by providing traffic calming or measures to dissuade cars from using the route through Dwygyfylchi as a rat-run. Also, issues with relation to severance may also be mitigated by the installation of pedestrian crossings. However due to the residential nature of the area, with the exception of specific crossing points, for example at Capelulo primary school or at the junction near to St Gwynan's church, it may be difficult to address this issue fully.

Similarly, with the exception of Option B for which the traffic flows are forecast to decrease, there may also be an increased risk in relation to severance along Bangor Road, in Penmaenmawr. However although this issue is not considered to be significant, mitigation measures may be required depending on which option is chosen (for example to provide traffic calming measures).

All of the options are forecast to reduce the amount of traffic using the Sychnant pass, supporting the argument that the current issues in relation to delays and unreliability of the A55 as a route, will be improved by the removal of the roundabouts.

3.4.2.3 Options performance against environmental impacts

Overall, due to the nature of the project the majority of the options performed similarly with respect to the impact on the environment, with the main differences relating to noise from the A55 corridor, how the option sits within the landscape and townscape (ie the visual impact), and what opportunities the option might present with regards to environmental enhancements. As shown in Appendix 2 – Table 1, the option that provides the **greatest opportunities for**

enhancement is Option A. However, care would need to be taken to minimise the impact on the local undesignated biodiversity area.

Overall, the options that perform the best are:

- Noise – **Option B**. (The option that performed the worse is Option C, as the main line needs to be raised on an embankment.)
- Visual impact – **Option C**. (The option that performs the worst, especially from a viewpoint adjacent to the Gladstone is Option B, as it could have an especially detrimental impact on their business.)

Although the impact in relation to air quality is neutral overall, as discussed above, the greater traffic flow may create localised impacts (especially first thing in the morning when engines are running cold and the catalytic convertors are not effective). This is of particular concern if the traffic is queuing along a route where children are walking to school.

3.4.2.4 Key viability criteria, acceptability and risk

As discussed for Junction 15, although inevitably criticism has been received regarding the public consultation, as illustrated by the general levels of engagement with the public, the consultation has allowed the public to be involved in the decision-making process and for the most affected people to receive the information that they needed. Based on the questionnaire responses, the favoured option for Junction 16 for the public was Option C. Whereas the overall preferred option from the perspective of the key stakeholders, including the North Wales Police, NMWTRA and the bus companies was **Option A**. The preference for the Fire Services was Option B, due to the location of their fire station.

Representations have been received not only from the public, but also key stakeholders and the local councils / councillors.

Conwy CBC in their formal response stated that when deciding on the preferred options, the Welsh Government should have regard to the following overall desired local outcomes, as well as considering the views of the elected members for the wards of Pant-yr-Afon/Penmaenan and Capelulo). As illustrated by Table 3-21, the best performing option against the majority of the Conwy CBC local outcomes is split between Options A and B. However on the balance Option B performs slightly better unless Conwy CBC's outcome regarding the additional road maintenance funding needed for Option A is addressed.

Option B would also address some of Cllr Ken Stevens concerns regarding the use of the Red Gables eastbound off slip road. However, the only option which would address many of the issues raised by Cllr Anne McCaffrey (notwithstanding that her preference is for Option C) is Option A.

Table 3-21: Assessment of options against Conwy CBC Desired Local Outcomes

	Desired Local Outcomes	Performance of options against desired local outcomes
(i)	Any **increase** in traffic flows and speeds on county road network is minimised and measures taken to mitigate its impact.	This outcome links to the distributional impact of changes in traffic flow. The options with the minimal changes in traffic flow <5% are for: • Bangor Road, Penmaenmawr – Option B • Conway Road, Penmaenmawr – Option A, B, C and D • Old Conway Road – Option B • Ysguborwen Road, Dwygyfylchi – Options C and D • Glan-Y-Afon Road, Dwygyfylchi – Options B, C and D For this outcome, **Option B performs the best**, followed by Options C and D.
(ii)	Any increase in the maintenance costs of the county road network resulting from the proposals are mitigated through additional road maintenance funding.	This outcome links to the length of any additional county roads. For Junction 16 all of the options would have a similar impact on the county road network, with the exception of Option A which creates approximately 1 mile of county road. This issue however would be mitigated through additional road maintenance funding.
(iii)	The level and speed of traffic diverting off the A55 due to incidents is minimised and measures taken to mitigate its impact.	For all options, traffic calming measures will be designed. Therefore again, all options would perform similarly.
(iv)	The impact on connectivity and journey times between the A55 and the county road network is minimised.	The impact on connectivity and journey times is directly linked to the vehicle operating costs. For this outcome, **the best performing option is Option A**, followed by Options C/D. The worst performing option is Option B.
(v)	Connectivity by active travel modes along the A55 corridor and between the towns/villages and the coast between Junctions 14 and 16A is improved.	This outcome is directly related to Objective OBJ6 (Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists). For OBJ6, **Option A performed the best**. There may however be opportunities for all the options to construct a new footbridge in the vicinity of Junction 16A.
(vi)	The impact on the local environment, including traffic noise, is minimised.	Overall, due to the nature of the project the majority of the options performed similarly with respect to the impact on the environment, with the main differences relating to noise from the A55 corridor, how the option sits within the landscape and townscape (ie the visual impact), and what opportunities the option might present with regards to environmental enhancements. As shown in Appendix 2 – Table 1, the option that provides the greatest opportunities for enhancement is **Option A**. However, care would need to be taken to minimise the impact on the local undesignated biodiversity area. Overall, the options that perform the best are: • Noise – **Option B**. The option that performed the worse is Option C, as the main line needs to be raised on an embankment. • Visual impact – **Option C**. The option that performs the worst, especially from a viewpoint adjacent to the Gladstone is Option B.

	Desired Local Outcomes	Performance of options against desired local outcomes
		Although the impact in relation to air quality is neutral overall, as discussed above, the greater traffic flow may create localised impacts (especially first thing in the morning when engines are running cold and the catalytic convertors are not effective). This is of particular concern if the traffic is queuing along a route where children are walking to school.
(vii)	The impact on local amenity areas is minimised.	The main local amenity areas for Penmaenmawr are the beach, promenade and play areas (such as the football field in Dwygyfylchi). One of the main reported issues relates to noise. All of the options provide an opportunity to reduce the noise impact by removing rumble strips and replacing the surfacing within the scheme footprint with low noise finishes. Also by removing the roundabouts, the emergency services will be less likely to use their sirens. Otherwise, Option A may have a short-term impact on the football field and the public footpath to the Puffin Café and across to the beach. Notwithstanding, this is an impact that can be mitigated against. Consequently, it is noted that although all options perform equally for this outcome, Option A provides the greatest opportunities to create or enhance local amenity areas.
Pant-y-afon / Penmaenan Ward		
Cllr Ken Stevens raised the following points in his representation to the public consultation, with regards to the desired outcomes: • Preference for overpass Option D • Four-way movement is critical • Concern regarding use of Red Gables off slip if travelling from Bangor.		How each option performs with regards to addressing the outcomes is summarised below: • Option D • Four-way movement only provided by Options A and B. As Option A would not address Cllr Ken Stevens concern regarding people using the Gables off slip when travelling from Bangor, and there is not sufficient space to accommodate a fourth arm for Option D, the best performing option otherwise is **Option B**.
Capelulo Ward		
In summary, Cllr Anne McCaffrey had a clear preference with respect to Option C. However, she also raised the following issues that she would like to see addressed: • Safety issues associated with Junction 16A, including signage • Safety issues associated with access to Puffin Services • Noise pollution generally – request for low noise tarmac • Sheep and mountain ponies – need for cattle grids and other barriers • Issues with drainage along Ysguborwen road and ice. • Traffic calming measures – pedestrian crossing and roundabout in Dwygyfylchi. Suggested compensation items:		How each option performs with regards to addressing public concerns is summarised below: • The safety issues associated with Junction 16A would be addressed as part of Option A. • Option A also provides an opportunity to create a new access to Puffin Services, addressing the safety concerns with the current arrangement. • All options address the issue regarding general noise pollution equally, with the exception of Option C which due to the need to elevate the A55 mainline may exacerbate the situation. • The only option which would provide an opportunity to address issues with sheep and mountain ponies gaining access onto the A55 is Option A. • All options provide an opportunity to address the issue regarding drainage equally. • The only option where mitigation with respect to traffic calming might be considered appropriate in Dwygyfylchi

	Desired Local Outcomes	Performance of options against desired local outcomes
	• Provision of a fully furnished community centre and outdoor space • Provision of equipment and upgrade of football field (to a multi-purpose use)	(due to the forecast in increased traffic flow through the village) is Option A. The consideration of the compensation items are outside the scope of the project. However it should be noted that Option A is the only option which affects the field that is currently is it understood to be used for football. Notwithstanding Cllr Anne McCaffrey's preference for **Option C**, the option which will address the majority of the issues raised is **Option A**.
Penmaenmawr Town Council		
No collective statement was received from Penmaenmawr Town Council.		N/A

The two main significant service risks for Junction 16 (which include design risks, planning risks, build risk, the quality of the initial site investigation and surveys, environmental risks, procurement risk, in addition to risks related to the whole life of the asset), are risks associated with:

- **Ground contamination** in the vicinity of the roundabout at Junction 16 (which potentially affects Options B, D and D); and
- **Delivery of programme** for Option A because of the physical extent of scheme compared with the options (plus the need to interface with Network Rail), and for Option C due to the need to raise the ground level in the order of 4.5m.

Overall, the Option at Junction 16 with the most manageable significant service risks is Option B.

3.4.3 Mitigation of concerns raised during the public consultation

The primary concerns raised during the public consultation for Junction 16 (Penmaenmawr and Dwygyfylchi) related to the increases in traffic flow and impacts on the local community (such as due to noise and children walking to school) for all of the options, the visual impact especially in relation to Option B, the potential loss of green open space associated with options A and B and the need to maximise the schemes contribution to well-being goals overall. Additionally, issues were raised with respect to the service risks associated with the delivery of Option A (such as the interface with Network Rail's North Wales coast railway line).

How the concerns have been addressed is described below, and have split as follows:

- Mitigation for increases in traffic flow (for all options)
- Issues associated with Option A
- Visual impact of the scheme (especially Option B)
- Loss of green open space used by the community (Options A and B)

3.4.3.1 Mitigation for increases in traffic flow (for all options)

The key concerns raised in relation to increases in traffic flow and impacts on the local community, relate to the following:

i. Option A: is forecast to in a significant increase in traffic flow through Dwygyfylchi;

ii. Options A and B: will result in the need for eastbound vehicles (including lorries from the Quarry) to travel along Ysguborwen Road to reach the new junctions; and
iii. Options C and D: are forecast to result in an increase in forecast traffic flow along the west end of Ysguborwen Road.

To address the first point, further SATURN traffic modelling has been carried out to confirm that it would be feasible to mitigate the forecast increased traffic flow through Dwygyfylchi, by means of traffic calming measures. This traffic calming acts by lowering the average speed along the links, making it more economic for the traffic to revert to routes that are similar to the existing situation.

Table 3-22: Do Something Junction 16 Option A with Traffic Calming, Two-way Traffic Flows (AADT) for 2037

Link	AM Peak	% Difference compared to DM	Inter Peak	% Difference compared to DM	PM Peak	% Difference compared to DM
Ysguborwen Rd west of village	336	138%	213	115%	222	80%
Treforris Rd	7	-68%	7	-42%	13	-32%
Ysguborwen Rd village centre	34	-33%	31	-59%	46	-65%
Glan Yr Afon Rd	41	11%	49	-38%	57	-56%
Link Rd	349	N/A	242	N/A	244	N/A

As illustrated by Table 3-22, for the design year (2037), with the traffic calming measures the majority of the traffic flow is transferred away from the centre of Dwygyfylchi via the section of Ysguborwen Rd to the west of village, onto the Link Road for the AM Peak, Interpeak and the PM Peak. Notwithstanding an increase in forecast traffic flow is still predicted along Glan Yr Afon Road for the AM Peak.

To address the second point, further highway geometric design work has been carried out to assess the feasibility of realigning the link road so that it ties-in with the county road closer to the existing roundabout for Option A. This would limit the length of Ysguborwen Road that would be affected by increased traffic flows; as traffic such as the Quarry lorries travelling eastbound from Penmaenmawr would be diverted onto the link road before reaching the residential properties. Further traffic modelling would need to be carried out during WelTAG Stage Three to confirm how the local traffic flow would be reallocated due to the extended link road.

Considerable work had already been carried out prior to the public consultation, which determined that there is minimal scope to reposition Option B towards the west, whilst retaining four-way movement. Therefore no further action has been taken to mitigate Option B.

No further action has been taken with respect to the third point, as the reason for the addition forecast traffic flow is due to the fact that both Options C and D only provide three-way movement. Therefore, there is minimal opportunity to mitigate.

3.4.3.2 Issues associated with Option A

For Junction 16 Option A, a number of issues were raised during public consultation such as the concerns about the impact of increases in traffic flows (discussed above), and the buildability of the option, especially in relation to its impact at Maes-y-Llan and the risks associated with the interface with Network Rail. Moreover concerns were raised regarding existing drainage issues

along Ysguborwen Road and the options' impact on existing green open space. A revised version of Option A has been developed to address these concerns.

Extension of link road to tie in with Junction 16:

As described above, further highway geometric design work has been carried with respect to the tie-in with Ysguborwen Road. By diverting traffic directly onto the link road (avoiding the need to use Ysguborwen Road), as illustrated by Figure 3-5, mitigated Option A addresses the concerns raised by the public in respect to the volume of traffic using Ysguborwen Road and the associated impact on residents. By aligning the link road closer to the A55 it minimises the impact on open green space which is used by the community (such as areas used for dog walking or playing sports).

Figure 3-1: Mitigated Option A – Realigned tie-in with Ysguborwen Road

Both during and following the public consultation, work has been undertaken in response to concerns raised regarding the impact on the properties in Maes-y-Llan that are closest to the A55. The cross-sections produced from the work carried out during the public consultation were presented during a public meeting with residents, organised by Conwy CBC. This work has confirmed that there is sufficient space to accommodate a narrow 'green' strip of land (with enough space for a noise barrier if required), and to construct a retaining wall between the properties and the new link road. The properties will be elevated above the new link road, thus separating them from the traffic.

Mitigation of service risks associated with the interfaces at Junction 16A:

A primary concern raised with respect to the service risks associated with Option A relates to the interface with the Dwr Cymru Welsh Water (DCWW) access and risks associated with the new bridge across the Network Rail north coast railway line. To address this concern, additional highway geometric design work has been undertaken to determine the feasibility of repositioning

the junction to negate the need to construct a new bridge, without adversely affecting design standards. The revised layout shown in the figure below retains the well-being benefits associated with Option A, including: improved access to the National Cycle Network Route 5 (NCN 5), the potential creation of new links to active travel routes, in addition to opportunities to reduce severance with the coast and encourage healthy lifestyles.

Figure 3-2: Mitigated Option A – DCWW treatment works accessed via eastbound off slip road

Representatives from the Welsh Government Departures Panel and A55 Network Management Team have been consulted since the end of the public consultation. Although their feedback has been incorporated into the layout shown in the figure above, the revised layout at Junction 16A introduces a minor risk with respect to the acceptability of the DCWW access to the departures panel.

3.4.3.3 Visual impact of the scheme (especially Option B)

One of the main areas of concern raised with respect to all options, and especially Option B, related to the visual impact of the scheme. Following the public consultation, consideration has been given whether enhancements to the design could address these concerns.

As discussed above, the visual impact of Option A could be minimised by realigning the link road closer to the A55, at a lower level and potentially in a false cutting, facilitating enhanced screening. Similarly, for Options C and D, there are opportunities to reduce the visual impact of the option. This would be less extensive than for Option A, as the footprint of the options is less.

Notwithstanding, the greatest concern in relation to visual impact was raised for Option B. The tender version of the option layout incorporated costings for a false cutting to minimise the visual impact associated with the realigned section of the A55 corridor and the potential to screen the

bridge structure by means of planting. Although this will improve the view from Maes-y-Llan and the majority of the properties along Ysguborwen Road, it is acknowledged that the screening may block out the view of the sea for some properties and the position of the junction will result in a notable impact on the views from properties such as the Gladstone even with mitigation. Notwithstanding, it is recognised that local residents are also concerned about the link road and eastbound slip roads (and vehicles/quarry vehicles on them) which remain unmitigated.
Considerable work was undertaken prior to the public consultation to investigate the feasibility of accommodating a four-way junction closer to the existing roundabout. Therefore, although further refinement of the location may be feasible at detailed design, it is not envisaged that this would have make a significant difference to the visual impact for Option B overall.

3.4.3.4 Loss of green open space used by the community (Options A and B)

Concerns were raised by the public with respect to loss of green open space used by the community for Options A and B. For Option A the impact can be minimised by realigning the link road closer to the A55. Whereas for Option B, which crosses through land which it is understood is used by dogwalkers, it may be possible to address this concern by means of enhancements.

3.4.3.5 Effectiveness of mitigation to address the key concerns raised during the public consultation

The table below details the potential effectiveness of mitigation measures to address key concerns raised during the public consultation.

Table 3-23: Summary of effectiveness of potential mitigation measures for options to address concerns

Potential effectiveness of measures to:	Option A	Option B	Option C	Option D
Mitigate increased traffic flow through Dwygyfylchi	✓	N/A	N/A	N/A
Mitigate increased traffic flow along Ysgurborwen Road	✓	×	×	×
Reduce visual impact of scheme	✓	×	✓	✓
Reduce the loss of green open space used by the community	✓	✓	N/A	N/A

3.4.4 Value for Money Statement

As illustrated by the figures in Table 3-24, the option that presents the **best value for money** for Junction 16 **is Option B**. This option is one of four options that have been sifted from a long list of options considered under WelTAG Stage One which considered a broad range of interventions ranging from integrated transport options to improvements to the junction itself.

Option B also provides the advantage that it is the least expensive intervention option, with a **Present Value Capital (PVC) cost in the order of £18.3 million**. Additionally, although it has the most significant impact with regards to increased vehicle operating costs (the least impact was provided by Option A), it is the only option for Junction 16 that does not have negative accident benefits.

All of the options have similar levels of benefits to the local economy (including wider economic benefits) in the order of £1million.

As the BCR for Option B is 1.7 it places it in the Medium 'Value for Money' band. However as per Junction 16, it should be noted that as summer peak flows have not been taken into account during the economic appraisal it is expected that the benefits are currently understated.

The main area of uncertainty relates to the extent of the economic growth and how the economic benefits might be uplifted for summer traffic peak flows. No sensitivity test has been carried out to ascertain the extent of this impact. No issues have been identified with regards to the robustness of data sources.

Table 3-24: Summary of the Economic Appraisal for Junction 16

	Option A	Mitigated Option A	Option B	Option C	Option D
Present Value Capital Costs, Excluding VAT (at 2018 prices)	**£23,027**	**£22,571**	**£18,328**	**£21,843**	**£18,893**
Present Value Benefits (PVB) (discounted to 2010 prices)	£20,906	£21,029	£22,357	£22,617	£22,767
Present Value Costs (PVC) (discounted to 2010 prices)	£16,451	£16,127	£13,107	£15,603	£13,508
Net Present Value (NPV) (discounted to 2010 prices)	£4,455	£4,902	£9,250	£7,014	£9,259
Benefit Cost Ratio (BCR)	**1.2**	**1.3**	**1.7**	**1.3**	**1.6**
Value for money band	**Low**	**Low**	**Medium**	**Low**	**Medium**

3.4.5 Summary of Option Appraisal

The appraisal of the project objectives has been updated to take into account the mitigation measures. The three key areas where the appraisal has been changed compared to the AST table presented at public consultation are for:

- **OBJ4 – Improve resilience on the A55 for strategic and local traffic**, where further information from meetings with NMWTRA indicate that the parallel distributor will provide additional resilience between J16 and 16A compared with other options. OBJ4 for the mitigated Option A has therefore been assessed to have increased from having a neutral impact to a moderate beneficial impact. The increase in the level of resilience has also been reflected in the table, comparing the options performance, which can be Section 3.3.1.1.
- **OBJ7 – To take reasonable steps to build healthier communities and better environments**. The original option included for essential mitigation. Further environmental enhancement measures could be incorporated, such as the creation of a habitat corridor. Additionally, the creation of additional footpaths and cycleway links will encourage active travel and health lifestyles. Moreover, for the mitigated Option A, many of the social issues associated with the distributional impact of increased flows through Dwygyfylchi and along Ysguborwen Road have been negated. Therefore the option has been assessed overall to have a moderate beneficial impact.

- **TECH OBJ11 – Minimising disruption during construction.** As the length of construction period has been reduced, OBJ11 has been assessed to have a slight adverse impact instead of a moderate adverse impact.

Table 3-25: Summary of WelTAG 2 Appraisal of Junction 16 Options

Criteria	Option A	Mitigated Option A	Option B	Option C	Option D
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.	++	++	0	-	-
OBJ5 Improve journey times, journey time reliability and safety for access onto the A55	+	+	++	0	0
OBJ6 Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	+	+	0	0	0
OBJ7 To take reasonable steps to build healthier communities and better environments[50]	++	++	0	0	0
OBJ8 Opportunities to provide integrated transport are increased	+	++	0	+	+
TECH OBJ9 Minimising technical departures from standard (to improve safety)	--	--	-	---	--
TECH OBJ10 Minimising the need to reduce speed limits (to reduce delays)	0	0	0	-	-
TECH OBJ11 Minimising disruption during construction (to local residents and business, as well as along the A55 itself)	--	-	-	--	--
Social and Cultural Impacts					
Physical Activity	+	+	0	0	0
Journey quality (Delay savings pcu.hrs - AMP, IP, PMP)	+	+	+	+	+

[50] Following the public consultation and the identification of additional benefits, the scoring from this option was increased from having a slight beneficial to a moderate beneficial impact.

Criteria	Option A	Mitigated Option A	Option B	Option C	Option D
Accident Savings[51]	9	7	10	13	13
Personal security	+	+	0	0	0
Accessibility to employment and services (Journey speed increase kph - AMP, IP, PMP)	+	+	+	+	+
Severance	0	0	0	0	0
Permeability (walking cycling)	+	+	0	0	0
Equality, diversity & Human Rights	0	0	0	0	0
Environment					
Noise	-	-	0	--	-
Air quality	0	0	0	0	0
Greenhouse gases	0	0	0	0	0
Landscape and townscape	+	+	--	-	-
Historic environment	0	0	0	0	0
Biodiversity[52]	++	++	+	+	+
Water environment	++	++	0	0	0
Economic Impacts (£ thousands)					
Journey time changes (discounted to 2010 prices)	£22,240	£21,831	£22,866	£23,017	£23,017
Journey time reliability savings (seconds per vehicle - AMP, IP, PMP)	16, 9, 15	16, 9, 15	16, 10, 16	17, 10, 15	17, 10, 15
Vehicle Operating Costs (discounted to 2010 prices)	-£1,092.00	-£341.00	-£1,772.00	-£1,441.00	-£1,441.00
Accident Benefits (discounted to 2010 prices)	£550.00	£465.60	£549.00	£721.00	£721.00
Local economy (Wider Economic Benefits, discounted to 2010 prices)	£989.00	£1019.00	£974.00	£1,002.00	£1,002.00
Economic Appraisal (£ thousands)[53]					
Present Value Capital Costs, Excluding VAT (at 2018 prices)	**£23,027**	**£22,571**	**£18,328**	**£21,843**	**£18,893**
Present Value Benefits (PVB) (discounted to 2010 prices)	£20,906	£21,029	£22,357	£22,617	£22,767
Present Value Costs (PVC) (discounted to 2010 prices)	£16,451	£16,127	£13,107	£15,603	£13,508

[51] The accident savings have been updated since the Public Consultation, for Options A and C / D. They were previously quoted as -32 and -21 respectively in error.

[52] Following the environmental surveys, which were carried out during the public consultation period, additional opportunities for enhancement were identified and the impact on biodiversity has been assessed as having a moderate beneficial impact (compared to the slight beneficial impact reported previously). Similarly, increased opportunities for benefits were identified for the water environment.

[53] The economic impacts, including the PVB and NPV, have been updated for Option A and C / D since the Public Consultation

Criteria	Option A	Mitigated Option A	Option B	Option C	Option D
Net Present Value (NPV) (discounted to 2010 prices)	£4,455	£4,902	£9,250	£7,014	£9,259
Benefit Cost Ratio (BCR)	**1.2**	**1.2**	**1.7**	**1.3**	**1.6**
Value for Money	**Low**	**Low**	**Medium**	**Low**	**Medium**

4. FINANCIAL CASE

As described in the WelTAG 2017 guidance [1], the purpose of the financial case is to present information regarding whether an option is affordable in the first place and the long term financial viability of the scheme. It has been confirmed that funding for the project will be sourced both via European (WEFO) and the Welsh Government.

Assumptions

The lifetime costs for the scheme will be built up as the project develops based on a number of assumptions, including:

- The financial case costs presented are for the preferred option(s) combined;
- Ongoing maintenance requirements will be similar to the existing situation, with the additional costs for the structures being balanced against the reduced costs associated with maintaining the mainline highway. Therefore, the revenue profile has been presented as having a net zero cost.
- The construction will be completed by 2023, with a three-year maintenance period;
- Allowance will be made for inflation;
- Risk allowances and contingencies will be developed;
- Whole life costings, including costs for re-use, disposal and end of life will be developed; and
- The impact of environmental, social and cultural issues will be quantified as appropriate.

Summary of the financial appraisal

The indicative financial implications of the proposed investment are projected to be spread over the seven-year period as per the following table. This spend and funding profile will be updated as the WelTAG appraisal process progresses.

Table 4-1: Spend and funding profile

£million (Including VAT)	**Year 0 (2020)**	**Year 1 (2021)**	**Year 2 (2022)**	**Year 3 (2023)**	**Year 4 (2024)**	**Year 5 (2025)**	**Year 6 (2026)**	**Total**
Preferred way forward:								
Capital	£3.70	£11.90	£22.65	£14.90	£0.90	£0.25	£0.20	£54.50
Revenue	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Total	**£3.70**	**£11.90**	**£22.65**	**£14.90**	**£0.90**	**£0.25**	**£0.20**	**£54.50**
Funded by:								
Existing	£3.04	£6.31	£10.50	£7.30	£0.90	£0.25	£0.20	£28.50
Additional (WEFO)	£0.66	£5.59	£12.15	£7.60				£26.00
Total	**£3.70**	**£11.90**	**£22.65**	**£14.90**	**£0.90**	**£0.25**	**£0.20**	**£54.50**

As the WelTAG appraisal develops, the following information will be provided:

- A statement with regards to the overall affordability of the scheme
- Confirmation with respect to who has expressed their support for the proposed scheme.
- Any variation to the funding arrangements

5. COMMERCIAL CASE

The purpose of the commercial case is to describe whether a scheme will be commercially viable, whether it is going to be possible to procure the scheme and then continue with it in the future. Further details will be provided as the WelTAG appraisal process develops.

5.1 The Procurement Strategy

Subject to further analysis at WelTAG Stage Two Outline Business Case stage, it is envisaged the scheme will be procured in accordance with the Government Procurement Agreement (WTO) and the EU Consolidated Public Sector Procurement Directive (2004), with the following Key Stages:

- Key Stage 3: Outline design and associated Environmental Impact Assessment documents
- Key Stage 4: Statutory process
- Key Stage 5: Procurement of a contractor
- Key Stage 6: Construction

Up to Key Stage 4:

The project will be delivered up to Key Stage 4, by means of a NEC3 Professional Services form of contract (Option C Target Cost).

Key Stage 5:

In Key Stage 5 the Welsh Government and it's Employer's Agent will procure a Design and Build Contractor to deliver the preferred options, should the Inspector recommend the Draft orders be made. The Contractor will be appointed using the NEC3/4 Option A or C Form of Contract. This is consistent with how similar schemes are being delivered by Welsh Government. The decision as to which Contract option will be determined following completion of the Inquiry and will be determined upon the market conditions and Risk Transfer preferences.

Key Stage 6:

The Design and Build Contract would be appointed to deliver the scheme including a three-year period of aftercare. Depending upon the Junction Option the Date for Completion would be included, and it is expected for the Contractor to deliver the works in that period to avoid delay damages. The Contract would be administered by the Welsh Government Employer's Agent.

5.2 Potential for Risk Transfer and Potential Payment Mechanisms

The main risks associated with the scheme include:

- The dependency of the project on EU funding, including in relation to the EU funding business case criteria and programme;
- Ministerial approval to proceed/ gain the powers to construct the road;
- Avoiding programme delays and cost over-run during construction; and
- Stakeholders – a detailed stakeholder engagement plan is to be developed and maintained as the scheme progresses.

A risk management strategy is in development to enable informed decision-making, reduce the likelihood of unanticipated events and address unresolved risk items at the earliest opportunity. A risk register will be developed for all project activities. A quantitative risk assessment methodology will be developed which will be actively managed as a live process throughout the project. A summary of the high level risks associated with each option can be found in Appendix 2.

At the start of construction, risks are clearly allocated to the parties on the basis of which is best able to positively influence the outcome.

Other risks related to record keeping, procurement, eligibility of expenditure and state aid are managed by the EU programme team within the Welsh Government.

6. MANAGEMENT CASE

The purpose of the management case is to inform with regards to whether an option is achievable. The management case will be developed throughout the WelTAG appraisal process, to provide details of the delivery arrangements for the project, and management during its lifetime; including the arrangements for procurement, construction and ongoing operation, in addition to undertaking monitoring and evaluation once the intervention is constructed.

6.1 Project Management Arrangements

Overall responsibility for the delivery of major road schemes in Wales lies with the Deputy Director Infrastructure Delivery, who reports to the Director for Transport and ICT Infrastructure and then to the Deputy Permanent Secretary for the Economy Skills and Natural Resources.

A Core Management Team will be set up and will be responsible for the day-to-day detailed management of the scheme. The Core Management Team would be led by the Welsh Government Project Managers and includes representatives of the Employer's Agent, the consultant's team and later members of the contractor's team procured to deliver the scheme. The primary activities would include:

- Promoting the scheme both internally and to external partners and stakeholders – an agreed stakeholder consultation plan was agreed at the beginning of WelTAG Stage Two. This will be reviewed and updated as the project progresses;
- Ensuring the scheme delivered is the optimum solution;
- Ensuring scheme activities comply with Welsh Government policy;
- Ensure the scheme complies with its commitment to the Sustainability Objective of the Welsh Government;
- Ensuring the scheme is delivered to budget & programme; and
- Ensuring the scheme delivers Value for Money within delegated financial commitments.

The Core Management Team would report to a Strategic Board which oversees the strategic direction of the scheme. The Strategic Board comprises senior personnel from the Transport Division within Welsh Government. The role of the Strategic Board would be to:

- Consider and approve the ongoing Business Case to enable scheme development to continue;
- Agree the final procurement option;
- Approve the preferred bidder;
- Agree on a high-level project timetable for delivery - the timetable presented during the WelTAG Stage Two public consultation is shown in Figure 6-1 below. It will be reviewed at the end of WelTAG Two; and
- Review the scheme against Policy objectives at agreed milestones and provide continued commitment and endorsement where appropriate.

The scheme also includes a Project Board responsible for strategically managing the scheme between key milestones. The Project Board forms a link between the Strategic Board and the Management Team. It comprises senior personnel from each of the main parties to the scheme. The role of the Project Board is to manage by exception and only intervening with the work of the Project Team where necessary:

- Create an environment in which the scheme can thrive;
- Advise and support the Project Team;
- Setting boundaries between key decision points;
- Championing early dispute resolution where possible; and
- Promoting the ethos of partnering.

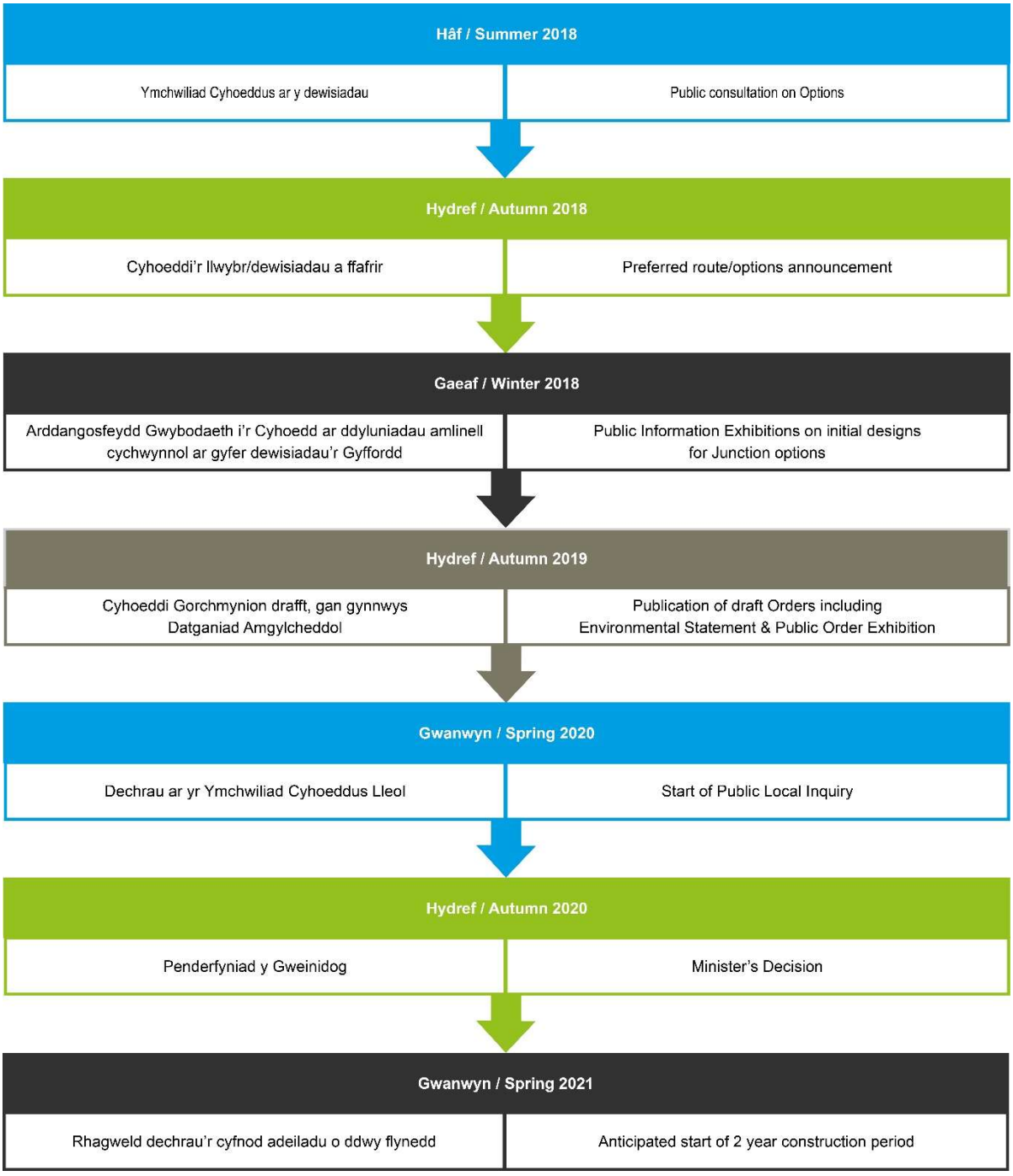


Figure 6-1: Project timetable at the end of WelTAG Stage Two (at the time of writing)

6.2 Gateway Reviews Arrangements

The scheme would be progressed in line with Transport Division's linear Key Stage Approval process to obtain financial approval for projects through all stages of design and construction. Each key stage will be subject to a review by members of the Project Board to seek approval to continue to the next stage:

Key Stage 3:	Relates to the development stage and will include the outline design and production of the associated Environmental Impact Assessment documents. The stage incorporates the production of the WelTAG Stage Two Outline Business Case (OBC). During WelTAG Two the short list of options are examined in further detail. The OBC provides the evidence required for the Review Group to select a preferred option to take forward to Stage Three. Much of the information which will be used to inform the decision as to whether or not to proceed onto KS4, implementation and the WelTAG Stage Three Full Business Case (FBC) is collated during KS3.
Key Stage 4:	Is the statutory process stage to seek the powers to build the road. This stage generally involves the publication of draft Orders and if required, a local public inquiry. As well as agreement of the final target cost for construction. The FBC is written during KS4 and presented along with the monitoring and evaluation plan for WelTAG Stage Four (Implementation) and WelTAG Stage Five (Post Implementation).
Key Stage 5:	Is the stage where a contractor will be procured for the scheme. After the procurement exercise, a final price and set of defined deliverables will be available. The FBC is updated to reflect the final agreed project price, scope and deliverables. Is the construction phase, which will proceed subject to the satisfactory completion of the statutory procedures, the availability of finance and the Minister's decision. This phase relates to the detailed design, construction, defects maintenance and environmental aftercare periods.
Key Stage 6:	The stage includes the production of the WelTAG Stage Four (Implementation) and WelTAG Stage Five (Post Implementation) document. The aim of these documents is to record what happens and what is delivered, within the wider context (for example weather conditions or changes in legislation/policy). This will enable lessons to be learnt and may lead to alterations to the scheme. The information collated during Stage Four will support the evaluation of the scheme during WelTAG Stage Five.

Performance in delivery of the project will be monitored in accordance with the Transport's Roads Procedures Guidance System to provide governance approval through all stages of design and construction. Output will be based on routes created or reconstructed.

Detailed performance indicators and procedures for monitoring the performance shall be developed for all advisors, consultants and contractors involved in the project. Performance shall be measured quarterly in accordance with procedures set out in Infrastructure Group 'Supplier Performance Monitoring Regime'.

6.3 Technical Working Groups

The Review Group which will meet at the end of each stage, will for WelTAG Stage Two, consist of the following functions represented at the Transport Working Group. In addition, representatives from North and Mid Wales Trunk Road Agent and Network Rail will be invited, including:

- Project delivery and management (Welsh Government);
- Resilience (Welsh Government);
- Transport/traffic modelling (Welsh Government's agent/designer);
- Compliance with technical highway design standard;
- Buildability expertise (Contractor); and
- Environmental issues (Welsh Government's agent/designer).
- North and Mid Wales Trunk Road Agent (NMWTRA)
- Network Rail

6.4 Links to other assessments

In addition to the cross-cutting policies referred to in Section 2.5, WelTAG has a links to a number of other assessments, including those related to planning, the environment, health and social impact.

The requirement for an EIA

The Determination process (EIA Screening) has been commenced and the need to carry out a statutory Environmental Impact Assessment has been established. The screening process has also identified the need to produce a separate Environmental Statement for the improvements at Llanfairfechan (Junction 15) and Penmaenmawr/Dwygyfylchi (Junction 16). Because the two schemes will involve two geographically separated Draft Orders, with no connecting Line Order, two separate Public Inquiries would be required, with one for each set of Draft Orders. To ensure that both sets of Draft Orders are assessed separately, an Environmental Statement will accompany each set. The scope of the Environmental Statements will form the subject of two separate EIA Scoping Reports and Scoping Opinions and Records of Determination from the relevant authority.

Assessment of Impacts on European Sites (AIES)

The two schemes are within 30 kms of a number of statutory designated sites. The closest of these are a marine Special Area of Conservation (SAC) and a Special Protection Area (SPA) which lie to the north at a distance of less than 500 metres.

The 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 SI 2017/1012. In the UK, sites supporting the most representative or best example of:
habitats and non-bird species are designated as Special Areas of Conservation (SAC)
significant numbers of birds, including wintering, breeding and migratory populations are designated as Special Protection Areas (SPA).

Regulation 63 of the *Habitats Regulations* requires a Competent Authority, to consider whether the plan or project is likely to have a significant effect on a European site and so an Assessment of Implications for European Sites (AIES) is required. The assessment is carried out in stages which commence with a Stage 1, the Test of Likely Significance of the Assessment of the Implications on European Sites (AIES). If required, a Stage 2 Statement to Inform an Appropriate Assessment (SIAA) will be prepared.

AsHIdol

The schemes lie within the boundary of a Historic Landscape, North Arllechwedd, (HLW (Gw) 12). This is a non-statutory designation established by Cadw, the Countryside Council for Wales (CCW) and the International Council on Monuments and Sites (ICOMOS UK) and all sites are listed on a Register of Landscapes of Historic Interest in Wales. Development within a designated historic landscape will require an Assessment of the Significance of the Impacts of Development on Historic Landscape (ASIDHOL). There is a defined method for this process and one will be required for each scheme.

Conservation assessments of World Heritage Sites, Scheduled Ancient Monuments, Listed Buildings, Listed Parks and Gardens, Conservation Areas

Both schemes will directly affect some designated heritage sites and will potentially or indirectly affect others. The Historic Environment (Wales) Act 2016 amends the Planning (Listed Buildings and Conservation Areas) Act 1990. Should any proposed development conflict with the objective of preserving or enhancing the character or appearance of a Conservation Area, Listed Building or their setting, there will be a strong presumption against the grant of planning permission.
A Heritage Impact Assessment is required and a heritage impact statement must be prepared in all cases where development proposals require listed building consent, conservation area consent or an application for scheduled monument consent. An assessment could also be required where the development affects a World Heritage Site.

Protected Species Licences: 'Ghost licences'

The presence of Protected Species mean that European Protected Species Derogation Licences (Otter and Bat species) could be required for both schemes and a Development Licence to exclude badgers from setts (if found to be present) might also be required.

Marine Licences/Permits (if working in tidal range)

Construction or activity that affects the inshore or offshore areas will require a Marine Licence. It is unlikely that either scheme will affect the inshore areas (areas that are submerged at the mean highwater spring tide). Junction 15 (Llanfairfechan) Option B could require construction of a link road down to the Promenade within the inshore limit. Works at Junction 16a (Dwygyfylchi) Option A could require construction in the inshore limit to provide a new access road to the sewage works.

7. CONCLUSIONS AND WAY FORWARD

The purpose of the OBC, as described in WelTAG 2017, is to "examine in greater detail the short list of options for tackling the problem under consideration" and to provide the evidence required for the selection of the preferred option to be taken forward to stage three, full business case. It describes the appraisal of the short-list of five options for Junction 15 and four options for Junction 16, which were presented during the 12-week WelTAG Stage Two Public Consultation (which commenced on the 4 June 2018). It also considers the proposed mitigation measures in response to comments during the public consultation. The findings, of this report, take the views of key stakeholders and the public into consideration.

The Impact Assessment carried out under WelTAG Stage Two has been undertaken in line with the WelTAG 2017 guidance, applying the DfT WebTAG Transport Analysis Guidance for the transport appraisal process in a proportionate manner. Each option on the short-list has been assessed either qualitatively or quantitively, as appropriate for the stage of the process, against the criteria to allow the social and cultural, environmental and economic impacts to be compared.

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
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
TECH OBJ9	Minimising technical departures from standard (to improve safety)
TECH OBJ10	Minimising the need to reduce speed limits (to reduce delays)
TECH OBJ11	Minimising disruption during construction (to local residents and business, as well as along the A55 itself)

The final stage in the appraisal process has been to assess whether the short-list options would pass key viability and acceptability criteria, including whether the scheme would be deliverable from the perspective of:

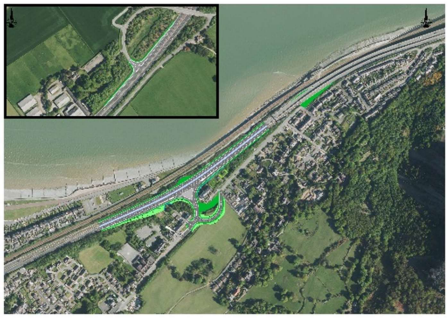
a) Business risks which relate to the risk that the Welsh Government cannot meet its business and/or transport objectives and any resultant reputational risk. It also includes the risk that the scheme would not be acceptable to stakeholders and the public.
b) Service risks are those related to the risk that the intervention is not fit for purpose. These include: design risks, planning risks, build risk (eg. Constructability), the quality of the initial site investigation and surveys, environmental risks, procurement risk, in addition to risks related to the whole life of the asset including funding, maintenance, technological obsolescence and the level of demand.
c) External systematic and catastrophe risks which by their nature are unpredictable. These are risks that affect all of society and are not necessarily directly connected to the project.

A summary of the performance of each option for Junctions 15 and 16 can be found below.

7.1 Junction 15

Summary of the Junction 15 option's performance

Junction 15 Option A



Map data © 2018 Google

Although the overall social and environmental impact on Llanfairfechan is minimal, Option A performs worse compared to the other options from the perspective of the project objectives. It performs particularly poorly with respect to the impact on the level of resilience, access onto the A55 for local residents and the increased risk of accidents. The option also does not maximise opportunities towards the 'well-being goals'. Although it has the lowest capital costs, Option A provides poor value for money, with the lowest BCR of all of the options.

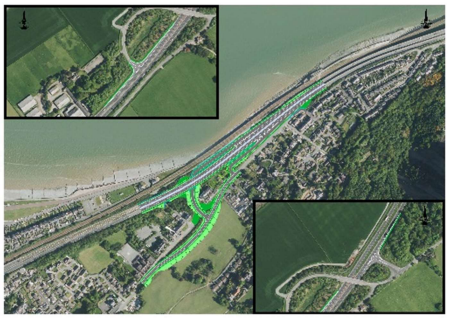
As the issues described above are not considered to be tenable in the long-term, it is proposed that Option A should be dropped.

Junction 15 Option B

Map data © 2018 Google

The option performed well against the project objectives and the WelTAG social and environmental criteria, as the option retained four-way movement and was the only option that improved access to the promenade. However these benefits need to be balanced against the social and environmental impact; including the impact of the demolition of residential properties, the visual impact of the structures and the impact on village life and the promenade. Additionally, the option carries the greatest risk from the perspective of public acceptability and service risks associated with the interface with Network Rail and the SAC. Option B also has the highest capital cost and provides low value for money.

Junction 15 Option C



Map data © 2018 Google

Option C performed reasonably well against the project objectives and provides the advantage that it is favoured by the public locally as it is expected to have less of an impact on the community. In particular, it minimised the number of residential properties that would require demolition. However, the option creates an 'island' which brings its own social impacts. It also performs the worst with respect to the number of accidents compared with the other options and carries the greatest risks with respect to key stakeholder acceptability for technical departures standards. Option C provides poor value for money.

Therefore, especially as the option reduces the level of resilience below the current level, it is proposed that Option C should be discarded.

Junction 15 Option D

Map data © 2018 Google

Option D performs the most consistently well out of the options. Overall it has either a neutral or a beneficial impact for the project objectives. It is also the option that has the least changes in traffic flow and resulting distributional impact on the community. Similarly, taking into account the environmental impact and the overall potential for benefits or enhancements, it is the option which performs the best at Junction 15.
From the perspective of business risks, although it may not be the favoured option for key stakeholders it meets their desired outcomes.
Although it was the second least favoured option for the public, the option addresses many of the concerns raised either directly or through its potential to provide opportunities for mitigation. In particular mitigated Option D negates the need to demolish the Fernbank properties. Further opportunities to mitigate the impact of the demolition on the Sunnybank properties exist, which could also be pursued. The option also provides the opportunity to improve the visual impact of the structures within the setting with landscaping. The mitigation measures do not have a detrimental impact on the options performance against the objective.
Critically Option D and has the least impact on Penmaenmawr Road and the Promenade, due to changes in traffic pattern, and provides the benefit that the junction is set away from the primary school. Notwithstanding Option D provides low value for money.

Junction 15 Option E

Map data © 2018 Google

Out of the options, Option E layout provided a median performing option from the perspective of the project and technical objectives. Overall it has a neutral impact from a social perspective. Although, it provides an opportunity to minimise the number of residential properties that might need to be demolished, by relocating the roundabout adjacent to the school it has introduced the potential for long term social and health impacts. It has also created an 'island' which brings its own social impacts.
Moreover Option E performs the worst from the perspective of the environmental impact due to its location within the conservation area (and also the impact on biodiversity). It was the worst performing option from the perspective of public opinion.
Option E provides low value for money.
Since the social issues are considered to be untenable in the long-term, it is proposed that Option E should be dropped.

Impact on the community of Llanfairfechan

Out of the options, only Options B, D and E maintain the existing standards with respect to resilience. Whereas Options A and C provide a reduced standard of resilience; which means that the scheme would impact on local access to services and employment. For Option A this would detrimentally impact on peoples access to key services in Conwy, whereas Option C would affect people wishing to access services in Bangor (such as the A&E department and the maternity ward at Ysbyty Gwynedd).

Notwithstanding, as highlighted above, Option B along with Option D to a lesser extent (especially with mitigation), would require the demolition of residential properties; some of which is new low-

cost housing. This is an extremely emotive issue, which has attracted a lot of concern locally, and it is recognised that it could have a notable short term social impact both in relation to the health of the occupiers and the surrounding community.

An alternative would be to choose Option E which, avoids the problem by demolishing the Heath building. However this option introduces alternative social and cultural concerns. These primarily relate to concerns regarding the long term impact of the new roundabout, which is located adjacent to the primary school, on vulnerable persons such as children due to the effect of severance and the increased localised risk of air pollution from starting and stopping vehicles. Concerns have also been raised with respect to severance socially (due to the creation of an island effect) and culturally (as the new roundabout and link road to the A55 would sever the conservation area). The Heath building is owned by Conwy CBC and, although it is known to have a resident bat population, if re-developed would provide opportunities for quality housing. Therefore, it is suggested that applying the principle of sustainable development as per the Well-being of Future Generations Act, any options that introduce the risk of long term social or health issues (which can't be mitigated), such as for Option E, should be discarded.

A similar approach can be applied in relation to the choice between Option D and Option B, as it could be argued that it would be short-sighted to not take advantage of the opportunities associated with creating the link to the Promenade under Option B, due to the short-term concerns regarding the need to demolish properties. However for this option to be taken forward, concerns regarding how the structure would alter the character of Llanfairfechan and how large vehicles would be able to turn before reaching the A55 underpass (in addition to the social impact of the increased traffic flow along the promenade and Station Road) would need to be addressed. In particular, it is worth noting that although this option would benefit residents on the promenade it would disproportionately result in a dis-benefit to other residents of Llanfairfechan and Pendalar, due to the increase in Vehicle Operating Costs associated with Option B.

The option that performs the best against the majority of the Conwy CBC's desired local outcomes is Option D. However, this option is not supported by the local community and councillors. Notwithstanding, as illustrated by the outcome of the assessment of the options against the local councillors and Llanfairfechan Town Council's collective statement, it is not possible to satisfy all of their concerns which include:

i. Minimising visual impact
ii. Reducing the need to demolish houses and
iii. Providing the greatest safety benefits

The options which perform well for the first two points in comparison perform particularly poorly from the perspective of safety. Therefore, there is a risk that whichever option is chosen it will not be acceptable to the local residents or councillors at Junction 15.

Nevertheless, as illustrated by the work carried out since the public consultation, many of these concerns can be addressed to some degree by mitigated Option D, including:

- The visual impact can be minimised by created landscape zone between two bridge spans;
- By realigning the junction approximately 20m towards the west and placing the eastbound link road on the skew, negates the need to demolish the new Fernbank properties; and
- The junction arrangement maximises sight line distances, and provides an arrangement that would accommodate traffic calming measures. The arrangement also provides the least impact on Penmaenmawr Road.

Comparative performance of the options

For Junction 15, the options that perform the best against the project objectives is Option B. This option has the highest capital cost and the median Benefit Cost Ratio (BCR). It also has the greatest significant service risks, due to its interface with Network Rail and it vicinity to the SAC. In addition, as an option it is very emotive with local residents due the benefits that it provides with regard to improved access, but also the impact that it will cause to the centre of the community, from the perspective of concern about increased traffic along the Promenade and along Penmaenmawr Road, its visual impact but also due to the number of houses that would need to be demolished.

The pattern above was reflected by the key stakeholders, including the emergency services, NMWTRA and the bus companies, who preferred Option B (followed by Options D/E as they provide four-way movement), with Option A being the least favoured option.

The second best performing option against the project objectives was Option D. In contrast with Option B, although Option D has second highest capital cost, it also has the highest BCR and far fewer risk associated with delivery. The option that results in the least changes in traffic flow, and resulting distributional impact on the community, is Option D. Also as it is located on the edge of the community, its immediate impact will be less.

Overall, mitigated Option D is the option that will provide the greatest opportunities to maximise the contributions to the Welsh Government's well-being goals, as follows:

- A prosperous Wales – Although both Options B and mitigated D both provide full-movement junctions at Junction 15, improving access to employment and services, there more opportunities for the mitigated Option D to promote a sustainable design that fits better within its setting.
- A resilient Wales – Both Options C and mitigated Option D provide opportunities to create new habitat as part of the scheme. However due to the size of the footprint of the scheme, these opportunities are limited. Notwithstanding through collaboration, the scheme could also act as a catalyst to increase awareness of environmental issues and eco-tourism for all of the options.
- A healthier Wales – As described above, due to the limited scheme footprint, although there are limited opportunities to create new amenities, through collaboration with other bodies (such as Conwy CBC Active travel team), all of the options provide equal opportunities to encourage healthy lifestyles.
- A more equal Wales – Options B and mitigated Option D will provide similar opportunities with respect to improved access to services and employment, compared with Options A and C which due to the reduced junctions movements could have a detrimental impact.
- A Wales of cohesive communities – In comparison with Option B, mitigated Option D will have less of an immediate detrimental impact on the community. It is also the option that has the least distributional impact from traffic flow, and an option that does not introduce severance or create social islands.
- A Wales of Vibrant Culture and Welsh Language – All of the options provider a similar opportunity to promote culture, heritage, the Welsh language, and participation in art, sports and recreation. Nevertheless, each of the options will have a varying impact on the local community, which has to be balanced against the benefits provided.
- A globally responsible Wales – Consequently, it is held that the mitigated Option D provides the greatest benefits (by providing four-way movement and maximising resilience), whilst providing the greatest opportunities to place the well-being of the community and nation at the heart of the scheme.

Way forward for Junction 15 (Llanfairfechan)

It is recommended that mitigated **Option D** at Junction 15 should be considered for being taken forward as the preferred option. The mitigated option comprises of the measures to minimise the need to demolish residential properties (to meet project objective OBJ7). It is recommended that mitigation and enhancement measures should be adopted to maximise opportunities with respect to the well-being goals, including (not-exclusively):

- Promote improvements to Junction 14 (to meet project objective OBJ2);
- Incorporate measures to ensure reduction in traffic speeds on link roads to levels commensurate with the local road system (to meet project objective OBJ5)
- The replacement of the existing footbridge to minimise the impact of severance to the coast for non-motorised users (to meet project objective OBJ6);
- Encourage and enable active travel enhancements – such as improving the Sustrans National Cycle Route 5 (NCR5) through Pendalar or improvements to the North Wales Coast Path (to meet project objectives OBJ6 and OBJ7);
- As part of development of the design for mitigated Option D, consider further the viability of further mitigation to negate the impact;
- Incorporate environmental enhancements as part of the scheme – such as the creation of new, or more accessible, public open space within land take associated with the scheme, and the improvement of habitat connectivity along the A55 (to meet project objective OBJ7); and
- Investigate measures to minimise the impact of the closure of the bus gate on the population of Pendalar (to meet project objective OBJ8).

The enhancement measures could be funded either as part of the scheme, other transport schemes or collaboratively by partner organisations.

7.2 Junction 16

Summary of the Junction 16 option's performance

Junction 16 Option A

Overall Option A performs the best in relation to the project objectives. Moreover, Option A provides the greatest benefits compared to the other options both with respect to social and environmental impacts.
It is the only option that provides the opportunity to substantially improve the resilience of the A55 corridor for Penmaenmawr and Dwygyfylchi, as part of the scheme. Additionally it is the only option that provides a significant betterment for eastbound buses, and for resilience. Similarly it is the only option that creates new links to the coast, new active travel routes and has the potential to create a new habitat corridor.

Map data © 2018 Google

Option A provides the advantage that the junction is located away from the residential areas of Penmaenmawr and Dwygyfylchi, allowing it to be screened effectively, reducing its visual impact. Moreover, the option provides the opportunity by placing the link road in a false cutting, to not only screen the link road but also to mitigate against some of the existing environmental impacts (including noise and visual impact) associated with the A55 corridor.

A key benefit is that it was a preferred option for the majority of key stakeholders, performed well against the Conwy CBC local outcomes and addressed many of the issues raised by Cllr Anne McCaffrey. In addition, although it was not a favoured public option, many of the public's concerns can be addressed through the design, such as:

- Further traffic modelling has shown that providing traffic calming measures mitigate against the increased traffic forecast through the villages of Dwygyfylchi and St Gwynan's; and
- Extending the link road to tie in at Junction 16, negates the need for traffic (for example from the quarry) to use Ysguborwen Road.

Similarly the key service risk associated with the delivery of Option A can be mitigated by negating the need to construct a bridge over the Network Rail north coast railway line. The option also has the advantage that it provides greater flexibility to design and construct the works; and the greatest opportunities to address concerns raised during the public consultation. The mitigated version of Option A has similar capital costs to Option C. Notwithstanding that it provides low value for money (from the perspective of the BCR), the non-monetised benefits provided by the option maximise the opportunities to contribute towards the Welsh Government 'well-being goals'.

Junction 16 Option B

Map data © 2018 Google

Overall, Option B is the second best performing option against the project objectives, and the best performing option with respect to the technical objectives. Similarly, for the majority of the social criterion, it has been assessed to have a neutral impact. Moreover, Option B has been assessed to have the greatest detrimental impact compared to the other options from the perspective of the environmental impact, in particularly in relation to the impact on the townscape and landscape, for which it has been assessed to have a moderate adverse impact.

Although the option performed well from the perspective of responses from key stakeholders and the public consultation, feedback has been that it is not necessarily supported locally. Consequently, the business risk associated with public acceptability remains. Otherwise the option performs relatively well in relation to service risks; with the main significant risk being associated with the potential for contamination within the site area.
Option B has the lowest capital cost and provides medium value for money. Although in its current form it does not maximise opportunities with respect to the well-being goals, additional benefits could be provided by further environmental and active travel enhancements (such as additional footpath connections and a new footbridge across the A55 in the vicinity of Junction 16A, creating a new circular walking/cycling route).

Junction 16 Option C

Both Options C and D provide a three-way movement solution. However, whereas Option D utilises an overbridge, Option C eastbound slip joins the A55 via an underpass. Consequently, both options perform the same with respect to the project objectives, and the WelTAG social and environmental criterion. The main difference relates to the lower standard provided by Option C with respect to departures from standards, due to the physical constraints. Option C performed the worst environmentally due to noise.

Map data © 2018 Google

Of the options, Option C has the greatest number of service risks associated with the delivery of the scheme, which could impact on the programme. It should be noted that neither Options C or D maximise opportunities with respect to the well-being goals.
Option C has the second from highest capital cost and provides a low value for money. Although in its current form it does not maximise opportunities with respect to the well-being goals, additional benefits could be provided by further environmental and active travel enhancements (such as additional footpath connections and a new footbridge across the A55 in the vicinity of Junction 16A, creating a new circular walking/cycling route).

Junction 16 Option D

Option C and D provide a similar three-way movement solution. However, whereas Option D utilises an overbridge, Option C eastbound slip joins the A55 via an underpass. Consequently, both options performed the same with respect to the project objectives. The main difference relates to the higher standard provided by Option D (compared to C) with respect to departures from standards. Similarly, Option C and D perform the same from the perspective of social and environmental impacts. However, Option D will have a worse visual impact compared to Option C.

Map data © 2018 Google

A key business risk relates to the acceptability of Option D, as it is the least favoured public option and it is less likely to have the support of key stakeholders as it only has three-way movement. However with respect to service risk, Option D performs better than Option C, as it has fewer risks associated with the delivery of the scheme.
It is therefore proposed that Option D should be discarded as the worst performing option from the perspective of project objectives, the WelTAG social, cultural and environmental criterion, and business risks related to the acceptability of the option. Option D provides a medium value for money. Although in its current form it does not maximise opportunities with respect to the well-being goals, additional benefits could be provided by further environmental and active travel enhancements (such as additional footpath connections and a new footbridge across the A55 in the vicinity of Junction 16A, creating a new circular walking/cycling route).

Impact on the community of Penmaenmawr

The main impacts for Penmaenmawr relate to the level of resilience provided by whichever option replaces the existing roundabouts. Currently Junction 16 provides an alternative to the use of Red Gables slip road when travelling from Conwy. Only option B would provide this locally. The next

best option is Option A, whereby residents would have to travel further via Junction 16A and the new link road. Option B is the closest to the option variation supported by Cllr Stevens and has the least impact with respect to traffic in Penmaenmawr itself. However, it does not have as many social benefits as Option A, such as those associated with an improved bus route or the beneficial health issues associated with the introduction of a circular walking/cycling route.

Impact on the community of Dwygyfylchi

Without mitigation, the option that has the greatest potential social impact for Dwygyfylchi due to the increased forecast traffic flows, both from the perspective of beneficial and adverse localised impacts, is Option A. However, as illustrated by the SATURN traffic modelling, the mitigated Option A mitigates against many of these impacts; for example by extending the link road towards Junction 16, and by providing traffic calming, pedestrian crossings or measures to dissuade cars from using the route through Dwygyfylchi as a rat-run. Notwithstanding, Option A also brings the greatest opportunities. This argument is illustrated in Section 3.3.2, which highlights that Option A would address the majority of issues and concerns raised by Cllr Anne McCaffrey.

In contrast, the majority preference expressed locally by residents (and Cllr Anne McCaffrey) is for Option C which has the least visual impact from the Gladstone; whereas Option B has the greatest visual impact from the Gladstone. It should be noted though, that although the position of the Gladstone is prominent, it is only one viewpoint, and the view of the junction would be screened by landscaping for many of the overlooking properties. Moreover critically Option C does not provide the current level of resilience and consequently it is envisaged that it would not be supported by key stakeholders such as NMWTRA and did not perform strongly against the stated Conwy CBC Desired Local Outcomes.

Comparative performance of the options

For Junction 16, the options that perform the best against the project objectives are Options A and B. These are also the preferred options from the perspective of the key stakeholders, with Option A being preferred by the North Wales Police, NMWTRA and the bus companies.

Overall, Option A is the option that will provide the greatest opportunities to maximise the contributions to the Welsh Government's well-being goals, as follows:

- A prosperous Wales – Mitigated Option A is the only option that will provide an improvement to resilience to the A55 corridor (Objective OBJ4). It is also the only option, which will include measures to encourage sustainable/active travel and tourism, such as making the coast and the Sustrans cycleway more accessible. Mitigated Option A is also the only option which will improve bus routes.
- A resilient Wales – In addition to promoting sustainable travel, the mitigated Option A is the only option that will maximise opportunities to create habitat corridors and create new public open spaces. These enhancements could also act as a catalyst to increase awareness of environmental issues and eco-tourism.
- A healthier Wales – The creation of the new link road and associated habitat corridor, will create a new circular route which will intercept existing footpaths and provide improved access to the beach for walkers and cyclists. Consequently, mitigated Option A is the option that provides the greatest opportunities to encourage healthy lifestyles.
- A Wales of cohesive communities – The only options that will either maintain the equivalent to the current connectivity are Options A and B. Moreover, with the creation of the link road, mitigated Option A will improve connectivity.

- A more equal Wales – Although Option B provides many of the benefits which will improve access to employment and services, unlike mitigated Option A it would not create opportunities to improve sustainable transport.
- A Wales of Vibrant Culture and Welsh Language – As described above, the mitigated Option A provides the greatest opportunities to promote pride in the local area. However, based on the public consultation feedback, the option that is most likely to receive local support is Option C.
- A globally responsible Wales – The mitigated Option A consequently provides the greatest opportunities to place the well-being of the community and nation at the heart of the scheme.

Although Option B has a higher BCR and lower cost compared with Option A, as many of these additional benefits are non-monetised they are not reflected in the economic appraisal.

Notwithstanding, some of the benefits could be provided by measures (such as the construction of a new footbridge at Junction 16A to improve access to the beach or the creation of environmental enhancement as part of the associated screening works). However these measures would be limited to the far smaller footprint it would not be to the same extent and their impact would not be significant.

Way forward for Junction 16 (Penmaenmawr and Dwygyfylchi)

It is recommended that the mitigated **Option A** at Junction 16 should be considered for being taken forward as the preferred option. The mitigated Option A comprises mitigation measures, including traffic calming and extension of link road, to minimise changes in traffic flows through Dwygyfylchi and along Ysguborwen Road (to meet project objective OBJ7). It also incorporates changes to the junction arrangement at Junctions 16 and 16A. It is recommended that mitigation and enhancement measures should be adopted to maximise opportunities with respect to the well-being goals, including (not-exclusively):

- Investigate whether the Puffin Services access could be improved (to meet project objective OBJ2);
- Investigate ways of increasing linkages to the Sustrans National Cycle Route 5 (NCR5), to maximise opportunities associated with reducing severance to the coast for non-motorised users (to meet project objective OBJ6);
- Encourage and enable active travel enhancements – such as creating a new active travel route along the link road, which will create improved linkages with Dwygyfylchi and Penmaenmawr (to meet project objectives OBJ6 and OBJ7);
- Incorporate environmental enhancements as part of the scheme – such as the creation of new, or more accessible, public open space within land take associated with the scheme, measures to improve the overall landscape and visual effect of the A55, and opportunities for the creation of habitats, and the improvement of habitat connectivity along the A55 (to meet project objective OBJ7).

The enhancement measures could be funded either as part of the scheme, other transport schemes or collaboratively by partner organisations.

8. GLOSSARY & ABBREVIATIONS

Glossary	
ARCADY	Transport software used to assess roundabouts
COBA	The COBA (COst Benefit Analysis) software estimates the effects of highway improvements in terms of travel time, vehicle operating and accident costs on users of the road system.
LSOA	Lower Layer Super Output Areas are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales. Lower Layer Super Output Areas are built from groups of contiguous Output Areas and have been automatically generated to be as consistent in population size as possible, and typically contain from four to six Output Areas. The Minimum population is 1000 and the mean is 1500.
NTEM	The National Trip End Model (NTEM) model forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling
STATS19	Road safety data about the circumstances of personal injury road accidents in Great Britain from 1979. The statistics relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form.
S-PARAMICS	Traffic simulation model software
SUSTRANS	Charity whose aim is to make it easier for people to walk and cycle
TEMPRO	Trip End Model Presentation Program (TEMPRO) is used for viewing the National Trip End Model (NTEM) information
TUBA	The TUBA software performs transport scheme economic appraisals in accordance with the Department for Transport's guidance.
WIMD	The Welsh Index of Multiple Deprivation (WIMD) is the Welsh Government's official measure of relative deprivation for small areas in Wales. It is designed to identify those small areas where there are the highest concentrations of several different types of deprivation. It is a National Statistic and is produced by statisticians at the Welsh Government.

Abbreviations	
AST	Appraisal Summary Table
ATA 2013	*Active Travel Act* 2013
BCR	Benefit Cost Ratio
CCTV	Closed Circuit Television
DfT	Department of Transport
DM	Do Minimum
DN	Do Nothing
DS	Do Something
FGA 2015	*Well-being of Future Generations (Wales) Act* 2015
HA	Highways Agency
HGV	Heavy Goods Vehicle
Junction	Junction (of the A55)
LDP	Local Development Plan
LSOA	Lower Level Super Output Area (also known as a Lower Super Output Area)
LTP	Local Transport Plan
mph	Miles per hour (speed)
NCN5	National Cycling Network Route 5
NMU	Non-motorised users
NMWTRA	Mid Wales Trunk Road Agent
NTEM	National Trip End Model
NHS	National Health Service
NRW	Natural Resource Wales
NTP	National Transport Plan
OBC	Outline Business Case
PCU	Passenger Car Units
PIA	Personal injury accident
PIE	Public Information Exhibition
PM Peak	Highest hourly afternoon/evening traffic flow
PVB	Present Value Benefits
PVC	Present Value Costs
RTC	Road Traffic Collision
SOC	Strategic Outline Case
TADR	Traffic and Accident Data Report
TEMPRO	Trip End Model Presentation Program
TEN-T	Trans-European Transport Network
VOC	Vehicle operating costs
VMS	Variable Messaging Sign
WebTAG	Transport analysis guidance (produced by the DfT)
WEFO	Welsh European Funding Office
WelTAG	Welsh Traffic Appraisal Guidance
WIMD	Welsh Index of Multiple Deprivation

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APPENDIX 1
STRATEGIC CASE

Appendix 1 - Table 1: Bus services serving Llanfairfechan, Penmaenmawr and Dwygyfylchi[54]

Service	Bus route	Serves
5	Llandudno-Conwy-Bangor-Caernarfon	Westbound bus services 5 and X5, access Dwygyfylchi at Junction 16A, passes through Penmaenmawr, continues on the A55 via Junction 15A and access Llanfairfechan from Junction 15 before they exit on A55 via Junction 14. Eastbound routes of bus services 5 and X5 exit Llanfairfechan at Junction 14, continue on the A55, accessing Penmaenmawr via Junction 15A and exiting Dwygyfylchi via Junction 14A, where they have to travel west along A55 and use Junction 16 roundabout to turn around to head east.
X5	Llandudno-Conwy-Bangor-Caernarfon	
A55	Llandudno-Conwy-Bangor-Caernarfon	Westbound and eastbound routes of the A55 bus service are the same for both directions, with buses accessing/exiting Llanfairfechan at Junction 14, continuing on the A55, accessing/exiting Penmaenmawr at Junction 15A and finally accessing/exiting the A55 via Junction 16.
75	Llanfairfechan-Llandudno	Bus service 75 accesses/exits Llanfairfechan at Junction 14, continues on the A55, accesses/exits Penmaenmawr via Junction 15 and finally enters/exits Dwygyfylchi from Junction 16A.

[54] Source: http://www.conwy.gov.uk/en/Resident/Parking-Roads-and-Travel/Public-Transport/Assets-Bus-pass/documents/Bus-Information/Conwy- Public-Transport-Guide-2018.pdf

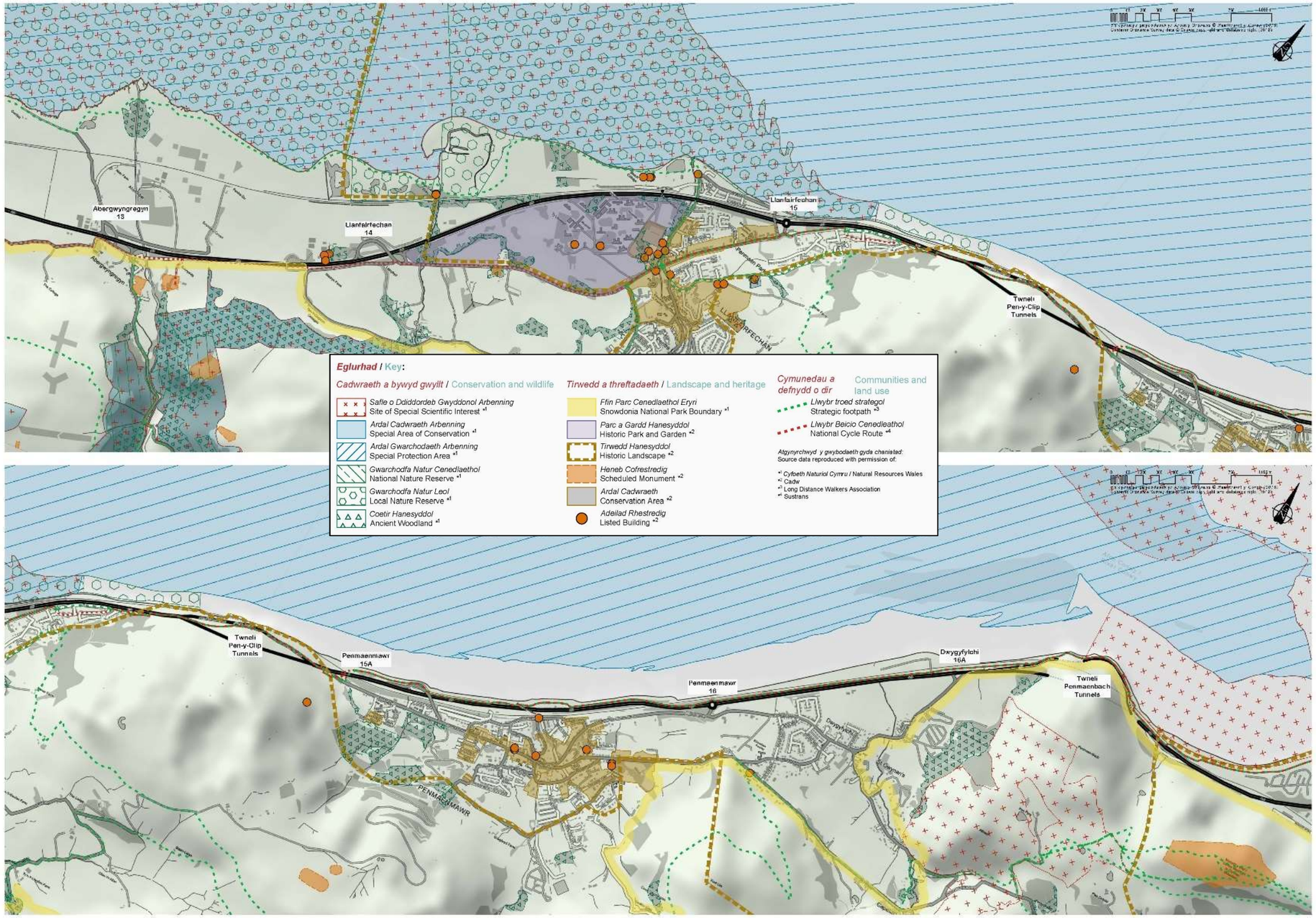
Appendix 1 - Table 2: Population profiles of the wards in the vicinity of Junctions 15 and 16[55]

Indicator	Junction 15		Junction 16		Conwy CBC	Wales	GB
	Bryn	Pandy	Pant-yr-afon/ Penmaenan	Capelulo			
Population (ONS MYE)							
Mid-year population 2016	1900	1900	2750	1350	-	-	-
Children 0-15	16.2%	17.4%	16.1%	14.8%	16.2%	17.9%	18.8%
Young people 16-29	16.1%	14.8%	15.8%	10.5%	14.0%	18.0%	18.3%
Older people 65+	**21.6%**	**23.0%**	**20.8%**	**29.7%**	27%	20%	18%
Health (Census 2011)							
People with limiting long term illness	**24.9%**	20%	22.8%	**29.1%**	24.2%	22.7%	17.9%
Ethnicity (Census 2011)							
Ethnic Minorities	1.3%	1.6%	1.5%	0.9%	2.3%	4.4%	14%
Welsh speakers	45%	48.4%	34.1%	33.3%	27.4%	19%	-
Religion and beliefs (Census 2011)							
Christian	59.6%	59.1%	56.7%	64.7%	64.7%	57.6%	59.3%
Other religion	0.8%	0.5%	1.5%	0.9%	1.5%	2.7%	8.4%
Level of deprivation							

[55] Source: http://www.conwy.gov.uk/statistics Statistics being used under the terms of the Open Government Licence.

Indicator	Junction 15		Junction 16		Conwy CBC	Wales	GB
	Bryn	Pandy	Pant-yr-afon/ Penmaenan	Capelulo			
September 2017 unemployment claimant rates (NOMIS, 2017)	2.1%	1.4%	**3.5%**	1.0%	1.8%	2.0%	1.9%
Households below 60% GB median (= £17,669) (CACI PayCheck, 2016)	30%	29.5%	29.5%	29.5%	34%	34%	29%
Children in families receiving tax credits (HMRC, 2016)							
In work families	40.0%	**41.2%**	**43.4%**	**44%**	44.4%	40.0%	38.8%
Out of work families	20.0%	22.1%	**23.6%**	14%	20.5%	22.1%	19.8%
Personal security (North Wales Police, 2017)							
Annual crime rate per 1000 population	32.49	30.46	50.16	23.34	55.24	65.91	77.94

Appendix 1 - Figure 1: Plan showing environmental constraints in the vicinity of A55 Junctions 15 and 16



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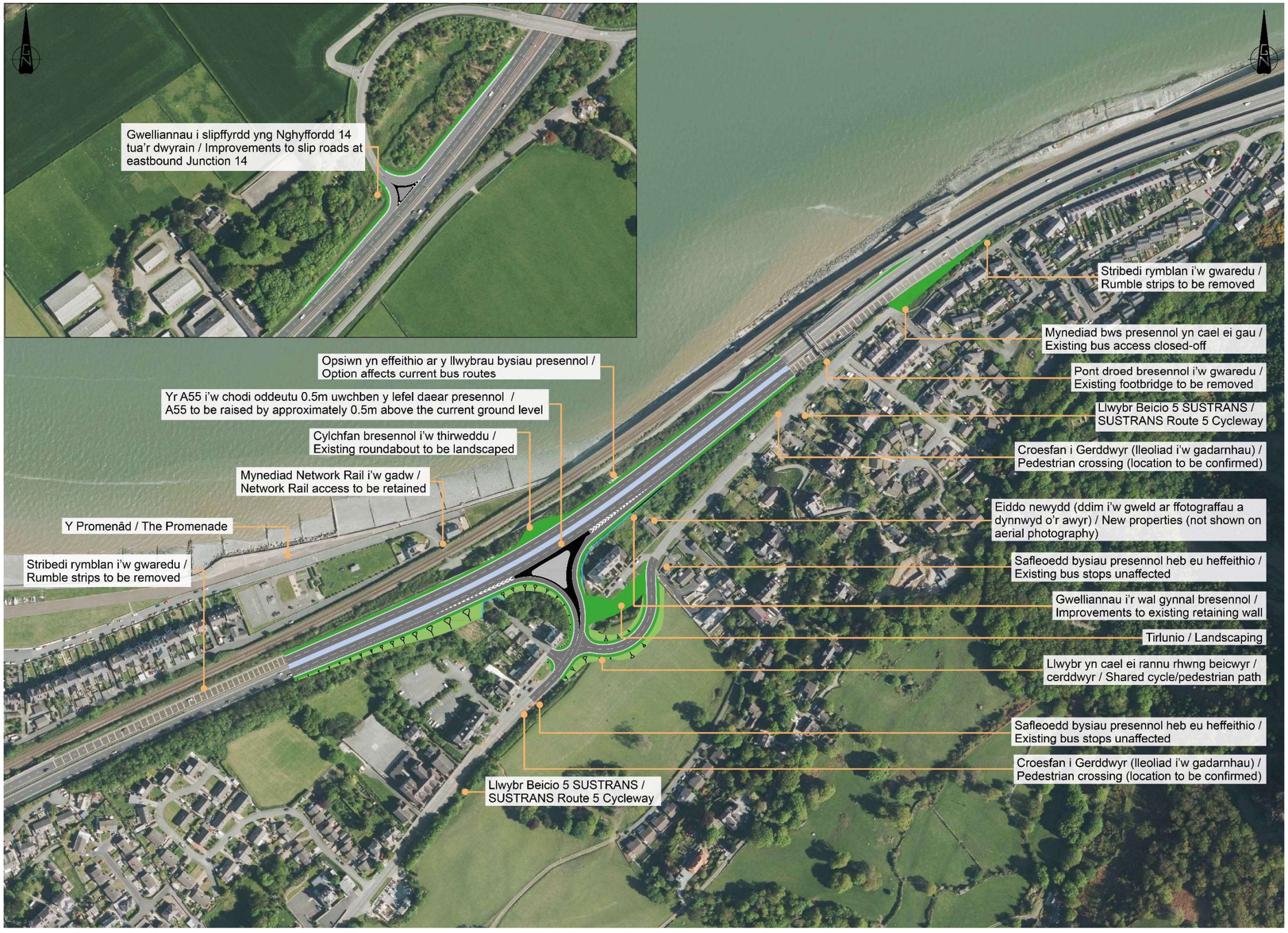
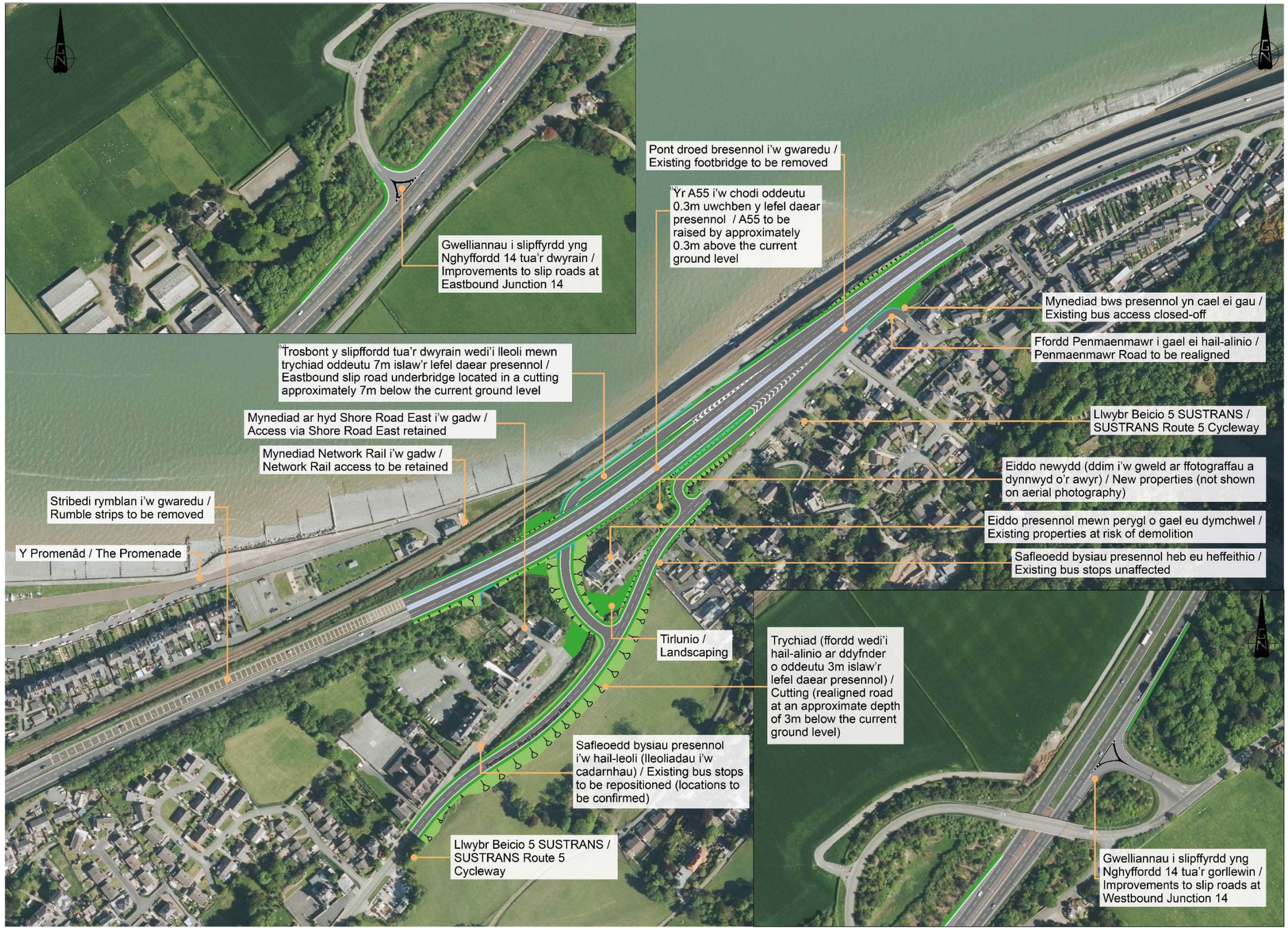
Appendix 1 - Figure 2: A55 Junction 15 OPTION A

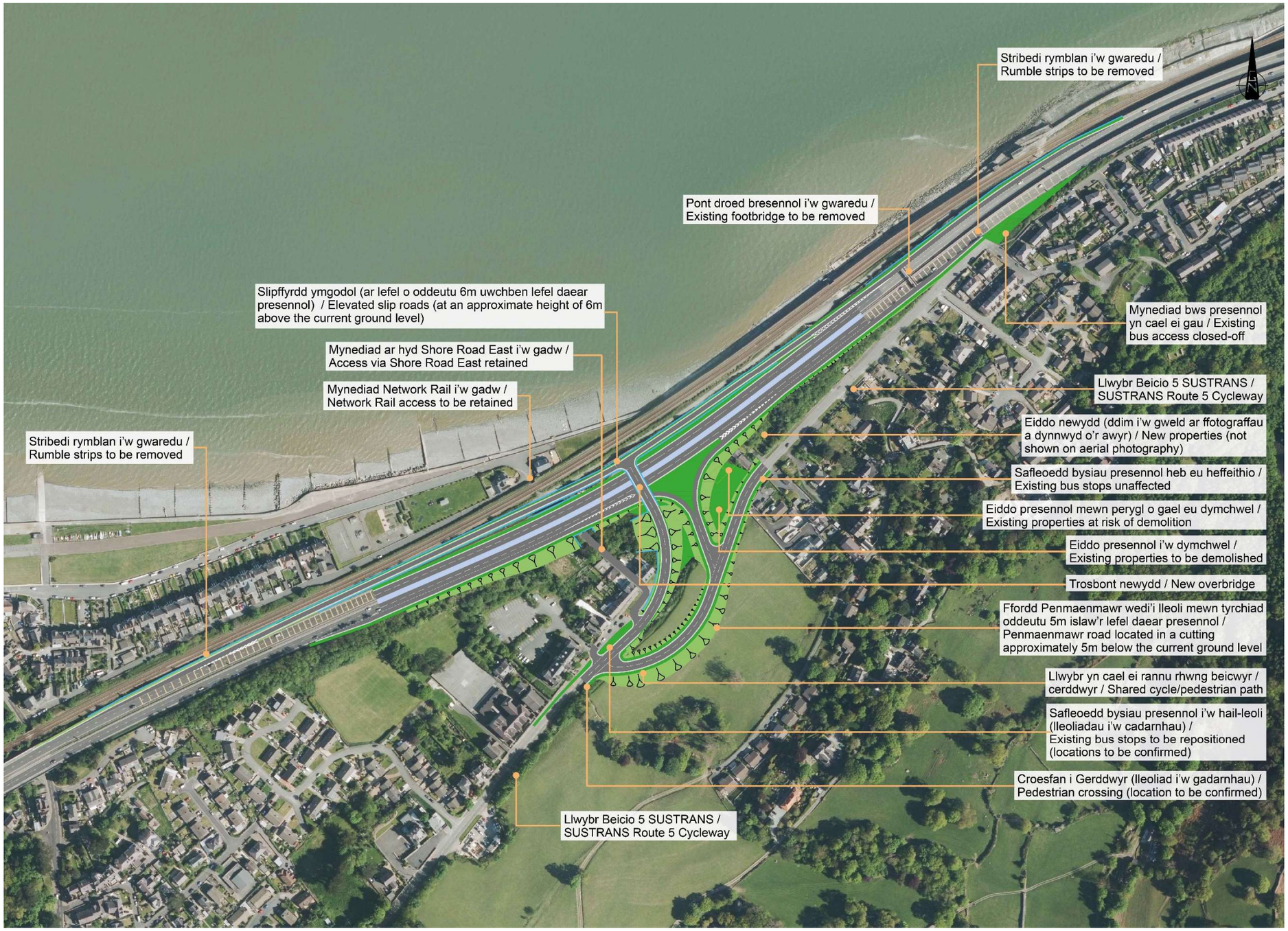


Appendix 1 - Figure 3: A55 Junction 15 OPTION B

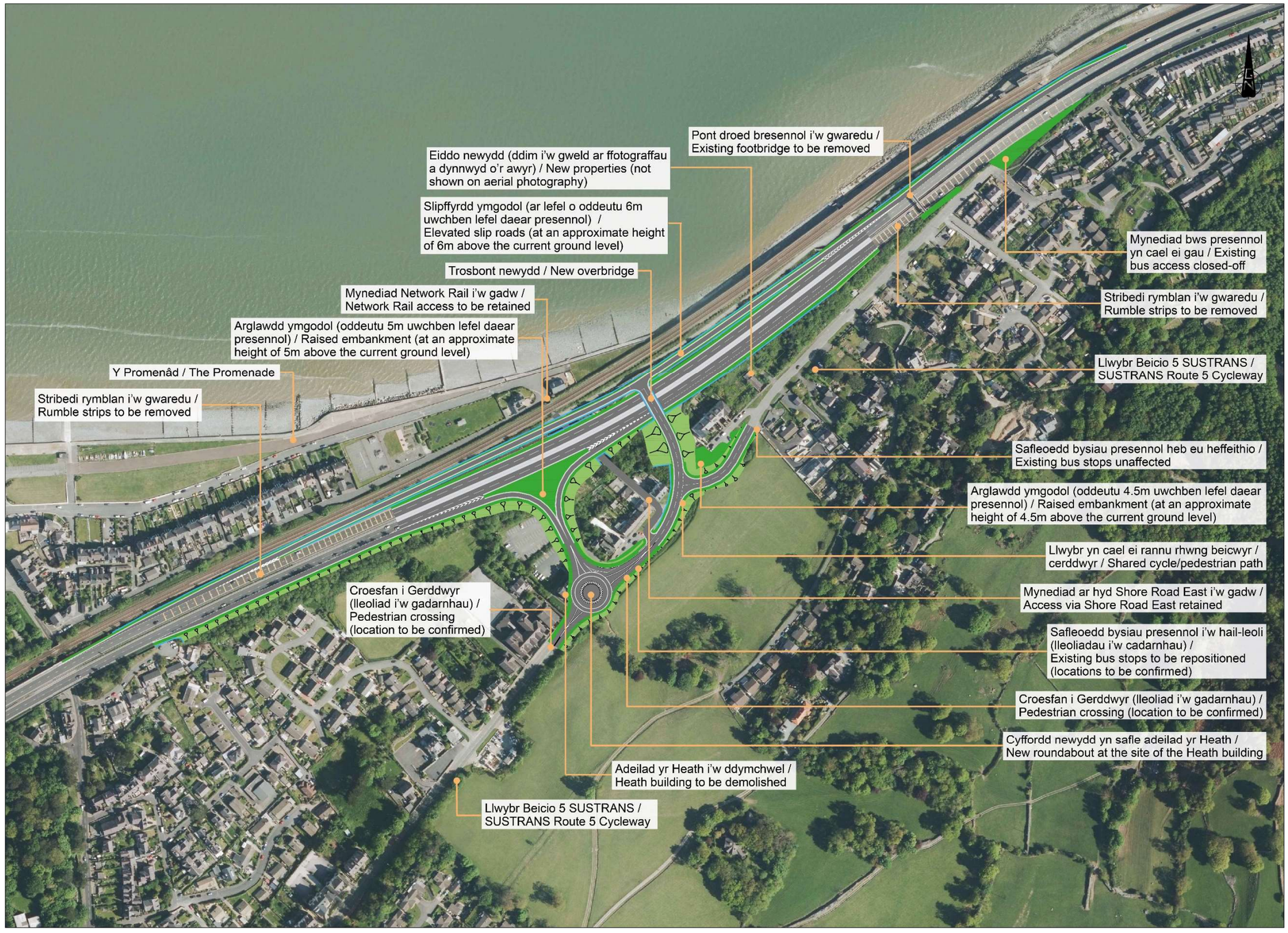
Appendix 1 - Figure 4: A55 Junction 15 OPTION C



Appendix 1 - Figure 5: A55 Junction 15 OPTION D

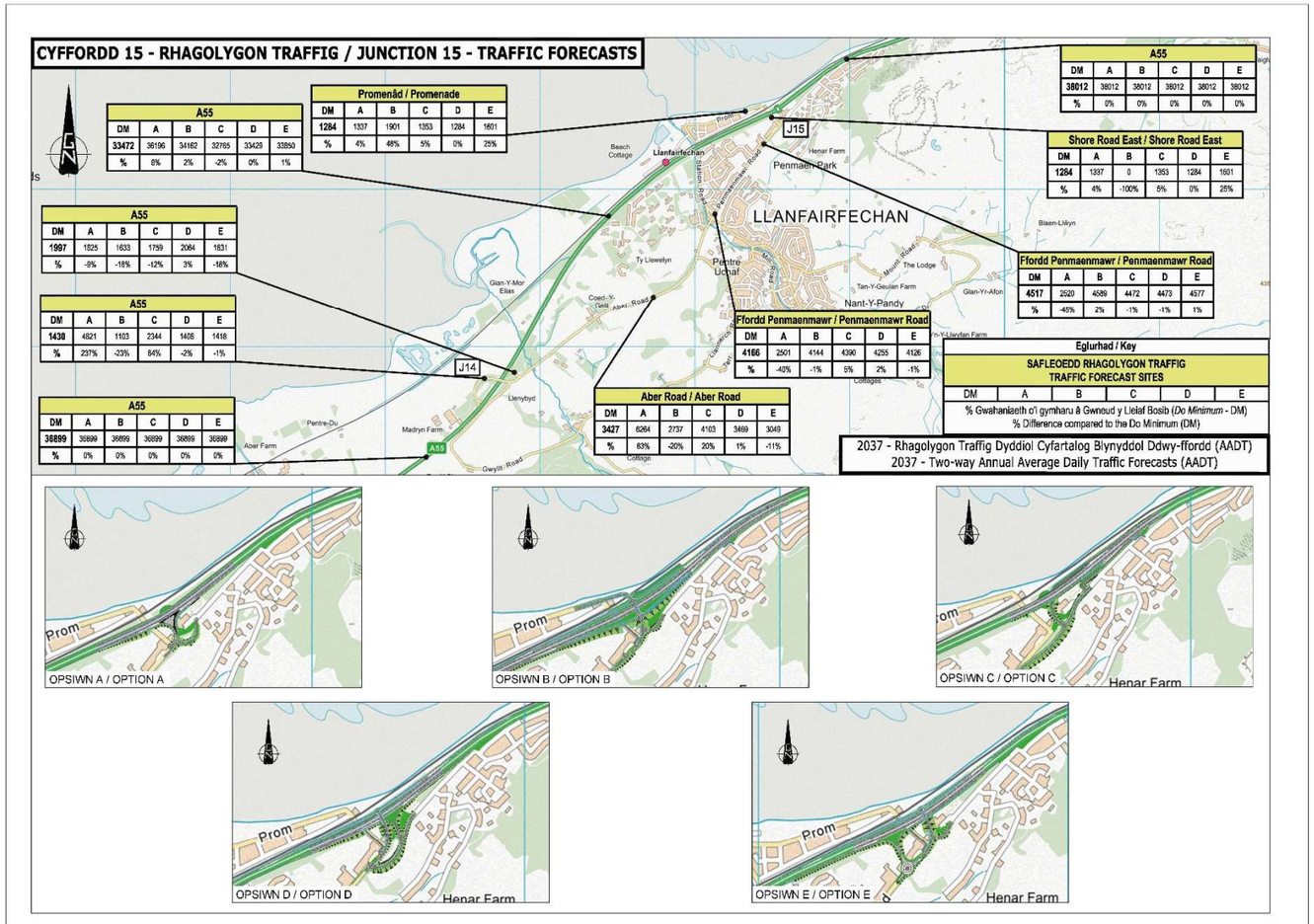


Appendix 1 - Figure 6: A55 Junction 15 OPTION E

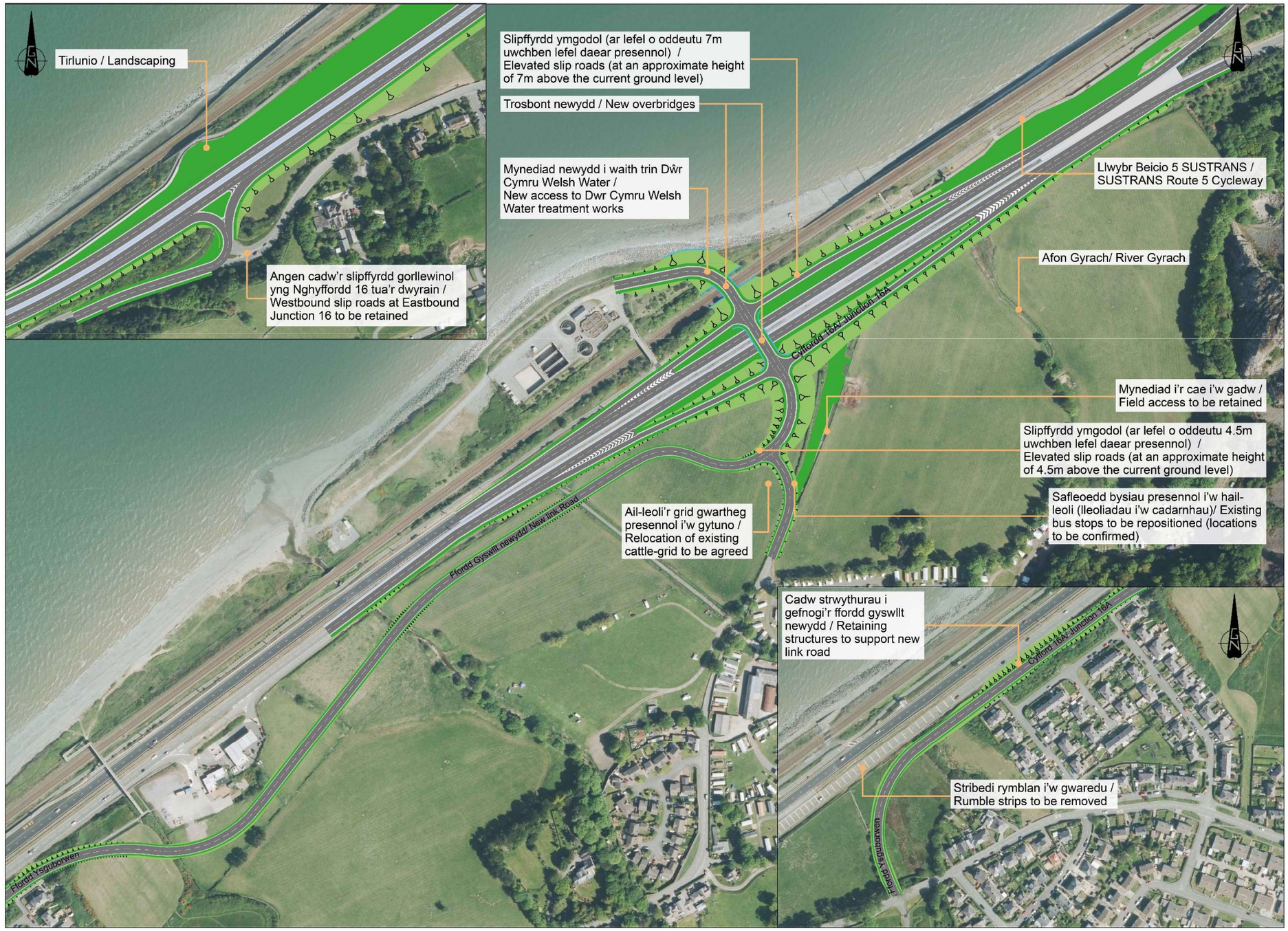


Appendix 1 – Figure 7: A55 Junction 15 TRAFFIC FORECAST FLOWS

CYFFORDD 15 YR A55 - RHAGOLYGON LLIF TRAFFIG
A55 JUNCTION 15 - TRAFFIC FORECAST FLOWS



Appendix 1 - Figure 8: A55 Junction 16 OPTION A



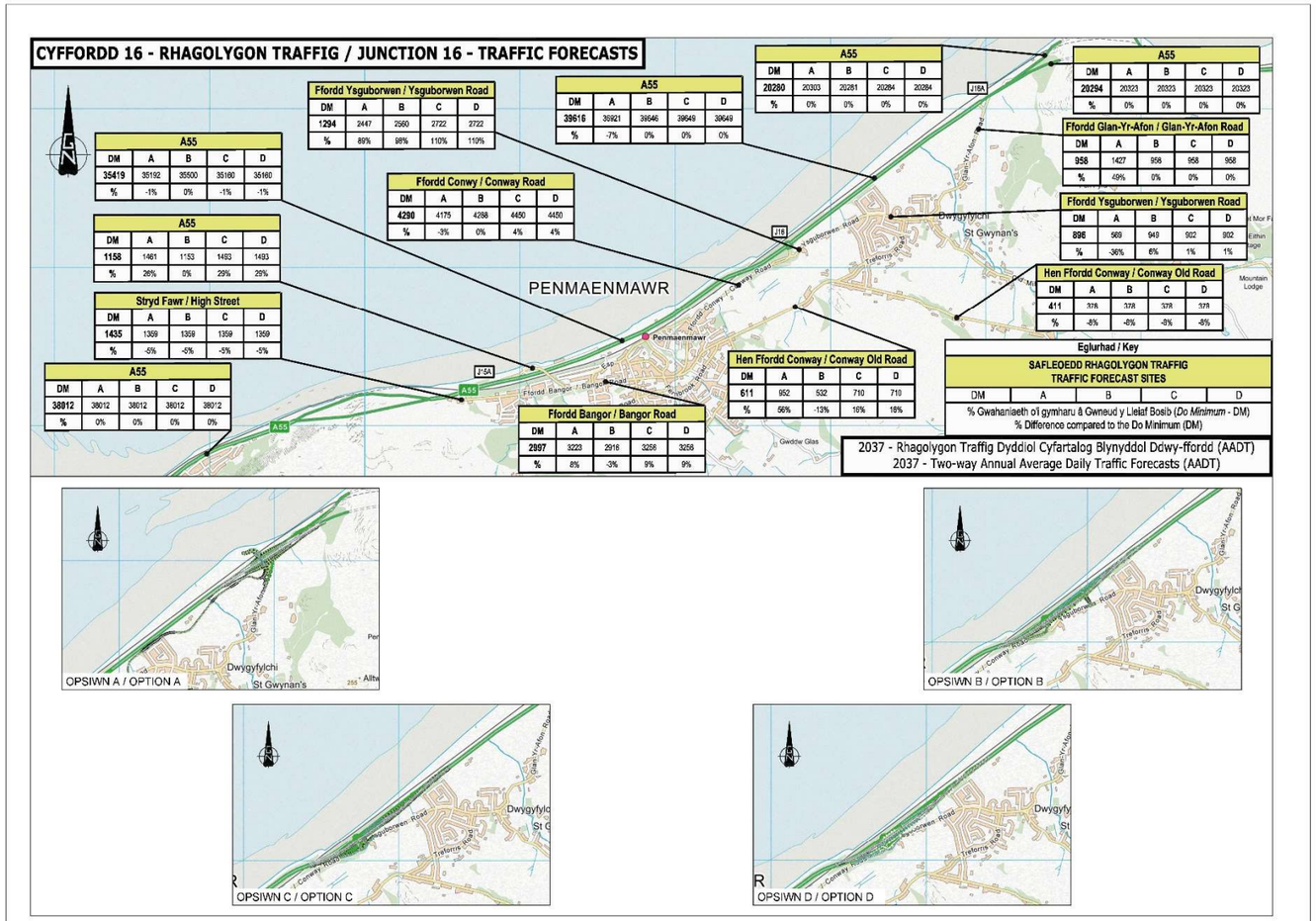
Appendix 1 - Figure 9: A55 Junction 16 OPTION B

Appendix 1 - Figure 10: A55 Junction 16 OPTION C

Appendix 1 - Figure 11: A55 Junction 16 OPTION D

Appendix 1 – Figure 12: A55 Junction 16 TRAFFIC FORECAST FLOWS

CYFFORDD 16 YR A55 - RHAGOLYGON LLIF TRAFFIG
A55 JUNCTION 16 - TRAFFIC FORECAST FLOWS



APPENDIX 2
TRANSPORT CASE

Appendix 2 – Table 1: Potential for environmental benefit(s) and enhancement opportunities (Objective OBJ7)*

Potential for benefit / enhancement *(Reasons for potential)*	Junction 15					Junction 16			
	A	B	C	D	E	A	B	C	D
Improved links across the A55 and connectivity east west for non-motorised users (NMU). These could be new links, or existing links that are improved by removing traffic for the benefit of non-motorised users. In particular improved NMU connectivity with the Promenade in either town. *Reasons: new routes across A55/accessible land made availability for useful east west links other than footways.*	N	Y	N	N	N	Y Y	N	N	N
Creation of new, or more accessible, public open space within land take associated with the scheme. Each option provides different opportunities to create linear routes and associated areas of soft landscape. *Reasons: accessible land made available by scheme and space adequate for public use and enjoyment.*	N	Y	Y	Y Y	Y	Y Y	Y	N	N
Measures to improve the overall landscape and visual effect of the A55 by comparison with the existing scheme. Through better integration with landform, better roadside planting and other enhancements of the setting. *Reasons: new road and traffic less widely visible in views than the existing/new road generally open-up views.*	N	N	N	N	N	Y Y	Y	N	Y
Opportunity to reduce noise for some receptors compared with the existing A55 by altering vertical or horizontal alignment of the road or by providing landform or physical barrier to traffic noise. *Reasons: new road reduces traffic noise annoyance compared with existing, in particular for some of the closest receptors.*	Y	Y	N	N	N	Y Y	Y	N	Y
Improvement of habitat connectivity along the A55 corridor for the benefit of bats and other mobile species. *Reasons: adequate land made available by scheme so that connectivity habitat can effectively link with setting.*	N	Y	Y	Y	N	Y Y	N	Y	Y
Improvement of existing agricultural and amenity grassland habitats to serve a greater range of species and meet Biodiversity Objectives. *Reasons: adequate land made available by scheme for habitat to be created in areas where biodiversity benefit can be achieved.*	N	N	N	Y	Y	Y Y	Y	Y	Y
Overall potential for benefits or enhancements (Low, Medium or High)	Low	Med	Low	Med	Low	High	Med	Low	Med
Risk that benefits cannot be achieved (Low, Medium or High)	High	Med	High	Med	Med	Low	Med	Med	Med

*Reference the Impact Assessment Report (A55J15J16-RAM-60-XX-RP-T-002) for more information

Appendix 2 – Table 2: Junction 15 Risk Assessment

Risk Item	J15-A	J15-B	J15-C	J15-D	J15-E
Business Risks					
Reputational risks	All options have a similar level of risk				
Public acceptability of intervention	Option A was the most popular option with the residents of Llanfairfechan (in the public consultation held in June 2018)	Option B received approximately half the amount of support as Option A (which was the most popular option)	Option C was the second most popular option with residents of Llanfairfechan.	Option D was the second least popular option during the June 2018 Public Consultation.	Option E is the least preferred option with the residents of Llanfairfechan
Local Town Councillors acceptability of intervention	Unfortunately, there no consensus has been reached with respect to the preferred option. Option E was originally put forward as an option by Councillor Hinchcliff. However, the Town Council has not conveyed that there is consensus of opinion with regards to their preferred option. Instead they have stated that they would like an option that does not result in the loss of residential properties and protects users of services along Penmanemawr Road. Other concerns that have been raised include those in relation to the visual impact, housing prices and safety.				
Llanfairfechan Town Council acceptability of intervention					
Key stakeholder acceptability of intervention	Stakeholders generally disliked option as does not have four-way movement. NMWTRA particularly concerned about resilience for option.	Preferred option for emergency services and bus companies.	Dislike option as does not have four-way movement. NMWTRA concerned about the risk to resilience and of flooding due to the options configuration as an underpass.	Four-way movement provided. North Wales Police preferred Options D or E after Option B.	Four-way movement provided. North Wales Police preferred Options D or E after Option B.
Conwy CBC acceptability of intervention					
Service Risks					
Appraisal risks	All options have a similar level of risk. With the exception of the traffic modelling, the majority of the appraisal work at WelTAG Stage Two has been based on a qualitative appraisal of the impacts. Further work to quantify the impacts will be carried out in WelTAG Stage Three.				
Design risks	Technical departures from standards minimised. Least risk associated with approvals process.	Although most complex structure to design, technical departures from standards minimised. Notwithstanding there is a risk related to the approvals process associated with Network Rail.	Design may require a drainage pumping station. Also, a number of technical departures from standards required. Although there is a risk related to the approvals process, this risk is less than Option B as there is only a limited interface with Network Rail.	Although technical departures from standards minimised, option requires the design of a bridge structure. Therefore, there is a risk related to the approvals process.	Although technical departures from standards minimised, option requires the design of a bridge structure. There is a risk related to the approvals process. Further investigation required to determine whether the option could be designed to address the concerns of the local community and the Town Council.
Quality of initial investigations	All of the options have a similar level of risk, as no ground investigation has been carried out to date.				
Delivery – Statutory Process	CPO for open land. May result in blight of residential properties. However least likely option to result in an inquiry.	The largest number of properties will require CPO (and demolition) for Option B – most likely to result in an inquiry.	CPO for open land. May require CPO of front gardens along Penmaenmawr Road. Also, may result in blight of residential properties. Other than Option A, next least likely option to result in an inquiry.	Properties will require CPO (and demolition) and/or be blighted for Option D. Compared to option B, next most likely option to result in an inquiry.	Requires CPO of the Heath Building, which although is not listed, is considered by some to be 'iconic'. Affects the Llanfairfechan conservation area.
Environmental risks	As Option A is the least intrusive option, it is likely to have less of an environmental risk. However the option may potentially introduce risks due to its position relative to the conservation area and the Snowdonia National Park Boundary at Junction 14. The risk of encountering bat habitat is the similar to the other options. In addition, as open land is being taken there is a risk of exposing archaeology.	Due to the vicinity of the construction works immediately adjacent to the SAC, this option has the greatest environmental risk. Risk of impact on bat habitat at Sunnybank (the old flats). This option has a lower risk of exposing archaeology.	The risk of impact on bat habitat is similar to the other options. The option may potentially introduce risks due to its position relative to the conservation area and the Snowdonia National Park Boundary at Junction 14. In addition, as open land is being taken there is a risk of exposing archaeology as per option A.	The risk of impact on bat habitat is similar to the other options. The option may potentially introduce risks due to its position relative to the conservation area. The risk of encountering bat habitat is the similar to the other options. In addition, as open land is being taken there is a risk of exposing archaeology as per option A.	This option introduces a medium risk due to its vicinity within the conservation area. There is also a risk of an impact on bat habitat which has been identified at the Heath building. due to the need to demolish the Health building, which has a known bat population, would have an adverse effect on biodiversity (as a European protected species) and also increases the risk of delays to programme due to the license requirements. This option has a risk of exposing archaeology.
Contaminated land – potential risk associated with encountering contamination	Former garage located below A55 footprint - adjacent to eastern end of Option A. Likely to be low as the garage appears to be located just outside the construction works area.	Former garage located below A55 footprint – below proposed scheme. Possible if excavations are required.	Former garage located below A55 footprint – below proposed scheme. Possible if excavations are required.	Former garage located below A55 footprint – below proposed scheme. Possible if excavations are required.	Former garage located below A55 footprint – appears to be located adjacent to eastern end of Option E. Low as the garage appears to be just outside of the site area.

Risk Item	J15-A	J15-B	J15-C	J15-D	J15-E
Delivery risks – cost	Greatest certainty in design. Potential to retain existing footbridge.	Most complex option to construct. No potential to retain existing footbridge. Replacement footbridge is not included in costing.	Costs associated with realigning Penmaenmawr Road are not included. Also there is a risk associated with the cost of the drainage pumping station increasing. No potential to retain existing footbridge. Replacement footbridge is not included in costing.	Potential to retain existing footbridge.	Potential to build a lot of the works off line (for example relocate the roundabout into the field), minimising risks associated with the cost of delivery. Potential to retain existing footbridge.
Delivery risks – programme	Least complex and risk of disruption (of all the options) during construction.	The risk of disruption during construction. Most complex to construct with the greatest number of interfaces, including those with the • Agreement to work on NRW Coastal Defences, requirement for marine license • Network Rail • Demolition Complex structure – impact on approval process time required	The greatest risk of disruption (of all the options) during construction. Option would need approvals for a number of departures from standards. Risk that the approval process could impact on the programme.	Risk of disruption during construction due to the construction works.	Risk of disruption during construction due to the construction works.
Delivery risks - Affordability / funding risk	All options have a similar level of risk				
Delivery risks - Procurement risk	All options have a similar level of risk				
Whole life asset risks	Least intervention would be required in the long term with respect to maintenance.	Option with most significant structure spanning Network Rail. Greatest asset maintenance costs associated with intervention.	Although an underpass is theoretically the least complex structure to maintain, if a drainage pumping station is required, risks exist for the ongoing liability associated with the asset.	Maintenance of bridge structure would be required - similar level of risk for Options D and E	Maintenance of bridge structure would be required - similar level of risk for Options D and E
External risks					
Legislative risk	All options have a similar level of risk				
Catastrophic risks	All options have a similar level of risk				

Junction 16 – Risk Assessment

Risk Item	J16-A	J16-B	J16-C	J16-D
Business Risks				
Reputational risks	All options have a similar level of risk			
Public acceptability of intervention	Option A received approximately half the amount of support as Option C (which was the most popular option)	Second favourite option based on the June 2018 Public Consultation.	Public favourite option based on June 2018 Public Consultation	Least preferred option based on June 1018 Public Consultation
Local Town Councillors acceptability of intervention			Preferred option for Cllr Anne McCaffrey	Understood to not be favoured by local councillors
Penmaenmawr Town Council acceptability of intervention				
Key stakeholder acceptability of intervention	Greatest support from North Wales Police and bus companies. However, although four-way movement it is not necessarily preferred by Conwy CBC Highways Team as it has a long length of county road that would require adopting/maintaining.	Preferred option for North Wales Fire Services.	Option generally disliked as it does not have four-way movement. NMWTRA concerned about resilience and the risk of flooding.	Dislike option as it does not have four-way movement. NMWTRA concerned about resilience.
Conwy CBC acceptability of intervention				
Service Risks				
Appraisal risks	All options have a similar level of risk. With the exception of the traffic modelling, the majority of the appraisal work at WelTAG Stage Two has been based on a qualitative appraisal of the impacts. Further work to quantify the impacts will be carried out in WelTAG Stage Three.			
Design risks	A number of technical departures from standards are required. Although the option comprises of a relatively straightforward bridge design at Junction 15, it has the greatest extent of works. There is also a tight interface with DCWW and Network Rail. There is also the risk associated with the impact that the option could have on the Sustrans Route 5 cycleway. There are retaining structures required at Maes-y-Llan, where there are pinch points. Risk associated with gaining design approvals.	Option B has the least number of technical departures from standards (compared with other options). It also has a relatively straightforward bridge design. Consequently, the option has the lowest risk in relation to gaining design approvals. However further investigation is required to ensure that access for Network Rail and NRW to their coastal defences can be accommodated.	The design consists of an underpass structure. Risk that a drainage pumping station may be required. Option C also has the greatest number of technical departures of standards, and therefore the highest risk associated with gaining design approvals. Further investigation is required to ensure that access for Network Rail and NRW to their coastal defences can be accommodated.	Option D consists of a bridge which is to be constructed on the skew. This is a slightly more complex design than for example Option A or B. A number of technical departures from standards are required. Therefore, the design has greater risk associated with gaining approval compared to option B. Further investigation is required to ensure that access for Network Rail and NRW to their coastal defences can be accommodated.
Quality of initial investigations	Risk that if additional ecological surveys are required, they could impact on the delivery programme.	All other options have a similar level of risk		
Delivery – Statutory Process	CPO of open land would be required. **Further investigation is required to clarify if a couple of properties at Maes-y-LLan might also be affected.** No properties would need to be demolished. Edge of site may encroach over the boundary – and consequently could need approvals from National Park for affected component of the design. It might also impact on the informal 'biodiversity woods/field', for which the landownership and the status needs to be confirmed formally. The likelihood of this	Option B would require the CPO of open land. However, no properties would need to be demolished. Although there have been no specific representations against Option B by the Town Council, it's route passes through land where there is an informal 'biodiversity woods/field'. The ownership and status of this land needs to be confirmed formally. Currently it is felt that option B has a greater chance of resulting in inquiry than Option A.	Although Option C is likely to require the CPO of some private open land, it has the smallest footprint of all of the options. It also has the support of both one of the local councillor and a significant proportion of local residents. It is therefore the option that is least likely to result in an inquiry. No properties would need to be demolished.	The footprint for Option D is slightly larger than Option C. Again, it is likely to require the CPO of some private open land. No properties would need to be demolished.

Risk Item	J16-A	J16-B	J16-C	J16-D
	being a risk is considered to be less than Option B.			
Environmental risks	See comments regarding initial investigations. Potential risk that option would impact on 'biodiversity woods/field'. Feasibility of minimising/mitigating risk. Link road crosses a main river. Vicinity of option to Snowdon National Park.	Impact on 'biodiversity woods/field' – cost and feasibility of mitigation (if required)	Due to the small footprint, there is a minimal risk compared to the other options.	Similar to Option C, due to the relatively small footprint, there is a minimal risk compared to the other options.
Contaminated land – potential risk associated with encountering contamination	No specific areas of contamination identified with the site area. Railway lines, sewage works and former 'brick field' located outside of the site area, to the north of the A55. Likely to be low as no specific areas of contamination have been identified within the scheme area.	Areas of potential contamination within the site area; former gas works and incinerator waste disposal area below A55, former landfill to the south of the A55 /west of Junction 16. There is a higher potential for encountering contamination where excavations are required based on the presence of historical potentially contaminating uses. The potential for encountering contamination should be low adjacent to the existing petrol station where only shallow excavations (such as resurfacing) are required on the A55.	Areas of potential contamination within the site area; former gas works and incinerator waste disposal area below A55, former landfill to the south of the A55 /west of Junction 16. There is a higher potential for encountering contamination where excavations are required based on the presence of historical potentially contaminating uses. The potential for encountering contamination should be low adjacent to the existing petrol station where only shallow excavations (such as resurfacing) are required on the A55.	Areas of potential contamination within the site area; former gas works and incinerator waste disposal area below A55, former landfill to the south of the A55 /west of Junction 16. There is a higher potential for encountering contamination where excavations are required based on the presence of historical potentially contaminating uses. The potential for encountering contamination should be low adjacent to the existing petrol station where only shallow excavations (such as resurfacing) are required on the A55.
Delivery risks – cost	Although the option with the greatest extent and potentially complex solution (as it needs to cross over Network Rail, there is more space to construct the works. Also, there is a risk associated with the cost of additional mitigation / finishes due to options vicinity to Snowdon National Park.	Option B has the greatest amount of space to construct the works. Also, as the design of the bridge is straight forward compared for example to option D. Therefore, the risk of the cost escalating is less than the other options.	Option C has the smallest footprint, and therefore the least space to construct the works. A drainage pumping station may be required. Risk that the cost could increase.	Bridge design on the skew – which will be slightly more complex to design and potentially to construct than the other bridges.
Delivery risks – programme	The risk of disruption during construction will be similar to Options C and D. Most complex to construct with the greatest number of interfaces, including those with the • NRW • Network Rail • DCWW The option has a number of technical departures from standards. Consequently, there is a risk that the approval process could impact on the programme. The option also has the greatest extent and the longest construction programme.	Option with the least risk of disruption during construction (of all the options). The option has the least number of technical departures from standards – minimising the risk that the approval process could impact on the programme. Notwithstanding, as agreement needs to be reached with Network Rail, NRW and DCWW regarding an alternative access this could impact on the programme.	The construction of Option C will be more difficult due to the need to raise the A55 in the order of 4.5m at the highest point. Consequently, the risk to extend the period of disruption during construction will be greater than Options A and D. Option would need approvals for the greatest number of departures from standards. Risk that the approval process could impact on the programme. As agreement needs to be reached with Network Rail, NRW and DCWW regarding an alternative access, this could impact on the programme.	The risk of disruption during construction will be similar to Options A and C. However, as agreement needs to be reached with Network Rail, NRW and DCWW regarding an alternative access, this could impact on the programme. The option has a number of technical departures from standards – there is a risk that the approval process could impact on the programme.
Delivery risks - Affordability / funding risk	All options have a similar level of risk			
Delivery risks - Procurement risk	All options have a similar level of risk			
Whole life asset risks	Although the asset has the greatest length of link roads, as much of this length will be adopted by Conwy CBC, the long-term risk associated with it will also be adopted by them. Nevertheless, the risk to the nation	Of the options, Option B has the most standard bridge design and consequently the whole life asset liabilities associated with it will be less than for the other options.	Although an underpass is theoretically the least complex structure to maintain, if a drainage pumping station is required, risks exist for the ongoing liability associated with the asset.	Due to the more complex structure (as it is on the skew), the long-term liability associated with the bridge may be greater than for a standard bridge design (for example Option B).

Risk Item	J16-A	J16-B	J16-C	J16-D
	would be greater in comparison than the other options. Also, the option will have a greater whole life asset risk as the bridge spans across Network Rails North Wales Coast railway line.			
External risks				
Legislative risk	All options have a similar level of risk			
Catastrophic risks	All options have a similar level of risk			

Appendix 2 – Table 3: A55 Junctions 15 and 16 Pre-Consultation Economics and Appraisal Summary Tables

Thabl Economaidd Cam 2 WelTAG / WelTAG Stage 2 Economic Table		Cyffordd 15 / Junction 15					Cyffordd 16 / Junction 16			
		Opsiwn A / Option A	Opsiwn B / Option B	Opsiwn C / Option C	Opsiwn D / Option D	Opsiwn E / Option E	Opsiwn A / Option A	Opsiwn B / Option B	Opsiwn C / Option C	Opsiwn D / Option D
COSTAU'R CYNLLUN A GWERTHUSIAD ECONOMAIDD (£ miloedd) / SCHEME COSTS & ECONOMIC APPRAISAL (£ thousands)	Costau Cyfalaf Gwerth Presennol, ac eithrio TAW (prisiau 2018) Present Value Capital Costs, Excluding VAT (at 2018 prices)	£17,042	£30,303	£26,504	£27,949	£27,171	£23,027	£18,328	£21,843	£18,893
	Buddion Gwerth Presennol (PVB) (wedi'u disgowntio i brisiau 2010) Present Value Benefits (PVB) (discounted to 2010 prices)	£579	£23,530	£12,635	£25,440	£23,096	£19,220	£22,357	£20,929	£21,079
	Costau Gwerth Presennol (PVC) (wedi'u disgowntio i brisiau 2010) Present Value Costs (PVC) (discounted to 2010 prices)	£12,287	£21,863	£18,999	£20,153	£19,533	£16,451	£13,107	£15,603	£13,508
	Gwerth Presennol Net (NPV) (wedi'i ddisgowntio i brisiau 2010) Net Present Value (NPV) (discounted to 2010 prices)	-£11,708	£1,667	-£6,364	£5,287	£3,563	£2,769	£9,250	£5,326	£7,571
	Cymhareb Cost Budd (BCR) Benefit Cost Ratio (BCR)	0.1	1.1	0.7	1.3	1.2	1.2	1.7	1.3	1.6

Gwerthusiad yn cael ei gymharu â senario Gwneud y Lleiaf Bosib (+++/---) / Appraisal compared with the Do Minimum Scenario (+++/---) Budd Mawr / Large Beneficial +++ Budd Cymedrol / Moderate Beneficial ++ Budd Bychan / Slight Beneficial + Niwtral / Neutral 0 Andwyol Bychan / Slight Adverse - Andwyol Cymedrol / Moderate Adverse -- Andwyol Mawr / Large Adverse ---			Cyffordd 15 / Junction 15					Cyffordd 16 / Junction 16			
			Opsiwn A / Option A	Opsiwn B / Option B	Opsiwn C / Option C	Opsiwn D / Option D	Opsiwn E / Option E	Opsiwn A / Option A	Opsiwn B / Option B	Opsiwn C / Option C	Opsiwn D / Option D
AMCANION Y PROSIECT / PROJECT OBJECTIVES		OBJ1 – Gwella mynediad i farchnadoedd rhanbarthol, cenedlaethol a rhyngwladol a gwella mynediad i gyfleoedd gwaith OBJ1 – Improve access to regional, national and international markets and improve access to employment opportunities	++	++	++	++	++	++	++	++	++
		OBJ2 – Gwella diogelwch ffordd ar yr A55 o Gyffordd 14 i Gyffordd 16A OBJ2 – Improve road safety on the A55 from Junction 14 to Junction 16A	+	+	+	+	+	+	+	+	+
		OBJ3 – Gwella amseroedd siwrne a dibynadwyedd amser siwrne ar yr A55 o Gyffordd 14 i Gyffordd 16A OBJ3 – Improve journey times and journey time reliability on the A55 from Junction 14 to Junction 16A	++	++	++	++	++	++	++	++	++
		OBJ4 – Gwella gwydnwch ar yr A55 i draffig strategol a lleol OBJ4 – Improve resilience on the A55 for strategic and local traffic	--	0	--	0	0	0	0	-	-
		OBJ5 – Gwella amseroedd siwrne, dibynadwyedd amseroedd siwrne a diogelwch ar gyfer mynediad ar yr A55 OBJ5 – Improve journey times, journey time reliability and safety for access onto the A55	-	++	-	+	+	+	++	0	0
		OBJ6 – Lleihau datgysylltiad ag ardaloedd arfordirol ar gyfer Defnyddwyr Di-fodur a gwella'r ddarpariaeth sydd ar gael i gerddwyr a beicwyr OBJ6 – Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	0	+	+	0	-	+	0	0	0
		OBJ7 – Cymryd camau rhesymol i adeiladu cymunedau iachach a gwell amgylcheddau OBJ7 – To take reasonable steps to build healthier communities and better environments	+	--	0	+	-	+	0	0	0
		OBJ8 – Cyfleoedd i ddarparu trafnidiaeth integredig yn cynyddu OBJ8 – Opportunities to provide integrated transport are increased	--	+	+	+	+	+	0	+	+
AMCANION TECHNEGOL YCHWANEGOL / ADDITIONAL TECHNICAL OBJECTIVES		Lleihau'r achosion technegol o fod yn groes i'r safonau Minimising technical departures from standards	+	+	---	0	0	--	-	---	--
		Lleihau'r angen i ostwng cyfyngiadau cyflymder Minimising need to reduce speed limits	0	0	-	0	0	0	0	-	-
		Lleihau'r aflonyddwch yn ystod y gwaith adeiladu Minimising disruption during construction	-	--	---	--	--	--	-	--	--
EFFEITHIAU AMGYLCHEDDOL, CYMDEITHASOL A DIWYLLIANNOL / ENVIRONMENTAL, SOCIAL AND CULTURAL IMPACTS	Effeithiau Cymdeithasol a Diwylliannol / Social and Cultural Impacts	Gweithgarwch Corfforol Physical Activity	0	+	0	0	0	+	0	0	0
		Ansawdd siwrne (Arbedion oedi pcu hrs – AMP, IP, PMP) Journey quality (Delay savings pcu.hrs - AMP, IP, PMP)	19, 8, 18	21, 12, 20	20, 9, 17	21, 11, 20	21, 11, 20	22, 11, 20	22, 11, 20	23, 12, 20	23, 12, 20
		Arbedion Damweiniau (Nifer y damweiniau) Accident Savings (No. accidents)	-41	18	-50	8	14	-32	10	-21	-21
		Diogelwch Personol Personal security	0	+	-	-	0	+	0	0	0
		Hygyrchedd i waith a gwasanaethau (Cynnydd yng nghyflymder siwrne cya – AMP, IP, PMP) Accessibility to employment and services (Journey speed increase kph - AMP, IP, PMP)	0, 1, 2	2, 2, 2	2, 1, 2	2, 2, 2	2, 2, 2	2, 1, 2	2, 2, 2	2, 2, 2	2, 2, 2
		Datgysylltiad Severance	-	+	-	0	-	0	0	0	0
		Athreiddedd (cerdded, beicio) Permeability (walking cycling)	0	+	+	0	0	+	0	0	0
		Cydraddoldeb, amrywiaeth a Hawliau Dynol Equality, diversity & Human Rights	0	0	0	0	0	0	0	0	0
	Effeithiau Amgylcheddol (wedi'u lliniaru) / Environment (mitigated)	Sŵn Noise	-	-	-	0	-	-	0	--	-
		Ansawdd Aer Air quality	0	0	0	0	0	0	0	0	0
		Nwyon Tŷ Gwydr Greenhouse gases	0	0	0	0	0	0	0	0	0
		Tirwedd a threfwedd Landscape and townscape	-	-	0	0	--	+	--	-	-
		Amgylchedd hanesyddol Historic environment	-	--	---	---	--	0	0	0	0
		Bioamrywiaeth Biodiversity	0	0	+	+	0	+	+	+	+
		Amgylchedd Dŵr Water environment	0	0	0	0	0	0	0	0	0

Appendix 2 – Table 4: A55 Junctions 15 and 16 Post-Consultation Economics and Appraisal Summary Tables

WelTAG Stage 2 Economic Table		Junction 15							Junction 16				
		Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E	Option A	Mitigated Option A	Option B	Option C	Option D
Scheme Costs & Economic Appraisal (£ thousands)	Present Value Capital Costs, Excluding VAT (at 2018 prices)	£17,042	£30,303	£26,504	£27,949	£24,578	£27,171	£27,171	**£23,027**	**£22,571**	**£18,328**	**£21,843**	**£18,893**
	Present Value Benefits (PVB) (discounted to 2010 prices)	£730	£23,530	£12,635	£25,521	£22,673	£23,096	£23,096	£20,906	£21,029	£22,357	£22,617	£22,767
	Present Value Costs (PVC) (discounted to 2010 prices)	£12,289	£21,863	£18,999	£20,153	£17,561	£19,533	£19,533	£16,451	£16,127	£13,107	£15,603	£13,508
	Net Present Value (NPV) (discounted to 2010 prices)	-£11,557	£1,667	-£6,364	£5,368	£5,112	£3,563	£3,563	£4,455	£4,902	£9,250	£7,014	£9,259
	Benefit Cost Ratio (BCR)	**0.06**	**1.08**	**0.67**	**1.27**	**1.29**	**1.18**	**1.18**	**1.2**	**1.2**	**1.7**	**1.3**	**1.6**

Appraisal compared with the Do Minimum Scenario (+++/---) Large Beneficial +++ Moderate Beneficial ++ Slight Beneficial + Neutral 0 Slight Adverse - Moderate Adverse -- Large Adverse ---		Junction 15							Junction 16				
		Option A	Option B	Option C	Option D	Mitigated Option D	Option E	Mitigated Option E	Option A	Mitigated Option A	Option B	Option C	Option D
Project 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	--	0	--	0	0	0	0	++	++	0	-	-
	OBJ5 – Improve journey times, journey time reliability and safety for access onto the A55	-	++	-	+	+	+	+	+	+	++	0	0
	OBJ6 – Reduce severance with coastal areas for the Non-Motorised Users and enhance provision made for walkers and cyclists	0	+	+	0	0	-	-	+	+	0	0	0
	OBJ7 – To take reasonable steps to build healthier communities and better environments	+	--	0	+	+	-	0	++	++	0	0	0
	OBJ8 – Opportunities to provide integrated transport are increased	--	+	+	+	+	+	+	+	++	0	+	+
Technical Objectives	OBJ9 Minimising technical departures from standards	+	+	---	0	+	0	0	--	--	-	---	--
	OBJ10 Minimising need to reduce speed limits	0	0	-	0	0	0	0	0	0	0	-	-
	OBJ11 Minimising disruption during construction	-	--	---	--	--	--	--	--	-	-	--	--
Social and Cultural Impacts	Physical Activity	0	+	0	0	0	0	0	+	+	0	0	0
	Journey quality (Delay savings pcu.hrs - AMP, IP, PMP)	6, -2, 6	17, 11, 17	16, 8, 13	17, 11, 17	17, 11, 17	17, 10, 16	17, 10, 16	16, 9, 15	16, 9, 15	16, 10, 16	17, 10, 15	17, 10, 15
	Accident Savings	-41	18	-50	8	8	14	14	9	7	10	13	13
	Personal security	0	+	-	-	0	0	0	+	+	0	0	0
	Accessibility to employment and services (Journey speed increase kph - AMP, IP, PMP)	0	+	+	+	+	+	+	+	+	+	+	+
	Severance	-	+	-	0	0	-	-	0	0	0	0	0
	Permeability (walking cycling)	0	+	+	0	0	0	0	+	+	0	0	0
	Equality, diversity & Human Rights	0	0	0	0	0	-	0	0	0	0	0	0
Environment	Noise	-	-	-	0	0	-	-	-	-	0	--	-
	Air quality	0	0	0	0	0	0	0	0	0	0	0	0
	Greenhouse gases	0	0	0	0	0	0	0	0	0	0	0	0
	Landscape and townscape	-	-	0	0	0	--	-	+	+	--	-	-
	Historic environment	-	--	---	---	---	--	-	0	0	0	0	0
	Biodiversity	0	0	+	+	+	0	0	++	++	+	+	+
	Water environment	0	0	0	0	0	0	0	++	++	0	0	0

ES Chapter 4 Appendices	
4.1	EU Directive 2014/52.EU Annex iV
4.2	Environmental Impact Assessment Screening Report
4.3	Environmental Impact Assessment Scoping Report
4.4	Record of Determination

APPENDIX 4.1
EU DIRECTIVE 2014/52.EU ANNEX IV

EU DIRECTIVE 2014/52.EU
ANNEX IV

The following text is taken from the Official Journal of the European Union dated 25 April 2014, to show the requirements for Information for the Environmental Impact Assessment Report

DIRECTIVE 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 16 April 2014

amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

Annex IV

INFORMATION REFERRED TO IN ARTICLE 5(1)

(INFORMATION FOR THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT)

1. Description of the project, including in particular:

   (a) a description of the location of the project;

   (b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;

   (c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;

   (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.

2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific

characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

4. A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.

5. A description of the likely significant effects of the project on the environment resulting from, inter alia:

   (a) the construction and existence of the project, including, where relevant, demolition works;

   (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

   (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;

   (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

   (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

(g) the technologies and the substances used.

The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.

6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.

7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

8. A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council (*) or Council Directive 2009/71/Euratom (**) or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and

details of the preparedness for and proposed response to such emergencies.

9. A non-technical summary of the information provided under points 1 to 8.

10. A reference list detailing the sources used for the descriptions and assessments included in the report.

Footnotes

(*) Directive 2012/18/EU of the European Parliament and the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ L 197, 24.7.2012, p. 1).

(**) Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, 2.7.2009, p. 18).

APPENDIX 4.2
ENVIRONMENTAL IMPACT ASSESSMENT SCREENING REPORT

Intended for
Welsh Government

Document type
Report

Date
January 2019

A55 JUNCTION 15 & 16 IMPROVEMENTS

ENVIRONMENTAL IMPACT ASSESSMENT SCREENING

RAMBOLL

A55 JUNCTION 15 & 16 IMPROVEMENTS ENVIRONMENTAL IMPACT ASSESSMENT SCREENING REPORT

Project name	**A55 Junction 15 & 16 Improvements**
Project no.	**RML 3066**
Recipient	**Welsh Government**
Document type	**Report**
Version	**A55J15J16-RML-30-ZZ-RP-X-0002 P04**
Date	**29/01/2019**
Prepared by	**Andrew Sumner**
Checked by	**David Richards (Approved RML: Ivor Richards)**
Approved by	**Rob Griffiths**
Description	**Report on the Screening exercise and the Records of Determination**

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1. PURPOSE OF THIS REPORT

1.1 Screening for Environmental Impact Assessment

1.1.1 This Screening Report describes the approach taken with regards to determining whether an Environmental Impact Assessment (EIA) is required.

1.1.2 Determination as required by the Highways Act 1980 and the Directive 2014/52/EU of 2014 (which amended the 2011 Directive) and the Environmental Impact Assessment (Miscellaneous Amendments relating to Harbours, Highways and Transport) Regulations 2017.

1.1.3 In accordance with the provisions under the EIA Regulations, a determination must be made to confirm whether a proposed project constitutes an EIA development i.e. whether an EIA process is required, and a statutory Environmental Statement must be prepared and accompany the consent process for a proposed scheme.

1.1.4 The project will be delivered in accordance with the Design Manual for Roads and Bridges: Volume 11 Environmental Assessment (DMRB, Volume 11) guidance. Whilst Highways England has withdrawn DMRB without yet publishing a replacement, it still provides an acceptable basis for EIA and so this report has been developed in accordance with the requirements of DMRB Volume 11 Section 2 Part 3 (HD47/08) and IAN 126/09(W).

1.1.5 The following information is provided within this report (as required by Directive 2011/92/EU as amended by Directive 2014/52/EU) as transposed through the Highways Act (1980) and *The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017*, which came into force in December 2017. This screening report gives due consideration to the specific requirements Article 4, Annex IIA and Annex III.

1.1.6 Article 4(4) states:

'Where Member States decide to require a determination for projects listed in Annex II, the developer shall provide information on the characteristics of the project and its likely significant effects on the environment. The detailed list of information to be provided is specified in Annex IIA. The developer shall take into account, where relevant, the available results of other relevant assessments of the effects on the environment carried out pursuant to Union legislation other than this Directive. The developer may also provide a description of any features of the project and/or measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment.'

1.1.1 Annex II.A requires:

Description of the project, including in particular:

(a) a description of the location of the project;

(b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;

(c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;

(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.

A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.

A description of the likely significant effects of the project on the environment resulting from, inter alia:

(a) the construction and existence of the project, including, where relevant, demolition works;

(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;

(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

(g) the technologies and the substances used.

The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.

A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.

A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council (*) or Council Directive 2009/71/Euratom (**) or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

A non-technical summary of the information provided under points 1 to 8.

A reference list detailing the sources used for the descriptions and assessments included in the report.

2. THE SCHEME CONTEXT AND PROGRAMME

2.1 Introduction

2.1.1 The A55 trunk road is a key element of the UK and European strategic road network and provides the main economic artery for the whole of North Wales. The A55 forms part of Euroroute 22, which is the Trans European Route from Dublin in Ireland to Ishim in Russia. Of the 235 miles of E22 in the UK, the two at grade roundabouts at Junction 15 at Llanfairfechan, and Junction 16 between Penmaenmawr and Dwygyfylchi, are the only roundabouts on the route from Holyhead to Hull and hence are a constraint to the smooth flow of traffic on this strategic route.

2.1.2 Improvement schemes are proposed for the existing junctions 15 and 16. The Welsh Government appointed Ramboll, RML and YGC as their technical and environmental advisors with Corderoy with WSP and TACP as Employers Representative, to develop and consider a range of options with the intention of identifying a preferred solution for each junction and then developing the design up to publication of draft Orders.

2.2 Two projects

2.2.1 The EIA regulations do not define the limits of a 'project' and so do not clarify whether the two junctions should be treated as one or two projects. Whilst the separated engineering schemes to improve each of the two junctions are similar in form, and are influenced by traffic on the same expressway, they are sufficiently topographically separated for their settings to be markedly different. Both junctions serve different and discrete settlements that are not served by any other classified road link. Furthermore, there is no unifying Line Order.

2.2.2 On the basis that separate sets of Draft Orders are to be prepared, one for each junction scheme, separate Local Public Inquiries (LPI) would be required for each junction and so are considered to be separate projects for which a separate Environmental Statement would be required to accompany each set of Draft Orders.

2.2.3 This Screening Report addresses both junctions as separate projects. A separate Record of Determination has been produced for each project.

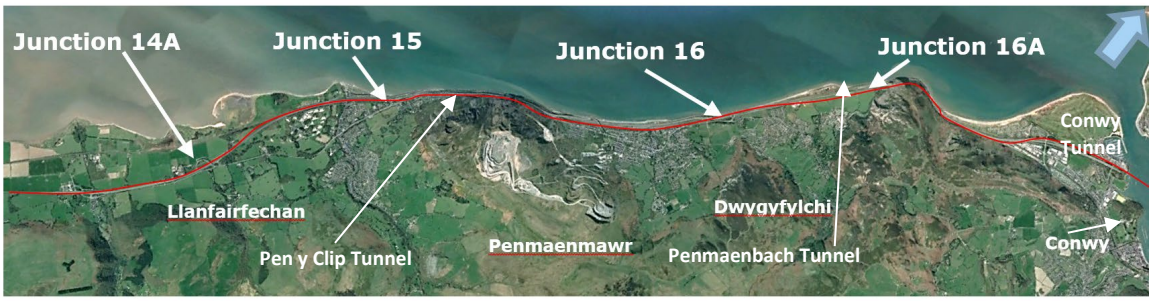
2.3 Locations of the two junction improvement Schemes

2.3.1 The two junctions are located on the A55 Dual-carriageway between Conwy and Bangor. The road is in close proximity to the North Wales mainline railway from Chester to Holyhead, which follows the north Wales coast. This section of the A55 is punctuated by three tunnels, the first at Conwy, under the River Conwy, the second, Penmaenbach tunnel lies to the east of Junction 16, while the Pen-y-clip tunnel lies to the west of Junction 16 and to the east of Junction 15. The location of the two junctions, and other junctions in close proximity is shown in Figure 1.

2.3.2 Junction 15, is an at-grade roundabout, located in Llanfairfechan, to the south of the railway and within 40 metres of the high tide line. Inland of the junction are suburban residential areas, with the main area of Llanfairfechan to the west and south. Junction 15, with Junction 14a, which is

2.8 km to the west, serves only the Llanfairfechan area. There are no other public roads out of the settlement.

Figure 1: Location plan (not to scale)



Google Maps 2018 TerraMetrics

2.3.3 Junction 16 is an at-grade roundabout, 4.5km east of Junction 15, with the River Conwy tunnel 6.2km to the east. Junction 16, along with 15a and 16a, serves Penmaenmawr and the smaller, adjacent village of Dwygyfylchi. The only alternative public road in and out of these two settlements is the narrow and winding Sychnant Pass, which leads east to the town of Conwy. Junction 16 is located between the two settlements, 30 metres from the high tide line with only the North Wales mainline railway lying between. Immediately south of the A55 lies agricultural land with residential areas in both settlements nearby.

2.4 Development of the Scheme

2.4.1 Junctions 15 and 16 of the A55 have been subject to a number of recent studies as they are the only at-grade roundabout interchanges on this major North Wales trunk road. An initial study and assessment was carried out by Capita Symonds and completed in 2005. 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 removing the at-grade roundabout.

2.4.2 The study included a stakeholder workshop on the options, traffic data collection and modelling, some local topographical survey, preliminary environmental assessments and an initial Stage 1 WelTAG[1] appraisal. This study which was completed in April 2009 concluded that new grade-separated options should be progressed to provide safety improvements.

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

2.4.4 In October 2017 the current project team were commissioned to undertake the Stage 2 appraisal in accordance with the new WelTAG 2017. A review of Stage 1 was carried out first and a range of options for further consideration was selected from those previously developed. A Public

[1] WelTAG is acronym for Welsh Transport Appraisal Guidance

Information Exhibition (PIE) was held in December 2017 and the views of those who responded in the questionnaire were taken into consideration in the WelTAG Stage 2 Appraisal.

2.4.5 In the Stage 2 Appraisal five options were considered for Junction 15 and 16. These were taken to the statutory 12-week Public Consultation which commenced in June 2018. The public response was taken into consideration in the appraisal to identify an option that could be recommended to Ministers as a possible Preferred Route.

2.5 The problems

2.5.1 Consultation with key stakeholders, including the Local Authority, Welsh Government Departments and the Regional Transport Planner, identified the following problems. The Project Objectives (Section 3.2) and Environmental Objectives (Section 3.3) are cross-referenced below to demonstrate how the Welsh Government intend to address the identified problems.

Safety: Junctions and sections of the A55 between junctions 14 and 16A do not comply with current design standards. This is believed to affect safety and capacity1;

Traffic Delays: The need to reduce journey times and delays, especially during peak periods (for example due to ferry flows)2;

Poor Network Resilience: The need to reduce the number of incidents. Issues associated with the lack of local and strategic diversion routes, in case of incidents or planned works. In addition to the need to address operational issues associated with the tunnel maintenance;3 and

Sustainable Travel: Lack of competitive sustainable travel options, safety of cyclists and poor coastal access for Non-Motorised Users 4.

A. Junctions 15 and 16 are the only at-grade roundabout interchanges on this major North Wales trunk road. The limitations imposed on the flow of traffic by these roundabouts has led to increased journey times and poor journey time reliability.

   Scheme Objectives: 1, 3, 5

   Environmental Objective: 6

B. The roundabouts contribute to the incidence of stationary traffic backing up into Pen-y-Clip and Penmaenbach Tunnels, a situation that is considered a safety hazard.

   Scheme Objective: 1, 2, 3, 4, 7.

   Environmental Objective: 6,

C. The original A55 dual-carriageway road was designed to make use of existing roads, where possible and to weave through a tightly constrained corridor between the railway and coast to the north and steep topography and residential areas to the south. The road is subject to departures from standard, but there is limited space for the kinds of improvements that

would be required for the two junctions. Fitting in the new junctions to full design standards while minimising impacts is a significant challenge.

Scheme Objective: 2, 4, 5, & Technical Objective 1.

Environmental Objectives: 2, 3, 5, 6, 7, 8, 9, 10, 14.

D. Both junctions are near residential properties and residents perceive that the original A55 is visually intrusive and traffic it carries is also acoustically intrusive. At the public exhibitions held in December 2017, local stakeholders indicated that they are troubled by traffic noise and the impact of the road on views, At both junctions, changes to the road could affect traffic noise and increase visual impact from residential areas.

Scheme Objective: 7.

Environmental Objectives: 2, 5, 6, 7, 8, 14, 15

E. At the public exhibitions, local stakeholders indicated that the restrictions imposed on pedestrian and cyclists wishing to access the shoreline across the road.

Scheme Objectives: 6, 7, 8, & Technical Objective 3.

Environmental Objectives: 1, 2, 3, 5.

F. There is potential for significant effects on the Snowdonia National Park (SNPA), the marine Special Protection Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) and several urban Conservation Areas and other important heritage, landscape and ecological designations.

Scheme Objective: 7.

Environmental Objectives: 3, 4, 5, 6,7, 8, 9,10, 11, 16.

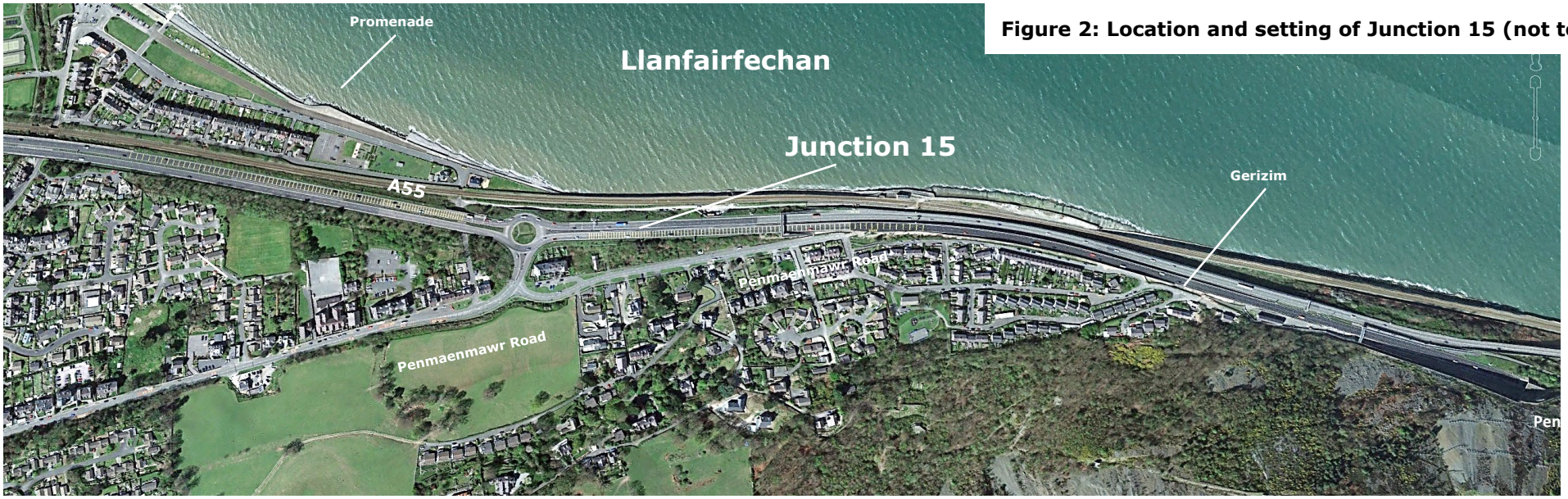


Figure 2: Location and setting of Junction 15 (not to scale)

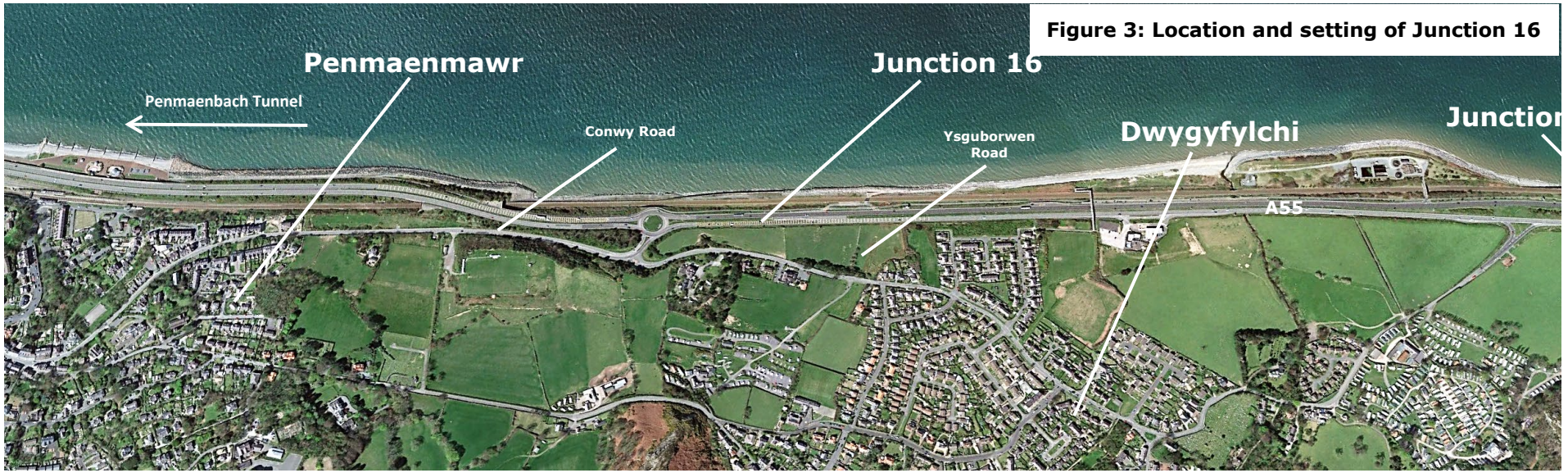


Figure 3: Location and setting of Junction 16

Google Maps 2018 TerraMetrics

3. SCHEME OBJECTIVES

3.1 Transport planning objectives (TPOs)

3.1.1 TPOs have been developed during previous development work and engagement on the scheme, aiming to address one or more of the identified problems at each of the junctions. During the early stages of Key Stage 3 the problems and objectives were refreshed during a focused workshop event to take into account the WelTAG 2017 guidance and Wellbeing of Future Generations (Wales) Act wellbeing goals.

3.1.2 The scheme objectives are:

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
TECH OBJ 1	Minimising technical departures from standards
TECH OBJ 2	Minimising need to reduce speed limits
TECH OBJ 3	Minimising disruption during construction

3.2 Environmental Objectives

A **Avoid or mitigate impact to provide:**

1 Connectivity to and from the coast, and either side of the A55 so that communities continue to enjoy public services and open spaces;

2 Protection of community assets and local businesses from adverse impacts during construction;

3 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 and tree and shrub planting;

4 Avoid adverse impacts on buried archaeological sites;

5 Landscape integration the junctions into their coastal settings by avoidance of further 'industrialisation' of the road corridor;

6 Consider the design of the schemes to achieve an overall reduction in traffic noise nuisance, and visual impact of traffic; with no significant increases problems associated with air borne pollution;

7 Protect valued seaward views in the long term through careful design and aftercare;

8 Minimise light spill from highway lighting to avoid or reduce the impact on 'Dark Skies' within the Snowdonia National Park;

9 Protection of the marine SPA, associated species and habitats;

10 Improved road drainage to reduce the adverse impacts of A55 traffic pollutant spills on water quality in watercourses and on the sea;

11 Protect habitats and biodiversity and provide habitats designed to suit the coastal context;

12 Consider long term implications of maintenance and vegetation management when designing the soft estate to avoid or reduce health and safety risks or onerous management commitments;

B Benefits to be achieved by the Scheme, maximising delivery of added value:

13 Support community life and economic viability through enhanced cohesion and connectivity, support for education, learning and community involvement;

14 Enhanced quality and quantity of public spaces associated with the road corridor;

15 Improve access and enjoyment of the coastal setting, the townscape and the seafront, while enhancing opportunities for walking cycling and healthy lifestyles;

16 Enhance biodiversity through habitat creation, habitat connectivity and improvements within the road corridor in a manner that reflects and supports the coastal setting.

C How we want to achieve avoidance, mitigation and benefits

17 Aligning the scheme with legislation including Well-Being of Future Generations Act, Active Travel Act and Environment Act;

18 Delivery of Welsh Government policy;

19 Work effectively together throughout the development of the project;

20 To offer a full and open exchange of information and views during project development to make sure that the right project for Wales is published;

21 To work together to develop deliverable and effective environmental mitigation.

4. PROGRAMME: KEY DATES

4.1.1 The Procurement of services for the current commission was commenced in 2016, with Carillion plc appointed in October 2017 under an Early Contractor Involvement contract. Following the liquidation of Carillion in January 2018, the contract for design was transferred to Ramboll with Richards, Moorehead & Laing (RML) and Ymgynghoriaeth Gwynedd Consultancy (YGC) as subcontractors. The indicative programme, in January 2019 is:

Options Appraisal between **October 2017 and October 2018**
Preferred Route Announcement: **February 2018.**
Publication of ES and Draft Orders: **Late 2019**
Local Public Inquiry: **Summer 2020**

5. DESCRIPTION OF THE SCHEME

5.1 Contextual descriptions

5.1.1 The A55 expressway is a dual carriageway between Chester and Holyhead which generally runs east to west in parallel with the north Wales coast. Between Conwy and Llanfairfechan the A55 follows a tightly constrained corridor to pass the northern extreme of the Snowdonia massif where the mountainous terrain abuts the coast and splits the coastal plain. Tunnels carry the road through the headlands at Penmaenbach and Pen-y-Clip. Junction 15, along with Junction14a serves the settlement of Llanfairfechan to the west of Penmaenbach tunnel, while Junction 16, along with Junction 16a, serves the town of Penmaenmawr and village of Dwygyfylchi. Figure 2 and 3, on the previous page, show the location and setting of affected junctions.

5.1.2 The small figures (Figures 4 to 12) accompanying the text are intended to be indicative only. For larger versions of these images reference should be made to the Weltag Stage 2 reports.

5.1.3 Junction 15 is considered in Section 5.2, which follows, while Junction 16 is considered in Section 5.3.

5.2 Junction 15

5.2.3 Junction 15 is a roundabout providing access and egress for east and west bound traffic onto local roads to the south of the A55. On the north (seaward) side is the North Wales mainline railway from Chester to Holyhead, then the foreshore, with the Llanfairfechan Coastal Promenade and terraced residential properties to the west. The proposed scheme will replace the roundabout with at-grade or grade-separated slip roads. To accommodate the junction and the necessary highway alignments and slip roads the A55 dual-carriageway will be moved south towards residential properties along Penmaenmawr Road. The dual-carriageway in the area of the former roundabout will be remodelled to provide a safe junction with the A55 slip roads. The Scheme objectives are set out in Section 4.

5.2.4 Five options are being considered with the changes occurring mainly within 600 metres east and west of the existing roundabout. For some options there would be improvements to the slips roads at Junction 14a as well. In all options there would be indirect and direct impacts on the Llanfairfechan town centre Conservation Area, while Options C, D and E would have the greatest direct impact.

5.2.5 **J15 Option A** would replace the roundabout with westbound on and off slip roads only. A new junction arrangement would be requiring around 100 metres of Penmaenmawr Road to be realignment further south. Eastbound traffic would have to use Junction 14A. Existing bus stops would not be affected. A shared cycle way and pedestrian path would be provided to maintain continuity.

Figure 4: J15 Option A

5.2.6 **J15 Option B** would replace the roundabout with a full grade-separated junction with slip roads providing four-way movements and a new link down to the Promenade. An overbridge over the A55 would be required. A new junction arrangement would require realignment of around 200 metres of Penmaenmawr Road further south. The junction would be raised several metres higher than the existing roundabout and residential properties would be demolished to make way for the slip roads and the link to the Promenade. Bus stops would be repositioned and non-motorised access to the Promenade would be possible via Shore Road East.

Figure 5: J15 Option B

5.2.7 **J15 Option C** would replace the roundabout with a junction providing a westbound off-sliproad and an eastbound on sliproad. The eastbound slip road would be accommodated with an underbridge and this would require the dual carriageway to be elevated higher than the existing road. A new junction arrangement would require realignment of around 300 metres of Penmaenmawr Road further south in a cutting. The westbound slip road could require the demolition of properties on Penmaenmawr Road. Bus stops would be repositioned and access to the Promenade would be maintained via Shore Road East.

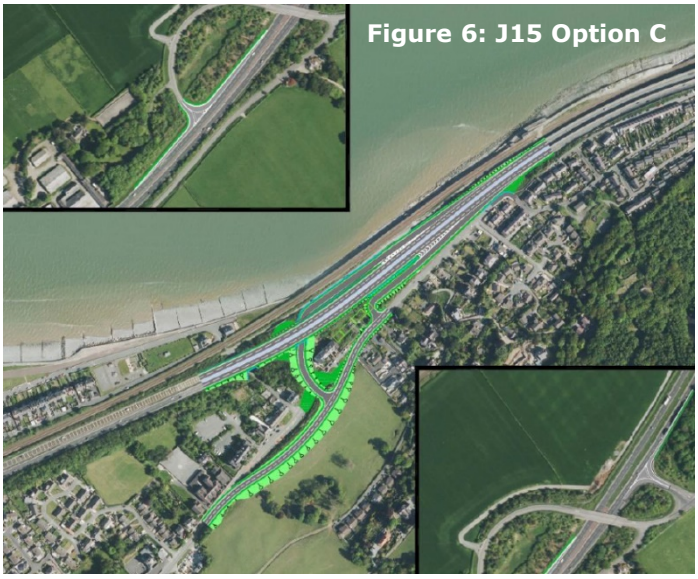


Figure 6: J15 Option C

5.2.8 **J15 Option D** would replace the roundabout with a junction providing four-way movements The eastbound slip roads would be elevated on embankments and would cross the A55 on an overbridge located to the east of the existing roundabout, while the west bound slip roads would be provided at grade. The new junction arrangement would require realignment of around 200 metres of Penmaenmawr Road further south in a cutting. The westbound slip road would require the demolition of properties close to the existing roundabout on Penmaenmawr Road. Bus stops would be repositioned and access to the Promenade would be maintained via Shore Road East.

Figure 7: J15 Option D

5.2.9 **J15 Option E** would replace the roundabout with a junction providing four-way movements. The eastbound slip roads would be elevated on embankments and would cross the A55 on an overbridge located over the existing roundabout. The west bound slip roads would be located on embankment to the west of the existing roundabout and would require the demolition of a large office building known as 'The Heath' on Penmaenmawr Road. The new junction arrangement would require a new roundabout located on Penmaenmawr Road, on the site of The Heath, and realignment of around 200 metres of Penmaenmawr Road. Bus stops would be repositioned and access to the Promenade would be maintained via Shore Road East.

Figure 8: J15 Option E

5.3 Junction 16

5.3.1 Junction 16 is a roundabout providing access and egress for east and west bound traffic onto local roads to the south. On the north (seaward) side is the north Wales mainline railway from Chester to Holyhead and beyond that is the foreshore. The proposed scheme will replace the roundabout with a grade separated junction. For most options the dual-carriageway will be realigned to the south of the existing road to allow room for slip roads to the north between the A55 and the railway. All options for Junction 16 would retain the existing Sustrans Route 5.

5.3.2 The Scheme objectives are set out in Section 4. Figure 3 shows the location and setting of Junction 16 and 16a

5.3.3 **J16 Option A** would include the removal of roundabout at Junction 15, leaving only westbound off slip roads at a similar level to the existing road. A new four-way grade-separated junction would replace Junction 16a. The A55 would remain at a similar level to the current situation, but the new junction would have elevated slip roads on embankment and an overbridge across the A55 and the railway. The latter would provide improved access to the Sewage Treatment Plant on the seaward side of the railway. A single carriageway link road would follow the south side of the A55 from junction 16 to join Ysguborwen Road approximately 100 metres east of Junction 16. The link road would curve around the south side of the Puffin services and pass through a narrow corridor between the A55 and Maes y Llan. A link would also allow access to to Glan yr Afon Road into Dwygyfylchi. In all this option would extend to approximately 2.5 kilometres. Provision would be made to retain the existing Sustrans Route 5, which runs parallel to the north of the A55.

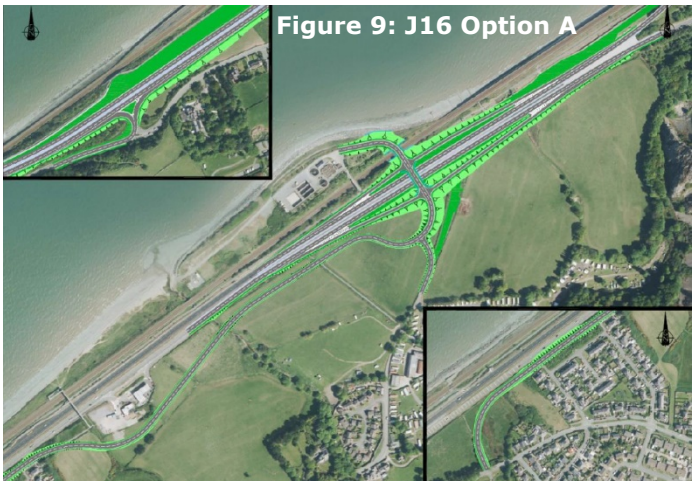


Figure 9: J16 Option A

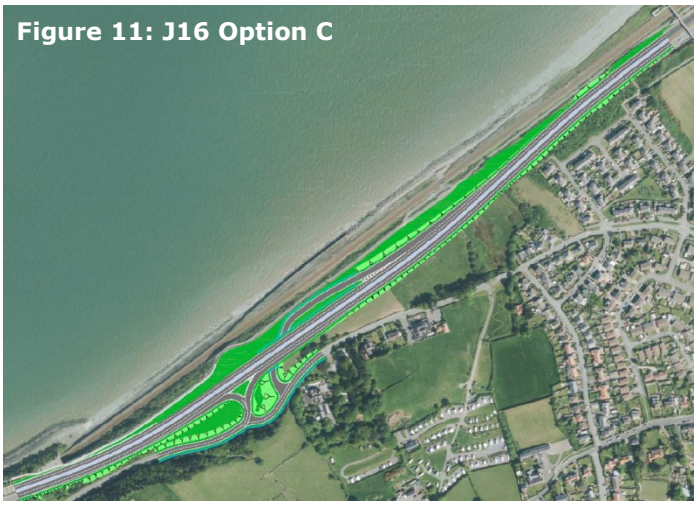
5.3.4 **J16 Option B** would include the removal of roundabout at Junction 15, leaving only westbound off slip roads at a similar level to the existing road. The more southerly alignment of the dual-carriageway would result in a deeper cutting on the south side which would taper away to east and west, for the full length of the scheme. Eastbound slip roads on embankment would be provided on the north side of the A55 rising to an overbridge across the dual-carriageway 500 metres east of the existing roundabout. The overbridge would rise to the south and an embankment would carry a link road to join Ysguborwen Road to the east of the Gladstone Hotel. The improvements would extend to approximately 1 kilometre.

Figure 10: J16 Option B

5.3.5 **J16 Option C** would include the removal of roundabout at Junction 15, leaving only westbound slip roads at a slightly elevated level compared to the existing road. An eastbound on slip road would pass under the dual-carriageway. Facilitating adequate headroom through the underbridge would raise the A55 by several metres above existing ground levels between the

location of the existing roundabout and Maes y Llan. The more southerly alignment of the dual-carriageway, required to accommodate the eastbound slip road between the A55 and the railway, and the need for adequately gently gradients down to the underbridge would push Conwy Road and Ysguborwen Road southwards and into a deep cutting. The improvements would extend to approximately 1 kilometre.

Figure 11: J16 Option C



5.3.6 **J16 Option D** would be similar to Option C, including the removal of roundabout at Junction 15, but with the westbound slip roads at a lower level compared to the existing road. An eastbound on slip road would cross the dual-carriageway on an overbridge with the slip road on an embankment on the north side. Keeping to a minimum the overall increase in height of the bridge above the existing road would require the dual-carriageway to pass through a cutting through the location of the existing roundabout as far as Maes y Llan. The more southerly alignment of the dual-carriageway, required to accommodate the eastbound slip road between the A55 and the railway, would push Conwy Road and Ysguborwen Road southwards and into a cutting. The improvements would extend to approximately 1.1 kilometre.

Figure 12: J16 Option D

6. THE SCREENING PROCESS

6.1 Definition of the project

6.1.1 To require a formal EIA, a project must fall within the definitions of Annex 1 or Annex 2 of the EIA Directive.

Annex 1

6.1.2 The proposed improvements of the two junctions do not constitute an Annex 1 project which is defined as:

> *'Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road or realigned and/or widened section of road would be 10 km or more in continuous length.'*

6.1.3 The two junction schemes, together or separately, would not constitute a project of 10km or more and therefore do not constitute an Annex 1 project.

Annex 2

6.1.4 Annex 2 projects are defined as all projects not listed within Annex 1 of the EIA Directive that are not considered to be strictly maintenance projects. In order to confirm whether the project is considered a 'relevant project' under EIA Regulations, the thresholds of size and environmental sensitivity are applied. Essentially an Annex 2 'relevant project' is defined as:

> *'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.'*

6.1.4 Within the UK, a sensitive areas is defined as Areas of Special Scientific Interest (ASSIs), Areas of Outstanding Natural Beauty (AONBs), National Parks, World Heritage Sites and European Sites (Special Protection Areas classified under the Wild Birds Directive and Special Areas of Conservation under the Habitats Directive.

6.1.5 The proposed improvements of the two junctions, whether considered together as one project with two geographically separated components, or as two separate construction projects, both are situated within or adjacent to 'sensitive area(s)', as defined by the EIA Regulations as amended. Each junction will occupy an area that exceeds 1 hectare and thus the proposed junction improvements are classified as a relevant project.

6.1.6 All relevant Annex 2 projects require a determination to be undertaken to confirm whether the project is considered likely to have a significant environmental effect. This examines the characteristics of the proposed project in terms of its location and the potential impacts that may arise and is informed by the selection criteria in Annex 3 of the EIA Directive.

Annex 3 selection criteria for screening decisions

1. Characteristics of projects

The characteristics of projects, having regard in particular to:

1. the size of the project;
2. the cumulation with other projects;
3. the use of natural resources;
4. the production of waste;
5. pollution and nuisances; and
6. the risk of accidents, having regard in particular to substances or technologies used.

2. Location of project

The environmental sensitivity of geographical areas likely to be affected by projects, having regard in particular to:

7. the existing land use;
8. the relative abundance, quality and regenerative capacity of natural resources in the area; and
9. the absorption capacity of the natural environment, paying particular attention to the following areas:
    i. wetlands;
    ii. coastal zones;
    iii. mountain and forest areas;
    iv. nature reserves and parks;
    v. areas classified or protected under legislation (including European sites);
    vi. areas in which environmental quality standards laid down in a legislation of the Communities have already been exceeded;
    vii. densely populated areas; and
    viii. landscapes of historical, cultural or archaeological significance.

3. The potential impact

The potential significant effects of projects, in relation to criteria set out und and 2 above, having regard in particular to:

10. the extent of the impact (geographical area and size of the affected population);
11. the impact on other member States;
12. the magnitude and complexity of the impact;
13. the probability of the impact; and
14. the duration, frequency and reversibility of the impact.

The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017

6.1.7 The screening process has seen some changes in the regulation, which apply in England and Wales. The new regulations require a greater depth of information and assessment at the screening stage and encourage screening to take account of other assessments, such as Strategic Environmental Assessments.

6.1.8 There are additional considerations:

1. the sensitivities of the proposed location;
2. the aspects of the environment likely to be significantly affected;
3. a description of likely effects;
4. a description of any mitigation, avoidance measures proposed in relation to those potential effects.

6.1.9 The emphasis (item 4) above on early identification of mitigation and avoidance measures to reduce the likelihood of significant effects can be taken into account as part of the screening decision.

6.1.10 Revision of the timeframes for screening mean that three weeks is allowed for the adoption of a screening direction. There is the option to extend this period to 90 days if agreed in writing.

7. CHARACTERISTICS OF THE LOCATION OF THE PROPOSED PROJECT

7.1 General description

7.1.1 The Junctions are located on the coast. To the north lies Conwy Bay, which is the eastern end of the Menai Straits. The sea, from the low tide line, is designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA), while to the west of Pen-y-Clip the sea is also a Site of Scientific Interest (SSSI).

7.1.2 To the south the land rises steeply to the northern edge of the Snowdonia Mountain Range, which here rise to around 550 metres above sea level. The mountains are within the Snowdonia National Park (SNP), with the park boundary passing to the south of the developed areas of Llanfairfechan, Penmaenmawr and Dwygyfylchi and the heavily quarried headland of Penmaenmawr.

7.1.3 Urban development is restricted to the lower lying land near the coast, while the land rising to the south is generally pasture, with rough pasture and heath on the upper slopes.

7.1.4 The locations of environmental designations in the study areas of the two schemes are shown in Figures 4 and 5.

Nature Conservation designations

7.1.5 The sea along this coastline, below the high tide line, is designated as:

Designation	Reasons for designation	In proximity:	
		Junction 15	Junction 16
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	Sandbanks which are slightly covered by sea water all the time Mudflats and sandflats not covered by seawater at low tide Reefs	Adjacent	Adjacent
Coedydd Aber SAC, SSSI and National Nature Reserve (NNR), to the south	Habitats including old sessile oak with alluvial forest of alder and ash	5km	9km
Liverpool Bay / Bae Lerpwl (Wales) Special Protection Area (SPA) to the north	Overwintering birds including Common Scoter and other waterfowl	Adjacent	Within 10km
Traeth Lafan / Lavan Sands, Conway Bay Site of Special Scientific Interest (SSSI) and Local	Overwintering birds including Oyster Catcher	Adjacent	Adjacent

Designation	Reasons for designation	In proximity:	
		Junction 15	Junction 16
Nature Reserve (LNR) to the north			
Sychnant Pass SSSI to the south of J16	Heathland habitat with plants and insects listed as important features.	5.6 km	1.9km
Aber Afon Conwy SSSI, 6.22km the east	Coastal Plain estuary and intertidal habitats of interest for marine and terrestrial invertebrates	11.3km	6.7km

Built heritage and landscape designations

7.1.6 There are Conservation Areas and Listed Buildings close to both junctions, in Llanfairfechan and Penmaenmawr. These and their settings could be indirectly affected. In Llanfairfechan the proposals for Junction 15 could have a direct impact on the Conservation Area.

7.1.7 There are several Scheduled Ancient Monuments (SAM) on high ground over a km to the south of the A55 corridor. These are at sufficient distance for the schemes to have only an indirect effect on the wider settings.

Designated Historic Parks and Gardens

7.1.8 Junction 15 improvements could have indirect impacts on the two sites in Llanfairfechan, namely, Wern Isaf to the south of junction 15 and Bryn y Neuadd on the west side of Llanfairfechan and extending along the A55 southern boundary.

Snowdonia National Park

7.1.9 The park extends north to the edges of the hills south of the A55. At Junction 15 the boundary lies between 1 and 2km to the south of the A55, but to the west of Junction 14A the boundary is adjacent to the A55.

7.1.10 At Junction 16 the park boundary lies about 250 metres to the south, while at Junction 16A the park boundary approaches and then follows a line adjacent to the A55.

Registered Historic Landscapes

7.1.11 The Register of Historic Landscapes is non-statutory and advisory. Its primary aim is to provide information on the most significant historic landscapes in order to aid their protection and conservation. There are:

North Arllechwedd, which covers most of the study area;

Lower Conwy Valley, to the south east of the study area;

Creuddyn and Conwy to the east;

Ogwen Valley to the west.

7.2 Junction 15

7.2.1 The junction lies slightly to the east of the town centre of Llanfairfechan with an almost separate community lying to the west, under the steep scree-covered slopes of Penmaenmawr. The main settlement of Llanfairfechan lies on both banks of a small watercourse that discharges into the sea at the west end of the Promenade. Residential areas and individual properties lies close to the existing A55, although properties on the Promenade are separated from the A55 corridor by the North Wales main line railway.

7.2.2 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 Route follow the A55 and the coast. Among these are some sensitive receptors.

7.3 Junction 16

7.3.1 The Junction lies between the town of Penmaenmawr and the village of Dwygyfylchi. Both of these settlements lie within different watercourse catchments with the junction falling on the boundary. Residential properties in Penmaenmawr extend across most of the coastal plain with the railway and A55 occupying a wide corridor along the coast. On the seaward side of the railway is the promenade, a wide paved area, café, paddling pool, skatepark and pebble beach that was constructed into the sea when the A55 was built. In Dwygyfylchi residential areas and caravan parks are mostly located further inland with only a small number of properties close to the A55.

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

7.3.3 There are three places of worship, a primary school, a public beach, a parish hall, a hotel and public house in Dwygyfylchi and several caravan parks.

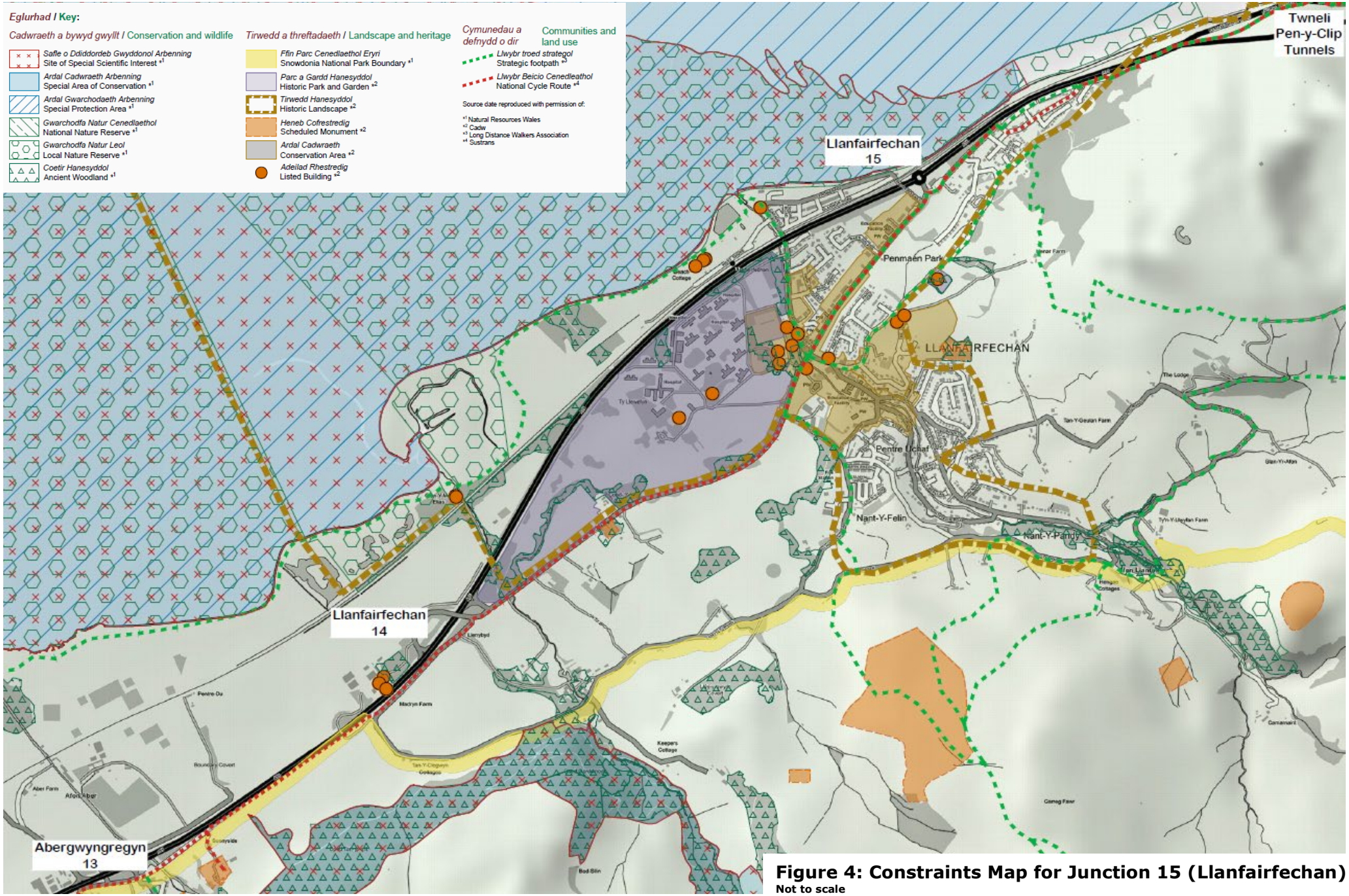


Figure 4: Constraints Map for Junction 15 (Llanfairfechan)
Not to scale

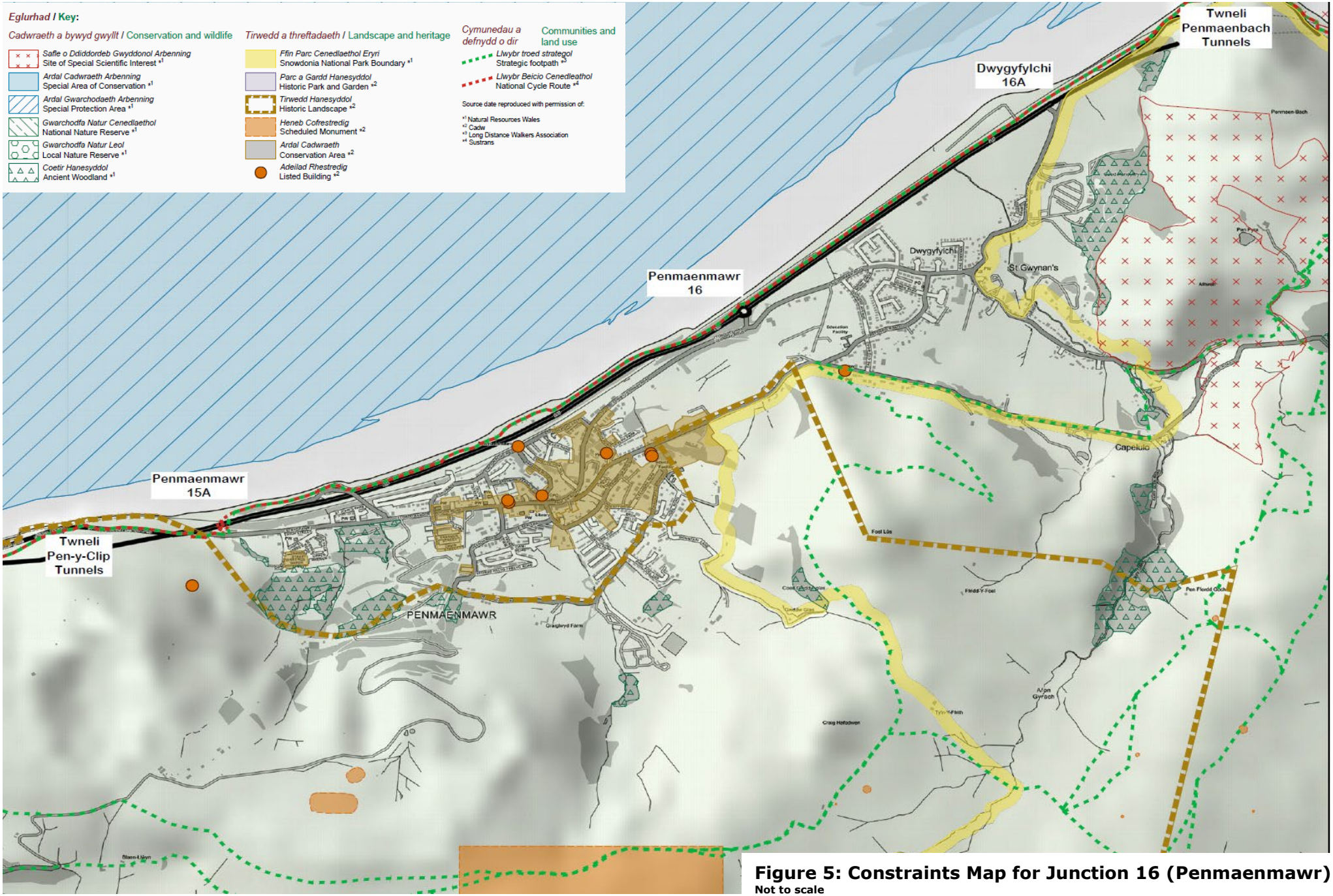


Figure 5: Constraints Map for Junction 16 (Penmaenmawr)
Not to scale

8. CHARACTERISTICS OF THE POTENTIAL IMPACTS

8.1 Basis for the topics covered

8.1.1 The topics under consideration are those listed in the Design Manual for Roads and Bridges, supplemented with other topics that are possibly relevant to this project. Recent legislation has added further topics to the DMRB list and these topics will be covered as appendices or as components of the established topics.

8.1.2 The DMRB topics are:

DMRB Topic
Air Quality
Cultural Heritage
Landscape Effects
Nature Conservation
Geology and Soils
Materials
Noise and Vibration
Effects on All travellers
Community and Private Assets
Road Drainage and the Water Environment

Additional topic	To be covered in
Population and Human Health	A self-contained assessment reported in a single chapter but cross referring, as necessary, to the noise and air quality assessments.
Climate Change	The two main elements of this topic will be Greenhouse Gases and Flood Risk. These will be covered within a self-contained chapter, or a supplement to the Air Quality chapter and as part of the Water Quality topic, respectively.
Major Accidents / Disasters	The two main elements of this topic will be Flood Risk and Ground stability. These will be covered in the Water Quality and Drainage topic and the Geology and Soils chapter.
Heat and Radiation	This topic is not considered of relevance to the project and will be scoped out.

9. JUNCTION 15

9.1 Air Quality

Baseline /surveys
Baseline air quality data is available from Conwy County Council and the Department of Environment, Food and Rural Affairs. Baseline air quality data will be sourced from existing sources (Conwy County Council) and will supplemented with monitoring at key receptors, carried out during summer 2018. No baseline surveys are required for an assessment of greenhouse gases because the assessment is a calculation of carbon released by vehicles, based on traffic data from the traffic model as an addition to global immissions.
Possible effects of the scheme
Potential construction stage effects of airborne dust and $PM_{10,}$ although particulate levels are below UK Air Quality Objective Levels. There are no Air Quality management Areas present in the study area. Potential operational effects include changes to concentrations of PM_{10} and NO_2 as a result of changes to traffic behaviour. It is likely that greenhouses gases would increase as a result of the increased speed of traffic on the A55.
Possible mitigation
Dust control mitigation would be applied during construction. Careful consideration of the design will aim to avoid pockets of pollution gathering in residential areas. Mitigation for greenhouse gases could include highway lighting to a lower carbon version (less power) to offset the increase in vehicle emitted CO2.
Conclusions: will the effects be significant
Air quality in the locality of the junction is anticipated to be well below the UK Air Quality Objective Levels and a comparison of the options for both junctions the 'Do Minimum' indicates that any change will be negligible (0). The risk of construction dust soiling affecting properties and PM10 affecting human health is considered to be low and with appropriate mitigation measures is considered negligible. Effects of dust on the Lavan Sands and Conwy Bay Special Protection Area, Menai Straits and Conwy Bay Special Area of Conservation and the Treath Lavan Site of Special Scientific Interest will be negligible. Minor changes in NO2 and PM10 concentrations are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors. It is unlikely that pollutant concentrations will change significantly enough to go above the UK Air Quality Objective Levels. Minor changes in Carbon are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors.

9.2 Archaeology and cultural heritage

Baseline /surveys
Data already available will be gathered from the National Library of Wales, Royal Commission on Ancient and Historic Monuments Wales, Local Record Offices, Cadw, National Monuments Record/Coflein; Historic Environment Record (HER) for Gwynedd and Snowdonia National Park, which have separate records, Historic documents, OS map data, Aerial photographs from the 1940s onwards and LiDAR data. A walkover survey will be carried out to identify visible evidence and further investigations could include a Geophysical survey on previously undisturbed ground. In the event that the geophysical survey or other work identifies high risk areas, trial trenching will be carried out. Figure 4, Constraints Plan, shows the locations of designated sites.
Possible effects of the scheme
Construction effects could include direct damage to a site or its setting, or temporary damage to the setting. Operational effects could include permanent change to the settings or damage to sites. The location of Junction is theoretically visible across Conwy Bay from the World Heritage Site (WHS) of Beaumaris Castle, although the separation distance is 8km would render the proposed scheme invisible against the backdrop. Gwern y Plas Ancient Village Scheduled Ancient Monument (SAM) is within 1km of Junction 15 and the setting of this could be effected. The setting of Wern Isaf Registered Historic Park and Garden and the two Listed Buildings within this site (Grade II and II*) could be affected. The scheme lies within North Arllechwedd Historic Landscape and the Conservation Area of Llanfairfechan Town centre, which is very close to the Junction and both will be directly effected. There are also undesignated sites noted on Coflein and the Historic Environment Record which include buildings such as Bryn Celyn, Plas y Coed and The Heath which could be indirectly or directly affected. The desk study and surveys could also identify previously unknown features which are not designated. Possible construction effects on buried archaeology, such as disturbance, or destruction are unlikely to be significant because most of the proposed changes will affect ground that has already been disturbed by construction of the existing A55.
Possible mitigation
The mitigation strategy will include assessing the nature and scale of impacts on known cultural heritage receptors. Slight Adverse to Large Adverse impacts will potentially inform the junction design to allow recommendations for avoidance or physical mitigation in design to be applied. Mitigation could involve excavation and recording. Detailed recording of the structures effected by the scheme, with results lodged in the local record office.

Conclusions: will the effects be significant
There is a direct / indirect significant impact on the Llanfairfechan Conservation Area, the setting of the Gwern y Plas Ancient Village SAM (CN072) and the Historic Park and Garden of Wern Isaf (formerly Rosebriars) PGW(Gd) 009 (CON) and the Grade 2* listed building of Wern Isaf. Other features, listed buildings, sites noted on Coflein and the Historic Environment Record will potentially experience less impact on setting and no direct impact. As much of the site has already been disturbed or is built up there is a low risk of significant impact on buried remains.

9.3 Nature Conservation (biodiversity)

Baseline /surveys
Know sources will include reports from previous surveys, reference to historic species records (COFNOD), information about designated sites, including sites where bats are a qualifying feature. A Phase 1 survey of habitats within 500metres of the junction scheme has been completed. Winter bird surveys of the marine and terrestrial habits have been completed between November 2017 and March 2018 to cover all areas within 500metres of the scheme. Bat activity surveys are in progress to include repeat transects through the summer to a method agreed with NRW. Bats have been encountered on the south side of the junction. No roost surveys are considered necessary at this stage. Evidence of otters using the coast and watercourses has been found. Walk over surveys of reptile habitat have been completed and no reptile surveys are not considered necessary. Designated areas are shown in Figure 4 Constraints Plan.
Possible effects of the scheme
Oyster catchers: a qualifying feature of the SPA, use the tidal areas and also graze grassland south of the A55 during high tides. There is potential, during construction, for storage areas and the contractor's compounds or haul roads to temporarily remove some grazing areas. Bats: are known in the area. The impact of construction with the removal of roadside vegetation could adversely affect bats, if they are using the areas as commuting routes. If bats are roosting in buildings to be demolished they could be adversely affected. Reptiles: if present these species could be impacted if habitat, in the form of roadside vegetation, were cleared during construction. The potential for loss of grassland for grazing oyster catchers during operation is considered unlikely to affect the species due to the small area permanently lost. Lavan Sands, Conway Bay SPA: potential adverse effects of increased traffic noise, waterborne pollution from accidental spillages. Bats: are known in the area and surveys are planned to confirm if they are roosting or flying and foraging in the area.
Possible mitigation
The construction stage temporary impact on grassland grazed by oyster catchers will be minimised by careful avoidance of areas used, or only infrequently used by the species. Undertaking vegetation clearance under a precautionary approach to dissuade reptiles from the works area. Provision of replacement habitat in roadside areas.

Surveys to determine the presence or absence of bats will be completed and if present, appropriate mitigation implemented to avoid harm to the species during construction and to provide replacement roadside vegetation and replacement roosts, as necessary Highway drainage, during operation and construction, will be provided with pollution control devices to reduce the potential risk of contamination of the marine designations and their constituent habitats and species. Habitat creation, management and repair will be applied where appropriate.
Conclusions: will the effects be significant
There is potential for significant impacts on the marine nature conservation sites (SCA, SPA, SSSI), but with mitigation there are unlikely to be any significant adverse impacts on these sites or other receptors.

9.4 Landscape and townscape

Baseline /surveys
Desk study of available resources including previous reports; Wales LANDMAP landscape assessment database; the Cadw Register of Parks and Gardens, and data on Historic Landscapes; Aerial photographic data, OS mapping. Wintertime and summer landscape surveys and photographic surveys have been completed. A drone terrain data capture survey has been completed. Figure 4 Constraints Plan: shows the locations of designated landscapes.
Possible effects of the scheme
The proposed scheme will be a modification of the existing A55 dual carriageway, so the impacts would have less of an effect than an entirely new road in the landscape setting. Some dwellings directly affected by construction of embankments to provide slip roads and other junctions on the local roads. Residents of Pandy: slight to moderate adverse effect caused by re-alignment of Penmaenmawr Road. Construction stage impacts would be worse than operational impacts in most cases. An adverse impact on residential area of Lafan to the south of the A55. Impacts on views to the sea, which are considered valuable by local residents. Impacts on views from the Snowdonia National Park on elevated ground nearby. Impacts on the two Registered Parks and Gardens and their settings are possible. Impacts on the character of North Arllechwedd Historic landscape Area.
Possible mitigation
Re-establishment of roadside vegetation, using locally appropriate species as integration and screening mitigation. Acoustic barriers could also provide screening of moving traffic on the A55. False cuttings may be applicable where adequate land is available.
Conclusions: will the effects be significant
Because the A55 already exists, the impacts for many receptors are slight by comparison to the existing situation. At some receptors it is considered likely, both without and with mitigation, that new embankment, slip roads and structures could have significantly adverse effects for residential receptors, on key views and on the townscape of Llanfairfechan.

9.5 Community and Private Assets

Baseline /surveys
Desk study of published sources including mapping, aerial photograph, local authority records, Local Development Plan and agricultural land classification maps will be used. Surveys of community facilities, retail services, tourism, land use and farm businesses will be carried out as necessary.
Possible effects of the scheme
Potential land take of grazing land during construction and operation, but no severance of farmland so an assessment on farm businesses will not be required. CPO and demolition of residential properties and offices. Clearance of roadside amenity land and tree planting. Potential adverse effect of construction and positive effect during operation on access to community and public services, retail and administrative services.
Possible mitigation
Management of construction works to minimise disruption to public transport, emergency services and general traffic and access to facilities.
Conclusions: will the effects be significant?
Without mitigation during construction there could be some potentially significant adverse impacts on connectivity via the A55 and access to public facilities. With mitigation it is unlikely that the potential impacts on access to public and community facilities will be significant at any stage. Demolition of residential properties and offices would be a significant impact.

9.6 Noise and Vibration

Baseline /surveys
The effects of noise are as yet to be examined in detail. The assessment will involve the development of a noise model based on traffic data. There are a number of Noise Action Planning Priority Areas along the A55 corridor, designated by Welsh Government. These include a location at Junction 15 (Area 6 on Figure 7), and to the west in the centre of Llanfairfechan. The proximity of sensitive receptors will then be taken into account in deciding whether surveys of existing noise are necessary. Traffic data is available from Welsh Government. If necessary, further traffic data will be gathered by monitoring of the A55.
Possible effects of the scheme
During construction, noise immissions are considered likely to be slightly increased as a result of construction activity. The removal of the roundabout on the A55 will reduce the noise immissions arising from braking and accelerating. The noise of vehicles running over the rumble strips on the approaches to the roundabout and no longer occur. However, traffic should be free-flowing and there will be an overall increase in traffic speed. Overall, the noise emissions are predicted to change and to

increase for sensitive receptors around the junction. The main areas where noise is predicted, at this stage, to increase are shown in Figure 7 below.

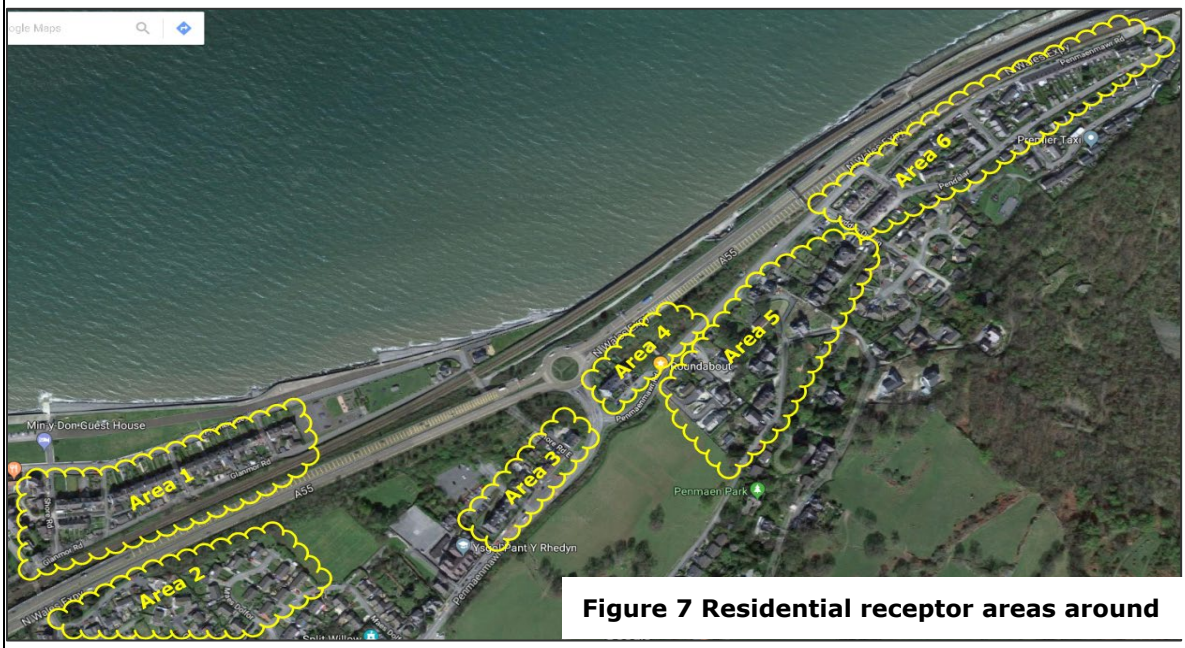


Figure 7 Residential receptor areas around

Possible mitigation

Mitigation for noise impacts during construction would include avoidance of noisier activities at sensitive times of the day and the use of modern well-maintained plant

Long term mitigation of operational effects could include low noise surfacing, acoustic barriers in the form of fences or earth banks/false cuttings, or combinations of these.

Conclusions: will the effects be significant

Taking account of the use of low noise surfacing throughout and localised use of noise barriers, the effects of the scheme is likely to be an increase in noise at local receptors, for some of these the impacts could be a significant change.

9.7 All travellers

Baseline /surveys

A desk study will be undertaken to obtain any data from published or public sources, including information on Public Rights of Way, National Cycle Routes and Footpaths.

Walkover surveys and drive-through surveys will determine the network of non-motorised user (NMU) routes, the experience of vehicular travellers and constraints on access.

NMU travel through the area on key routes within the network (e.g. public-rights-of-way, cycle routes, North Wales Coastal Path, promenades and beaches, that would be affected by the scheme, will be monitored as necessary. There are no known equestrian routes crossing the A55, although it is understood that there are equestrian routes to the south.

Possible effects of the scheme

Construction impacts could include some restricted use, diversion or temporary closures of routes under or close to the A55. This would restrict access, increase severance, add to journey times, disrupt local travel patterns and adversely affect amenity. Vehicular travellers would experience disruption to journeys on the A55, and for local traffic wanting to use the A55, if additional speed restrictions and a temporary reduction in the number of lane is required. During operation, all existing routes will be retained in a fully operational form. This will include Shore Road East, the National Cycle Route and North Wales Coastal Path. All existing accesses to the coastal strip will be retained. The local route northeast and southwest along Penmaenmawr Road will be impacted by changes to the junction which will add to journey length, disruption and severance through road crossings and would reduce amenity for pedestrians and cyclists. Vehicle travellers would experience a beneficial effect on journeys as a result of the existing roundabouts being removed. It is also likely that local traffic entering and leaving the A55 at the junction would benefit from the junction improvements. Local traffic not using the A55 would be largely unchanged, although changed junction arrangements could require slightly longer journeys.
Possible mitigation
Mitigation including works phasing and construction methods would reduce temporary impacts by minimising disruption of traffic and access to and from the towns and the A55. During operation the scheme would provide new routes for any NMU effected. Where space allows, mitigation, in the form of planting and other vegetation, would improve amenity.
Conclusions: will the effects be significant
Temporary construction effects are anticipated to have significant adverse impacts on all travellers without mitigation. However, it is unlikely that the potential permanent operational impacts on NMUs will be significant.

9.8 Road drainage and the Water Environment

Baseline /surveys
Desk study to gather data from previous surveys and published sources, including abstraction information, discharge consents, Envirocheck reports, the Welsh Government and NRW flood mapping. TAN 15 maps show that the area is classified as Zone C Without significant flood defence infrastructure, see Figure 8. A Flood Consequences Assessment will be carried out. The main areas of concern is the marine environment which lies a short distance to the north. The coastal waters are covered by several European and national nature conservation designations. Two small watercourses could also be adversely affected. Water quality data from watercourses passing under the A55 will be gathered if necessary to support the assessment.

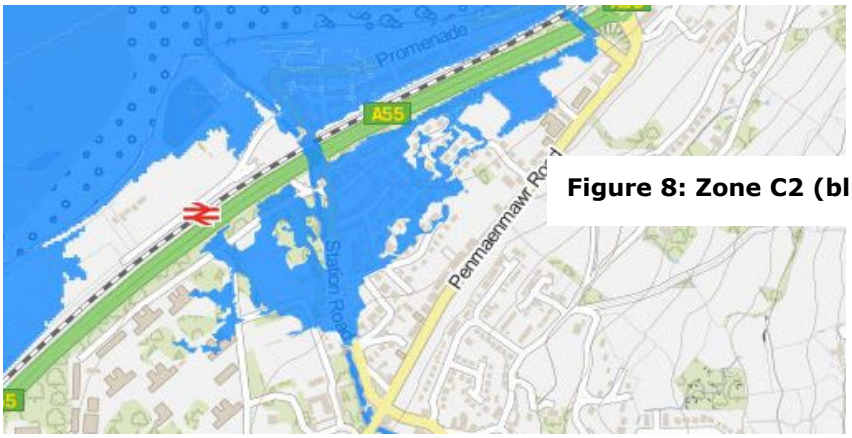


Figure 8: Zone C2 (blue)

Possible effects of the scheme
During construction there is potential for silt, including contaminated materials, if encountered, to be carried into the local watercourses and the sea, with adverse impacts on the habitats and species within the European and nationally designed nature conservation sites. During operation, the proposed improvement is unlikely to have an adverse impact on water quality because the existing drainage scheme will be utilised. Removal of the roundabout might change the risks of spillages on the road. Whilst the area of hard surfacing might marginally increase the volume of storm water entering the drainage system, the scheme is unlikely to impact on the risks of flood in the C2 Zone.
Possible mitigation
Mitigation during construction would include measures to contain silt generated on site and to minimise the risk of spillage of construction materials and fuel. During operation mitigation could include attenuation capacity within the drainage system; pollution control devices to contain contamination spillages; the road would be constructed above the level affected by floods.
Conclusions: will the effects be significant
Without mitigation there is potential for significant impacts during construction or operation, in the event of silt or road spillage on sensitive receptors, namely, the marine nature conservation sites (see figures 4 and 5). With suitable mitigation no significant impacts are expected.

9.9 Geology and soils

Baseline /surveys
Reference to published geological mapping (sheet 106) and BGS online mapping sources (Geology of Britain Viewer) indicates the underlying solid and superficial geology to be Mudstones and Siltstones of the Nant Ffrancon subgroup of Ordovician Age (Arenig to Caradoc, 447Ma-478Ma) overlaid with glacial till of Quaternary age (<2Ma), storm beach deposits (predominantly gravels), and coastal zone deposits (predominantly clays and silts). In terms of geological structure, a geological fault is inferred, oriented north-east to south-west, with downthrow to the north. The displacement on the fault has not been recorded.

Borehole logs carried out to inform the original design and construction of the A55 indicate that anthropogenic deposits 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. It should be noted however, that not all these strata were observed in all boreholes. 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.

Close to the existing 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.

Long sections drawn 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.

Reference to the online MAGIC viewer and the Joint Nature Conservation Committee (JNCC) website indicates that the site does not lie within a protected site (SSSI) or other protected site (such as RIGS) in relation to its geology. The nearshore sand/mudflats however are within the Traeth Lafan/Lafan Sands SSSI.

Further discussion of the geology and existing ground investigation information will be provided in the Preliminary Sources Study Report (PSSR).

Construction of the A55 could have involved removal or treatment of contaminated materials. Ground investigations may be required because there is believed to be the potential for contamination in the ground arising from a demolished garage, a school and a horticultural nursery.

The sites of potential contamination are shown in Figure 6.

Figure 6: Potentially contaminated sites

Possible effects of the scheme

The scheme may disturb contaminated land and made ground along and immediately adjacent to the existing A55, with some further disturbance of natural ground for the slip roads and changes to local roads. Sources of contamination associated with the two garages could be affected. Other than to potential presence of contaminants the effects of the scheme on the geology and soils are anticipated to be negligible.
Possible mitigation
Ground investigations with boreholes and trial pits could identify whether contamination is present and suitable treatments can be applied to remove or treat contamination or leave it undisturbed in the ground. During construction the best practicable environmental option would be applied to contain and or remove contamination.
Conclusions: will the effects be significant?
Without mitigation there is potential for adverse impacts but taking proposed mitigation into account there is unlikely to be any significant adverse impact, although removal or treatment could have a slight beneficial impact.

9.10 Materials

Baseline /surveys
The assessment focuses on the construction phase of the proposed scheme but does not address the sources of raw materials, for example minerals from quarries. The assessment would be desk study based on estimates of construction quantities. Information will be obtained from published sources, including previous ground investigations. Information relating to the cut and fill balance and the requirement for bulk construction materials will be obtained from the design team as the scheme design proceeds. An assessment of the reuse potential of the materials to be excavated as part of the scheme will be discussed within the PSSR.
Possible effects of the scheme
There would be substantial excavation to form embankments and cuttings which both generate and require fill material. Where possible a cut and fill balance would be achieved, but there is the possibility that surplus or shortfall could be generated. There is also the potential that contaminated materials could be excavated in high risk areas which would be defined as a waste and so require disposal off-site. Topsoil excavated on site would be reused as part of the finished scheme. Possible minerals beneath the footprint of the scheme could be used as construction materials. Construction of the road pavement, structures and drainage would require aggregate and cement, steel and other manufactured products. During operation there will be a requirement for renewal of pavements and structures over intervals ranging from 10 years to 40 years.
Possible mitigation

Construction site waste management plan to encourage effective waste minimisation. Reuse and recycling of materials generated from demolition and processing to maximise the value of excavated materials and minimise the need for haulage to landfill. Minimise waste of construction materials imported to site. Purchase bulk raw materials from local sources to minimise use of the road network, the burning of fossil fuels and the production of exhaust emissions.
Conclusions: will the effects be significant
The use and import of materials for construction is anticipated to have potentially significant effects without mitigation. Taking account of the potential for recycling of materials derived from the site and design to achieve a cut and fill balance, these would not be significant. There is potential for contaminated ground to be found and removal of material would be a significant impact on landfill capacity.

9.11 Population and Human Health

Baseline /surveys
Desk study-based assessment drawing on known data and the results of noise and air quality assessments. Monitoring of air quality will be carried out in summer 2018 to supplement data gathered by Conwy County Council.
Possible effects of the scheme
The scheme could influence public health and wellbeing in the areas surrounding the proposed junction improvements. These impacts would most likely occur as a result of any environmental impacts such as noise and air quality, or socio-economic impacts such as the loss of access to services and facilities, public open space, and opportunities for physical activity. The impacts would likely have a disproportionate effect on sensitive or vulnerable members of the community. The changes proposed for the junction may not radically change existing impacts because there is potential for air quality to be adversely affected and traffic noise could increase. However, the opportunity to provide mitigation and enhancement, such as better access to facilities, improved public open space and non-motorised user routes and relief from some aspects of traffic noise could improve public health and wellbeing.
Possible mitigation
Design to minimise the propagation of noise at receptors and to reduce the potential for pockets of air pollution would be considered. Other mitigation and enhancements would also be considered to improve the quality of life such as public open space, measures to encourage active travel and tree planting for amenity purposes within the scheme land take.
Conclusions: will the effects be significant
The temporary construction effects of the scheme are anticipated to have potential impacts without mitigation. The operational impacts are considered unlikely to be significant.

9.12 Climate Change

Baseline /surveys
Desk-study based assessment drawing on known climate data and traffic modelling. The assessment of greenhouse gases takes global changes into account, but the study area for each junction will be determined by the extent of the traffic model, and all roads, existing and new are considered
Possible effects of the scheme
There are two areas of concern that could affect climate change, or could result from climate change: 1 The production of Greenhouse gases (Carbon dioxide) as vehicle exhausts; 2A Sea level rise and severe rainfall events arising from climate change that could adversely affect the road or traffic; and the exacerbation of sea level rise and severe rainfall events as a result of the scheme, that could cause flooding of surrounding areas. Using traffic data for the existing scheme and the traffic model for the proposed junction improvements the quantity of Cox produced as exhaust emissions will be calculated. The embodies carbon arising from construction and the use and transport of materials and the effects of long-term maintenance would be considered. The change in the volume of Cox produced will represent an increased (adverse) or decreased (beneficial) effect.
Possible mitigation
The effects of climate change on flood risk would be considered in the Drainage and Water Environment chapter of the ES with the scheme design adjusted to minimise the risk of adverse effects.
Conclusions: will the effects be significant?
All changes to carbon emissions are considered to be significant. The scheme is not anticipated to have a significant effect on flood risk associated with climate change.

9.13 Risk of Disaster

Baseline /surveys
Desk study-based assessment drawing on known data and the results of consultations.
Possible effects of the scheme
Risk of Disaster requires an assessment of 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 or disasters. The assessment would address the relevant

risks to the resilience of the A55. For example, flood risk from the sea, major rail or road accidents, landslides and road or tunnel closures could be relevant, while volcanic eruptions, famine and plagues of pests are not. The scheme could influence public health and wellbeing in the areas surrounding the proposed junction improvements. These impacts would most likely occur as a result of any environmental impacts such as noise and air quality, or socio-economic impacts such as the loss of access to services and facilities, public open space, and opportunities for physical activity. The impacts would likely have a disproportionate effect on sensitive or vulnerable members of the community. The changes proposed for the junction may not radically change existing impacts because there is potential for air quality to be adversely affected and traffic noise could increase. However, the opportunity to provide mitigation and enhancement, such as better access to facilities, improved public open space and non-motorised user routes and relief from some aspects of traffic noise could improve public health and wellbeing.
Possible mitigation
Design to minimise the risk of accidents and disasters will be fundamental to the scheme. Further mitigation would be measures put in place by the emergency services, Natural Resources Wales, and the Trunk Road Maintaining Agent and Local Authority to manage the consequences.
Conclusions: will the effects be significant
The temporary construction effects of the scheme are anticipated to have potential impacts without mitigation. The operational impacts are considered unlikely to be significant.

9.14 Heat and Radiation

Baseline /surveys
Desk study-based assessment drawing on known data and the results of consultations.
Possible effects of the scheme
During the Scoping study for these two junctions t need for a full assessment will be considered. However, this is unlikely to identify any significant changes to the environmental as a result of the scheme.
Possible mitigation
No mitigation is considered likely.
Conclusions: will the effects be significant?
This topic is not considered to be relevant to a highway improvement project and so further consideration is unlikely. The details of the scoping out of this topic will be set out in a separate Scoping Report for each junction.

9.15 Conclusions for Junction 15

9.15.1 Under the EIA Directive 2011/92/EU as amended, the proposed works at Junction 15 are not an Annex I development. However, the works are an Annex II relevant development because the total area of the scheme will exceed the 1-hectare threshold and therefore have undergone the determination process.

9.15.2 The determination concludes that the proposed works are of more than local importance, but are set within a sensitive location (located beside designated marine sites, close to Snowdonia National Park and partly within the Llanfairfechan Conservation Area, and are anticipated to have significant adverse effects on the receiving and surrounding environment. To ensure that all environment effects are considered during the design process a Statutory Environmental Assessment will be undertaken on the proposed project.

9.15.3 In line with best practice requirements and to ensure that all environmental effects are identified, and the appropriate level of assessment applied, a scoping report will be produced and agreed with the Statutory Environmental Bodies before the Environmental Assessment process is commenced. The conclusions about the environmental topics are set out below:

Topic	**Potential significant impacts with and without mitigation**		
	Conclusion	Without	With
Geology and Soils	Without mitigation there is potential for adverse impacts to occur but taking proposed mitigation into account, there is unlikely to be any significant adverse impact, although removal or treatment of contaminated soils could have a slight beneficial impact.	Yes	No
Noise and Vibration	Removal of the roundabouts will reduce the traffic noise from rumble strips, braking and accelerating, but overall traffic noise resulting from increased vehicle speeds will increase. Mitigation in the form of low noise road surfacing throughout and localised use of noise barriers, will reduce impacts overall, but some local receptors could still see an increase compared with the existing situation. Some of these increases could still be a significant change with mitigation.	Yes	Yes
Road Drainage and the Water Environment	Without mitigation there is potential for significant impacts during construction, or in the event of a road spillage on sensitive receptors, namely, the marine nature conservation sites. With suitable mitigation no significant impacts are expected.	Yes	No
Nature Conservation (Biodiversity)	There is potential for significant impacts on the marine nature conservation sites (SCA, SPA, SSSI), but with mitigation there are unlikely to be any significant adverse impacts on these sites or other receptors.	Yes	No

Topic	Potential significant impacts with and without mitigation		
	Conclusion	Without	With
Landscape and Townscape	Because the A55 already exists, the impacts for many receptors are slight by comparison with the existing situation, but at some receptors it is considered likely, without and with mitigation, that new embankments, slip roads and structures could have significantly adverse effects or residential receptors, key views and the townscape / conservation area of Llanfairfechan.	Yes	Yes
Archaeology and Cultural Heritage	There is a direct / indirect significant impact on the Llanfairfechan Conservation Area, the setting of the Gwern y Plas Ancient Village SAM (CN072) and the Historic Park and Garden of Wern Isaf (formerly Rosebriars) PGW(Gd) 009 (CON) and the Grade 2* listed building of Wern Isaf.	Yes	Yes
Community and Private Assets	Without mitigation during construction there could be some potentially significant adverse impacts on connectivity via the A55 and access to public facilities. With mitigation it is unlikely that the potential impacts on access to public and community facilities will be significant at any stage, but any demolition of residential properties and offices, which several of the options would require, would be a significant impact.	Yes	Yes
Air Quality	Minor changes in NO2, CO2 and PM10 concentrations are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors.	No	No
All Travellers	Temporary construction effects are anticipated to have significant adverse impacts on all travellers without mitigation. However, it is unlikely that the potential permanent operational impacts on NMUs will be significant.	Yes	No
Materials	The use and import of materials for construction is anticipated to have potentially significant effects without mitigation. Taking account of the potential for recycling of materials derived from the site and design to achieve a cut and fill balance, these would not be significant. There is potential for contaminated ground to be found and removal of material would be a significant impact on landfill capacity which could not be mitigated.	Yes	Yes
Population and Human Health	The temporary construction effects of the scheme are anticipated to have potentially significant impacts without mitigation. The operational impacts are considered unlikely to be significant, unless housing demolitions are required.	Yes	Yes
Cumulative and in-combination effects	Improvements at both junctions 15 and 16 could be constructed in parallel or in sequence, but it is likely that there could be some cumulative impacts. Physical separation of the junctions and receptors by several kms of road and by the intervening headland and tunnel		

Topic	Potential significant impacts with and without mitigation		
	Conclusion	Without	With
	mean that cumulative impacts from the two improvements are likely to be limited to:		
	• Potential impacts of traffic congestion and reduced journey time reliability during construction as a consequence of lane narrowing/closures and temporary speed restrictions. These impacts on travellers and local residents would be mitigated by careful programming of the works to minimise adverse effects on traffic flows.	Yes	No
	• Potential ecological effects of construction on species such as over-wintering birds from the SAC, SPA and SSSI. During construction the loss of terrestrial grazing habitat for oyster catchers at both sites could adversely affect the birds. Mitigation would include avoidance of important grazing habitat in both locations.	Yes	No
	• The effect of the junction improvements in combination on traffic flow, congestion, access to Llanfairfechan and journey time reliability should be **beneficial** to local and through travellers;	Yes	Yes
	Cumulative impacts of construction of Junction 15 and other concurrent developments around Llanfairfechan (such as housing construction) could include increased numbers of construction traffic on local roads, construction noise, visual impact and reduced air quality as a result of airborne dust from construction activity. The likelihood of both occurring concurrently is low and mitigation proposed for construction of junction 15 should avoid any increase of construction traffic on local roads or minimise the duration when such combined traffic could occur.	No	No

10. JUNCTION 16

10.1 Air Quality

Baseline /surveys
Baseline air quality data available from Conwy County Council and the Department of Environment, Food and Rural Affairs. Monitoring of local air quality for key receptors, which include residential areas, will be carried out as necessary to supplement Conwy County Council monitoring. No baseline surveys are required for an assessment of greenhouse gases because the assessment is a calculation of carbon released by vehicles, based on traffic data from the traffic model as an addition to global immissions.
Possible effects of the scheme
Potential construction stage effects of airborne dust and PM10, although particulate levels are below UK Air Quality Objective Levels. There are no Air Quality management Areas present in the study area. Potential operational effects include changes to concentrations of PM10 and NO2 as a result of changes to traffic behaviour. It is likely that greenhouses gases would increase as a result of the increased speed of traffic on the A55.
Possible mitigation
Dust control mitigation would be applied during construction. Careful consideration of the design to avoid pockets of pollution gathering in residential areas. Mitigation for greenhouse gases could include highway lighting to a lower carbon version (less power) to offset the increase in vehicle emitted CO2.
Conclusions: will the effects be significant
Air quality in the locality of the junction is anticipated to be well below the UK Air Quality Objective Levels and a comparison of the options for both junctions the 'Do Minimum' indicates that any change will be negligible (0). The risk of construction dust soiling affecting properties and PM10 affecting human health is considered to be low and with appropriate mitigation measures is considered negligible. Effects of dust on the Lavan Sands and Conwy Bay Special Protection Area, Menai Straits and Conwy Bay Special Area of Conservation will be negligible. Minor changes in NO2 and PM10 concentrations are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors. It is unlikely that pollutant concentrations will change significantly enough to go above the UK Air Quality Objective Levels. Minor changes in Carbon are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors.

10.2 Archaeology and cultural heritage

Baseline /surveys
Data already available will be gathered from the National Library of Wales, Royal Commission on Ancient and Historic Monuments Wales, Local Record Offices, Cadw, National Monuments Record/Coflein; Historic Environment Record (HER) for Gwynedd and Snowdonia National Park, which have separate records, Historic documents, OS map data, Aerial photographs from the 1940s onwards and LiDAR data. A walkover survey will be carried out to identify visible evidence and further investigations could include a Geophysical survey on previously undisturbed ground. In the event that the geophysical survey or other work identifies high risk areas, trial trenching will be carried out. Figure 4 Constraints Plan shows the locations of designated sites.
Possible effects of the scheme
Construction effects could include direct damage to a site or its setting, or temporary damage to the setting. Operational effects could include permanent change to the settings or damage to sites. The location of Junction is theoretically visible across Conwy Bay from the World Heritage Site (WHS) of Beaumaris Castle, although the separation distance is 8km would render the proposed scheme invisible against the backdrop. The cultural heritage of Snowdonia National Park (SNPA) could be affected directly or indirectly, depending upon the extent of the scheme. The settings of up to 6 Grade II Listed Buildings in Penmaenmawr, and the setting of the Conservation Area could be indirectly affected. The scheme lies within North Arllechwedd Historic Landscape which would be directly affected. There are also a number of undesignated sites noted on Coflein and the Historic Environment Record which include buildings, wrecks and some known archaeological sites, where the settings could be affected. The desk study and surveys could also identify previously unknown features which are not designated. Possible construction effects on buried archaeology, such as disturbance, or destruction are unlikely to be significant because most of the proposed changes will affect ground that has already been disturbed by construction of the existing A55.
Possible mitigation
The following mitigation strategy would be applied: Assess nature and scale of impact on known cultural heritage receptors. Slight Adverse to Large Adverse impacts will potentially inform the junction design to allow recommendations for avoidance or physical mitigation in design to be applied. Mitigation could involve excavation and recording. Detailed recording of the structures effected by the scheme, with results lodged in the local record office.
Conclusions: will the effects be significant
There is a strong likelihood of a significant impact on the Penmaenmawr Conservation Area but less likelihood of impact on other receptors. The Gas works wall identified on Coflein indicates potential for impact to further sections of the gasworks should they survive. An archaeological watching brief would be required to record any remains. All options have the potential to directly impact on previously unknown archaeology, but as much of the site has already been disturbed or is built up there is a low risk of significant impact on buried remains.

10.3 Landscape and townscape

Baseline /surveys
Desk study of available resources including previous reports; Wales LANDMAP landscape assessment database; the Cadw Register of Parks and Gardens, and data on Historic Landscapes; Aerial photographic data, OS mapping. Wintertime and summer landscape surveys and photographic surveys have been completed. A drone terrain data capture survey has been completed. Figure 4 Constraints Plan: shows the locations of designated landscapes.
Possible effects of the scheme
The proposed scheme will be a modification of the existing A55 dual carriageway, so the impacts would have less of an effect than an entirely new road in the landscape setting. Residential areas: slight adverse effect due to construction works and operational impacts of traffic. Temporary Construction stage impacts would be worse than operational impacts in most cases. A slight to moderate adverse effect due to loss of pastoral grassland to accommodate earthwork embankments and a new road. slight adverse effect due to indirect impact of new structures and earthworks, with seaward views adversely effected. For coastal strip: slight adverse effect due to loss of scrubland on platform and banks between beach and railway, and railway and the A55. Impacts on views to the sea, which are considered valuable by local residents. Impacts on views from the Snowdonia National Park on elevated ground nearby. Impacts on the two Registered Parks and Gardens and their settings are possible. Impacts on the character of North Arllechwedd Historic landscape Area.
Possible mitigation
Re-establishment of roadside vegetation, using locally appropriate species as integration and screening mitigation. Acoustic barriers could also provide screening of moving traffic on the A55. False cuttings may be applicable where adequate land is available.
Conclusions: will the effects be significant
Because the A55 already exists, the impacts for many receptors are a slight increase or slight improvement by comparison to the existing situation. At some receptors it is considered likely, both without and with mitigation, that new embankment, slip roads and structures could have significantly adverse effects for residential receptors, on key views and on the townscape of Penmaenmawr.

10.4 Nature Conservation (biodiversity)

Baseline /surveys
Know sources will include reports from previous surveys, reference to historic species records (COFNOD), information about designated sites, including sites where bats are a qualifying feature. A Phase 1 survey of habitats within 500metres of the junction scheme has been completed. Winter bird surveys of the marine and terrestrial habits have been completed between November 2017 and March 2018 to cover all areas within 500metres of the scheme. Bat surveys are in progress to a method agreed with NRW and bats have been encountered on the south side of the junction. Evidence of otters using the coast and watercourses has been found. Designated areas are shown in Figure 4 Constraints Plan.
Possible effects of the scheme
Know sources will include reports from previous surveys, reference to historic species records (COFNOD), information about designated sites, including sites where bats are a qualifying feature. A Phase 1 survey of habitats within 500metres of the junction scheme has been completed. Winter bird surveys of the marine and terrestrial habits have been completed between November 2017 and March 2018 to cover all areas within 500metres of the scheme. Bat activity surveys are in progress to include repeat transects through the summer to a method agreed with NRW. Bats have been encountered on the south side of the junction. No roost surveys are considered necessary at this stage. Evidence of otters using the coast and watercourses has been found. Walk over surveys of reptile habitat have been completed and no reptile surveys are not considered necessary. Designated areas are shown in Figure 4 Constraints Plan.
Possible mitigation
The construction stage temporary impact on grassland grazed by oyster catchers will be minimised by careful avoidance of areas used, or only infrequently used by the species. Undertaking vegetation clearance under a precautionary approach to dissuade reptiles from the works area. Provision of replacement habitat in roadside areas. Surveys to determine the presence or absence of bats will be completed and if present, appropriate mitigation implemented to avoid harm to the species during construction and to provide replacement roadside vegetation and replacement roosts, as necessary Highway drainage, during operation and construction, will be provided with pollution control devices to reduce the potential risk of contamination of the marine designations and their constituent habitats and species. Habitat creation, management and repair will be applied where appropriate.
Conclusions: will the effects be significant
There is potential for significant impacts on the designated marine nature conservation site, but with mitigation there are unlikely to be any significant adverse impacts on these sites or other receptors.

10.5 Geology and soils

Baseline /surveys

Desk studies of published sources have identified the underlying solid and superficial geology to be Siltstones overlaid with glacial till. Records of boreholes along the line of the existing A55 demonstrate that there is a substantial thickness of made ground under the pavement.

Construction of the A55 could have involved removal or treatment of contaminated materials. Ground investigations may be required because there is believed to be the potential for contamination in the ground arising from a demolished garage, a school and a horticultural nursery.

The sites of potential contamination are shown in Figure 6.

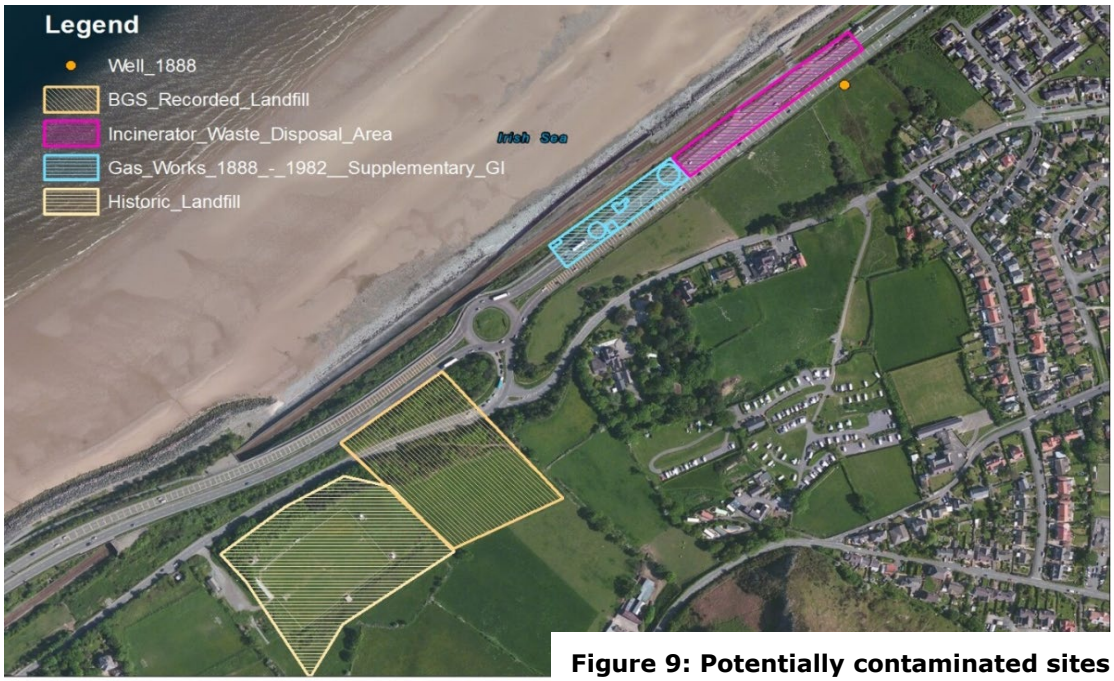


Figure 9: Potentially contaminated sites

Possible effects of the scheme

The scheme would disturb land within the extent of the gasworks and incinerator waste disposal site, with some further disturbance of the landfill areas under Conwy Road. There would be disturbance of natural ground.

Possible mitigation

Ground investigations with boreholes and trial pits could identify whether contamination is present and suitable treatments can be applied to remove or treat contamination or leave it undisturbed in the ground. During construction the best practicable environmental option would be applied to contain and or remove contamination.

Conclusions: will the effects be significant?

Taking proposed mitigation into account there is unlikely to be any significant impact, although removal or treatment could have a slight beneficial impact.

10.6 Materials

Baseline /surveys
The assessment focuses on the construction phase of the proposed scheme but does not address the sources of raw materials, for example minerals from quarries. The assessment would be desk study based on estimates of construction quantities. Information will be obtained from published sources, including previous ground investigations. Information relating to the cut and fill balance and the requirement for bulk construction materials will be obtained from the design team as the scheme design proceeds
Possible effects of the scheme
There would be substantial excavation to form embankments and cuttings which both generate and require fill material. Where possible a cut and fill balance would be achieved, but there is the possibility that surplus or shortfall could be generated. There is also the potential that contaminated materials could be excavated in high risk areas which would be defined as a waste and so require disposal off-site. Topsoil excavated on site would be reused as part of the finished scheme. Construction of the road pavement, structures and drainage would require aggregate and cement, steel and other manufactured products. During operation there will be a requirement for renewal of pavements and structures over intervals ranging from 10 years to 40 years.
Possible mitigation
Construction site waste management plan to encourage effective waste minimisation. Reuse and recycling of materials generated from demolition and processing to maximise the value of excavated materials and minimise the need for haulage to landfill. Minimise waste of construction materials imported to site. Purchase bulk raw materials from local sources to minimise use of the road network, the burning of fossil fuels and the production of exhaust emissions.
Conclusions: will the effects be significant
The use and import of materials for construction is anticipated to have potentially significant effects without mitigation. Taking account of the potential for recycling of materials derived from the site and design to achieve a cut and fill balance, these would not be significant. There is potential for contaminated ground to be found and removal of material would be a significant impact on landfill capacity which could not be mitigated.

10.7 Noise and Vibration

Baseline /surveys
The effects of noise are as yet to be examined in detail. The assessment will involve the development of a noise model based on traffic data. There are a number of Noise Action Planning Priority Areas along the A55 corridor, designated by Welsh Government. These include a location at Junction 15A, and also at 16 (in Area 3 in Figure

10). The proximity of sensitive receptors will be taken into account in deciding whether surveys of existing noise are necessary. Traffic data is available from Welsh Government. If necessary, further traffic data will be gathered by monitoring of the A55.

Possible effects of the scheme

During construction, noise emissions are considered likely to be slightly increased as a result of construction activity.

The removal of the roundabout on the A55 will reduce the noise emissions arising from braking and accelerating. The noise of vehicles running over the rumble strips on the approaches to the roundabout and no longer occur. However, traffic should be free-flowing and there will be an overall increase in traffic speed. Overall, the noise emissions are predicted to change and to increase for sensitive receptors around the junction. below. The main areas where noise is predicted, at this stage, to increase are shown in Figure 10 below.

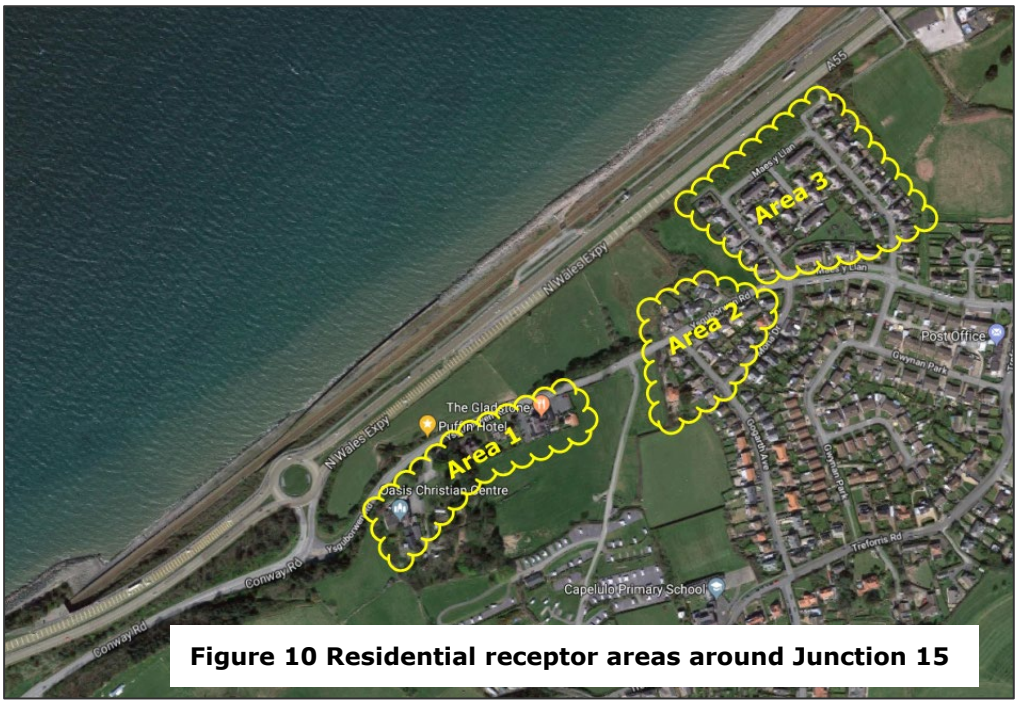


Figure 10 Residential receptor areas around Junction 15

Possible mitigation

Mitigation for noise impacts during construction would include avoidance of noisier activities at sensitive times of the day and the use of modern well-maintained plant

Long term mitigation of operational effects could include low noise surfacing, acoustic barriers in the form of fences or earth banks/false cuttings, or combinations of these.

Conclusions: will the effects be significant

Taking account of the use of low noise surfacing throughout and localised use of noise barriers, the effects of the scheme is likely to be an increase in noise at local receptors, for some of these the impacts could be a significant change.

10.8 All travellers

Baseline /surveys
A desk study will be undertaken to obtain any data from published or public sources, including information on Public Rights of Way, National Cycle Routes and Footpaths. Walkover surveys and drive-through surveys will determine the network of non-motorised user (NMU) routes, the experience of vehicular travellers and constraints on access. NMU travel through the area on key routes within the network (e.g. public-rights-of-way, cycle routes, North Wales Coastal Path, promenades and beaches, that would be affected by the scheme, will be monitored as necessary. There are no known equestrian routes crossing the A55, although it is understood that there are equestrian routes to the south.
Possible effects of the scheme
Construction impacts could include some restricted use, diversion or temporary closures of routes under or close to the A55. This would restrict access, increase severance, add to journey times, disrupt local travel patterns and adversely affect amenity. Vehicular travellers would experience disruption to journeys on the A55, and for local traffic wanting to use the A55, if additional speed restrictions and a temporary reduction in the number of lane is required. During operation, all existing routes will be retained in a fully operational form. This will include Shore Road East, the National Cycle Route and North Wales Coastal Path. All existing accesses to the coastal strip will be retained. The local route northeast and southwest along Conwy Road and Ysguborwen Road will be impacted by changes to the junction which will add to journey length, disruption and severance through road crossings and would reduce amenity for pedestrians and cyclists. Vehicle travellers would experience a beneficial effect on journeys as a result of the existing roundabouts being removed. It is also likely that local traffic entering and leaving the A55 at the junction would benefit from the junction improvements. Local traffic not using the A55 would be largely unchanged, although some options require altered junction arrangements which could slightly extend journeys.
Possible mitigation
Mitigation including works phasing and construction methods would reduce temporary impacts by minimising disruption of traffic and access to and from the towns and the A55. During operation the scheme would provide new routes for any NMU effected. Where space allows, mitigation, in the form of planting and other vegetation, would improve amenity.
Conclusions: will the effects be significant
Temporary construction effects are anticipated to have significant adverse impacts on all travellers without mitigation. However, it is unlikely that the potential permanent operational impacts on NMUs will be significant.

10.9 Community and Private Assets

Baseline /surveys
Desk study of published sources including mapping, aerial photograph, local authority records, Local Development Plan will be used. Surveys of community facilities, retail services, tourism, land use and farm businesses will be carried out as necessary.
Possible effects of the scheme
For all options there would be potential for land take of grazing land during construction and operation. For Option A there would be greater impact from the loss of grazing land and the potential for severance of farmland. Clearance of roadside amenity land and some established tree planting would be required. Potential adverse effect of construction and positive effect during operation on access to community and public services, retail and administrative services.
Possible mitigation
Management of construction works to minimise disruption to public transport, emergency services and general traffic and access to facilities.
Conclusions: will the effects be significant?
Without mitigation during construction there could be some potentially significant adverse impacts on connectivity via the A55 and access to public facilities. With mitigation it is unlikely that the potential impacts on access to public and community facilities, farmland and amenity land will be significant. In the case of Option A the scale of landtake in this area could have an adverse effect on an agricultural unit and could affect landuse further by influencing future housing development associated with Dwygyfylchi. Option A could provide some mitigation and enhancement of public access across the A55 and along the A55 corridor within the scheme.

10.10 Road drainage and the water environment

Baseline /surveys
Desk study to gather data from previous surveys and published sources, including abstraction information, discharge consents, Envirocheck reports, the Welsh Government and NRW flood mapping. TAN 15 maps show that the area is classified as Zone C Without significant flood defence infrastructure, see Figure 8. A Flood Consequences Assessment will be carried out. The main areas of concern is the marine environment which lies a short distance to the north. The coastal waters are covered by several European and national nature conservation designations. Two small watercourses could also be adversely affected. Water quality data from watercourses passing under the A55 will be gathered if necessary to support the assessment.

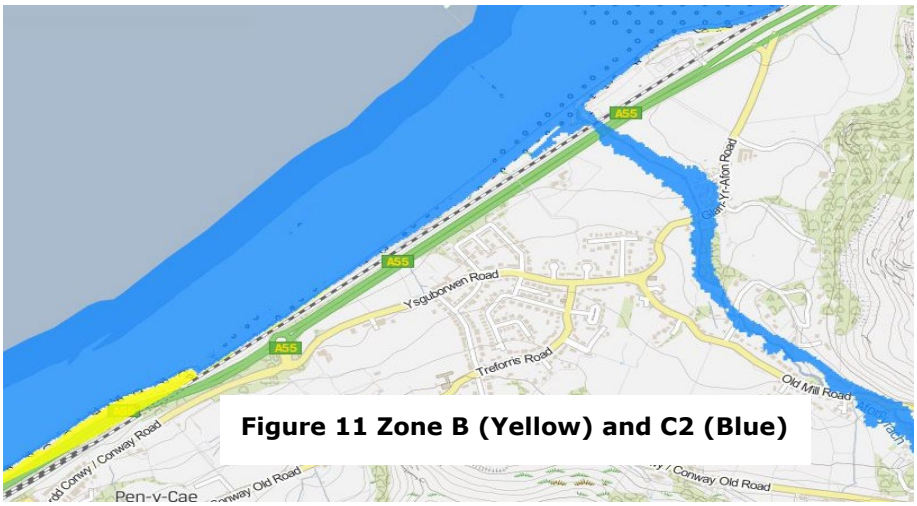


Figure 11 Zone B (Yellow) and C2 (Blue)

Possible effects of the scheme

During construction there is potential for silt, including contaminated materials, if encountered, to be carried into the local watercourses and the sea, with adverse impacts on the habitats and species within the European and nationally designed nature conservation sites.

During operation, the proposed improvement is unlikely to have an adverse impact on water quality because the existing drainage scheme will be utilised. Removal of the roundabout might change the risks of spillages on the road.

Whilst the area of hard surfacing might marginally increase the volume of storm water entering the drainage system, the scheme is unlikely to impact on the risks of flood in the C2 Zone. Flood Zone B

Possible mitigation

Mitigation during construction would include measures to contain silt generated on site and to minimise the risk of spillage of construction materials and fuel.

During operation mitigation could include attenuation capacity within the drainage system; pollution control devices to contain contamination spillages; the road would be constructed above the level affected by floods.

Conclusions: will the effects be significant

Without mitigation there is potential for significant impacts during construction, or in the event of a road spillage on sensitive receptors, namely, a minor watercourse and the marine nature conservation sites. With suitable mitigation no significant impacts are expected.

10.11 Population and Human Health

Baseline /surveys

Desk study-based assessment drawing on known data and the results of noise and air quality assessments. Monitoring of air quality will be carried out in summer 2018 to supplement data gathered by Conwy County Council.

Possible effects of the scheme
The scheme could influence public health and wellbeing in the areas surrounding the proposed junction improvements. These impacts would most likely occur as a result of any environmental impacts such as noise and air quality, or socio-economic impacts such as the loss of access to services and facilities, public open space, and opportunities for physical activity. The impacts would likely have a disproportionate effect on sensitive or vulnerable members of the community. The changes proposed for the junction may not radically change existing impacts because there is potential for air quality to be adversely effected and traffic noise could increase. However, the opportunity to provide mitigation and enhancement, such as better access to facilities, improved public open space and non-motorised user routes and relief from some aspects of traffic noise and local air quality could improve public health and wellbeing.
Possible mitigation
Design to minimise the propagation of noise at receptors and to reduce the potential for pockets of air pollution would be considered. Other mitigation and enhancements would also be considered to improve the quality of life such as public open space, measures to encourage active travel and tree planting for amenity purposes within the scheme landtake.
Conclusions: will the effects be significant?
The temporary construction effects of the scheme are anticipated to have potentially significant impacts without mitigation. The operational impacts are considered unlikely to be significant.

10.12 Climate Change

Baseline /surveys
Desk-study based assessment drawing on known climate data and traffic modelling. The assessment of greenhouse gases takes global changes into account, but the study area for each junction will be determined by the extent of the traffic model, and all roads, existing and new are considered
Possible effects of the scheme
There are two areas of concern that could affect climate change, or could result from climate change: 2 The production of Greenhouse gases (Carbon dioxide) as vehicle exhausts; 2A Sea level rise and severe rainfall events arising from climate change that could adversely affect the road or traffic; and the exacerbation of sea level rise and severe rainfall events as a result of the scheme, that could cause flooding of surrounding areas. Using traffic data for the existing scheme and the traffic model for the proposed junction improvements the quantity of Cox produced as exhaust emissions will be calculated. The embodies carbon arising from construction and the use and transport of materials and the effects of long-term maintenance would be considered. The change in the volume of Cox produced will represent an increased (adverse) or decreased (beneficial) effect.

Possible mitigation
The effects of climate change on flood risk would be considered in the Drainage and Water Environment chapter of the ES with the scheme design adjusted to minimise the risk of adverse effects.
Conclusions: will the effects be significant
All changes to carbon emissions are considered to be significant.

10.13 Risk of Disaster

Baseline /surveys
Desk study-based assessment drawing on known data and the results of consultations.
Possible effects of the scheme
Risk of Disaster requires an assessment of 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 or disasters. The assessment would address the relevant risks to the resilience of the A55. For example, flood risk from the sea, major rail or road accidents, landslides and road or tunnel closures could be relevant, while volcanic eruptions, famine and plagues of pests are not. The scheme could influence public health and wellbeing in the areas surrounding the proposed junction improvements. These impacts would most likely occur as a result of any environmental impacts such as noise and air quality, or socio-economic impacts such as the loss of access to services and facilities, public open space, and opportunities for physical activity. The impacts would likely have a disproportionate effect on sensitive or vulnerable members of the community. The changes proposed for the junction may not radically change existing impacts because there is potential for air quality to be adversely affected and traffic noise could increase. However, the opportunity to provide mitigation and enhancement, such as better access to facilities, improved public open space and non-motorised user routes and relief from some aspects of traffic noise could improve public health and wellbeing.
Possible mitigation
Design to minimise the risk of accidents and disasters will be fundamental to the scheme. Further mitigation would be measures put in place by the emergency services, Natural Resources Wales, and the Trunk Road Maintaining Agent and Local Authority to manage the consequences.
Conclusions: will the effects be significant
The temporary construction effects of the scheme are anticipated to have potential impacts without mitigation. The operational impacts are considered unlikely to be significant.

10.14 Heat and Radiation

Baseline /surveys
Desk study-based assessment drawing on known data and the results of consultations.
Possible effects of the scheme
During the Scoping study for these two junctions t need for a full assessment will be considered. However, this is unlikely to identify any significant changes to the environmental as a result of the scheme.
Possible mitigation
No mitigation is considered likely.
Conclusions: will the effects be significant
This topic is not considered to be relevant to a highway improvement project and so further consideration is unlikely. The details of the scoping out of this topic will be set out in a separate Scoping Report for each junction.

10.15 Conclusions for Junction 16

10.15.1 Under the EIA Directive 2011/92/EU as amended, the proposed works at Junction 16 are not an Annex I development. However, the works are an Annex II relevant development because the total area of the scheme will exceed the 1-hectare threshold and therefore have undergone the determination process.

10.15.2 The determination concludes that the proposed works are of more than local importance and are set within a sensitive location (located beside designated marine sites, Snowdonia National Park and a Conservation Area, and are anticipated to have potentially significant adverse effects on the receiving and surrounding environment. To ensure that all environment effects are considered during the design process a Statutory Environmental Assessment will be undertaken on the proposed project.

10.15.3 In line with best practice requirements and to ensure that all environmental effects are identified, and the appropriate level of assessment applied, a scoping report will be produced and agreed with the Statutory Environmental Bodies before the Environmental Assessment process is commenced. The conclusions about the environmental topics are set out below:

Topic	**Potential significant impacts with and without mitigation**		
	Conclusion	Without	With
Geology and Soils	Without mitigation there is potential for adverse impacts to occur but taking proposed mitigation into account, there is unlikely to	Yes	No

Topic	Potential significant impacts with and without mitigation		
	Conclusion	Without	With
	be any significant adverse impact, although removal or treatment of contaminated soils could have a slight beneficial impact.		
Noise and Vibration	Taking account of the use of low noise surfacing throughout and localised use of noise barriers, the effects of the scheme is likely to be an increase in noise at local receptors, for some of these the impacts could be a significant change with or without mitigation.	Yes	Yes
Road Drainage and the Water Environment	Without mitigation there is potential for significant impacts during construction, or in the event of a road spillage on sensitive receptors, namely, a minor watercourse and the marine nature conservation sites. With suitable mitigation no significant impacts are expected.	Yes	No
Nature Conservation (Biodiversity)	There is potential for significant impacts on the designated marine nature conservation sites, but with mitigation there are unlikely to be any significant adverse impacts on these sites or other receptors.	Yes	No
Landscape and Townscape	Because the A55 already exists, the impacts for many receptors are slight by comparison with the existing situation. At some receptors it is considered likely, without and with mitigation, that new embankments, slip roads, junctions, local roads and structures could have significantly adverse effects or residential receptors, key views and the townscape of Penmaenmawr.	Yes	Yes
Archaeology and Cultural Heritage	There is a strong likelihood of a significant impact on the Penmaenmawr Conservation Area. All options have the potential to directly impact on previously unknown archaeology.	Yes	Yes
Community and Private Assets	Without mitigation during construction there could be some potentially significant adverse impacts on connectivity via the A55 and access to public facilities. With mitigation it is unlikely that the potential impacts on access to public and community facilities, farmland and amenity land will be significant. In the case of Option A the scale of land-take in this area could have an adverse effect on an agricultural unit and could affect land-use further by influencing future housing development associated with Dwygyfylchi.	Yes	Yes
Air Quality	Minor changes in NO2, CO2 and PM10 concentrations are expected due to the introduction of additional slip roads. These impacts are considered likely to be negligible to human and ecological receptors.	No	No
All Travellers	Temporary construction effects are anticipated to have significant adverse impacts on all travellers without mitigation. However, it is unlikely that the potential permanent operational impacts on NMUs will be significant.	Yes	No
Materials	The use and import of materials for construction is anticipated to have potentially significant effects without mitigation. Taking account of the potential for recycling of materials derived from the site and design to achieve a cut and fill balance, these would	Yes	Yes

Topic	Potential significant impacts with and without mitigation		
	Conclusion	Without	With
	not be significant. There is potential for contaminated ground to be encountered at the former gasworks site and removal of material would have a significant impact on landfill capacity which could not be mitigated.		
Population and Human Health	The temporary construction effects of the scheme are anticipated to have potentially significant impacts without mitigation. The operational impacts are considered unlikely to be significant.	Yes	Yes
Cumulative and in-combination effects	Improvements at both junctions 15 and 16 could be constructed in parallel or in sequence. It is predicted that there would be cumulative impacts. Physical separation of the junctions and receptors by several kms of road and by the intervening headland and tunnel mean that cumulative impacts from the two improvements are likely to be limited to:		
	• Potential impacts of traffic congestion and reduced journey time reliability during construction	Yes	No
	• Potential ecological effects of construction on species such as over-wintering birds from the SAC, SPA and SSSI.		
	• The effect of the junction improvements in combination on traffic flow, congestion, access to Penmaenmawr and Dwygyfylchi.	Yes	No
	Cumulative impacts of construction of Junction 15 and other concurrent developments around Penmaenmawr and Dwygyfylchi (such as housing construction) could occur	No	Yes
		Yes	No

11. CONSULTATIONS

11.1 Consultations carried out before 2017

11.1.1 The sequence of consultations is set out chronologically. The earliest, carried out by Atkins, took place in July 2008, and comprised a workshop attended by the statutory consultees and other interested parties that included emergency services, tourism, road haulage, NWTRA and local politicians. Further consultation was then carried out individually with each organisation, as necessary. Useful baseline data was obtained from various sources provided by the statutory consultees. A report of the consultation workshop was published in July 2008 and included a set of initial project objectives identified in the group sessions. A summary of feedback from the workshop sets out views in relation to the Junction 14, 15, 15a, 16 and 16a, as well as laybys and minor accesses.

11.1.2 In March 2011 Atkins undertook a further consultation workshop with NWTRA. From this came further development of project objectives and a scoring of the various arrangement options for the junctions.

11.2 Consultations since 2017

11.2.1 Under the Contract awarded to Carillion in 2017, consultations took place with a number of local organisations including the town councils, Sustrans and the emergency services. Formal consultations have taken the form of a Project Information Exhibition, at which the options that were developed before the contract was awarded were exhibited for a day each in Penmaenmawr, Dwygyfylchi and Llanfairfechan. The results assisted in the selection of options for further consideration in Weltag Stage 2.

11.2.2 Public Consultation on the options for each junction was carried out between June and August 2018. This was accompanied by a public exhibition was held in June 2018 to allow the public to comment on the Weltag Stage 2 options. The public and other stakeholders and statutory consultees were invited and given the opportunity to submit a response on a questionnaire, or as a written submission.

11.2.3 The first Environmental Liaison Group (ELG) Meeting was held in May 2018. These will be repeated on a quarterly basis. The organisations invited to the ELG meetings include Natural Resources Wales (NRW), Cadw (and their Gwynedd Archaeological Trust representatives), Conwy County Council, Gwynedd Council, Snowdonia National Park Authority and North & Mid Wales Trunk Roads Agency (NMWTRA).

11.2.4 Using the Project Objectives as a starting point, the ELG will assist in the development of the Environmental Objectives and then subsequently advise on the development of the scheme, on appropriate environmental surveys and on a scheme of mitigation. These organisations hold or administer databases of relevant information, and they will be able to assist by sharing data.

11.2.5 A list of consultations is provided in Appendix 1

12. OVERALL CONCLUSIONS

12.1 The requirement for EIA

12.1.1 It is considered unlikely that there would be any adverse emissions, wastes or overuse of non-renewable resources associated with this project.

12.1.2 Under the EIA Directive 2011/92/EU as amended, the proposed works are not an Annex I development. However, the works are an Annex II relevant development because the total area of the Scheme would exceed the 1ha threshold and therefore have undergone the determination process.

12.1.3 The determination concludes that the proposed works at both junction 15 and 16 are:

a. of more than local importance;
b. are not set within a sensitive location;
c. are anticipated to have significant adverse effects on the receiving and surrounding environment.

12.1.4 The conclusion of this report is that a separate formal Environmental Impact Assessment must be completed for Junction 15 and Junction 16. A Record of Determination has been prepared for both schemes and these are included in Appendix 2 and Appendix 3.

12.2 Scoping

12.2.1 In line with best practice requirements and to ensure that all environmental effects are identified, and the appropriate level of assessment applied, a Scoping Report will be produced and agreed with the Statutory Environmental Bodies.

12.2.2 The characteristics of the potential impacts of the Scheme were identified in this screening report and it is considered likely that topics likely to be considered are set out below. Further justification for this will be detailed in the Scoping report.

12.2.3 Topics scoped in to the EIA:

a) Geology and Soils
b) Road Drainage and the Water Environment
c) Nature Conservation
d) Landscape
e) Archaeology and Cultural Heritage
f) Community and Private Assets
g) Air Quality
h) Noise and Vibration
i) All Travellers
j) Materials
k) Population and Human Health
l) Climate Change
m) Risk of Major Accident and Disaster

APPENDIX 1:
RECORD OF CONSULTATIONS

RECORD OF CONSULTATIONS

Statutory environmental consultees have been consulted on several occasions before and during the preparation of this EIA Screening Report.

Environmental Liaison Group (ELG)

The ELG was established under the current contract in early 2018. The following organisations have been invited to attend the ELG meetings. Briefing notes were issued to all those invited to attend. The first meeting was held in May 2018, with follow up meetings in August and November2018. The minutes of the May 2018 meeting are attached.

Natural Resources Wales (all sections through the development planning advisor team)

Conwy County Borough Council: Environmental Health, Air Quality, Biodiversity and Ecology, Trees, Planning policy, Landscape and Townscape, Heritage.

Gwynedd Council: (general invitation, but not attending currently because the scheme does not directly affect the administrative area).

Snowdonia National Park Authority (SNPA): (general invitation, but not attending currently because the scheme does not directly affect the administrative area)

Cadw: (expressed and interest but not currently attending. See GAT below.

Gwynedd Archaeological Trust (GAT): in a curatorial role to represent Cadw.

North and Mid Wales Trunk Road Agency (NMWTRA) as the client's maintaining agent.

Environmental Coordination and Advice Team (ECAT): a team within the Welsh Government Department for Economy and Infrastructure.

Consultations with the ELG member organisations have also taken place directly between related specialists such as air quality, ecology and archaeology. These contacts have been made to facilitate early discussion of available data and the need for surveys and monitoring.

Public Information Exhibition (December 2017)

No environmental organisations attended this early meeting to comment on previously developed options being considered. The exhibition was well attended by local stakeholders.

Public Consultation (Summer 2018) and Consultation Exhibition (June 2018)

All statutory environmental consultees and many non-statutory stakeholder organisations were invited to attend the exhibition and to formally respond and express views on the junction options under consideration. In addition to the organisations listed under the ELG, many others were invited by letter and were sent copies of a project brochure setting out the options. The full list of those invited is included with the Consultation report.

RICHARDS MOOREHEAD & LAING LTD	File Note		Sheet 64 of 82
Job name:	A55 Junctions 15 & 16 Improvements	Our ref	
Job no:	3066	Date of note:	9th May 2018

A55 Junctions 15 & 16 Improvements Environmental Liaison Meeting Nº. 1

9th May 2018. Welsh Government Offices, Sarn Mynach, Llandudno Junction

	Minutes of the meeting		Action
1	**Attendance**		
JH	James Healey	Welsh Government	
AS	Andrew Sumner	RML	
RG	Rob Griffiths	Ramboll	
LC	Luci Clark	TACP	
GB	Gareth Barker	Corderoy	
SC	Simon Cottrill	CCC	
JE	Jenny Emmett	GAT	
BO	Barbara Owsianka	CCC	
JJ	Jill Jackson	NMWTRA	
MWJ	Mark Watson-Jones	NMWTRA	
1	**Apologies**		
BJ	Bryn Jones	NRW	
NGJ	Neil Garton-Jones	WSP	
CO	Cara Owen	GCC	
SC	Steve Chewins	Ramboll	
JeB	Jenny Bringloe	Ramboll	
JB	Jonathan Berry	Cadw	
HD	Huw Davies	CCC	
DW	David Watson	CCC	
AL	Aled Lloyd	SNPA	
3	**Introduction to the project**		
	JH set out the background to the project, explained how the liquidation of Carillion meant a new contract, for design services, had been set up with Ramboll. RML and YGC are subcontractors to Ramboll. European funding is in place for the improvements and there is a requirement to spend the funds before a cut-off date. Delegates were reminded of the briefing document sent out by AS with the invitations.		
4	**WelTAG and the route selection process**		
	RG set out a brief overview of WelTAG 2017, which provides a structure for tackling a transport problem in two or more stages; Stage 1 is to identify the problem and possible solutions (completed and range of options identified); Stage 2 is to investigate the selected options and work towards finding a preferred option (currently in progress). Following Public Consultation, we will then be recommending preferred options to Welsh Government.		
5	**Route options under consideration**		

RG explained the 5 options for Junction 15 and the 4 options for J16 with their intendant benefits and disbenefits. The purpose is to replace the roundabouts with slip roads. The options for J15 included a small amount of work at J14A. One of the options for J16 included substantial improvements at J16A. For both junctions there are options that do not include full four-way movements and so adjacent junctions could see more traffic.

Route Options are shown in the PowerPoint presentation pdf: *2018 May ELG presentation Slides 4 to 9.*

SC raised the matter of potential demolitions for some of the options. Those present expressed concern at the implications for residents in the existing terrace at Junction 15 and the adjacent new apartment blocks. Both noise and air pollution could potentially increase, and these receptors are close by the road. RG: demolition might not be required for some of the options if high retaining walls were built to support the road. AS: in some cases, the new road would be nearly as high as roof level for the existing and newly built terraces at J15.

BO asked about J15 Option E which required demolition of The Heath. It was explained that this option was proposed as a result of comments made at the Public Information Exhibition in December 2018, which indicated that the building was owned by Conwy Council, but was likely to be redundant soon. JE mentioned that the building and the link roads/roundabout were in the Conservation Area and that the Heath, while not Listed, might be considered of architectural value.

6 The statutory process and the project programme

AS explained the programme, and summarised the surveys undertaken and still to come. Because there are two separate schemes, which will require separate sets of Orders, two separate Public Inquiries will have to be addressed with two separate Environmental Statements with Cumulative and In-combination impacts covered.

Project programme is shown in the PowerPoint presentation pdf: *2018 May ELG presentation. Slide 16*

7 & 8 Key Environmental Constraints and opportunities and setting Environmental Objectives

1 **Transport Planning Objectives** (TPOs) and **Environmental Constraints** Maps: see PowerPoint presentation pdf: *2018 May ELG presentation. Slides 17 and 18.*

Suggested amendment (MWJ) to Transport Planning Objective 4: include the additional word 'All local traffic' so that it more clearly encompasses buses.

Draft Environmental Objectives are shown in PowerPoint presentation pdf: *2018 May ELG presentation. Slides 19 and 22.*

2 AS showed maps setting out the main environmental constraints including some important national and international designations including the SAC, SSSI, SPA, NNR, Conservation Areas and Historic Parks and Gardens and Historic landscapes. A number of matters were raised:

JJ: The use of highway lighting, especially important at J16A, could have an adverse effect on Dark Skies policies in the National Park.
Landscape.

JJ: sea views are valued by local residents and that there is local concern about the height of roadside trees which block the view. Therefore, ensuring that views remain open is an important consideration.

MWJ: Typical roadside grassland is not appropriate in coastal/salty areas and so a more appropriate type of vegetation would help to integrate the road into the setting.

MWJ: was concerned about the piecemeal 'industrialisation' of the A55 road corridor with more and more concrete and steel appearing with each phase of improvements. Suggested that stone cladding of concrete or other ways of minimising the impact of large areas of concrete should be considered.

SC: Air Quality concerns where air pollution can pool in canyons and hollows. Particularly the case with PM^{10}s. Is concerned that some key receptors would receive more pollution if there is more traffic. Requested that we include a specific air quality objective 'minimise the potential for increasing pollutants at significant receptors. Also raised the concern that we need to future proof the scheme against future worsening of air pollution. The potential impact of electric vehicles was discussed now that UK government is planning to be 100% electric by 2040. This is a change that cannot be modelled within the normal method in DMRB.

Great opportunity to provide non-motorised users with better connectivity across the A55 and to north and south. There is potential under the Well-being of Future Generations Act and the Environment (Wales) Act to provide enhancements for connectivity, amenity, biodiversity on land taken for the road for cycling and walking routes.

JJ: considered that habitat connectivity and using land take to maximise biodiversity benefits was important, particularly now that the Environment Act (Wales) encourages biodiversity enhancements.

BO: suggested that the enhancements could be separated from the roads, using new public open space. The Well-Being of Future Generations Act and the need to encourage active travel justified taking land through CPO to provide good quality public open space/public realm.

Possible improvements to beach and sea front at Penmaenmawr with benefits for local people and visitors.

Need to design public spaces to avoid the threat, or fear of the threat of anti-social behaviour in public spaces.

SC Noise barriers are themselves visually intrusive, so in some locations perhaps some innovative solutions should be considered as an alternative to conventional fences

Need to design for low maintenance and safe access for maintenance of vegetation to minimise lane closures and reduce risks to maintenance operatives working in road. Also need to consider whole life costs. Perhaps provide access from the county road network to landscape plots.

JJ: consider whole life cost and a balance between capital and maintenance budgets for example, using low fertility soils to reduce grass growth. Also avoiding grass in plots that are difficult or dangerous to access.

At Junction 15 we need to consider the impact on the setting and key views from the Cadw Registered Garden at Wern Isaf.

JE: Archaeology: the coast is often rich in evidence for settlements. These may not have been destroyed when A55 was built. There is no reporting of any investigations undertaken for construction.

Geophysical surveys usually not that effective for a number of reasons, so trial trenching is important prior to ES so that findings can be considered.

BO: Marine: need to improve drainage and pollution control systems on the highway drainage because there are none. Recommended to avoid French drains and to provide added capacity within pipes to provide attenuation and pollution containment capacity and so avoid the need for attenuation ponds or basins.

JJ: Drainage systems are not necessarily good for wildlife. Amphibians are caught in gulley pots and die. Consider outfalls with wildlife in mind. Also consider swales instead of pipes in some locations.

9 Next meetings

AS proposed a programme of approximately three-monthly ELG meetings in August and November 2018, then March and possibly July 2019. Details of these are set out in the PowerPoint Presentation pdf: Slide 23.

Bryn Jones of NRW was unable to attend the meeting today and so a separate meeting will be organsised to brief him on progress to date.

Post meeting note: Meeting arranged with Bryn Jones and Sion Williams of NRW for the 16th May 2018 at 10.30 am at their Maes y Ffynnon office in Bangor.

10 AOB

Monitoring of air quality. SC explained that he had been contacted by Ramboll to discuss whether there is any current monitoring of the existing A55. Key receptor monitoring locations were discussed and agreed with SC. Subsequently SC had decided to undertake additional monitoring at further receptors and was keen to liaise with the project team and to assist in assessing and avoiding impacts and in design to minimise air pollution problems. AS suggested that at a suitable stage the ELG should meet to discuss the scheme design, possibly in August or November ELG meetings.

SETTING THE ENVIRONMENTAL OBJECTIVES

The following draft objectives were discussed at the meeting and comments relating to these have been made as a result and the changes shown as ~~deleted text~~ or added/revised text.

1. Whilst achieving the required junction improvements, avoid or mitigate impacts to provide or maintain:

A. ~~Protection of communities and~~

~~B. Connectivity and improved public spaces across the A55 for non-motorised users~~ Connectivity to and from the coast, and either side of the A55 so that communities continue to enjoy public services and open spaces;

C. Protection of community assets and local businesses from adverse impacts during construction;

D. 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 and tree and shrub planting;

E. Avoid adverse impacts on buried archaeological sites;

F. Landscape integration ~~of the A55~~ the junctions into their coastal settings by avoidance of further 'industrialisation' of the road corridor;

G. Consider the design of the schemes to achieve an overall reduction in traffic noise nuisance, problems associated with air borne pollution and visual impact of traffic;

H. Protect valued seaward views in the long term through careful design and aftercare;

I. Minimise light spill from highway lighting to avoid or reduce the impact on 'Dark Skies' within the Snowdonia National Park;

~~J. Protect community assets and local businesses from adverse impacts~~

K. Protection of the marine SPA, associated species and habitats ~~and water quality~~;

L. Improved road drainage to reduce the adverse impacts of A55 traffic pollutant spills on water quality in watercourses and on the sea;

M. Protect habitats and biodiversity and provide habitats designed to suit the coastal context;

N. Consider long term implications of maintenance and vegetation management when designing the soft estate to avoid or reduce health and safety risks or onerous management commitments

2. Enhancements aligned with the ***Well-being of Future Generations Act*** and the ***Environment Act,*** by **maximising added value:**

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;

~~1. Enabling walking cycling and healthy lifestyles.~~

~~2. Improve access and enhance enjoyment of the coastal setting and townscape~~

~~3. Improve access and enhance enjoyment of the coastal setting and townscape~~

D. Enhance biodiversity through habitat creation, habitat connectivity and improvements within the road corridor in a manner that reflects and supports the coastal setting.

~~4. Support community life and economic viability through enhanced cohesion~~

~~5. Support education, learning and community involvement~~

3. How we want to achieve them:

1. Compliance with legislation.
2. Delivery of Welsh Government policy.
3. Work effectively together throughout the development of the project.
4. To offer a full and open exchange of information and views during project development to make sure that the right project for Wales is published.
5. To work together to develop deliverable and effective environmental mitigation.

A55 Junctions 15 & 16 Improvements
Environmental Liaison Meeting Nº. 1

Supplementary meeting with NRW

16th May 2018. NRW Offices, Maes y Ffynnon, Bangor

	Minutes of the meeting		Action
1	**Attendance**		
AS	Andrew Sumner	RML	
LH	Louise Henry	RML	
SC	Steve Chewins	Ramboll	
SW	Sion Williams	NRW	
BJ	Bryn Jones	NRW	
1	**Apologies**		
RG	Rob Griffiths	Ramboll	
3	**Introduction to the project**		
	AS sent previous briefing notes, PPT and minutes from ELG which NRW could not attend. AS set out the background to the project. European funding is in place for the improvements and there is a requirement to spend the funds before a cut-off date. Delegates were reminded of the briefing document sent out by AS with the invitations.		
4	**WelTAG and the route selection process**		
	AS set out a brief overview of Transport Planning Objectives and the draft Environmental objectives. The latter were developed following the discussion at the ELG meeting.		
5	**Route options under consideration**		
	SC explained the 5 options for Junction 15 and the 4 options for J16 with their intendant benefits and disbenefits. The purpose is to replace the roundabouts with slip roads. The options for J15 included a small amount of work at J14A. One of the options for J16 included substantial improvements at J16A. For both junctions there are options that do not include full four-way movements and so adjacent junctions could see more traffic. Route Options are shown in the PowerPoint presentation pdf: *2018 May ELG presentation Slides 4 to 9.*		.
6	**The statutory process and the project programme**		
	AS summarised the project programme. Because there are two separate schemes, which will require separate sets of Orders, two separate Public Inquiries will have to be addressed with two separate Environmental Statements with Cumulative and In-combination impacts covered. Project programme is shown in the PowerPoint presentation pdf: *2018 May ELG presentation. Slide 16* Amendment to mis-type in project programme: Publication of Draft Orders and Environmental Statements in Summer 2019 not Summer 2018.		

7 & 8	**Key Environmental Constraints and opportunities and setting Environmental Objectives**

1 **Transport Planning Objectives** (TPOs) and **Environmental Constraints** Maps: see PowerPoint presentation pdf: *2018 May ELG presentation. Slides 17 and 18.*

AS mentioned that the main points brought up in public consultations so far were the impact of the scheme on seaward views and traffic noise nuisance.

2 **Draft Environmental Objectives** are shown in PowerPoint presentation pdf: 2018 May ELG presentation. Slides 19 and 22.

BJ mentioned about a common pipistrelle (*Pipistrellus pipistrellus*) maternity roost present in Llanfairfechan. Also mentioned that *P. pipistrellus* forage to the tideline so the scheme's effect on bats cannot be ruled out solely based on it being in close proximity to the sea.

9	**Next meetings**

AS proposed a programme of approximately three-monthly ELG meetings in August and November 2018, then March and possibly July 2019. Details of these are set out in the PowerPoint Presentation pdf: Slide 23.

10	**AOB**

NRW now charge £125 per person p/hr + VAT for non-statutory work. AS and SC questioned when statutory process occurs. BJ suggested screening/scoping should go via Welsh Government to be a Welsh Government scheme and so NRW will be able to comment on drafts etc. without charge. BJ is still waiting for clarification from legal as to whether to charge or not if Welsh Government are ultimately paying. AS: Need agreement with NRW to ensure advice is good and honoured.

BJ raised concerns about bats because there is a known Maternity roost at Llanfairfechan Hospital. The roost is used by Pipistrelles which are a species that will forage on the strandline of the sea. There is no record of bats crossing the A55 and the railway to forage at Penmaenmawr, Dwygyfylchi and Llanfairfechan.

SC explained that the NRW's views on protected species surveys, particularly bats, are needed early in the programme of KS3 so that we can incorporate suitable mitigation and enhancement measures into the 1:2500 Outline Design and the Environmental Masterplan.

Water Quality is likely to be a matter of concern to the NRW and pollution control measures will need to be considered. AS asked if a standard pollution control device such as a penstock is considered sufficient. BJ confirmed these would be required.

BJ mentioned that views from the National Park should be considered.

APPENDIX 2:
RECORD OF DETERMINATION FOR JUNCTION 15

Record of Determination, Welsh Assembly Government, Transport, Housing and Regeneration.

For use with Annex II relevant projects only

Name of project: **A55 Junction 15 Improvements**	**Location** (including national grid reference): Junction 15 on the A55 Trunk Road approximately 10km west of the Conwy Tunnel. **OS Grid Ref: SH685755**

Qualifying criteria for Annex II relevant project: (please tick which are relevant)

Improvement element of project is >1ha	√	Project is located within 'sensitive' area		Other with potential for significant effect (e.g. adjacent to sensitive site)	√

A. Description of project: The A55 in north Wales forms part of Euroroute 22 from Dublin to Isham in Russia. Junction 15, which serves Llanfairfechan, is one of the two remaining at-grade junctions on this strategic route in the UK. It is considered to be a constraint on the smooth flow of traffic, and to increase journey times. Backing up of traffic into Pen y Clip Tunnel can occur and this is considered to be a safety hazard. The proposed improvements will occupy around 8 to 12 hectares (including the area of the existing road) during the construction stage and will replace the existing roundabout with slip roads and bridges. Providing an alignment that meets standards will result in the existing dual carriageway being re-aligned slightly to the south of the existing route, with side roads and junctions modified.

B. Description of local environment, including statutory and non-statutory designations: Between Conwy and Llanfairfechan the A55 follows a coastal route where mountainous terrain abuts the coast. The road tunnels through headlands at Penmaenbach and Pen-y-Clip. On the seaward side of Junction 15 is the mainline railway from Chester to Holyhead, then the foreshore, with the Llanfairfechan Coastal Promenade and terraced residential properties to the west and shingle beaches to the east of the junction.

Conwy Bay is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA) and a Site of Scientific Interest (SSSI). To the south of the A55 is a narrow coastal plain partly occupied by residential areas, some of which are in the Llanfairfechan Conservation Area. The remainder is pastureland rising steeply to a mountainous ridge around 550 metres above sea level. The mountains are within the Snowdonia National Park (SNP), with the park boundary passing to the south of the developed areas of Llanfairfechan. Wern Isaf and Bryn y Nueadd are two Listed sites on the Cadw Register of Parks and Gardens. The whole site is covered by the North Arllechwedd Historic landscape. There are a number of Ancient Monuments on the surrounding hills and listed buildings in the town.

Summary of main environmental effects of project: With mitigation, the scheme is expected to have some significant adverse effects on residential receptors as a result of traffic noise, visual impact and the loss of some seaward views. There will be a potential adverse impact on the setting and key view from Wern Isaf Historic Park and Garden and listed building. The

north east end of the Llanfairfechan Conservation Area will be affected by changes to the alignment of Penmaenmawr Road. Travellers using the A55 and county road network as well as local communities would be adversely affected during construction, but once the junction is in operation the effect would be beneficial. Demolition of one or more residential buildings near the junction is likely. There are unlikely to be any significant adverse effects on the marine nature conservation designations.

Details of extent of environmental impact assessment work undertaken and summary of any consultation undertaken with the statutory consultation bodies: Previous work on the scheme has included desk studies and reports completed between 2005 and 2015, with a number of environmental studies, based on records between 2005 and 2011 that including a WelTAG Stage 1 Environmental Appraisal of various route options in 2009. An Extended Phase 1 Habitats Survey was carried out by TACP in October 2015. A list of these reports and the dates of publication are set out in Section F.

During WelTAG Stage 2 Appraisal between October 2017 and May 2018, some additional desk study and field surveys have been conducted. These have included an update Extended Phase 1 Habitat survey, a landscape winter survey, an over-wintering bird survey, bat transect surveys, a drone aerial photographic survey, and air quality monitoring. Further and more detailed environmental surveys will be carried out once a Preferred Route has been identified. Environmental baseline data has also been obtained for various environmental topics including flood mapping, species records from COFNOD, Wales Landmap, records of previous land uses, Historic Environment Record and designated sites.

Consultations have included Cadw and Gwynedd Archaeological Trust, Natural Resources Wales, Conwy County Council and North and Mid Wales Trunk Roads Agency. The relevant predicted impacts are assessed on a precautionary basis but take account of mitigation which would typical be applied.

A full Environmental Impact Assessment will be carried out on the Preferred Route

E. Determination decision, statement of case in support of this decision as to whether EIA is/is not required: It has been identified that there are a number of sites that are subject to Article 6 (3) of the Habitats Directive. The scheme could have significant effects in relation to Natura 2000 sites (in line with Annex III of the EC Directive). Views from Snowdonia National Park will include the scheme from a short distance. There would be the potential for significant further environment impacts in relation to a number of topics, including (but not exhaustively) ecology, cultural heritage, landscape and townscape, motorised and non-motorised users and community impacts. The proposed project is therefore an 'EIA Development'.

File references of supporting documentation for future reference: 2008
Preliminary Planning Report- Environmental: Atkins

2009 Environmental Report: Atkins (including Appendices D2, D3 and D4

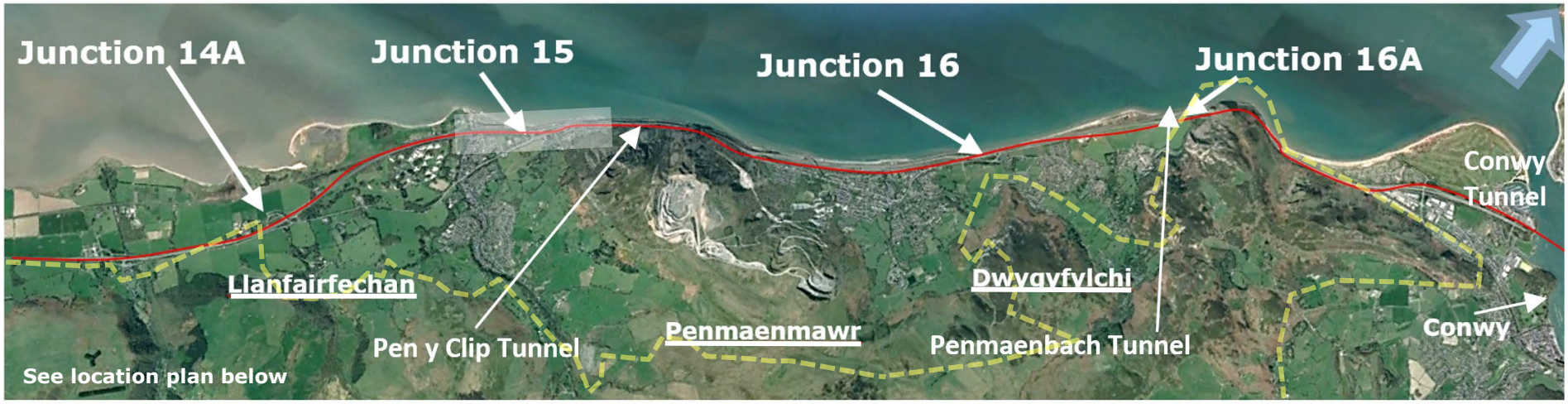
2015 Ecological Statement: TACP

2017 Environmental Surveys Scoping Report: Ramboll/ RML

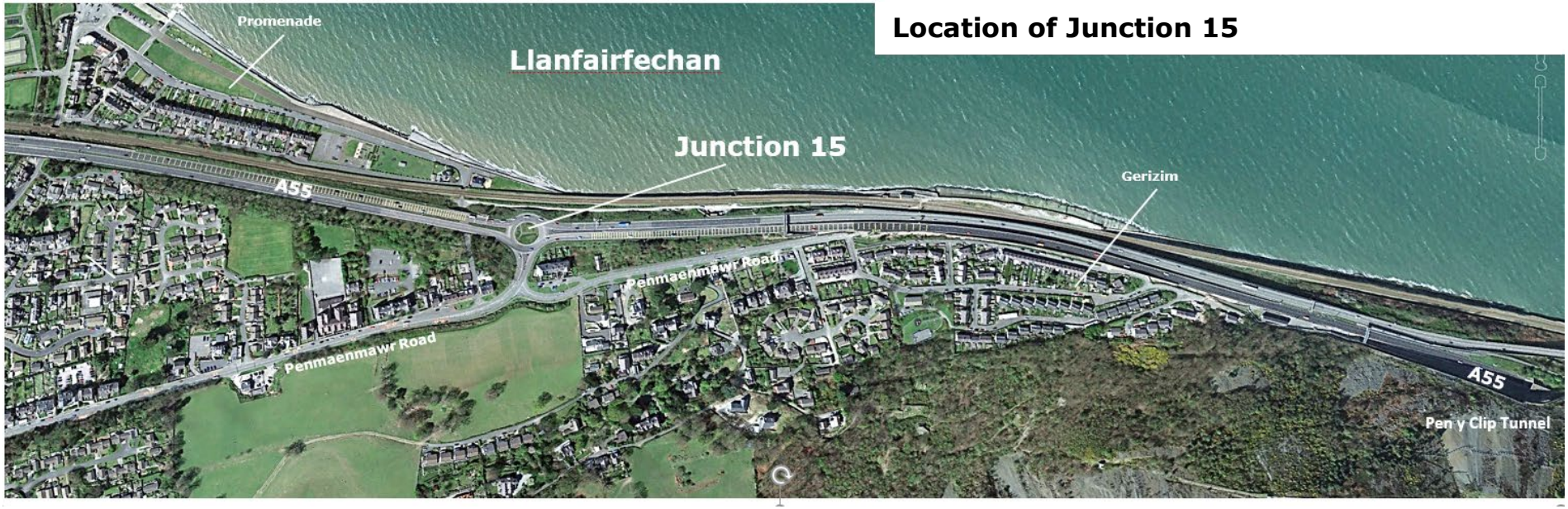
2018 Environmental Appraisal Report: Ramboll /RML

I have determined, following discussions with the Welsh Assembly Government's /Trunk Road Agent's Environmental Advisor that a statutory Environmental Impact Assessment is/is not required for this project.
Signature Project Director: Dated:
Authorisation to publish Notice of Determination:
Signature Welsh Ministers' Nominee: Dated:

Setting and Location Plans for the Record of Determination for Junction 15



Location of Junction 15



APPENDIX 3:
RECORD OF DETERMINATION FOR JUNCTION 16

Record of Determination, Welsh Assembly Government, Transport, Housing and Regeneration.

For use with Annex II relevant projects only

Name of project: **A55 Junction 16 Improvements**	**Location** (including national grid reference): Junction 16 on the A55 Trunk Road approximately 5km west of the Conwy Tunnel. **OS Grid Ref: SH727771**

Qualifying criteria for Annex II relevant project: (please tick which are relevant)

Improvement element of project is >1ha	√	Project is located within 'sensitive' area		Other with potential for significant effect (e.g. adjacent to sensitive site)	√

A. Description of project: The A55 in north Wales forms part of Euroroute 22 from Dublin to Isham in Russia. Junction 16, which serves Penmaenmawr and Dwygyfylchi, is one of the two remaining at-grade junctions on this strategic route in the UK. It is considered to be a constraint on the smooth flow of traffic, and to increase journey times. Backing up of traffic into Penmaenbach Tunnel can occur and this is considered to be a safety hazard. The proposed improvements will occupy around 15 to 22 hectares (including the area of the existing road) during the construction stage and will replace the existing roundabout with slip roads and bridges. Providing an alignment that meets standards will result in the existing dual carriageway being re-aligned slightly to the south of the existing route, with side roads and junctions modified.

B. Description of local environment, including statutory and non-statutory designations: Between Conwy and Llanfairfechan the A55 follows a coastal route where mountainous terrain abuts the coast. The road tunnels through headlands at Penmaenbach and Pen-y-Clip. On the seaward side of Junction 16 is the mainline railway from Chester to Holyhead, then the foreshore, with the Penmaenmawr Coastal Promenade to the west and beaches to the east of the junction.

At Penmaenmawr the sea is designated as a as a Special Area of Conservation (SAC) and Special Protection Area (SPA). To the south of the A55 is a short valley that is partly occupied by residential areas, some of which are in the Penmaenmawr Conservation Area. The remainder is pastureland rising steeply to a mountainous ridge around 550 metres above sea level. The mountains are within the Snowdonia National Park (SNP), with the park boundary passing to the east and south of the developed areas of Penmaenmawr and Dwygyfylchi. The whole site is covered by the North Arllechwedd Historic landscape. There are a number of Ancient Monuments on the surrounding hills and listed buildings in the town.

C. Summary of main environmental effects of project: With mitigation the scheme is expected to have some significant adverse effects on residential receptors as a result of traffic noise, visual impact and the loss of some seaward views. The north east end of the Llanfairfechan Conservation Area will be affected by changes to the alignment of Penmaenmawr Road. Travellers using the A55 and county road network as well as local communities would be adversely affected during construction, but once the junction is in operation the effect would be beneficial. Demolition of one

or more residential buildings near the junction is likely. There are unlikely to be any significant adverse effects on the marine nature conservation designations.

Details of extent of environmental impact assessment work undertaken and summary of any consultation undertaken with the statutory consultation bodies: Previous work on the scheme has included desk studies and reports completed between 2005 and 2015, with a number of environmental studies, based on records between 2005 and 2011 that include a WelTAG Stage 1 Environmental Appraisal of various route options in 2009. An Extended Phase 1 Habitats Survey was carried out by TACP in October 2015. A list of these reports and the dates of publication are set out in Section F.

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Consultations have included Cadw and Gwynedd Archaeological Trust, Natural Resources Wales, Conwy County Council and North and Mid Wales Trunk Roads Agency. The relevant predicted impacts are assessed on a precautionary basis but take account of mitigation which would typical be applied.

A full Environmental Impact Assessment will be carried out on the Preferred Route.

E. Determination decision, statement of case in support of this decision as to whether EIA is/is not required: It has been identified that there are a number of sites that are subject to Article 6 (3) of the Habitats Directive. The scheme could have significant effects in relation to Natura 2000 sites (in line with Annex III of the EC Directive). Views from Snowdonia National Park will include the scheme from a short distance. There would be the potential for significant further environment impacts in relation to a number of topics, including (but not exhaustively) ecology, cultural heritage, landscape and townscape, motorised and non-motorised users and community impacts. The proposed project is therefore an 'EIA Development'.

File references of supporting documentation for future reference:

2008 Preliminary Planning Report- Environmental: Atkins

2009 Environmental Report: Atkins (including Appendices D2, D3 and D4

2015 Ecological Statement: TACP

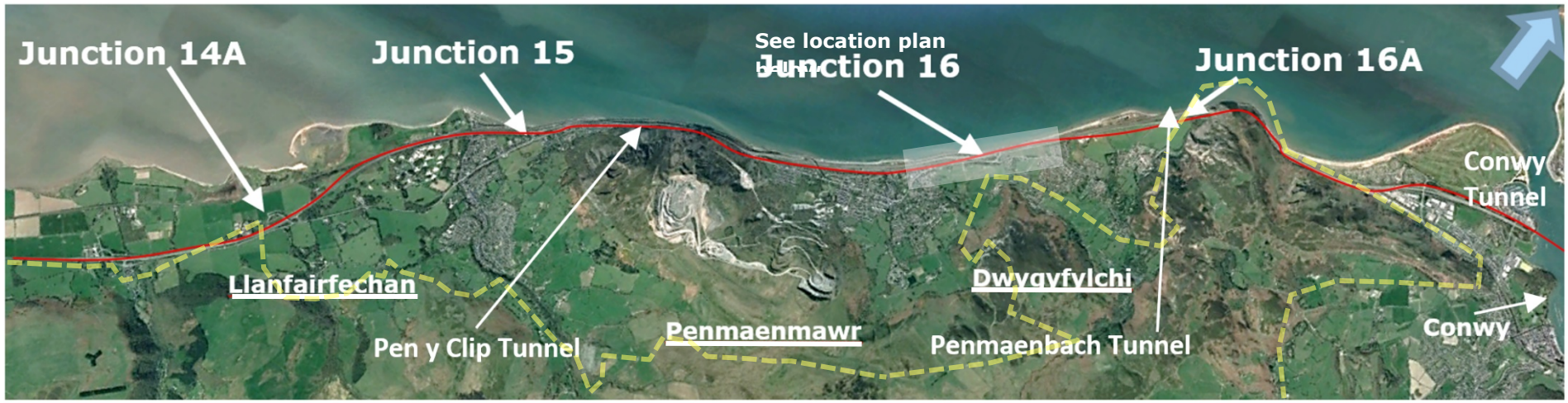
2017 Environmental Surveys Scoping Report: Ramboll/ RML

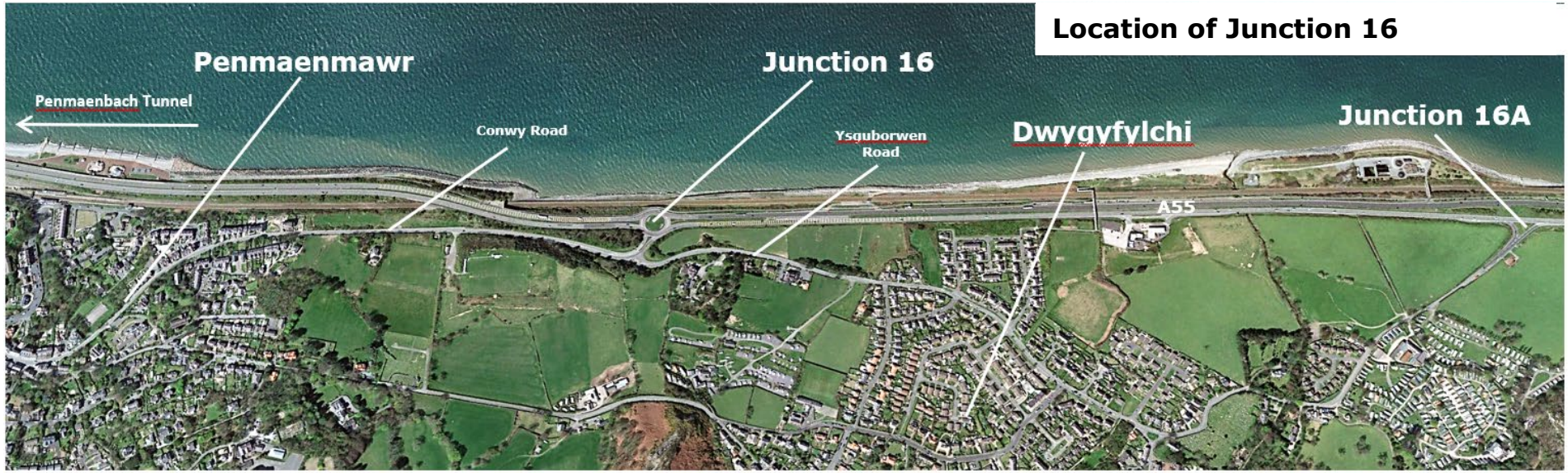
2018 Environmental Appraisal Report: Ramboll /RML

I have determined, following discussions with the Welsh Assembly Government's /Trunk Road Agent's Environmental Advisor that a statutory Environmental Impact Assessment is/is not required for this project.

Signature Project Director: Dated:
Authorisation to publish Notice of Determination:
Signature Welsh Ministers' Nominee: Dated:

Setting and Location Plans for the Record of Determination for Junction 16





APPENDIX 4.3
ENVIRONMENTAL IMPACT ASSESSMENT SCOPING REPORT

Intended for
Welsh Government

Document type
Report

Date
February 2019

A55 JUNCTION 16

ENVIRONMENTAL IMPACT ASSESSMENT

SCOPING REPORT

Llywodraeth Cymru
Welsh Government

RAMBOLL

RICHARDS
MOOREHEAD & LAING LTD
ENGINEERING, ENVIRONMENTAL and LANDSCAPE CONSULTANTS

CYNGOR GWYNEDD COUNCIL

A55 JUNCTION 16
SCOPING REPORT

Project name	**A55 Junctions 15 & 16 Improvements**
Project no.	**RML 3066**
Recipient	**Welsh Government**
Document type	**Report**
Version	**P02-2019-06-19**
Date	**18/02/2019**
Prepared by	**Various Competent Experts listed below**
Checked by	**Andrew Sumner (RML)**
Approved by	**Rob Griffiths**
Description	**Environmental Impact Assessment Scoping Report for A55 Junction 16**

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APPENDICES

Appendix 1
The preferred option

1. THE PROJECT

1.1 Context

1.1.1 The A55 trunk road is a key element of the UK and European strategic road network and provides the main economic artery for the whole of North Wales. The A55 forms part of Euroroute 22, which is the Trans European Route from Dublin in Ireland to Ishim in Russia. Of the 235 miles of E22 in the UK, the two at grade roundabouts at Junction 15 at Llanfairfechan, and Junction 16 between Penmaenmawr and Dwygyfylchi, are the only roundabouts on the route from Holyhead to Hull and hence are a constraint to the smooth flow of traffic on this strategic route and this has led to increased journey times and poor journey time reliability. They also 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.

1.1.2 Welsh Government appointed Ramboll, RML and YGC as their technical and environmental advisors with Corderoy, assisted by WSP and TACP, as Employers Representative to develop and consider a range of options with the intention of identifying a preferred solution for Junction 16 and then developing the design up to publication of draft Orders.

1.1.3 Improvement schemes are proposed for both the existing junctions 15 and 16, but due to the physical separation, and the need for an entirely separate set of Draft Orders for each junction, a discrete Environmental Statement will be required for each Junction Improvement scheme. This Scoping Report covers only Junction 16.

1.2 Background

1.2.1 Junctions 15 and 16 of the A55 have been subject to a number of recent studies as they are the only at-grade roundabout interchanges on this major North Wales trunk road. An initial study and assessment was carried out by Capita Symonds and completed in 2005. 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 removing the at-grade roundabout.

1.2.2 The study included a stakeholder workshop on the options, traffic data collection and modelling, some local topographical survey, preliminary environmental assessments and an initial Stage 1 WelTAG[1] appraisal. This study which was completed in April 2009 concluded that new grade separated options should be progressed to provide safety improvements.

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

1.2.4 In October 2017 the current project team were commissioned to undertake the Stage 2

[1] WelTAG is acronym for Welsh Transport Appraisal Guidance

appraisal in accordance with the new WelTAG 2017. A review of Stage 1 was carried out first and a range of options for further consideration was selected from those previously developed. A Public Information Exhibition (PIE) was held in December 2017 and the views of those who responded in the questionnaire were taken into consideration in the WelTAG Stage 2 Appraisal.

1.2.5 In the Stage 2 Appraisal four options were considered for Junction 16. These were taken to the statutory 12-week Public Consultation which commenced in June 2018. The public response was taken into consideration in the appraisal to identify an option that could be recommended to Ministers as a possible preferredoption . The Preferred Route (Option A) is subsequently referred to as 'The Scheme' in this document.

1.2.6 A plan indicating the layout of the preferred option is included in Appendix 1.

1.3 Scheme Objectives

1.3.1 A number of transport planning objectives have been developed iteratively during previous development work and engagement on the A55 project, aiming to address one or more of the identified problems. Between October 2017 and June 2018, the project objectives developed in 2009 were refreshed during a focused workshop to take into account the WelTAG 2017 guidance and Wellbeing of Future Generations (Wales) Act wellbeing goals. The scheme objectives are:

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
TECH OBJ	Minimising technical departures from standards
TECH OBJ	Minimising need to reduce speed limits
TECH OBJ	Minimising disruption during construction

1.4 Purpose of this Report

1.4.1 This report describes the results of the scoping exercise. Scoping seeks to decide which environmental topics are to be examined within a Statutory EIA. The scoping exercise should inform the assessment process and determine the appropriate assessment levels. Scoping is an ongoing activity that is reactivated at key stages in the project planning process. It can also be used to inform and activate discussion with the

statutory consultees (ELG process) with respect to defining the assessment activities.

1.4.2 The purpose of this scoping report is to request a formal Scoping Opinion from Welsh Government. The scoping assessment follows an EIA Screening Determination which was undertaken in accordance with the *Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017*, which substitutes Section 105A in the Highways Act 1980. These new regulations require greater detail regarding potential effects and mitigation to be included in the EIA Screening Report and Record of Determination. The conclusion of the report was that an Environmental Statement was required for both junctions 15 and 16.

1.4.3 While the Design Manual for Roads and Bridges (2008) (DMRB) has been withdrawn, the Guidance outlined in Volume 11 still provides relevant direction in relation to the Environmental Impacts Assessment (EIA) process and the preparation of the Environmental Statement (ES). It is the intention of the project team to continue to use DMRB Volume 11 (2008) as the basis for this project EIA where relevant. The 2017 DMRB refers to environmental topics as 'Factors', but in this ES the former term is retained for reasons of familiarity.

1.5 Structure and Contents of this Scoping Report

1.5.1 The *Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017* places greater weight on the contents of the EIA Screening Report than previously, including considerably more detail on the environmental topics to be considered and on the potential environmental effects and mitigation. To avoid repetition here, this Scoping Report carries less detail on potential impacts and mitigation, but places greater emphasis on the approach to EIA and on the way the new mandatory topics set out in the same regulations, will be addressed.

1.5.2 The Sections of this report are:

Section 1	This introduction
Section 2	Description of the scheme.
Section 3	Explains the administrative process in terms of the policy context.
Section 4	Identifies the consultation requirements in a legislative context, previous consultations undertaken to date and provides a list of statutory and non-statutory consultees that the project team proposes to engage with.
Section 5	Identifies the proposed content and structure of the EIA, in the form of chapter layout.
Section 6 onwards	Identifies the proposed technical chapter structure and assessment methodology. Identifying those matters which may have a potentially significant environmental effect and should be subject to EIA i.e. those topics to be 'Scoped in' to the EIA.
Appendix	Provides a site location plan and a plan of the Preferred option.

1.6 Assessment of Implications for European Sites (AIES)

1.6.1 Under the contract the project team are required to undertake an Assessment of Implications for European Sites (AIES) which will include Natura 2000 sites identified previously and newly designated and candidate sites. The assessment is carried out in stages which commence with a Stage 1: SIAA Screening Report (SIAA: Statement to Inform an Appropriate Assessment). If required a Stage 2 Statement to Inform an Appropriate Assessment (SIAA) will be prepared.

1.6.2 A list of European sites is provided in Chapter 8.

1.7 Details of Competent Experts

1.7.1 Screening requests, scoping reports and non-statutory environmental assessment reports shall be prepared by competent experts. Statements providing evidence of how individuals meet the definition of competent expert shall be provided within ES's, screening requests, scoping reports and non-statutory environmental assessment reports.

1.7.2 All the experts who contributed to this Scoping report are considered to be competent and to have the required qualifications, professional memberships and experience. Details of the competent experts will be provided in a confidential appendix to the ES.

2. THE PROPOSED DEVELOPMENT

2.1 Description of the scheme

2.1.1 The A55 expressway is a dual carriageway between Chester and Holyhead which generally runs east to west in parallel with the north Wales coast. Between Conwy and Llanfairfechan the A55 follows a tightly constrained corridor to pass the northern extreme of the Snowdonia massif where the mountainous terrain abuts the coast and splits the coastal plain. Tunnels carry the road through the headlands at Penmaenbach and Pen-y-Clip. Junction 15, along with Junction14a serves the settlement of Llanfairfechan to the west of Penmaenbach tunnel, while Junction 16, along with Junction 16a, serves the town of Penmaenmawr and village of Dwygyfylchi.

2.1.2 Junction 16 is a roundabout providing access and egress for east and west bound traffic onto local roads to the south. On the north (seaward) side is the north Wales mainline railway from Chester to Holyhead and beyond is the foreshore. The proposed scheme will replace the roundabout at Junction 16 with west bound on and off sliproads, while Junction 16A will be improved to be a grade-separated junction with east and west bound on and off slip roads, with an overbridge across the dual-carriageway. Conwy and Ysguborwen Roads, in the area of the former Junction 16 roundabout, will be remodelled to provide a safe junction with the A55 west bound slip roads. A proposed link road from the grade separated junction at 16A would extend westwards to bypass Dwygyfylchi and join Ysgurborwen Road close to Junction 16.

2.1.3 The Scheme objectives are set out in Section 5.

Figure 2.1: Location and setting of Junction 15 (not to scale)

Google Maps 2018 TerraMetrics

2.1.4 The existing Junction lies between the town of Penmaenmawr and the village of Dwygyfylchi. Both settlements lie within different watercourse catchments with the junction falling on the boundary. Residential properties in Penmaenmawr extend across most of the coastal plain with the railway and A55 occupying a wide corridor along the coast. On the seaward side of the railway is the paved promenade, with a café, paddling pool, a skatepark and pebble beach all of which was constructed into the sea when the A55 was built. In Dwygyfylchi residential areas and caravan parks are mostly located further inland with a small number of properties close to the A55 in the Maes y Llan area.

2.1.5 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 Route follow the A55 and the coast. Among these are some sensitive receptors.

2.1.6 There are three places of worship, a primary school, a public beach, a parish hall, a hotel and public house in Dwygyfylchi and several caravan parks.

2.1.7 A plan of the scheme is available in Appendix 1.

3. POLICY CONTEXT

3.1 European and National Legislation and Policy

3.1.1 This section of the scoping report outlines the relevant legislative and policy framework with an overview of guidance and strategy documents. These documents will be considered in detail as part of the 'Legislative and Policy Context' chapter of the Environmental Statement.

3.1.2 Consideration of European and national legislation is a requirement of the EIA regulations so that the scheme can be seen in the policy context and any problems caused, conflicts created and benefits to be derived can be identified and understood. DMRB Volume 11 states that the ES will *'indicate briefly the degree to which transport and environmental policies, and related transport appraisals, Environmental Reports published in accordance with the requirements of the SEA Directive and the Overseeing Organisation, and other relevant policies would be supported by the project*'.

3.1.3 Specific policy considerations and methods will be further covered on a topic by topic basis in the Environmental Statement. The EIA regulations are set out in Section 1 of this report.

Environment (Wales) Act 2016

3.1.4 The Environment (Wales) Act primary purpose is as follows:

a) To promote sustainable management of natural resources

b) To require the Welsh Ministers to meet targets for reducing emissions of greenhouse gases from Wales.

c) To ensure Waste is processed separately and effectively

Well-being of Future Generations (Wales) Act 2015

3.1.5 The Well-being of Future Generations Act 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.

Planning (Wales) Act 2015

3.1.6 The Planning (Wales) Act makes provision about sustainable development in the exercise of functions relating to development planning and applications for planning permission.

Active Travel Act, 2013

3.1.7 The Active Travel (Wales) Act requires local authorities in Wales to map and plan suitable routes for active travel, and to build and improve their 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. 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.

Clean Air Strategy 2019

3.1.8 '*Air quality is the largest environmental health risk in the UK. It shortens lives and contributes to chronic illness. Health can be affected both by short-term, high-pollution episodes and by long-term exposure to lower levels of pollution'*[2]. The Government will set long-term targets to progressively reduce exposure to PM2.5 and will publish evidence early in 2019 to examine what action would be needed to meet the World Health Organization (WHO) annual mean guideline limit of 10 µg/m3. By implementing the policies in the strategy, The Government intends to reduce PM2.5 concentrations across the UK, so that the number of people living in locations above the WHO guideline level of 10 µg/m3 is reduced by 50% by 2025.

Planning Policy Wales

3.1.9 Planning Policy Wales (Edition 10 – December 2018) is intended to 'help ensure that the planning decisions taken in Wales, no matter how big or how small, are going to improve the lives of both our current and future generations. It will support changing the way we live and work, and the buildings and environment of Wales today, building a better environment to accommodate current and future needs'. Section 3.57 addresses the need for adequate and efficient infrastructure and Section 5.3 Transport Infrastructure.

Technical Advice Notes

3.1.10 Welsh Government have prepared several Technical Advice Notes (TAN) to provide guidance on specific technical considerations within the consenting process. These will be used where applicable under the relevant topics within the Environmental Statement and would include:

a) TAN 5 Nature Conservation and Planning (2009)
b) TAN 11 Noise (1997)
c) TAN 14 Coastal Planning (1998)
d) TAN 15 Development and Flood Risk (2004)
e) TAN 18 Transport (2007)
f) TAN 23 Economic Development (2014)
g) TAN 24 The Historic Environment (2017)

Wales Transport Strategy, 2008

3.1.11 Published by Welsh Assembly Government, the overarching aim of the Wales Transport Strategy is to promote sustainable transport networks that safeguard the environment while strengthening the country's economic and social performance. The strategy has been prepared in the context of the One Wales Programme, which is a progressive agenda for Wales.

[2] Clean Air Strategy 2019 Executive Summary Published 14th January 2019

National Transport Finance Plan, 2015 and 2017 Update

3.1.12 Published by Welsh Government, the National Transport Finance Plans list the schemes the Welsh Government will deliver across the different areas of transport policy for which it is responsible. The plan is not a policy document but provides a framework of schemes pursuant to policy aims set out in the Wales Transport Strategy 2008. Improvements to the A55 Junctions 15 and 16 are included within the plan Delivery Schedule.

Trunk Road Forward Programme, 2002, 2004 & 2008

3.1.13 Published by Welsh Government, the Trunk Road Forward Programme seeks to improve the economic and social conditions in Wales, through increasing efficiency and accessibility in all areas. The Forward Programme indicated the Welsh Government's intentions for road schemes that were expected to cost £1 million or more.

3.2 Habitat Regulations Assessment

3.2.1 The UK is bound by the terms of the EC Habitats Directive, EC Birds Directive and the Ramsar Convention. The aim of the Habitats Directive is to conserve natural habitats and wild species across Europe by establishing a network of sites known as Natura 2000 sites.

3.2.2 Under Article 6 (3) of the Habitats Directive, an 'Appropriate Assessment' is required where a plan or project is likely to have a significant effect upon a European site, either individually or in combination with other projects.

3.2.3 In preliminary consultations, it was identified that the scheme could have significant effects in relation to Natura 2000 sites. Subsequently, as part of the ecological impacts, a separate document will be prepared as part of the Habitat Regulations Assessment (HRA) under the Conservation of Habitats and Species Regulations 2017 and in consultation with NRW.

3.2.4 The HRA would be assess potential impacts of the scheme on the relevant Natura 2000 sites and the need for an Appropriate Assessment will be assessed during the EIA in consultation with the relevant statutory consultees.

3.3 Previous Studies

3.3.1 Extensive studies have been undertaken over the course of the last decade, to assess the options for improving the A55 Junctions. These studies include (but not exhaustively) the following documents. These are outlined in Section 1.2.

3.4 The Need for an Environmental Impact Assessment

3.4.1 The potential environmental effects of a project must be understood to:

A. Satisfy legal obligations
B. Inform choices
C. Aid the planning and design process
D. Inform transport appraisals

E. Allow public scrutiny

3.4.2 The EIA regulations require that a new road project should be screened to determine if a formal Environmental Statement should be prepared. In accordance with the EIA regulations Welsh Government must provide a formal Screening Opinion to determine if the project proposals fall within Annex I or II of the EC Directives. A Screening has been undertaken and a Notice of Determination will be published. The screening process identified that the scheme would be below the threshold for Annex I 7(c) of the Directive but would be of sufficient size (over 1 hectare) to be considered under Annex II 10(e). Under Annex III the scheme is likely to have significant impacts near or within sensitive areas and so will require an Environmental Statement. The details are set out in a Record of Determination.

3.5 The Purpose of Scoping in the EIA Process

3.5.1 A formal Scoping Opinion is not a requirement under the Highway EIA Regulations[3] but it is seen as best practice to ensure the relevant topics and information which the EIA is to be based on, are included within the Environmental Statement.

3.5.2 The DMRB (Volume 11, Section 2, Part 4, para.1.8) states that:

'The statutory environmental bodies, local authorities, and other public authorities with environmental responsibilities, and other key stakeholders are likely to have views on the scope of the environmental impacts assessment and it is good practice, particularly in the case of EIA, to consult with these interests to ensure that the issues to be addressed are appropriate. In addition, the local community and other non-statutory consultees may initially be more knowledgeable about local conditions that those responsible for the assessment.'

3.5.3 The Scoping stage provides an opportunity to consult all relevant statutory and non-statutory consultees, who have an interest in the scheme and/or the area where the development will take place.

3.5.4 Good practice requires the following information to be provided with a formal scoping request:

A. A plan sufficient to identify the land; (See Appendix 1)

B. A brief description of the nature and purpose of the development and of its possible effects on the environment; and (See Sections 1 and 2)

C. Other information or representations as the person making the request may wish to provide or make. (Sections 5, 6 and 7 provide information on the content, structure and scope of the EIA)

[3] The Highways (Environmental Impact Assessment) Regulations 2007

4. CONSULTATION

4.1 Information and statutory consultations

4.1.1 The earliest consultations were carried out by Atkins in July 2008. These comprised a workshop attended by the statutory consultees and other interested parties that included emergency services, tourism, road haulage, NWTRA and local politicians. Further consultation was then carried out individually with each organisation, as necessary. Useful baseline data was obtained from various sources provided by the statutory consultees. A report of the consultation workshop was published in July 2008 and included a set of initial project objectives identified in the group sessions. A summary of feedback from the workshop sets out views in relation to the Junction 14, 15, 15a, 16 and 16a, as well as laybys and minor accesses.

4.1.2 In March 2011 Atkins undertook a further consultation workshop with NMWTRA. From this came further development of project objectives and a scoring of the various arrangement options for the junctions.

4.1.3 Under the Contract originally awarded to Carillion in late 2017, consultations took place with several local organisations including the town councils, Sustrans and the emergency services. A Project Information Exhibition was held in December 2017, at which the options that were developed before the contract was awarded were exhibited for a day each in Penmaenmawr, Dwygyfylchi and Llanfairfechan. The results assisted in the selection of options for further consideration in Weltag Stage 2.

4.1.4 In June 2018 a formal 12-week Statutory Consultation commenced to assist in the selection of a preferred option. In June 2018 the consultation exhibition was held with an evening session held in the Business Centre in Llandudno Junction for the benefit of Conwy County Councillors, followed by one full day each in Penmaenmawr, Dwygyfylchi and Llanfairfechan. The public and other stakeholders and statutory consultees were invited and given the opportunity to submit a response on an online or hard copy questionnaire, or as a written submission.

4.2 Environmental Liaison Group

4.2.1 The primary purpose of the Environmental Liaison Group (ELG) is to advise on mitigation and construction procedures, restoration and habitat management measures and raise any concerns relating to the construction of the development.

4.2.2 The first Environmental Liaison Group (ELG) Meeting was held in May 2018. These will be repeated on a quarterly basis. The organisations invited to the ELG meetings include the Statutory Environmental Bodies (SEB's) namely Natural Resources Wales (NRW), Cadw (and their representatives Gwynedd Archaeological Planning Services), Conwy County Council, Gwynedd Council, Snowdonia National Park Authority and North & Mid Wales Trunk Roads Agency (NMWTRA).

4.2.3 Members of the ELG are involved with the Scoping report, through recommendation of content and methodology. Further meetings will be programmed for later phases of the project, as required. An Introductory meeting was held in May 2018 and further meetings are planned for 2019. Further meetings will be programmed for later phases of the project, as required.

4.2.4 Using the Project Objectives as a starting point, the ELG will assist in the development of the Environmental Objectives and then subsequently advise on the development of the scheme, on appropriate environmental surveys and on a scheme of mitigation. These organisations hold or administer databases of relevant information, and they will be able to assist by sharing data.

4.2.5 This scoping report is to be circulated to the Statutory Environmental Bodies (SEB's) listed below so that the scope of the assessment can be agreed. The SEB's are also invited to attend Environmental Liaison Group (ELG) meetings as referred to in 4.2.2;

- Welsh Government
- NMWTRA
- Natural Resource Wales
- CADW
- Gwynedd Archaeological Planning Services
- Conwy County Council
- Gwynedd Council
- Snowdonia National Park

5. SCOPE AND STRUCTURE OF THE EIA/ES

5.1 Content

5.1.1 The scope of the Environmental Impact Assessment will be developed following a formal scoping request, site visits and desk-based topic specific assessments. The Environmental Statement will report on the results of the EIA process.

5.1.2 The range of environmental topics that have been addressed as part of this scoping exercise are those recommended in the guidance. In practice, the topics listed in the DMRB Volume 11 published in 2008, supplemented with the additional topics listed in the Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017.

5.1.3 The Environmental Statement will be structured as follows:

(a) Volume 1 - Main text, will be supported by;
(b) Volume 2 - Figures and;
(c) Volume 3 - Technical Appendices (where appropriate).
(d) A Non-Technical Summary (NTS) will also be provided.

5.1.4 The regulations state that the ES should include, 'a description of the likely significant effects of the project on the environment resulting from, amongst other things:

	Proposed Location (see Tables 5.1 & 5.2)
(a) *the construction and existence of the project, including, where relevant, demolition works;*	Section 2 aspects of construction; Sections 6 to 16 construction and operational effects
(b) *the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;*	Section 11: Land Section 6: Soil Section 7: Water Section 8: Biodiversity Section 15: Materials for construction
(c) *the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;*	Section 12: and 7: Pollution Section 13: Noise and vibration Section 16: Heat and Radiation Sections 12 and 13: Creation of Nuisances Section 15: Disposal and recovery of waste
(d) *the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);*	Section 19: Human health Section 10: Cultural heritage

	Proposed Location (see Tables 5.1 & 5.2)
	Sections 6, 7 and 18: Accident and Disaster
(e) the cumulation of effects with other existing or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;	Cumulative impacts within a topic are covered in that topic. Cumulative impacts between topics (Type 1) or between different developments (Type 2) are covered in Section 16
(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;	Section 12 will cover air quality. A subsection or appendix will cover an assessment of carbon. Section 7 will include flood risk associated with the sea, rivers and surface water.
(g) the technologies and the substances used.	Section 2 will describe aspects of construction and the technologies used. Section 15 will cover the bulk substances used

5.1.5 The EIA will assess the potential significant impacts associated with the proposal. The individual EIA topics or 'Factors' considered in this Scoping Report are listed in Table 5.1 and 5.2. The sections referred to are those used in the Scoping report and do not necessarily reflect Chapter numbering in the ES.

Table 5.1: Introductory Sections

Section	Topic
1.0	Introduction
2.0	Scheme Description
3.0	Assessment of Alternatives
4.0	EIA Methodology
5.0	Legislation and Policy Context

Table 5.2: Topic Sections

Section	Topic
6	Geology and Soils
7	Road Drainage and Water Environment
8	Nature Conservation (Biodiversity)
9	Landscape and Visual
10	Archaeology and Cultural Heritage

Section	Topic
11	Community and Private Assets (including Agricultural and land use)
12	Air Quality
13	Noise and Vibration
14	All Travellers
15	Materials
16	Heat and Radiation
17	Climate Change
18	Risks of accidents or disasters
19	Human Health
20	Social and Equality Effects
21	Cumulative Effects

5.2 Proposed Structure of the Environmental Topic Chapter

5.2.1 Design Manual for Roads and Bridges Volume 10 and Volume were withdrawn in 2017. As of the time of writing, 1st August 2018, a replacement has not been published. However, the methods and approach set out in Volumes 10 and 11 are still applicable and will form the base guidance applied in the proposed Environmental Impact Assessments.

5.2.2 The sections below describe the proposed structure and content of the technical ES chapters, along with the general methodology for defining proposed mitigation measures and assessing impacts. Each environmental topic has been considered by a specialist in that area.

a) Chapter introduction

b) Relevant Guidance (Legislation, policy and published guidelines relevant to the topic)

c) Study area – extent of study area defined

d) Description of the baseline environmental conditions - value and sensitivity

e) Methodology – assessment of effects

f) Assessment of potential effects (before mitigation is considered (including those arising during the construction and operational phases)

g) Mitigation Measures (including monitoring measures, where appropriate)

h) Assessment of the significance effects (taking account of mitigation measures in place)

i) Cumulative effects with other proposed developments and inter-relationships between topic areas will be assessed within a dedicated chapter of the ES. The assessment of cumulative effects will address;

- Type 1 - Intra Cumulative Effects -Interactions between different environmental topics within the same scheme
- Type 2 - Inter Project Effects – the interaction between the Scheme and other proposed developments in the area

5.2.3 The identification and evaluation of effects will be based on the information set out in the scheme description and construction details contained within the ES, in general and relevant topic-specific guidance where available.

Topic Introduction

5.2.4 Brief section stating the name of the organisations responsible for undertaking the impact assessment and the scope of the topic being considered.

Environmental Assessment Guidance

5.2.5 The EIA process has considered relevant guidance, including the following documents. While DMRB 2008 has been withdrawn, the guidance it contains is still applicable.

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).

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 3rd Edition (GLVIA3) (Institute of Environmental Management and Assessment, 2004 - updated 2006).

5.2.6 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.

Identification of Baseline Conditions

5.2.7 An ES requires sufficient 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.

5.2.8 Baseline data has been obtained from existing sources (including desk study and previous surveys) and from surveys commissioned specifically under the current contract. 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.

5.2.9 A programme of surveys, building on previous work by others, has been in progress since October 2017 and is likely to continue throughout 2018, to provide additional data for the design and the EIA. These include surveys and monitoring of noise, air quality, habitats and protected species, summer and winter landscape and visual surveys, water resources, ground investigations, non-invasive archaeological investigations, surveys of

non-motorised users and traffic.

5.2.10 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.

Assessment of Potential Effects

5.2.11 The EIA process requires the identification of the likely significant environmental effects of the scheme during the construction and operational phases. Potential significant effects can be identified by experienced specialists in the project team using the knowledge of the existing (baseline) and what is proposed. The form of those effects could influence the choice of the best method to use for impact assessment. This section will provide a summary of the types of impact that will then be assessed within the chapter.

5.2.12 Volume 11, Section 2 of the DMRB (HA 205/08) (Highways Agency et al., 2008e) provides guidance on the determination of significance of environmental effects for highway schemes. This includes consideration of the following, which are discussed later:

a) Environmental value (or sensitivity) of a resource or receptor

b) The level of impact

c) The level of significance of an effect

Sensitivity or Value of Receptors

5.2.13 'Receptors' are defined as '*individual environmental features that have the potential to be affected by a scheme*' (Highways Agency et al., 2008g). 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.

5.2.14 Sensitivity is defined within each ES topic chapter and takes into account factors including:

a) Vulnerability of the receptor to change

b) Recoverability of the receptor (ability to recover from a temporary impact)

c) Importance of the receptor

5.2.15 As a general guide, the definitions set out in Table 2.1 of HA205/08 apply, unless topic guidance requires otherwise. The five-point scale for assigning environmental sensitivity as shown in Table 5.2.

Assessment Methodology

5.2.16 This section sets out the methodology by which the impacts will been assessed. It will include references to published standards, guidance, best practice and the outcome of consultations. Relevant assumptions made in undertaking the assessment and any gaps in information will be set out.

5.2.17 The methodology will include tables that explain how the magnitude of impact and sensitivity of receptor are defined within the chapter as these vary by topic. Where possible, these will be based on best practice guidance and use appropriate terminology.

Table 5.3: Environmental Value (or Sensitivity) and typical descriptors

Value (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.

Impact Magnitude

5.2.18 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). The categorisation of the magnitude of impact is topic specific but generally takes into account factors such as the following:

a) **Extent** (Area and distance)

b) **Duration** (how long a time it will last)

c) **Frequency** (how often will it occur)

d) **Reversibility** (will the effect be undone or repaired)

5.2.19 When undertaking an EIA, environmental impacts are classified as either permanent or temporary, as appropriate:

'**Permanent'** changes are those which are irreversible (e.g. permanent land take) or will last for the foreseeable future (e.g. noise from generated road traffic).

'**Temporary'** impacts, the following has been used as a guide within this assessment, unless defined separately within the topic assessments:

a) **Short-term:** one to three years;

b) **Medium-term**: four to nine years;
c) **Long-term**: greater than nine years.

5.2.20 Impacts are also defined as either '**Adverse**' or '**Beneficial**'. As a general guide, the definitions set out in Table 2.2 of HA205/08 have been taken into account (except where topic guidance requires otherwise). This includes a five-point scale for assigning impact magnitude as shown in Table 5.4.

Table 5.4: The Five-Point Scale for Assigning Impact Magnitude

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 key characteristics, features or elements.
	Beneficial: minor benefit to or addition of one or more key characteristics, features or elements; some beneficial impact on attribute, or a reduced risk of negative impact occurring.
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)

5.2.21 Depending on discipline, some other terms are sometimes used:

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.

Impact Significance

5.2.22 The Determination of significance will be based on best practice, which can be topic-specific, using the standard terms listed in Table 5.2 and 5.3, which includes descriptors of effects, for the environmental value of an environmental resource and the magnitude of the impact. These descriptors will be used through-out the EIA process, providing a uniform approach to environmental value (sensitivity).

5.2.23 The outlined assessment methodology considers the following questions, where relevant, in evaluating the significance of potential effects:

A. Which receptors/resources would be affected and in what way?

B. Is the receptor/resource of a local, regional, national or international importance, sensitivity or value?

C. Does the effect occur over the long or short term; is it permanent or temporary and increase or decrease with time?

D. Is the change reversible or irreversible?

E. Are environmental and health standards (e.g., local air quality standards) being threatened?

F. Are feasible mitigating measures available?

5.2.24 A significance matrix (shown in Table 5.5) is used to ensure that it is clear to the reader how significance has been derived, based on the stated levels of impact magnitude and receptor sensitivity.

Table 5.5: Arriving at the Significance of Effects Descriptors

		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

Based on Table 2.4 of HA205/08 (Highways Agency et al., 2008e

Mitigation Measures

5.2.25 Mitigation is proposed where significant effects are identified, with the aim of avoiding, reducing, or compensating for potential adverse effects and maximising potential beneficial effects. The most effective form of mitigation measures are those that are

'designed in' to the scheme, leading to the avoidance of identified impacts or a reduction in impact magnitude.

5.2.26 EIA is an iterative process that develops in parallel with the design so that the scheme can, where feasible, be modified and adjusted to avoid, minimise and mitigate for environmental impacts. The proposals for the development are generally designed and updated to incorporate mitigation measures and their delivery is therefore, more certain. Measures to mitigate impacts associated with construction are normally based on accepted industry standards, resulting in a high degree of certainty over their delivery.

5.2.27 The approach is to present the mitigation measures in each technical chapter, after the potential effects and before the assessment of impacts (Section 6). The purpose of this is demonstrates the benefits and effectiveness of any mitigation.

5.2.28 Mitigation could include:

Mitigation Measures to be achieved during construction or in the years that follow to avoid, compensate or repair the effects of the scheme. These could be physical works or actions;

Enhancement Measures that are over and above the requirements of mitigating the impacts. Net benefits that can be incorporated into the scheme but are not required to reduce an impact.

5.2.29 Standard mitigation measures will be included in a Register of Environmental Actions and Commitments (REAC) which will form part of the draft Construction Environmental Management Plan (CEMP).

Assessment of Environmental Impacts (with Mitigation)

5.2.30 The purpose of an EIA is to identify and evaluate the environmental effects associated with the proposed development. These effects are assessed based on their magnitude (following mitigation) and the sensitivity of the receiving environment. The determination of impact significance will be undertaken against the environmental baseline and be based on the significance matrix included in Section 3 of the ES chapter.

Summary or Conclusion

5.2.31 A brief summary of the chapter and the findings of the assessment.

6. GEOLOGY AND SOILS

6.1 Introduction

6.1.1 This scoping chapter provides a summary of the existing baseline information relating to Junction 16 with respect to geology and soils as well as the methods that will be used to assess the effects associated with the construction and operation of the scheme.

6.2 Legislation, Policy context

6.2.1 In addition to the European and National legislation and policies listed above in Section 3, the assessment will refer to the following legislation, guidance and policy documents:

a) Water Resources Act 1991
b) Groundwater Directive (2006/118/EEC) on the protection of groundwater against pollution caused by certain dangerous substances
c) Directive (80/68/EEC) on the protection of groundwater against pollution and deterioration
d) Water Framework Directive (2000/60/EC)
e) Environmental Permitting Regulations (2010)
f) Part 2A of the Environmental Protection Act, 1990
g) Conwy Local Development Plan 2007-2022 (adopted in October 2013)

6.3 Relevant Guidance

6.3.1 The following guidance will be utilised to complete the assessment of potential effects relating to geology and soils:

a) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5 (HA 205/08) Assessment and Management of Environmental Effects, August 2008; and

b) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 Geology and Soils.

c) Environment Agency, 2004. CLR11 Model Procedures for the Management; and

d) BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice.

6.3.2 As well as identifying the importance of geology and soils and the significance of the potential effects, there is also a requirement to establish the potential for land contamination within the Scheme area.

Potential Land Contamination

6.3.3 Baseline studies will be completed to establish the 'geo-environmental' setting and establish the ground conditions within the Scheme area with particular emphasis on the value of the geology present, the presence of any historical land uses, any history of ground instability and the presence of any significant aquifer resources.

6.3.4 The baseline assessment will utilise desk-based information including published and publicly accessible background data to establish the ground conditions. The Desk Study

will also include a review of the available historical maps and records relating to the use of the Scheme area with a view to determining the likelihood of any contamination relating to historical uses being present prior to development.

6.3.5 A ground investigation will be undertaken to obtain geotechnical and contamination information to inform the Scheme design. This data will also be used to inform the risks from contamination.

6.3.6 The assessment for identifying significant effects from land contamination will be undertaken in line with CLR11. A Conceptual Site Model (CSM) will be produced to establish the presence of any 'contaminant linkages', put simply, for a potential risk to be identified, at least one contamination source, receptor and a pathway between will need to be identified. To assess the potential impact of each of the identified potential contaminant linkages, they will be 'ranked' according to both the probability and severity of any likely impact. This approach is based on guidance presented in CIRIA Document C552 'Contaminated Land Risk Assessment - A Guide to Good Practice 2001'.

6.3.7 For each of the contaminant linkages, an estimate will be made of:

a) The potential severity of the risk; and

b) The likelihood of the risk occurring.

6.4 Study Area

6.4.1 The assessment will be undertaken for the Scheme and up to 500m from the scheme boundary. The 500m buffer is to identify any 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 would also be covered by this buffer.

6.5 Methodology

6.5.1 The assessment will consider the significance of the effects relating to and from ground conditions which is based on geology and soils, including groundwater, and the potential for contamination which could arise from the proposed development during the construction and operation phases.

6.5.2 The scope of this assessment will comprise the following:

- A review of whether any protected geological features are likely to be impacted by the proposed development;
- A review of historical land use and potentially contaminative land uses;
- A review of the geological and hydrogeological setting;
- A review of the mining history of the area and implications on the proposed development;
- A review of geo-hazard issues and the associated implications on the proposed development or potential effects arising from the proposed development;
- A review of the existing potential for ground gas and radon;
- A review of the potential for encountering UXO;

- A review of environmental regulatory information relating to issues such as waste management, industrially permitted sites, water abstractions and discharges;
- Review of ground investigation information;
- Consultation with the Conwy County Borough Council Contaminated Land Officer and Natural Resources Wales;
- Consultation and liaison with Network Rail during design and construction;
- Undertake a review of the proposed development 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.

6.6 Significance Criteria

6.6.1 Significance of effects will be based on the methodology outlined in Section 2, Table 5.4 of this report.

6.6.2 The effect the development has on geology and soils will be assessed qualitatively. The sensitivity of the receiving receptor will be decided in accordance with criteria relating to level of geological designation; type of aquifer; presence of and CIRIA risk designation of contamination; sensitivity of land use to contamination; presence and location of geohazards; and sensitivity of proposed development to ground movement.

6.6.3 The magnitude of the impact will be decided using criteria relating to the scale and permanence of change, the level of risk to receptors relating to exposure to contamination; probability of encountering or altering geohazards.

6.7 Scoping Assessment

Baseline Environment: Geology and Ground Conditions

6.7.1 The British Geological Survey 'Geology of Britain Viewer' and 1:50,000 geological map shows that the solid geology to the east of the existing Junction 16 comprises rhyolite (volcanic in origin from silica rich magma) of the Conwy Rhyolite Formation which are Ordovician in age. Mudstone of the Conwy Rhyolite Formation is located to the west of the existing Junction 16 roundabout.

6.7.2 The near surface superficial deposits in the Scheme area comprise mostly Devensian Till (glacial till) which is Quaternary in age. Peat is shown around the River Gyrach (Afon Gyrach) with storm beach deposits to the north of the A55. Alluvium could also be present associated with other surface water features.

6.7.3 In terms of geological structure, bedding is shown to dip generally southwards at angles between 40° and 85°. In addition, a number of geological faults are inferred in the vicinity of the site, generally trending north to south with downthrow (magnitude not given) to the east.

6.7.4 Historical exploratory hole logs carried out to inform the original design and construction of the A55 indicate that anthropogenic deposits (made ground / fill) are underlain by firm to stiff clay with variable amounts of gravel and occasional bands of cobbles or boulders. Bedrock (rhyolite) was encountered at approximately 15m below ground level (prior to construction of the A55) within boreholes approximately 300m to

the west of the existing roundabout.

6.7.5 No protected geological features have been identified within 500m.

Baseline Environment: Groundwater – Aquifer Designation and Source Protection Zones

6.7.6 The bedrock is classed as a Secondary B aquifer and the superficial Devensian Till deposits are indicated as comprising unproductive strata. The storm beach deposits to the north of the A55 are classified as a Secondary A aquifer.

6.7.7 The Scheme is not located in or close to any groundwater abstraction source protection zones.

Baseline Environment: Potentially Contaminating Land Uses

6.7.8 A small gasworks and an incinerator waste disposal area was present to the east of the existing Junction 16 roundabout, this was present until the existing A55 was constructed. It appears that the A55 was constructed at least partly over the location of these features though it is not known whether any remediation was carried out prior to construction.

6.7.9 An area of landfilling is located to the west of Junction 16, to the south of the A55. The western area of landfilling is shown in the area of an existing football ground and extends up to Conwy Road which is located to the south of the A55. The more eastern area of landfilling is shown extending further to the north adjacent to the A55. The landfill is indicated as having operated from 1949 to 1969 with deposited waste including inert, commercial and household waste. The eastern area of landfilling is shown as a 'refuse tip' on the 1966 historical map and this is still shown on the 1975 map.

6.7.10 Railway lines are located to the north of the A55 which have been present since the earliest map dating from 1889. The A55 crosses over the railway lines at the western end of the Scheme area.

6.7.11 A 'brick field' with various areas of working / material processing is shown to the north of the A55 and railway lines in an area currently occupied by a sewage works.

6.7.12 An existing petrol filling station is located immediately to the south of the A55, north of Dwygyfylchi.

6.7.13 In addition to engineered fill associated the A55, an area of potentially infilled land has been identified in the area of the existing sewage works to the north of the A55 which appears to be associated with the former 'brick field'. Areas of made ground / fill are also likely to be present associated with existing and / or historical development.

Potential Effects

6.7.14 Potential effects relating to geology and soil within the Scheme area could arise as a result of the construction and subsequent operation of the scheme. Assessment of the current status of the site with respect to land contamination will be a key aim of the

baseline assessment with an assessment of the potential effects to receptors, including residents and users of land adjacent to the study area and ground and surface waters.

6.7.15 Other potential effects could include:

- The aggressivity of the ground conditions constraining the design of the scheme;
- The potential for local subsistence due to unstable slopes, mine workings, natural cavities or 'weak' soil deposits;
- Creation of new migratory pathways between potentially contaminated soils and underlying aquifers through ground disturbance such as the installation of foundation piles;
- Introduction of potential contaminating materials, e.g. inappropriate storage and use of fuels, etc. which may impact soil or water resources;
- Generation of waste soils requiring suitable classification and disposal;
- Health of construction workers arising from contact with possible contaminants within made ground, and potentially contaminating historical land uses such as landfills or inappropriate procedures and working methods;
- Increased hardstanding cover, compacted soils and /or reduction in vegetation which could lead to a reduction in infiltration and increase in surface water runoff which could also increase in sediment load to surface water bodies; and
- Potentially contaminated surface water runoff from the proposed scheme may discharge to surface water bodies or groundwater resources;
- Slope stability of the materials forming cuttings and embankments.

6.7.16 Potential effects arising due to the construction and / or operation of the new junction and road alignments relating to geology and soils will be assessed using information obtained as part of the baseline to determine mitigation requirements.

6.8 Conclusions

6.8.1 Based on the above scoping assessment it is concluded there is a potential for effects from or to the Scheme from issues relating to geology and soils and there is a need to assess these further as part of the EIA process.

7. ROAD DRAINAGE AND WATER ENVIRONMENT

7.1 Chapter Introduction

7.1.1 This scoping chapter discusses in outline the environment in which Junction 16 sits with respect to groundwater quality, surface water quality and flood consequences. It uses this information and the context of the proposed Scheme to propose the scope of assessment that will be taken forward to the Environmental Impact Assessment (EIA).

7.2 Legislation, Policy Context

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

7.2.1 The Water Framework Directive (2000/60/EC) was published in December 2000 and transposed into Welsh law in December 2003 through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003[4], later being updated through The Water Environment (WFD) (England and Wales) (Amendment) Regulation 2015[5] and most recently The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[6].

7.2.2 The intention of the Directive is to provide a more holistic approach to protection of the water environment than had previously been in place, addressing a wide range of aspects of the water environment, including physico-chemical, chemical, hydromorphological and ecological. The Directive places obligations on EU member states to ensure protection and betterment of designated surface water and groundwater bodies. 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[7], whilst those for groundwater have been through The Groundwater (England and Wales) Regulations 2009[8] and the supporting Groundwater (Water Framework Directive) (Wales) Direction 2016[9].

Flood and Water Management Act

7.2.3 This 2010 act[10] 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 for Wales, which was created in 2017 following implementation of The Environment (Wales) Act[11] in 2016 which enacted the

[4] http://www.legislation.gov.uk/uksi/2003/3242/contents/made
[5] http://www.legislation.gov.uk/uksi/2015/1623/resources
[6] http://www.legislation.gov.uk/uksi/2017/407/pdfs/uksi_20170407_en.pdf
[7] http://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en_auto.pdf
[8] http://www.legislation.gov.uk/uksi/2009/2902/contents/made
[9] https://gov.wales/docs/legislation/inforcenonsi/environmental/160526-groundwater-direction-en.pdf
[10] https://www.legislation.gov.uk/ukpga/2010/29/contents
[11] https://www.legislation.gov.uk/anaw/2016/3/contents

committee's creation.

The Bathing Water Regulations

7.2.4 These 2013 regulations[12] update earlier (2008) regulations and implement the requirements of the Bathing Water Directive[13], 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.

Water Strategy for Wales

7.2.5 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"[14].

Conwy Local Development Plan 2007-2022

7.2.6 This Local Development Plan[15] 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 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*

[12] https://www.legislation.gov.uk/uksi/2013/1675/contents/made
[13] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0007&from=EN
[14] https://gov.wales/docs/desh/publications/150521-water-strategy-for-wales-en.pdf
[15] http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf

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".

7.3 Relevant Guidance

7.3.1 The following guidance will be utilised in order to complete the assessment of potential impacts to the water environment:

Theme	Guidance
Flood risk (including Flood Consequences Assessment)	(TAN 15): Development and Flood Risk**Error! Bookmark not defined.**
Risk to surface water quality, groundwater quality, flood risk and hydromorphology from highways run-off	Design Manual for Roads and Bridges HD45 Road Drainage and the Water Environment
WFD compliance	HD45 (as above) Environment Agency protocol for WFD assessments of projects in the estuarine and coastal environment[16], adapted for the terrestrial setting of the project

7.4 Study Area

7.4.1 The study area for Junction 16 that has been adopted is an approximate 1 km radius from the junction alignments that will be assessed in the ES, allowing consideration of surrounding land use and drainage patterns as well as encompassing potential impacts on water bodies designated under the WFD.

7.5 Methodology

7.5.1 The methodology utilised within this scoping report follows that outlined in the Department for Communities and Local Government guidance, Environmental Impact Assessment: A Guide to Good Practice and Procedures17. This process can be summarised as follows:

a) Summarise the baseline conditions at the site

b) Consider the potential effects of the proposed development;

c) Identify those effects not considered significant, and thus scoped out, accompanied by justification;

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

[17] http://webarchive.nationalarchives.gov.uk/20080307004146/http://www.communities.gov.uk/documents/planningandbuilding/pdf/151087

d) Identify those effects considered potentially significant and thus scoped in, together with details of information to be collected, consultation and survey plans for example.

7.6 Significance Criteria

7.6.1 Classification of importance (including quality, scale, rarity and substitutability), magnitude of impact and resulting significance of impacts for the water quality assessment will be as per the following sources:

a) WebTAG Unit A3[18];
b) Planning Policy Wales document Development and Flood Risk[19];
c) Water Framework Directive waterbody classifications for Cycle 2**Error! Bookmark not defined.**.

7.7 Scoping Assessment

Baseline Environment

7.7.1 Junction 16 lies to the northeast of Penmaenmawr. The junction is approximately 30 m from Conwy Bay to the north separated from the bay by a rail line running adjacent to the A55. The Afon Gyrach discharges into the sea approximately 1 km to the northeast of the junction. An unnamed stream flows through Penmaenmawr approximately 1 km southwest of the junction and discharges to the sea. Ordnance Survey maps indicate the presence of a number of field drains/ditches within the vicinity of the junction, indicating the likely presence of groundwater close to the surface and thus the formation level of the A55 which is close to sea level.

7.7.2 Water from the road surface close to the junction passes through conventional highway drainage (including concrete, plastic and clay pipes) and is discharged through outfalls to the sea.

7.7.3 With respect to the WFD, the designated water bodies that lie close to the junction are listed in Table 7.1:

Table 7.1: Designated waterbodies lying close to the Junction 16 scheme

Name	Type	Distance from Junction	Current Status[20]	Protected Areas Close to Junction
Menai Strait	Coastal	40 m NW	Good	Menai Strait and Conwy Bay Special Area of Conservation (SAC) – Protected Area under the WFD
Llyn and Eryri	Groundwater	0 – beneath junction	Good (quantitative) Poor (chemical)	
Conwy Bay	Coastal	250 m NW	Moderate	Liverpool Bay SPA

7.7.4 Despite the proximity of Conwy Bay, the Junction 16 and the A55 either side (for a number of kilometres) is in Flood Zone 1. Junction 16 itself and the A55 road for

[18] TAG UNIT A3 Environmental Impact Appraisal December 2015 Department for Transport, Transport Analysis Guidance (TAG) https://www.gov.uk/transport-analysis-guidance-webtag

[19] Planning Policy Wales, Technical Advice Note 15 (TAN 15): Development and Flood Risk (July 2004)

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

approximately 200 m either side of the junction, is not classified as being at risk of surface water flooding (caused when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead). Several low-lying linear areas to the southwest and northeast of the junction are classified as being at risk of flooding from surface water. Beyond 200 m northeast of Junction 16, the carriageway is at risk of surface flooding. A more extensive area at risk of surface water flooding exists close to the Afon Gyrach – an area that would be included if Option 3 for Junction 16 were taken forward.

Potential Effects

7.7.5 The Scheme, result in changes to hardstanding area and road layout which in turn will result in changes to the quantity and rate of water discharged to outfalls and of the risk of spillage occurring. Lengthening of culverts or the creation of new culverts could result in hydrogeomorphological changes to the drainage regime and alter the risk of flooding. Where options involve development in areas prone to surface water flooding, the development could potentially exacerbate conditions in those areas and increase flood risk elsewhere.

7.7.6 Changes in discharge quality and quantity could have localised effects on aquatic habitats and water quality within the designated coastal water bodies adjacent to the site.

7.7.7 The aquifer below the junction is classified as having low productivity and is therefore not considered to be at risk from the proposed development in terms of its use as a resource, however springs do occur in the area indicating a high groundwater table and thus construction operations and installation of features below ground may present a risk to groundwater quality or localised flow regime.

7.7.8 Areas of land subject to historical use as a gasworks and landfill are located 70 m to the northeast and 170 m to the southwest of Junction 16 respectively. All but one of the options for Junction 16 involve works close to these areas. Should contamination remain at these locations, they may represent a potential source of water pollution. Option 3 passes over the Afon Gyrach but is not close to these areas.

7.7.9 During construction, run-off from construction activities has the potential to pollute drainage channels and thus downstream receptor waterbodies. Works may disrupt surface and groundwater flow paths or change hydrogeomorphology of streams.

Potential Effects Scoped Out

7.7.10 The risk identified of flooding from ‘rivers and the sea’ is all associated with flooding from the sea, not fluvial flooding from rivers. As the sea is effectively unlimited in volume, removal of flood storage capacity for flooding from the sea is not a consideration and is scoped out.

Potential Effects Scoped In

7.7.11 Based upon the potential effects discussed above, the following potential effects of the Scheme through construction and operational phases are scoped in and will be assessed as part of the ES.

7.7.12 Effects of Scheme on drainage or run-off patterns in the area and any resultant changes to flood and pollution incident risk associated with this;

1. Effects of the Scheme on the risk of flooding due to its presence and location
2. Effects of pollutants, waste, etc. on water quality
3. Effects on WFD status of designated water bodies and associated water-dependent ecology close to the Scheme
4. Effects of Scheme on the hydro-geomorphological status of existing watercourses, where the Scheme crosses them
5. Effects of major accidents or disasters

7.7.13 Where relevant, the implications of climate change on the above assessment will be included.

7.7.14 The water environment chapter within the ES will be supported by accompanying technical assessments including:

a) WFD assessment
b) Flood Consequences Assessment
c) HD45 assessment

7.7.15 No water sampling or detailed surveys are proposed, but a site walkover will be completed in summer/autumn 2018. This will provide additional information with regards to the small water features close to the Scheme (such as ditches, springs, streams) as currently it is not known how these could interact with or be affected by the Scheme and thus what implications this has for the Scheme design. The results of the site walkover will be incorporated into the Scheme design and impact assessment process as needed.

7.7.16 Consultation will be carried out with statutory consultees, including:

- Natural Resources Wales (NRW)
- Conwy County Borough Council

7.8 Conclusions

7.8.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in effects on the water environment and there is a need to assess these further as part of the EIA process.

8. NATURE CONSERVATION

8.1 Chapter Introduction

8.1.1 This chapter relates to the assessment of known features of ecological and nature conservation importance. The purpose of this assessment is to outline the scope to ensure that the proposals are executed within the framework of best practice guidelines, wildlife legislation and planning guidance, and to ensure that all potential adverse effects on ecology and nature conservation are identified and mitigation developed as appropriate.

8.1.2 There are interrelationships between Nature Conservation and other environmental topics including, Air Quality, Noise and Vibration, Road Drainage and the Water Environment.

8.2 Legislation and Policy and Context

8.2.1 The following relevant UK legislation has been considered within this assessment:

a) The Conservation of Habitats and Species Regulations 2017[21];

b) Wildlife and Countryside Act 1981 (as amended)[22];

c) The Environment (Wales) Act 2016[23];

d) Salmon and Freshwater Fisheries Act 1975[24];

e) The Protection of Badgers Act 1992[25];

f) Well-being of Future Generations (Wales) Act 2015[26];

g) Flood and Water Management Act 2010[27].

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 and Special Areas of Conservation) 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. Birds listed in Annex 1 are afforded special protection.

8.2.4 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

[21] Conservation of Habitats and Species Regulation 2017 http://www.legislation.gov.uk/uksi/2017/1012/contents/made
[22] Wildlife and Countryside Act 1981 (http://www.legislation.gov.uk/ukpga/1981/69)
[23] Environment (Wales) Act 2016 (http://www.legislation.gov.uk/anaw/2016/3/contents)
[24] Salmon and Freshwater Fisheries Act 1975 (https://www.legislation.gov.uk/ukpga/1975/51)
[25] Protection of Badgers Act 1992 (http://www.legislation.gov.uk/ukpga/1992/51/contents)
[26] Well-being of Future Generations (Wales) Act 2015)https://gov.wales/topics/people-and-communities/people/future-generations-act/?lang=en)
[27] Flood and Water Management Act 2010 https://www.legislation.gov.uk/ukpga/2010/29/contents

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.

8.2.5 The Welsh Government has 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.

8.2.6 All wild birds, their nests and eggs are protected under Part 1, Section 1 of the Wildlife and Countryside 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.

8.2.7 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.

Environment (Wales) Act 2016

8.2.8 The Environment 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.

8.2.9 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.

8.2.10 Section 7 of the Act is similar to the duty in section 42 of the NERC Act 200628 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.

Well-being of Future Generations (Wales) Act 2015

8.2.11 This act 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*

[28] Natural Environment and Rural Communities Act 2006
https://www.legislation.gov.uk/ukpga/2006/16/contents

and ecological resilience and the capacity to adapt to change (for example climate change).'

Flood and Water Management Act 2010

8.2.12 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 on the 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*'.

8.2.13 Standard S5 addresses the design of SUDs to ensure, where possible, that they create ecologically rich green and blue corridors in development and enrich biodiversity value by linking networks of habitats and ecosystems together.

Planning Policy

8.2.14 Planning Policy Wales (PPW) Edition 10 December 201829 sets out the land use policies of the Welsh Government, it is supplemented by a list of Technical Advice Notes (TANs). The Wales Spatial Plan People, Places, Futures sets out a strategic framework to guide future development. The Planning Directorate is working on the production of a National Development Framework (NDF). The NDF will set out a 20-year land use framework for Wales and will replace the current Wales Spatial Plan once published which is expected to be in September 2020.

8.2.15 The PPW, TANs, circulars and policy clarification letter comprise national planning policy. TAN 5 relates to nature conservation and planning (2009)[30].

8.2.16 The Conwy Local Development Plan 2007-2022[31], 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

8.2.17 The Conwy Local Development Plan is supplemented by non-statutory planning guidance documents. Relevant guidance documents include LDP05 – Biodiversity in planning.

8.2.18 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.

[29]Welsh Government: Planning Policy Wales Edition 10 December 2018 https://beta.gov.wales/sites/default/files/publications/2018-12/planning-policy-wales-edition-10.pdf
[30]Welsh Government: Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning September 2009 https://gov.wales/docs/desh/policy/100730tan5en.pdf
[31]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

Biodiversity Policy

8.2.19 Wales Biodiversity Partnership (WDP) 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.

8.2.20 Conwy County Borough Council have produced a Position Statement on Biodiversity which was adopted on 12th March 2009[32] which sets out the council's position on its role, responsibilities and duties in the conservation of biodiversity.

Relevant Guidance

8.2.21 In addition to the legislation and policy documents detailed in 8.2 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)[33];

b) Guidelines for Baseline Ecological Assessment (Institute of Environmental Assessment)[34];

c) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation (Highways Agency)[35];

d) DMRB Volume 11, Section 4, Part 1: Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)[36];

e) DMRB Volume 11, Section 2, Part 5, HA 205/08: Assessment and Management of Environmental Impacts (Highways Agency, 2008a)[37];

f) Interim Advice Note 116/08 (W) Nature Conservation in Relation to Bats[38];

g) Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment[39];

[33] 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

[34] Guidelines for Baseline Ecological Assessment (https://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/GPEA/GPEA_April_2013.pdf)

[35] 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)

[36] 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)

[37] 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

[38] IAN 116/08(W) nature conservation advice in relation to bats https://beta.gov.wales/interim-advice-note-11608w-nature-conservation-advice-relation-bats

[39] Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment (www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian130.pdf)

h) Welsh Transport Planning and Appraisal Guidance: WelTAG (Welsh Assembly Government, 2008)[40];

i) Green Corridors Initiative (Welsh Government, 2018)[41]

8.2.22 Other relevant documents referred to include the following:

a) Phase 1 Habitat Survey – a technique for Environmental Audit (JNCC, 2010);[42]

b) Bat Surveys for Professional Ecologists (2016)[43].

8.2.23 References above, to DMRB Volume 11, are made, despite the DMRB being withdrawn, because the guidance provided is a relevant and useful basis for the assessment method and approach.

8.3 Survey and Data Gathering

8.3.1 Welsh Government have been investigating solutions to improve road safety and traffic flow for the A55 Junction 15 at Llanfairfechan.

8.3.2 Atkins Highways & Transportation produced a Preliminary Planning Report on Environmental Issues for the North Wales Trunk Road Agency (NWTRA), and Welsh Government in April 2008. The preliminary report identified the presence of designated sites which may be affected.

8.3.3 Atkins Environmental produced an Environmental Report in January 2009 for NWTRA and Welsh Government in January 2009[44] and TACP produced an Ecological Statement in October 2015[45]. These reports considered potential impacts of minor improvement works to Junction 14 and Junction 15. Conclusions within the reports state the preferred option in terms of ecology and nature conservation and its predicted impact. More detailed assessment and consultation including protected species surveys were recommended.

8.3.4 A Stage 1 (Test of Likely Significant Effects) of the Assessment of the Implications on European Sites (AIES) has been carried out in accordance with the process as set out in HD44/09, Volume 11, Section 45 of the Design Manual for Roads and Bridges (2009) (DMRB). The report has been prepared to provide initial information to the Welsh Ministers ("the Competent Authority") on the implications of the Scheme on European Sites as required by Regulation 61 of the Conservation of Habitats and Species Regulations 2017 (the "Habitats Regulations"). European Sites are those sites which support habitat types and species which are most in need of conservation at a European level and are more broadly referred to as Natura 2000 sites. Within the UK, sites supporting the most representative or best example of habitats and non-bird species are designated as Special Areas of Conservation (SAC). Those sites supporting significant numbers of birds at a European level, including wintering, breeding and migratory populations, are designated as Special Protection Areas (SPA).

[40] Welsh Transport Planning and Appraisal Guidance WelTAG (June 2008) The Welsh Assembly Government. https://beta.gov.wales/sites/default/files/publications/2017-09/welsh-transport-appraisal-guidance-weltag.pdf
[41] https://gov.wales/newsroom/transport/2018/180724-green-corridors-improve-gateways-into-wales/?lang=en
[42] JNCC (2010) Handbook for Phase 1 Survey – a technique for environmental audit http://jncc.defra.gov.uk/PDF/pub10_handbookforphase1habitatsurvey.pdf
[43] Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edn). The BAT Conservation Trust, London.
[44] Atkins (January 2009) A55 Junction 15 & 16 Study Environmental Report. Doc Ref 506-4016/A55 J14-16a_Environmental Report_v4.
[45] TACP (October 2015. A55 Junctions 16 and 16 Improvements Ecological Statement.

8.3.5 Ecological surveys have been undertaken as part of the Environmental Impact Assessment (EIA) process and to date have included:

a) Extended Phase 1 Habitat surveys conducted in November 2017 and updated in June 2018;

b) Invasive non-native plant survey carried out in 2017 and updated in 2018;

c) Badger surveys conducted in conjunction with the extended phase 1;

d) Bat activity surveys which included five transect surveys conducted in June 2018 - September 2018 (inclusive) and the deployment of static bat detectors at suitable locations within the Scheme options footprint. These were deployed each month and left in situ for five nights;

e) Reptiles – habitat appraisal carried out as part of the extended phase 1;

f) Otter and water vole habitat appraisal carried out as part of the extended phase 1;

g) Otter survey along Afon Gyrach;

h) Over wintering bird surveys. A total of six Through-The-Tide-Count' (TTTC) surveys was completed, with monthly surveys between October 2017 and March 2018 (inclusive).

8.3.6 A data retrieval search was requested from the North Wales records centre, COFNOD, in September 2017 and consequently updated on the 15th October 2018.

8.3.7 Further surveys will be conducted in 2019 to compliment those conducted in 2018 and to survey areas which were not possible to gain access to during WelTAG Stage 2.

8.4 Study Area 'Zone of Influence'

8.4.1 The 'zone of Influence' will be 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.

a) The zone of influence to inform the desk study for the Scheme extended to

b) 30 km for Special Areas of Conservation designated for bats,

c) 10 km for other internationally designated sites,

d) 5 km for nationally designated sites such as SSSIs and LNRs, and

e) 2 km for locally designated Wildlife Sites.

8.4.2 For protected and otherwise notable species the desk study area extends to 2km and includes records within the last 10 years. These have been assessed form Junction 15 as it is unknown as to whether works would be undertaken to improve junction 14, and where this is the case, these would be minor improvements.

8.4.3 An extended Phase 1 habitat survey was undertaken by an experienced ecologist on 19th October 2017, which was updated in 2018. 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. 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).

8.4.4 The extended phase 1 habitat survey included all land within the area to be impacted and immediate adjacent land where accessible. The wintering bird surveys included the adjacent inter-tidal areas. Bat transects were conducted across the Scheme options from public rights of way.

8.5 Assessment Methodology

8.5.1 The Guidelines for Ecological Impact Assessment in the UK and Ireland (2018) are the current industry standard for ecological assessment and are current good practice. The assessment of effects on ecological receptors and the assessment of the significance of effects will be undertaken in line with the CIEEM guidance.

8.5.2 The assessment of the significant effects focuses on ecological features identified as important through desk study and field surveys. The value of an ecological feature is determined by professional judgement, taking account of the role of the ecological feature in the setting as well as considering its importance within a defined context. Various characteristics contribute to the importance of ecological features including whether it is important, the size of habitat or species population, habitat connectivity, rarity and robustness. Table 8.1 details of the importance of the ecological feature within the defined geographical context.

8.5.3 Where a feature has a 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.

8.5.4 In carrying out the assessment, a general method for the grading of the significance of effects will be 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. The assessment of potential and significant residual effects will utilise the following 5 level magnitude of effects as shown in Table 8.2.

Table 8.1: 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 10km squares in the UK. A regularly occurring, nationally significant population/number of any internationally important species.
High – National	A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve). 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. 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 10km 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 (or lower) – 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
Local	Semi-natural ancient woodland smaller than 0.25 ha.

Value (sensitivity)	Typical descriptors
	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.

Table 8.2: Magnitude of effect 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 positive effect. The change is likely to cause a permanent (irreversible) effect on the integrity of an ecological receptor– major negative effect.
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 positive effects. The change adversely affects the valued ecological receptor, but there would probably be no permanent effect on its integrity with appropriate mitigation and is reversible – moderate negative 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 positive effect. The change adversely affects the valued ecological receptor in the short term but there would be no permanent effect (reversible) – minor negative effect.
Negligible	The change is likely to restore or retain the status of an ecological receptor – neutral or slight positive effect. The change affects the valued ecological receptor in the short term but there would be no permanent effect (reversible) – slight negative effect.
No change	The change has no significant effect on the ecological receptor, either positively or negatively.

8.6 Significance Criteria

8.6.1 In addition to the magnitude and whether the effect has a positive or negative effect, the following would also be considered:

a) Extent – the spatial or geographical area over which the effects may occur;

b) Duration – to be characterised in terms of ecological characteristics as well as human timeframes;

c) Frequency and timing – e.g. when an activity occurs and for how long, an

d) Reversibility – whether the effect on the receptor can be reversed within a reasonable timescale or not.

8.6.2 In order to provide consistency across the Environmental Statement, a matrix approach will be adopted. However, the CIEEM EcIA guidelines avoid and discourage the use of the matrix approach in ecological assessment as it is considered to have several disadvantages for assessing the significance of residual effects. However, consideration has been given to the matrix shown in Table 5.5 using the tables above to assign a category of significant residual effect to ensure consistency across all the topics of the Environmental Statement.

8.6.3 In-combination effects will be considered as part of the EIA process. 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 influence water quality which in isolation would not be a significant effect, however in-combination with other effects, could be significant.

8.7 Consultations

8.7.1 A Public Information Exhibition (PIE) was held in December 2017 and the views of those who responded in the questionnaire were taken into consideration in the WelTAG Stage 2 Appraisal.

8.7.2 The first Environment Liaison Group (ELG) meeting was held in May 2018. The next meeting will be planned once the preferred option has been announced. These meetings were/will be 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 aim of the meetings is to discuss all environmental receptors.

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

8.7.4 For the EIA, consultation will continue with key stakeholders and Statutory Environmental Bodies in order to ensure that they are kept informed and are in agreement with the approach that has been adopted for the ecological appraisal of the Scheme.

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

8.8 Baseline Conditions

Designated Sites

8.8.1 The Menai Strait and Conwy Bay SAC and the Liverpool Bay SPA are located adjacent to Junction 16 and encompass the coastal waters directly north of the junction. The nearest terrestrial designated site is Sychnant Pass SSSI located approximately 0.6 km west of Junction 16. Aber Afon Conwy SSSI is located approximately 2 km north east of Junction 16.

8.8.2 A summary of these designated sites is provided in Table 8.3.

8.8.3 One National Nature Reserves (NNR) is located with 5km, this is Coedydd Aber which is a component of the SSSI and SAC. Four Local Nature Reserves are present within 5km. These are Traeth Lafan LNR, Nant-y-Coed LNR, Great Ormes Head LNR AND Bodlondeb woods. The closest of these is Traeth Lafan LNR which is located 4 km due west and is a component of the SPA and SSSI.

Non-Statutory Designated Sites

8.8.4 Seven 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 Relevant Statutory Designated sites

Site Name	Qualifying Features	Distance from Site
Sychnant Pass SSSI	A large area of heath is the dominant vegetation of this site with smaller, areas of bracken and acid grassland. The site is also of considerable entomological interest.	317 m east
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	Approximately 350m due north
Liverpool Bay / Bae Lerpwl (Wales) SPA UK9020294	Over winter the area regularly supports; A001 *Gavia stellata* (North-western Europe - wintering) 5.4% of the GB population 5-year peak mean 2001/02 - 2006/07 A065 Common scoter *Melanitta nigra* (Western Siberia/Western & Northern Europe/North-western Africa) 3.4% of the population 5-year peak mean 2001/02 - 2006/07 A117 Little gull *Hydrocoloeus minutus* (non-breeding) A193 Common tern *Sterna hirundo* (breeding) A195 Little tern *S. albifrons* (breeding)	Approximately 350 m due north
Coedydd Aber SAC UK0030118/SSSI	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)	2.1 km south west
Eryri / Snowdonia SAC UK0012946/SSSI	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:	3.5 km south

Site Name	Qualifying Features	Distance from Site
	3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea 6150 Siliceous alpine and boreal grasslands 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels 8110 Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) 8210 Calcareous rocky slopes with chasmophytic vegetation 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 tetralix 4030 European dry heaths 4060 Alpine and Boreal heaths 6170 Alpine and subalpine calcareous grasslands 6230 Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) * Priority feature 7130 Blanket bogs (* if active bog) * Priority feature 7150 Depressions on peat substrates of the Rhynchosporion 7220 Petrifying springs with tufa formation (Cratoneurion) * Priority feature 7230 Alkaline fens 7240 Alpine pioneer formations of the Caricion bicoloris-atrofuscae * Priority feature 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles 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*	
Aber Afon Conwy SSSI	Aber Afon Conwy is of special interest for its marine and terrestrial invertebrate biology. The tidal reach of the site extends approximately 16 kilometres, encompassing Conwy Bay between Penmaenbach Point and Great Orme's Head at its seaward limit, to its upstream boundary south of Tal y Cafn. The shoreline is backed by natural rock and boulder clay cliff,	3.6 km east

Site Name	Qualifying Features	Distance from Site
	sand dune, salt marsh and woodland, with artificial substrate and sea defence walls forming the boundary throughout the remainder of the estuary.	
Cadnant SSSI	Cadnant is of special interest for its geology, a complete sequence through the Cadnant Shales. The site consists of rock exposures in a railway cutting immediately outside the town walls of Conwy.	3.8 km east
Traeth Lfan / Lavan Sands, Conwy Bay SPA UK9013031 /SSSI	Over winter the area regularly supports; 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)	4 km west
Benarth Wood SSSI	A mixed deciduous woodland on Silurian rocks adjacent to the Conwy Estuary and receiving a low rainfall. The wood is ungrazed and has a diverse ground flora and adequate tree regeneration.	4.3 km east
Chwareli a Glaswelltir Degannwy SSSI	Chwareli a Glaswelltir Degannwy is of special interest for its geological and biological features: exposures of fossiliferous late Ordovician mudstone and sandstone rocks, maiden pink *Dianthus deltoides,* small-leaved sweet briar *Rosa agrestis* and a rare vascular plant assemblage.	4.3 km east
Bwlch Mine SSSI	It is the only recorded Welsh locality for the lead-antimony-sulphides semseyite, zinkenite and heteromorphite along with stibnite, jamesonite, galena, pyrites and blende.	4.9 km east
Great Orme's Head / Pen y Gogarth SAC UK0014788/SSSI	Annex I habitats that are a primary reason for selection of this site; 4030 European dry heaths 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site; 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	5.2 km north
Coedwigoedd Penrhyn Creuddyn / Creuddyn	Annex I habitats that are a primary reason for selection of this site; 9180 Tilio-Acerion forests of slopes, screes and ravines * Priority feature	5.7 km east

Site Name	Qualifying Features	Distance from Site
Peninsula Woods SAC UK0030124	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site; 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) 91J0 Taxus baccata woods of the British Isles * Priority feature	
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). The island is principally of interest for its nesting seabirds breeding both on its sea-cliffs and open grassland areas. The sea-cliffs support a typical maritime flora including sea spleenwort *Asplenium marinum*. The island is used as a hauling out ground by grey seals. The rare spider, *Meta bourneti*, known from only five British locations, has been recorded. The breeding puffin population, which formerly numbered several thousand pairs, has declined significantly to currently number less than a hundred pairs.	7.3 km north across the sea
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)	7.8 km north across the sea
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	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*	16.8 km south

Table 8.4 Non-statutory sites (Candidate Wildlife Sites) within 2 km of survey area

Site Name	Qualifying Features	Distance from Site
Orme View Vegetated Shingle	Vegetated shingle	73m due north
Orme View Reedbed	Reedbed	73m due north
Ty'n-y-ffrith	Dry dwarf shrub heath; acid grassland	1.35 km south
Penmaen Woods	Ancient semi-natural woodland covering approximately 15 hectares	1.55 km west
Coed Cwm Graig Llwyd	Broadleaved woodland	1.58 km south
Cefn Coch	Acid grassland/dwarf shrub heath mosaic	1.75 km due south
Craig Hafodwen	Acid grassland/dry heath mosaic; dry dwarf shrub heath	2 km south

Ancient Woodland

8.8.5 There are twenty-two Ancient Semi-natural woodland sites, including Restored Ancient Woodland and Plantation on Ancient Woodland within 2 km of the survey area. None of these would be affected by the Schemes proposals.

Habitats

8.8.6 The roundabout at Junction 16 consists of poor semi-improved grassland with the adjacent verges of a similar species composition. Broadleaved and mixed plantation woodland occurs around the slip roads to the west and east adjacent to Conway Road and Ysgubowen Road with scrub planting to the north of the A55 associated with the railway and cycle path. Heading east, the grassland is a mixture of improved pasture and poor semi-improved grassland. The Afon Gyrach crosses the Scheme area and flows under the A55 to the east of the Scheme. Two Local Wildlife Sites are located on the seaward side of the A55, beyond the railway. These are Orme View Vegetated Single and Orme View Reedbed.

8.8.7 The village of Penmaenmawr is located to the west of the Junction, whilst Dwygyfylchi is located to the east beyond which is a caravan park. A sewage works is located on the seaward side of the A55, beyond the railway, to the east of the Junction. The wider environs consist of improved pasture, woodland and heathland.

8.8.8 The preferred option would traverse areas of poor semi-improved grassland to the east of the Scheme, a new road is routed across the Afon Gyrach, in fields behind the shell garage through areas of scrub planting and grazed fields where it would join the existing slipway. The roundabout would be removed.

8.8.9 The following habitats were recorded during the extended phase 1 habitat survey:

a) Mixed plantation woodland A1.3.2;

b) Scrub dense and continuous A2.1 and scattered A2.2;

c) Hedgerows intact species poor J2.1.1
d) Built environment J3.6;
e) Neutral grassland – semi improved B2.2;
f) Poor semi-improved grassland B.6;
g) Amenity grassland J1.2;
h) Running water (Priority Habitat - Rivers) G.2;
i) Vegetated shingle H.3;
j) Marginal vegetation (reedbed) F2.2; and
k) Coastland H.

8.8.10 Further details on the habitats present within the survey area is provided in the following sections.

Mixed plantation woodland (A1.3.2)

8.8.11 Mixed plantation woodland occurs as part of the landscaping mix planted around junction 16, particularly to the south and west of this Junction. Species present include abundant maritime pine Pinus pinaster, dogwood Cornus sanguinea, Sycamore Acer pseudoplatanus, oak Querucus robur and ash Fraxinus excelsior. The ground flora was limited in these areas owing to the dense planting of the tree species and a leaf litter comprised of fallen pine needles.

8.8.12 Scattered trees are largely confined to the fields to the south of Junction 16 and within the landscape planting on the northern edge of the east bound carriageway. With mature ash, maritime pine and Pinus species present within the fields and maritime pine being the dominant tree species within the landscape planting on the northern edge of the east bound carriageway. A line of pine trees, including maritime pine, have been planted adjacent to Ysguborwen Rd where a small footpath offers a welcome break from the road and provides a seating area. Other isolated and scattered trees occur along field boundaries and along the Afon Gyrach.

Scrub dense and continuous (A2.1) and scattered (A2.2)

8.8.13 The landscape planting along the northern edge of the east bound carriageway comprise planting with the tree species stunted by the exposed environment adjacent to the sea. A varied species mix, with neither one species being dominant is present although trees have occasionally been planted in single species groups which may cover several metres. Species present include Escallonia sp., sea buckthorn Hippophae rhamnoides, maritime pine, sycamore, Italian alder Alnus cordata, common gorse Ulex europaeus, hawthorn Crataegus monogyna and bramble Rubus fruticosus agg. Plant density is high so that there are limited ground flora species present. A dense area of landscape planting/scrub of a similar mix occurs between the residential area of Maes y Llan and the A55.

8.8.14 Adjacent to the south edge of the west bound carriageway is a further area of scrub which is comprised of co-abundant holm oak Quercus ilex and blackthorn Prunus spinosa.

8.8.15 Other areas of dense and scattered scrub are associated with field boundaries.

Hedgerows intact species poor (J2.1.1)

8.8.16 Boundary features were to the field boundaries to the south of the A55 and included a hedge running adjacent to the west bound carriageway of the A55, covering a length of approximately 150 m. This hedge had recently been planted (within the last six years) and comprised hawthorn only.

8.8.17 Other hedgerows occur to the east of the Scheme where they enclose the fields and bound the public footpath. Species noted include field maple Acer campestre, sycamore, hawthorn and blackthorn with bramble.

Built environment (J3.6)

8.8.18 The built environment around junction 16 consists of the Oasis Christian Centre and Gladstone pub, the remainder area consists of open fields. To the east between Junction 16 and 16A is the village of Dwygyfylchi and a caravan site. The proposed new road is routed behind the shell garage located on the A55 west bound and in close proximity to the properties Located within Maes y Llan. A sewage treatment works is located on the north of the A55 accessed from the east bound carriageway across the railway bridge.

Neutral grassland – semi improved (B2.2)

8.8.19 A 1 -2 m wide strip of semi-improved neutral grassland runs for several hundred metres north east from Junction 16, dividing the A55 from a dedicated cycle way, within the central reservation and along the southern verge of the west bound carriageway.

8.8.20 Species recorded include frequent to abundant red fescue Festuca rubra, cock's-foot Dactylis glomerata, false-oat grass Arrhenatherum elatius, meadow vetchling Lathyrus pratensis, zigzag clover Trifolium medium, red clover T. pratense, common knapweed Centaurea nigra and red valerianCentranthus ruber with the verge on the east bound carriageway being more species rich than that on the west bound carriageway.

Poor semi-improved grassland (B.6)

8.8.21 The pasture fields within the survey area all comprise poor-semi improved grassland, with perennial ryegrass Lolium perenne, common bent Agrostis tenuis being the dominant grass species. The majority is maintained as a short sward by grazing, though some is cut for hay/silage whilst some is left unmanaged allowing Yorkshire fog to co-dominate with cocksfoot, common birds-foot trefoil Lotus corniculatus and ribwort plantain Plantago lanceolata.

Amenity grassland (J1.2)

8.8.22 There is a small area of grassland which is managed for amenity located between Maes Y Llan and the Shell garage. The edges of this field are bound by scrub. Species present within these areas include dominant to abundant perennial rye-grass, white clover Trifolium repens and crested dog's-tail Cynosurus cristatus.

Running water (G.2)

8.8.23 The Afon Gyrach is located approximately 1 km north east of Junction 16. The river channel is approx. 3m in width with steep and undercut banks, some exhibiting scouring and erosion. There was a moderate flow at the time of the survey (August 2018) but very little water with a depth of approximately 0.1m with some deeper pools which contained young salmonids. The substrate consisted of gravel, sand and cobble. No in channel vegetation was noted.

8.8.24 The river flows behind the properties at Gardd Eryri where it is bounded by a large stone wall to the east and broadleaved trees to the west. It then flows due north under the A55 and railway. The adjacent land use consists of grazed fields. The fields to the east are open to camping in the summer period. Noted tree species along the river include alder Alnus glutinosa and sycamore (dominant) with oak Quercus robur, holly Ilex aquifolium and ash. Dense areas of bramble scrub with hedge woundwort Stachys sylvatica, red fescue, cocksfoot, false oat grass, great willowherb Epilobium hirsutum, common nettle Urtica dioica and field horsetail Equisetum arvense line the banks. Stands of Himalayan balsam Impatiens glandulifera and Japanese knotweed Fallopia japonica occurs along the river corridor including a dense stand where it emerges to the north of the railway line.

8.8.25 The Afon Gyrach is used by otters and a number of bat species.

Vegetated shingle (H.3)

8.8.26 There is a small strip of vegetated shingle due east and west of the footbridge which crosses the A55. The survey area does not support significant amounts of vegetation with only sea kale Crambe maritima, yellow horned-poppy Glaucium flavum and sea beet Beta vulgaris subsp. maritima occurring sparsely along the section of habitat surveyed.

Marginal vegetation (reedbed) F2.2

8.8.27 There is a small strip of marginal vegetation due east of the footbridge which crosses the A55. The dominant species is common reed Phragmites australis (P. Communis) with areas of bramble scrub. To the east, where the Afon Gyrach discharges, there is a large stand of Japanese knotweed.

Coastland (H)

8.8.28 To the north of the site beyond the railway line is the coastline. A detailed survey was not carried out at this location as access was restricted. To the west of Junction 16 are hard sea defences and the railway line beyond which is the rocky shore and sand. Due east the habitat becomes more naturalised as described above. To the west of the Afon Gyrach is a sewage treatment works. The tide rises to cover most of the rocky shoreline.

Habitats of Principal Importance

8.8.29 There are three habitats of Principal Importance (as listed within Section 7 of the Environment (Wales) noted during the surveys. These are the Afon Gyrach, reedbed and vegetated shingle.

Protected and Notable Species (Flora)

8.8.30 The desk study identified thirty notable or protected plant species within a 2km search radius within the last ten years. None of these are located within the survey area.

Protected and Notable Species (Fauna)

8.8.31 The results of fauna within and adjacent to the Scheme has been gathered via desk study (within 2km and within the last ten years) and from surveys conducted between 2017 and 2018. Detailed accounts are provided below.

Invertebrates

8.8.32 The desk study identified twenty-six species of invertebrate within a 2km search radius. Most of these records are associated with the Pensychnant area and are mostly of the order odonata.

8.8.33 Suitable habitat to support rare or notable assemblages of invertebrate's species is limited, with the habitats present on site being species poor in terms of the plants they support or lacking other features typically associated with rare invertebrate species, such as dead wood or exposed, dry soils. The exception to this is the Afon Gyrach and coastal habitats including the vegetated shingle both of which may potentially support rare or notable invertebrate species.

Fish

8.8.34 Eel Anguillia and brown trout Salmo trutta have been recorded within the Afon Gyrach upstream from the Scheme location. Young salmonids were also observed during the otter surveys along the Afon Gyrach.

Amphibians

8.8.35 Great crested newts Triturus cristatus have been recorded approximately 1500 m east of the Scheme location, with the common frog Rana temporaria Common toad Bufo bufo and palmate newt Lissotriton helveticus recorded approximately 2 km due east within Pensychnant. However, there are no ponds within 500m of Junction 16 or the wider survey area which could support this species.

8.8.36 Habitats within the Scheme footprint are mostly unsuitable and considering their isolation and lack of suitable breeding habitat within 500m and also of records, this species group has been scoped out from further assessment.

Reptiles

8.8.37 Records for the grass snake Natrix helvetica and slow worm Anguis fragilis were recorded 30m due south within a caravan park adjacent to the golf course.

8.8.38 The grass verge which separates the cycleway from the A55 may potentially support reptiles, with the adjacent rail line also providing habitat and a 'green corridor' for reptiles to disperse from. The grassland to the south of Shell Garage currently has the potential to support slow worm as it is unmanaged.

Birds

8.8.39 A large number of bird records were received the majority of which relate to species associated with the adjacent SPA's. The over wintering bird surveys recorded a maximum of 120 oystercatcher Haematopus ostralegus within the Junction 16 survey area, occurring during the mid-tide survey in January 2018. Numbers within the survey area were typically fairly consistent during each survey during each month. At high tide, oystercatcher moved from the intertidal area to forage within nearby pasture and recreational areas. Red-throated diver Gavia stellata were recorded during two survey months (October 17 and November 2017) with a maximum of seven birds recorded during any survey (high tide, November 2017). Other species noted during these surveys include: Eider Somateria mollissima, great crested grebe Podiceps cristatus, red-breasted merganser Mergus serrator, curlew Numenius arquata , ringed plover Charadrius hiaticula and turnstone Arenaria interpres. Records of notable woodland and farmland bird species were also received, with numerous records around Pensychnant. Aside from the SPA habitats, those within the Scheme area which provide suitable foraging and nesting habitat for breeding and overwintering birds include the plantation woodland, Afon Gyrach, scrub and grassland.

Bats

8.8.40 A number of bats including noctule Nyctalus noctula, lesser horseshoe Rhinolophus hipposideros, soprano and common pipistrelle Pipistrellus pygmaeus and P. pipistrellus and whiskered/brandts Myotis mystacinus/brandtii agg have been recorded within 2 km of the survey area.

8.8.41 No roosts have been identified from the surveys conducted to date.

8.8.42 Species recorded during the transect surveys include common and soprano pipistrelle, noctule and Daubentons Myotis daubentonii. To be updated when results reviewed. The majority of activity noted by far was along the Afon Gyrach with very little activity noted adjacent to the A55, along the cycle path or around the Junctions.

8.8.43 The areas of landscape planting to the south west of Junction 16 may 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 areas of landscape planting which could supporting a bat roost.

8.8.44 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. Boundary features provide opportunity for commuting and foraging bats.

Dormice

8.8.45 No records of dormice Muscardinus avellanarius were received and there is no suitable habitat present within the survey area, with areas of woodland/ scrub being small in extent with no connectivity to larger areas of woodland which could support this species. As such, this species has been scoped out from further assessment.

Water voles

8.8.46 No records of water voles Arvicola amphibius were received. The Afon Gyrach 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. As such, this species has been scoped out from further assessment.

Badger

8.8.47 Badgers Meles meles have been recorded within 1.3 km of the survey area within woodland. No evidence of badgers was found during the extended Phase 1 habitat survey. Badgers may utilise the railway corridor, other suitable habitat includes the open fields to the south of the A55 which connect to the wider landscape which includes areas of woodland and open fields.

Otter

8.8.48 Otters Lutra have been recorded within 1.4 km of the Scheme associated with Pensynchant and Sychnant pass. Numerous field signs of the otter were recorded along the Afon Gyrach including fresh otter spraints on a ledges and boulders in the culvert which takes the Afon Gyrach under the A55 and also two noted up stream on boulders. Otters regularly use this a foraging and commuting route to the coast. No dens have been noted, however there are suitable areas for resting up. No other suitable habitat occurs within the Scheme location.

Other mammals

8.8.49 Hedgehog Erinaceus europaeus have been recorded from within the survey area, an RTA on Conway Rd to the west of Junction 16. Likewise, an RTA record for a polecat Mustela putorius and stoat Mustela erminea were returned at Dwygyfylchi on the A55 west bound. Weasles Mustela nivalis have been recorded in the wider area, associated with Sychnant Pass. The scrub, grassland, gardens and woodland habitats within the survey area may potentially support these species.

Invasive Non-native Species (INNS)

8.8.50 Three-cornered garlic Allium triquetrum, Japanese knotweed Fallopia japonica, cherry laurel Prunus laurocerasus, Portugal laurel Prunus lusitanica, Himalayan cotoneaster Cotoneaster simonsii and Rhododendron Rhododendron ponticum were highlighted during the desk study. Those closest to the Scheme include the three-cornered garlic which occurs along the cycle path and Japanese knotweed recorded on the seaward side where the Afon Gyrach discharges.

8.8.51 INNS noted during the phase 1 habitat surveys include Montbretia Crocosmia x crocosmiiflora which forms extensive patches within areas of landscaping planting adjacent to the A55. Japanese knotweed and Himalayan balsam Impatiens glandulifera occur along the Afon Gyrach with a large stand of Japanese knotweed occurring at the seaward side of the Gyrach as noted previously. Three cornered garlic/ leek was noted along the cycle path, as highlighted within the desk study.

8.9 Potential Effects Scoped In

8.9.1 The potential effects of the Scheme during preliminary activities may include the following:

a) Invasive Ground Investigations and Archaeological investigations

b) Indirect disturbance as a result of increased human presence, noise, dust, lighting and pollution during construction;

c) Spreading of invasive plants;

d) Direct habitat loss including impacts to scrub, shrubs, plantation woodland, and grassland;

8.9.2 The potential effects of the Scheme during construction may include the following:

a) Construction of temporary access routes and site compounds;

b) Movement of materials to and from site

c) Demolition operations

d) Indirect disturbance as a result of increased human presence, noise, dust, lighting and pollution during construction;

e) Construction of structures and hard surfaces

f) Spreading of invasive plants;

g) Direct habitat loss including impacts to scrub, shrubs, plantation woodland, and grassland;

h) Loss of and disturbance to foraging and commuting habitat for bats and otters;

i) Disturbance to watercourses

j) Impacts to hydrology

k) Disturbance to potential reptile habitat

l) The loss of and disturbance to breeding and overwintering bird habitat;

m) The potential for effects on the European designated sites would also be addressed in the Assessment of the Implications on European Sites (AIES) to fulfil the requirements of the Conservation of Habitats and Species Regulations 2017.

8.9.3 The potential effects of the Scheme during operation may include the following:

a) Drainage and run off;

b) Lighting;

c) Emissions;

d) Presence of people, vehicles and their activities; and

e) Site operation and maintenance.

8.10 Potential Mitigation

8.10.1 A sequential process would be adopted to avoid, mitigate and compensate ecological impacts.

8.10.2 The Scheme would include a number of mitigation and enhancement measures which would be developed during the EIA process. These are likely to include but not be limited to:

a) The loss of habitats including the grassland, plantation woodland, scrub and boundary features could be mitigated by landscaping. This should include species of local provenance with an aim to create species rich verges within the soft estate and enhanced woodland and tree/shrub and scrub planting, with a view to enhancing the green network (and to take into consideration the Green Corridors Initiative). With the incorporation of planting schemes designed by landscape architects with input from ecologists, the potential effect could be positive on the aesthetic and ecological values of the site.

b) Where any areas are identified as bat commuting and foraging routes (for example the Afon Gyrach) which may be disturbed, mitigation may include the retention and/or enhancement of these, as well as sensitive lighting schemes instigated so as to retain 'dark corridors' where this is feasible.

c) The potential disturbance to habitat utilised by otters (Afon Gyrach) would need to be subject to a licence from Natural Resources Wales. Methods set out within the licence to mitigate for any potential significant effects would need to be followed. No works to the Afon Gyrach would be able to proceed until the licence is obtained.

d) The potential effects on nesting birds would be greatest during the nesting bird season (March – August inclusive, but there can be early and late nesting depending on the bird species and current weather conditions) which can be mitigated by undertaking habitat clearance outside of the nesting bird season. It should be note that this period may change due to particular species of bird together with seasonal and climatic variations from year to year. These are factors that will need to be reviewed prior to the site clearance operations commencing.

e) None of the key areas associated with the designated sites used by overwintering waterfowl will be directly affected by the construction or operation of the road, as such it is considered that the effects from construction noise would not significantly disturb the aggregations of roosting, loafing or feeding overwintering waterfowl which are a feature of interest of these sites. However, birds may be temporarily displaced from locations near the works, in particular the fields to the east through which the new access road is routed. Works here may temporary displace these birds but not such that it significantly affects the aggregations within the designated sites. Construction noise will be reduced by turning off engines when not in use, using noise silencers on construction tools etc. These will be detailed with the CEMP.

f)

g) Where invasive plant species are present mitigation measures would be adopted to manage the presence of such species including the control of the species in accordance with existing guidelines such as the relevant Environmental Agency guidance.

h) Reasonable Avoidance Measures where habitat with the potential to support reptiles is disturbed.

8.10.3 Mitigation and enhancement measures will be discussed with the attendees of the Environmental Liaison Group.

8.11 Key Ecological Features Scoped In

8.11.1 At this stage of the assessment, the key ecological features identified at this stage of the assessment are:

a) Statutorily designated sites;
b) Candidate LWS located adjacent to the survey area;
c) Priority Habitats (as listed within Section 7 of the Environment (Wales) Act) including hedgerows and rivers, reedbeds, vegetated shingle;
d) Bats;
e) Otters;
f) Nesting birds;
g) Fish;
h) Overwintering birds; and
i) Reptiles.

8.12 Key Ecological Features Scoped out

8.12.1 Due to the lack of suitable habitat and connectivity or where the effects are not considered significant and can be mitigated for as an integral part of the Scheme (i.e. replacement of habitat lost for construction or by following Reasonable Avoidance Measures), it is felt that the following species/habitats should be scoped out of any further assessment:

a) Habitats – all other habitats which are not priority habitats which may be affected by the Scheme are considered to be of low conservation value and easily replicated within landscape proposals. As such, these habitats have been scoped out of further assessment as the effects are not considered significant under EIA regulations. However, mitigation which is integral to the Scheme, would include replacement planting which would be included in the nature conservation chapter of the Environmental Statement.
b) Amphibians, including great crested newts - Habitats within the Scheme footprint are mostly unsuitable and considering their isolation and a lack of suitable breeding habitat within 500m and lack of records, this species group has been scoped out from further assessment.
c) Dormice - No records of dormice were received and there is no suitable habitat present within the survey area, with areas of woodland/ scrub being small in extent with no connectivity to larger areas of woodland which could support this species.
d) Water voles - No records of water voles occur within 2km . The Afon Gyrach 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.

8.13 Conclusions

8.13.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in significant effects on the ecological features detailed in 8.13 and there is a need to assess these further as part of the EIA process.

8.13.2 Species and habitats which are considered to be widespread, unthreatened and which are likely to be resilient to the Scheme effects and which would remain viable and

sustainable have been scoped out of the assessment (as listed in 8.14). However, where a species or habitat has been ‘scoped out’ consideration would be given to safeguarding biodiversity in general in order to comply with relevant plans, policies and initiatives.

9. LANDSCAPE, TOWNSCAPE AND VISUAL EFFECTS

9.1 Introduction

9.1.1 This chapter describes the scope of the landscape, townscape and visual assessment and the surveys completed or still required. References to national and local planning policies to be considered are included as well as the approach to the assessment of likely significant effects of the preferred option and approaches to mitigation.

9.2 Legislation and Policy

9.2.1 The following policies, advice notes, and guidance documents are relevant to landscape and visual impact assessment and will be taken into consideration during the assessment.

Current Welsh Government land use planning policies

9.2.2 The current land use planning policies for the Welsh Government are set out in Planning Policy Wales Edition 10 (December 2018). Of particular relevance to landscape and visual impact effects is Chapter 6 – 'Distinctive and Natural Places that covers topics such as:

- The Historic Environment;
- Green Infrastructure;
- Landscape;
- Biodiversity and Ecological Networks and;
- Coastal Areas.

9.2.3 Planning Policy Wales (PPW) also supports the use of Natural Resources Wales' LANDMAP data system as an important information resource.

9.2.4 PPW is supplemented by a series of topic based Technical Advice Notes (TANs). The relevant TANs include:

TAN10 'Tree Preservation Orders'

TAN 12 'Design'

TAN 18 Transport

Conwy Local Development Plan 2007-2022

9.2.5 Adopted in October 2013, the Conwy Local Development Plan guides planning and development in the county, excluding the area within Snowdonia National Park. 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, reviewing the evidence base and calling for candidate sites.

Policy NTE/1 – The Natural Environment

Policy NTE/2 – Green Wedges and Meeting the Development Needs of the Community

Policy NTE/4 – The Landscape and Protecting Special Landscape Areas

Policy NTE/5 – The Coastal Zone

Policy CTH/2 – Development Affecting Heritage Assets

Conwy CBC Supplementary Planning Guidance

9.2.6 The Conwy Local Development Plan 2007-2022 is supplemented by non-statutory planning guidance documents:

LDP09 – Design

LDP14 – Conservation Areas

Eryri Local Development Plan (ELDP) 2016-2031

Adopted on 6th of February 2019 the ELDP guides planning and development in the National Park. The National Park Authority is in the process of revising the Local Development Plan. The key policies referring to landscape in the ELDP include;

- Strategic Policy A: National Park Purposes and Sustainable Development
- Strategic Policy C: Spatial Development Strategy
- Strategic Policy D: Natural Environment
- Strategic Policy Ff: Historic Environment
- Development Policy 1: General Development Principles
- Development Policy 2: Development and the Landscape
- Development Policy 10: Advertisements and Signs

Eryri Supplementary Planning Guidance

9.2.7 Further detailed information supporting the Local Development Plan is provided in supplementary planning guidance documents.

- 07 – Landscapes and Seascapes of Eryri
- 13 Landscape Sensitivity and Capacity Assessment
- 14 – Obtrusive Lighting (Light Pollution)

9.3 Relevant Guidance

9.3.1 The assessment of landscape, townscape and visual impact effects will be carried out in accordance with methodology set out within the following documents Design Manual for Roads and Bridges Volume 10 and Volume 11 were withdrawn, along with all the other volumes in 2017. The replacement has not been published (May 2019). However, the methods and approach are still applicable and will form the base guidance applied in the proposed Environmental Impact Assessments. A Welsh Government document Interim Advice Note (IAN) 135/10 (W) - Landscape and Visual Effects Assessment – Wales Only (hereafter referred to as IAN 135/10 (W)). Replaces guidance set out within Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 5 (Highways Agency, 1993).

9.3.2 IAN 135/10 (W) refers to the Guidelines for Landscape and Visual Impact Assessment – Third Edition (GLVIA3). Published by the Landscape Institute and Institute of Environmental Management and Assessment, 2013.

9.3.3 Other relevant documents referred to include the following:

a) *Landscape Character Map for Wales:* Countryside Council for Wales and Land Use Consultants

b) *LANDMAP:* Data system, formally adopted approach for landscape assessment in

Wales, devised and maintained by Natural Resources Wales (NRW), available to view online at http://landmap-maps.naturalresources.wales/

c) *Roads in Lowland Areas – A Design Guide* Highways Directorate, Welsh Office, 1993.

9.4 Surveys and Data Gathering

9.4.1 Atkins Highways & Transportation produced Preliminary Planning Report on Environmental Issues for the North Wales Trunk Road Agency (NWTRA), and Welsh Government in April 2008. The preliminary report identifies the main landscape and townscape receptors that would be affected by works.

9.4.2 Atkins Environmental produced an Environmental Report for NWTRA and Welsh Government in January 2009. The report considered potential impacts of 4 improvement options for Junction 16 and minor works to Junction 16A. Conclusions to the report state the preferred option in terms of landscape and visual amenity and its predicted impact. More detailed assessment including field survey work was recommended.

9.4.3 In November 2017 the current project team were commissioned by Welsh Government to develop the proposed improvements at Junction 15 and 16. Since that time a programme of surveys and data gathering has been undertaken. Surveys subsequently carried out in 2018 provide baseline information including winter landscape survey, summer landscape surveys, a photographic survey to determine suitable viewpoints for the assessment of the different options, and a tree survey.

9.5 Assessment Methodology

Study Area

9.5.1 In accordance with IAN 135/10 (W), an initial study area will be identified for the assessment of landscape and visual effects that includes the whole area from which the Scheme with traffic would theoretically be visible. This initial study area will be based on a digital Zone of Theoretical Visibility created using GIS software and Ordnance Survey (OS) Terrain 50 height data, based on a 50m resolution digital terrain model (DTM).

9.5.2 Field work will be carried out to refine this initial study area to identify where potentially significant effects upon the existing landscape resource, views and visual amenity are likely to occur because of the Scheme.

9.5.3 From the Pen-y-Clip headland to the Penmaenbach headland, the A55 and the Chester to Holyhead railway cross a narrow coastal strip between the beach and the built-up areas and outskirts of Penmaenmawr and Dwygyfylchi. To the inland side, coastal hills and Carneddau uplands form two semi-circular bays that enclose the villages. Preliminary visual analysis suggests that views from long distance are limited by landform. On the seaward side the limit of visibility is Anglesey across Traeth Lafan and Menai Strait, Great Orme across Conwy Bay, and the visual horizon set by the curvature of the earth and the elevation of the scheme.

Baseline Conditions

9.5.4 Baseline conditions have been established through a combination of desk study, visual and photographic surveys of the study area and the use of digital terrain data and an

aerial drone survey of the immediate setting of the proposed improvements. The baseline data will be supplemented with additional information during the development of the design, consultations with relevant bodies and the preparation of the EIA.

Landscape Receptors

9.5.5 The sensitivity of a landscape is a combination of judgements of the landscape's ability to accommodate change of the type proposed (in this case modification to an existing highway with its associated forms and infrastructure), and the quality of the receiving landscape established during the baseline assessment.

9.5.6 The relevant LANDMAP character areas, across each of the five aspect layers are assessed using the description and evaluation data to determine the susceptibility to change. Areas that are directly affected by the development, usually containing wholly or partly the development area, or lying next to the development area are those most likely to experience a significant impact.

9.5.7 Baseline study and site-based assessment consider the quality of the elements or components that make up the landscape. Landscape quality is a judgement based on the physical condition of the landscape and the value attached to it, often based on designation or recognition as expressed by national or local consensus. A judgement of landscape value will also take into consideration designations of ecological and archaeological significance.

9.5.8 Judgements of the relationship between the susceptibility to change attached to landscape receptors and their value are used to determine the landscape sensitivity. IAN 135/10 (W) suggests three categories of 'high', 'medium' and 'low' to describe the sensitivity of the landscape. The landscape character units defined as 'high' are considered particularly vulnerable to change and those categorised as 'low' are considered able to accept change of the type proposed.

Visual Receptors

9.5.9 The sensitivity of the visual receptor is a judgement of the type of change to views and visual amenity brought about by the scheme combined with the activity of the viewer. A judgement is also made about the value attached to the views experienced, which considers the recognition of the value attached to particular views by residents and visitors.

9.5.10 Sensitive visual receptors are identified following guidance within IAN 135/10 (W) and GLVIA3. Sensitive visual receptors are likely to be individual or groups of dwellings, users of public rights of way or visiting popular visitor attractions. IAN 135/10 (W) suggests three categories of 'high', 'medium' and 'low' to describe the sensitivity of visual receptors (see Table 9.1)

Table 9.1 sensitivity of visual receptors

Sensitivity	Typical Criteria
High	• Residential Properties; • Users of Public Rights of Way or other recreational trails;

	• Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside.
Moderate	• Outdoor Workers • Users of scenic roads, railways or waterways or users of designated tourist routes • Schools and other institutional buildings and their outdoor areas
Low	Indoor workers; Users of main roads (eg. 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 (eg sports facilities)
Table extracted from IAN 135/10 – Table 1 Visual Sensitivity and Typical Descriptors	

9.6 Assessment of Potential Effects

9.6.1 Potential effects can be short term construction effects, medium term effects once construction is complete, or long term; after a period of years after construction. The visual effects of a development can be influenced by the growth of vegetation, year on year, and by seasonal changes brought about by the annual growth and fall of leaves on deciduous trees. Accepted best practice, confirmed in DMRB and GLVIA3, is to make assessments of the proposed development during construction, on completion of construction and after 15 years of growth of any existing and proposed roadside plantations and hedgerows. The change from summer to winter is also considered.

Magnitude of Landscape Impact

9.6.2 The magnitude of impact on landscape character is determined by the degree of change that would be introduced by the scheme. It is determined by factors including size or scale, extent of area influenced, and duration of proposal.

9.6.3 Magnitude of impact could be adverse or beneficial. Magnitude of Impact is graded taking account of both scale and magnitude (see Table 5.4). The following aspects are used to determine the magnitude of impact.

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

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

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

Significance of Landscape Effect

9.6.4 Significance is determined using the Table 5.5. The evaluation of the significance is derived by combining the assessment of sensitivity of the landscape and the magnitude of impact of the proposed scheme. Categories can be either beneficial or adverse. In some circumstances the addition of new features will enhance the landscape, resulting in a beneficial effect. A nine-point scale is used to describe the significance of effect,

ranging from 'very large positive' (e.g. greatly enhancing character), through 'Neutral', to 'very large negative' (e.g. be at complete variance with landscape character).

Magnitude of Visual Impact

9.6.5 The magnitude of the effect on visual amenity is evaluated as the amount of change in view caused by the scheme. The size, scale and geographic extent of the change in view are considered. It also considers the duration of the change.

9.6.6 Judgements of how size, scale and geographical extent of the change in landscape as experienced by each receptor are needed. This should include a statement of existing landscape elements that would be lost, the proportion of the view that this represents and how views would be changed (e.g. broadened or narrowed), by the exclusion or inclusion of surface elements.

9.6.7 Effects during construction are considered short term. The visual effects of a development can be influenced by the growth of vegetation and by seasonal changes brought about by the annual growth and fall of leaves on deciduous trees. After construction is complete, the period where any vegetation planted to mitigate or enhance views becomes established is considered medium term. A period of years after construction when vegetation has matured sufficiently to reach the design commitment is considered a long term and lasting effect.

9.6.8 Accepted best practice, confirmed in IAN 135/10 (W), is to make assessments of the proposed scheme during construction and once completed, with and without mitigation. This will be achieved by an assessment of the first winter after completion of construction (without mitigation), and after 15 years of growth of any existing and proposed roadside plantations and hedgerows (with mitigation).

9.6.9 Indicative criteria used for the judgement of the magnitude of visual effect is given in a five-point scale ranging from *No change* to *Major* and described in Table 5.4.

Significance of Visual Effect

9.6.10 Significance is determined using the Table 5.5. The significance depends upon the judgements of receptor sensitivity, the factors that influence the magnitude of change and the relationship between sensitivity and magnitude. Receptors affected are described in terms of location, distance from proposed development boundary and the nature of the existing view. For different receptor groups, the information is presented in tabular form as Visual Effects Schedule.

9.6.11 The relationship between sensitivity and magnitude informs the impact significance of each receptor. The significance can be either negative or positive. Evaluations that are judged to be negligible or slight are not considered to be significant. A nine-point scale is used to describe significance of effect, ranging from 'very large negative' (e.g. cause loss of a view or constitute a dominant discordant feature), through 'neutral', to 'very large positive' (greatly enhance view).

Table 9.2 Significance of Visual Effect

Significance	Typical Descriptors of Effect
Very large Beneficial	The project would create an iconic new feature that would greatly enhance the view
Large Beneficial	The project would lead to a major improvement in a view from a highly sensitive receptor
Moderate Beneficial	The proposals would cause an obvious improvement to a view from a moderately sensitive receptor, or perceptible improvement to a view from a more sensitive receptor
Slight Beneficial	The project would cause limited improvement to a view from a receptor of medium sensitivity or would cause greater improvement to a view from a receptor of low sensitivity.
Neutral	No perceptible change in the view.
Slight Adverse	The project would cause obvious deterioration to a view from a receptor of medium sensitivity or cause greater deterioration to a view from a receptor of low sensitivity.
Moderate Adverse	The project would cause obvious deterioration to a view from a moderately sensitive receptor, or perceptible damage to a view from a more sensitive receptor.
Large Adverse	The project would cause major deterioration to a view from a highly sensitive receptor and would constitute a major discordant element in the view.
Very Large Adverse	The project would cause the loss of views from a highly sensitive receptor and would constitute a dominant discordant feature in the view.
Extracted from Table 4 of IAN 135/10 : Typical Descriptors of the Significance of Effect Categories	

Mitigation

9.6.12 The assessment of impact will be considered before and after the effects of mitigation so that the benefit and effectiveness of proposals can be understood.

9.7 Scoping Assessment

Landscape Designations

9.7.1 Preliminary visual analysis suggests that proposed improvement would be visible from Snowdonia National Park, the Anglesey Area of Outstanding Natural Beauty, Castles and Town Walls of King Edward in Gwynedd World Heritage Site and North Arllechwedd Landscape of Outstanding Historic Interest.

Snowdonia National Park

9.7.2 The boundary of Snowdonia National Park is located about 300 m south of the existing roundabout at Junction 16. Near (less than 0.5 km), and intermediate distance views (between 0.5 and 2.0 km), could be available from exposed upland and scarp slopes where the Carneddau mountains meet the coastal slopes of Penmaenmawr and Dwygyfylchi.

Anglesey Coast AONB and Beaumaris Castle

9.7.3 Anglesey Area of Outstanding Natural Beauty (AONB) and Beaumaris Castle (Castles and Town Walls of King Edward in Gwynedd World Heritage Site) are more than 11 km due west of Junction 16. Although there is a direct line of sight over Traeth Lafan, detail would be difficult to distinguish over long distances. Eastward views towards the A55 roundabout are of an urban area set within prominent headlands of Penmaenbach and Penmaenmawr.

Register of Historic Parks and Gardens and Historic Landscapes

9.7.4 The North Arllechwedd Historic Landscape overlaps parts of the National Park and includes Penmaenmawr Quarries and coastal slopes south of Penmaenmawr. At its closest point, the boundary of the Historic Landscape is about 250 m to the south of the existing roundabout.

Wales Coast Path

9.7.5 The Wales Coast Path promoted route is next to the eastbound carriageway of A55, and is linked to the local roads and footpaths at Orme View Filling Station, Beach Road and Penmaen Isa.

Coastal Zone

9.7.6 The Chester to Holyhead railway line defines the boundary of the Local designation of 'Coastal Zone' between Penmaenmawr and Penmaenbach. Proposed works within The Coastal Zone will only be permitted where the development complies with Conwy CBC Policy NTE/5.

9.7.7 The open land between the built-up areas of Penmaenmawr and Dwygyfylchi is designated as Green Wedge. The A55 forms the northern edge of this designation.

9.7.8 Improvements to Junction 16 would be near to Pen-y-Cae and Penmaenmawr Town Centre Conservation Areas.

Landscape Character

9.7.9 The scheme is located within National Landscape Character Area 3: Arfon. It is a lowland area bounded by the Menai Strait and the Snowdonia foothills. Key characteristics relevant to Penmaenmawr and Dwygyfylchi include the following:

a) Plateau - a broad gently, undulating lowland and valley land form, rising from the coast and flanked by higher adjacent uplands of Eryri;

b) Dramatic inland panorama of steeply rising mountains – many views to Carneddau uplands

c) Extensive mineral workings – old quarries, levels, tramways and workshops;

d) 'Gwerin' – landscapes associated with quarry workers' housing and smallholdings;

e) Pastoral land cover;

f) Lowland/Upland contrast – from sheltered lowland and pasture to exposed upland.

9.7.10 From the Pen-y-Clip headland to the Penmaenbach headland, the A55 and the Chester to Holyhead railway cross a narrow coastal strip between the beach and the built-up areas

of Penmaenmawr and Dwygyfylchi. The coastal scarp slopes form two semi-circular bays that enclose the villages. Pen-y-Clip headland, marked by tramways, inclines and worked quarry faces, dominates Penmaenan. Penmaenbach and Allt Wen dominate Pendyffryn and Capelulo. Foel Lus promontory divides Penmaenmawr and Dwygyfylchi.

9.7.11 At Penmaenan, rows of terraced houses ar located on steep slopes between the transport routes and the quarries. Further eastward the coastal slopes recede and are replaced by the broad sloping valley of the Afon Pabwyr, which runs from Cwm Graiglwyd and under the village centre. The settlement pattern is broadly made up of terraced properties and roads crossing sloping ground, the different levels are connected by steep roads that twist their way up and down the slope. Outside of the village, settlement is scattered or has developed along roads.

9.7.12 At Dwygyfylchi is a more gently sloping broad valley of the Afon Gyrrach. Settlement originally developed along the old roads and modern housing estates have gradually filled in fields easily accessible from these roads.

9.7.13 Landcover is a mixture of pastoral farmland, settlement, sand and shingle beaches, road and rail infrastructure, mineral quarries, scarp slopes and rock. Field boundaries tend to be a mixture of stock proof fences, hedges and dry-stone walls. Views from the coastal plateau are of Conwy Bay, the rock headlands of Pen-y-Clip, Penmaenbach and the Great Orme.

9.8 Potential Effects

9.8.1 The proposed improvements will increase the area of land taken by comparison with the existing junction arrangements. The increased area could extend sufficiently beyond the existing scheme to have an adverse effect on the townscape and landscape setting.

9.8.2 There could also be lengths of roads and structures that would rise above the existing road level. Traffic in some locations on the new road will be more visible to existing viewpoints. The changes in vertical alignment, loss of existing roadside planting could increase the number of receptors adversely affected.

9.8.3 Snowdonia National Park was awarded the status of *Dark Sky Reserve* in 2015. Whilst the whole of the National Park is designated, there are a number of core areas where proposals for new lighting must be appropriate. Core Zone 1 is the nearest to the Scheme and is centred around the Pen-y-Gwryd Hotel and includes the natural cradle created by the Snowdon, Glyder and Siabod massifs[46]. The Scheme is a modification to an existing highway in a coastal zone that is a significant light source. The Scheme would not significantly change night-time light pollution and the assessment of night-time lighting will be scoped out of further assessment.

9.9 Potential Mitigation

9.9.1 Means to avoid visual and landscape impacts wherever possible will be applied. These could include minor adjustments to the horizontal alignment to reduce the degree to which the new road and traffic intrude into views.

[46] http://www.snowdonia.gov.wales/__data/assets/pdf_file/0010/758026/merged_document_6.pdf

9.9.2 Subject to the availability of suitable land, landscape and visual mitigation would involve new plantations to provide landscape integration and visual screening. If noise barriers are deployed, these will provide a visual screening of traffic on the new road. Opportunities to form false cuttings from surplus excavated soils will be considered, where they will provide useful and effective mitigation. Planting will include native trees and shrubs and a selection of other, non-native, species are likely to be required to assist in the establishment of new vegetation in the harsh coastal conditions.

9.10 Conclusions

9.10.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in effects on the landscape and on visual receptors and there is a need to assess these further as part of the EIA process.

10. ARCHAEOLOGY AND CULTURAL HERITAGE

10.1 Chapter Introduction

10.1.1 This scoping chapter discusses in outline, the environment in which Junction 16 sits with respect to Cultural Heritage and the Historic Environment. It uses this information and the context of the proposed Scheme to propose the scope of assessment that will be taken forward to the Environmental Impact Assessment (EIA).

10.1.2 Archaeology and cultural heritage encompass evidence relating to earlier and existing cultures that may be found within the perimeter of a project and linguistic and cultural practises valued by contemporary society. DMRB defined three subject areas as follows:

a) Archaeological Remains are materials created or modified by past human activities that contribute to the study and understanding of past human societies and behaviour
b) Historic Buildings are architectural or designed or other structures with a significant historical value
c) Historic Landscapes are defined by perceptions that emphasise the evidence of the past and its significance in shaping the present landscape

10.2 Legislation and policy context

10.2.1 The assessments contained in the ES chapter will consider the following legislation.

a) The Historic Environment (Wales) Act 2016
b) Well-being of Future Generations (Wales) Act 2015
c) Planning (Listed Buildings and Conservation Areas) Act 1990
d) Ancient Monuments and Archaeological Areas Act 1979

10.2.2 The Historic Environment Act (Wales) 2016 and associated Technical Advice Notes and Guidance sets out up to date legislation relating particularly to scheduled monuments, listed buildings, parks and gardens, Conservation Areas and World Heritage Sites, the designated features of the historic landscape, and how they should be protected within the development process. However, it also makes the Historic Environment Record a statutory responsibility of Welsh Government. As well as including sites with a statutory designation the HER includes the vast majority of non-designated features and guidance sets out how these should be handled within the development process. This legislation does not replace the Ancient Monument and Archaeological (England and Wales) 1979 which this remains the primary legislation.

10.2.3 The Well-being of Future Generations Act (Wales) 2015 sets out underpinning principles which aim to improve the social, economic, environmental and cultural well-being of Wales. It ensures that all public bodies in Wales operate in a sustainable manner, there are 7 well-being goals one of which relates to a Wales of vibrant culture and thriving Welsh language.

National Policy

10.2.4 In Wales there are a number of policy documents that apply:

a) Planning Policy Wales Edition 9, November 2016 with Version 10 under Consultation in May 2018

b) Welsh Office Circular 1/98: Planning and the historic environment directions by the Secretary of State for Wales

c) Welsh Office Circular 60/96: Planning and historic environment – archaeology

d) Welsh Office Circular 61/96: Planning and historic environment: historic buildings and conservation areas

Local Policy

10.2.5 Conwy Local Development Plan (LDP) 2013 need to be considered and understood when looking at the different aspects of the known Cultural Heritage. At a strategic level (Policy CTH/1) the LDP sets out the council's commitment to protecting, conserving and enhancing the cultural heritage assets, which include designated sites, but also those features that provide local distinctiveness:

Policy CTH/2 requires new development affecting a heritage asset, and/or its setting, shall preserve or, where appropriate, enhance that asset. The policy includes a list including all cultural heritage designations as well as undesignated sites of archaeological importance to be considered;

Policy CTH/3 seeks to the protection of local character, interest and distinctiveness of buildings, structures and their setting

Policy CTH/5 aims to support and sustain the long term well-being of the Welsh language. It also states that any development 'which is likely to lead to the loss of community facilities as defined in Policy CFS/6' (includes shops, post offices, village halls, petrol stations, village and church halls and public houses) should be accompanied by a Community and Linguistic Statement. The council also encourages the use of bilingual signs and the retention of traditional Welsh names for new development and streets

Supplementary Planning Guidance: LDP14: Conservation Areas: This SPG provides 'guidance when considering developments that affect any of the Conservation Areas in the Conwy County Borough Council area (excluding Snowdonia National Park). It includes topics such as alterations to buildings, street scene, highways and open spaces

10.3 Relevant Guidance

10.3.1 While the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2 (HA 208/07) provides the main guidance for highways projects, the Chartered Institute for Archaeology provides Professional Code of Conduct and Standards and guidance for Commissioning work on, or providing consultancy advice on, archaeology and the historic environment[47]. In particular, 'Standards and guidance for historic environment desk-based assessment' (2017) is applicable.

10.3.2 The assessments contained in the ES chapter will also consider the following guidance:

a) Managing Change to Listed Buildings in Wales

b) Managing Change to Registered Historic Parks and Gardens in Wales

c) Managing Conservation Areas in Wales

d) Setting of Historic Assets in Wales

e) Heritage Impact assessment in Wales

f) Historic Environment Records in Wales: Compilation and Use

[47] https://www.archaeologists.net/codes/cifa

g) Technical Advice Note 24: The Historic Environment

h) Planning Policy Wales: Chapter 6

10.4 Study Area

10.4.1 The study area, based on DMRB methodology but extending more widely, will be 1km from the centre line of the proposed scheme with the break of slope formed by the hills to the south as the southernmost boundary. The assessment will include any cultural heritage features within this buffer that are likely to be affected by any changes to the road[48].

10.4.2 Known Cultural heritage receptors are located throughout the study area. While Conservation Areas and Listed Buildings adjacent to both Junction 16 are likely to be impacted. Many other listed buildings and sites noted on the Historic Environment Record have the potential to be impacted both directly and through changes to their setting.

10.5 Methodology

10.5.1 Initially, to establish the baseline, a comprehensive desk top study of all known cultural heritage features within the study areas will be undertaken. This will be followed up with a walkover survey in order to identify possible previously unknown features.

10.5.2 The methodology will be discussed and agreed with Conwy County Borough Council, and Cadw and their cultural heritage curator, the Gwynedd Archaeological Trust (GAT), prior to commencement of the survey work.

10.5.3 The initial studies, once agreed, will provide an understanding of the known cultural heritage receptors, their nature, scale, date, and value and the magnitude of impact of the proposals.

10.5.4 While much of the footprint of the scheme will be on land that has already been disturbed by the original A55 construction, there will be areas of undisturbed land. Undisturbed land will be subject to a non-invasive geophysical survey using either Magnetometry or Resistivity techniques. An evaluation report will be prepared and if appropriate some further archaeological field evaluation will be carried out to understand the nature, extent and date of possible features identified.

10.5.5 Following the initial surveys and studies, the likely cultural heritage impacts arising from the construction phases of the scheme will be assessed. This will enable an assessment of the significance of effects to be carried out, following guidance set out in the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 2 HA208/07 and suitable mitigation measures incorporated into the work programme.

10.5.6 Mitigation measures will be recommended for the construction and operational phases, where necessary.

10.5.7 A summary of possible residual effects and response to them will be provided, after the implementation of the recommended mitigation measures.

[48] https://www.archaeologists.net/codes/cifaayouts

10.6 Significance

10.6.1 Significance of effects will be based on the methodology outlined in Section 2, Table 5.4 of this report, which is based on HA205/08(Highways Agency et al., 2008). To use the table it is necessary to define the importance or value of an asset and then to assess the magnitude of change.

Appraisal of Importance or Value of an Asset

10.6.2 Classification of importance or 'value' is based on the criteria for scheduling of an asset (including period, rarity, documentation, group value, survival, condition, diversity and potential magnitude of impact and resulting significance of impacts for the cultural heritage assessment will be as set out in Table 10.1.

Importance	Examples
Very High (International)	World Heritage Sites Non-designated sites, settlements and landscapes of exceptional heritage value
High (National)	Scheduled Monuments Grade I and II* Listed Buildings Registered Parks and Gardens Registered Battlefields Non-designated sites, settlements and landscapes which are rare and well-preserved examples
Medium (Regional)	Grade II Listed Buildings Conservation Areas Non-designated sites, settlements and landscapes of good preservation, sufficient for comparative study and educational/cultural appreciation.
Low (Local)	Low significance and/or poor state of preservation results in resources of no more than local value Locally Listed Buildings
Very Low	Insignificant and/or badly damaged resources of little appreciable value
Uncertain	Resources that have a clear potential, but for which current knowledge is insufficient to allow significance to be determined

Table 10.1: Apprasial of 'Value'

10.6.3 There may be some residual impact on cultural heritage receptors once the schemes are operational. All previous work undertaken will be with the aim of keeping any residual impact to the absolute minimum.

10.7 Consultations

10.7.1 Cadw, the Welsh Government's Heritage body, and their cultural heritage curator Gwynedd Archaeological Trust, and Conwy County Borough Council and will be consulted on the methodology and significance criteria outlined in this scoping report.

10.8 Scoping Assessment

Baseline Environment

10.8.1 A superficial study of easily accessible known information has produced the following lists of sites broadly within the study area and which could be affected directly or indirectly, in terms of setting. The significance of some of the sites noted is straightforward to assess,

based on the designation, with the undesignated features it is not possible to accurately assess significance at this stage.

Table 10.2: Cultural Heritage Assets

Key Receptor	Designation	Importance / Significance
Castles and Town Walls of Edward I	WHS	Very High/International
Snowdonia National Park	National Park	Very High/International
Gwern y Plas Ancient Village	Scheduled Ancient Monument	High /National
The Tower ID 3525 Grade 2	Listed Building	Medium/Regional
Slate Fence opposite NE corner of Beamoor ID 3553 Grade 2	Listed Building	Medium/Regional
Beamsmoor (check sp) ID 3563 Grade 2	Listed Building	Medium/Regional
Wern Isaf House Grade 2* ID 3463	Listed Building	High/National
Wern Isaf Grade 2 PGW (Gd) 009 (CON)	Historic Park and Garden	High/National
Llanfairfechan Town Centre	Conservation Area	Medium/Regional
North Arllechwedd	Historic Landscape	High/National
Bryn Celyn LlanfairfechanHotel/house	NPRN 41139	Uncertain at this stage
Plas y Coed	NPRN 411383	Uncertain at this stage
The Heath ex Convalescent Home now Council offices	NPRN 411384	Uncertain at this stage
Caer Salem Chapel	NPRN 6963	Uncertain at this stage
Ysgol Pant y Rhedyn	NPRN 411151	Uncertain at this stage
Brondon English Presbyterian Church	NPRN 6962	Uncertain at this stage
Henar	NRPN 26597	Uncertain at this stage
Peniel Congregational Chapel In disuse by early 2000s	NRPN 6960	Uncertain at this stage
Bryn Goleu Post Medieval House	PRN GAT 56316 Undesignated on HER	Uncertain at this stage
Roman Coin hoard findspot located pre 1955	PRN GAT 4096 Undesignated on HER	Uncertain at this stage
Crushing Mill east of Tyddyn Drycin on early OS maps	PRN GAT 56317 Undesignated on HER	Uncertain at this stage
Footbridge NE of Tyddyn Drycin on early OS maps	PRN GAT 56318 Undesignated on HER	Uncertain at this stage
Findspot of figurine fragment bronze,	PRN GAT 24157	Uncertain at this stage

Key Receptor	Designation	Importance / Significance
modern	Undesignated on HER	
Graig Lwyd roughout findspot		Uncertain at this stage
St Winifred's School Modern	PRN GAT 6389 Undesignated on HER	Uncertain at this stage
English Weslyan Methodist Chapel Corrugated Iron building	PRN GAT 33361 Undesignated on HER	Uncertain at this stage
Previously Unknown features identified through surveys	Non-Designated	Uncertain at this stage

Potential Effects

10.8.2 At this stage the direct impact of the proposals will have more effect on any features as yet unidentified, for example, those features which may be hidden within the 'greenfield' areas of the proposed routes. Despite there being a World Heritage Site and National Park, of very high/international significance within the general area the impact on these features is likely to be minimal, while the indirect impact on the setting of features of High (Scheduled monuments/Listed Buildings Grade 2* and Historic Landscapes) and Regional (Listed Buildings Grade 2 and Conservation Areas) has the potential to be more damaging. Undesignated, and as yet unknown features will need to be assessed thoroughly in order to be able to accurately assess the effects of the proposals and thus design mitigation to lessen the impact.

Potential Effects Scoped In

10.8.3 The potential effects scoped in are the possible impacts of the Construction of the new junction layout and the new road alignments on the cultural heritage following the gathering of all known data, including attempts to understand previously unknown cultural heritage information.

Potential Effects Scoped Out

10.8.4 The potential effects scoped out are those impacts that could occur on unknown receptors, because these will not be identified until construction commences.

10.9 Conclusions

10.9.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in impacts of the construction phase on cultural heritage receptors. There is a need to assess these further as part of the EIA process

11. COMMUNITY AND PRIVATE ASSETS

11.1 Introduction

11.1.1 This chapter will include separate assessments of land use and community assets. In the case of land use the assessment will address agriculture.

11.1.2 Agricultural Land and Farm Businesses will be carried out in accordance with the methodology within the DMRB Volume 11, section 3, Part 6. As per the DMRB and national planning policy set out in Planning Policy Wales Edition 10, December 2018) the agricultural assessment will cover the loss of land and soil resources, the type of land management and farming practices currently operated and the potential impacts on these, and matters such as severance, disturbance and disruption.

11.1.3 The loss of land used by the community would be assessed in accordance with the methodology within the DMRB Volume 11, Section 3, Part 6, Chapter 4. However, it should be noted that previous studies have shown that no community land will be taken by the scheme.

11.1.4 The effects on development land will be considered because there are allocations under the Conwy Local Plan.

11.2 Policy Context

National Planning Policy

11.2.1 The Wales Spatial Plan divided into six cross-boundary Spatial Plan Areas (SPAs). The Conwy Plan Area falls mainly within the North East Wales – Border and Coast SPA and is seen as making a very important contribution to both the Welsh and UK economy. The future prosperity of the Area is closely linked with that of North West England SPA as well as the neighbouring SPA of North West Wales and Central Wales

11.2.2 Well Being of Future Generations Act which has the vision of community facilities that contribute to ‘A modern, fit for purpose, inclusive and sustainable infrastructure across Wales’. Under the Act it is proposed that there should be three levels of provision, with the overarching principles being the tackling of poverty and inequalities along with consideration of effective co-location of services appropriately applied to each level.

11.2.3 Public bodies, including Welsh Government, must work towards delivering all 7 wellbeing goals. The Resilient Wales goal of maintaining and enhancing a biodiverse natural environment with healthy functioning ecosystems must be given equal prominence within all well-being objectives laid out by Welsh Government and public bodies. Future land management policies must therefore deliver for this goal as much as any other goal. Sustainable land management is crucial to successful progress on Welsh Government indicators on the status of biodiversity and ecosystems and has a key role in helping gather the data to inform the measurements of progress.

11.2.4 Environment (Wales) Act 2016 also has relevance in achieving sustainable land management and biodiversity goals and to reducing carbon emissions by 2050.

11.2.5 National Planning Policy governing the non-agricultural development of agricultural land

is set out in Planning Policy Wales (Edition 10, 2018). Paragraphs 3.54 and 3.55 note that:

> *"Agricultural land of grades 1, 2 and 3a of the Agricultural Land Classification system (ALC)15 is the best and most versatile, and should be conserved as a finite resource for the future.*
>
> *When considering the search sequence and in development plan policies and development management decisions considerable weight should be given to protecting such land from development, because of its special importance. Land in grades 1, 2 and 3a should 15 only be developed if there is an overriding need for the development, and either previously developed land or land in lower agricultural grades is unavailable, or available lower grade land has an environmental value recognised by a landscape, wildlife, historic or archaeological designation which outweighs the agricultural considerations. If land in grades 1, 2 or 3a does need to be developed, and there is a choice between sites of different grades, development should be directed to land of the lowest grade."*

11.2.6 Technical Advice Note (TAN) 6 Planning for Sustainable Rural Communities also advises at paragraph 6.2.1 that *'when preparing development plans and considering planning applications, planning authorities should consider the quality of agricultural land and other agricultural factors.*' Section 6.2 advises on the 'other' factors to consider when assessing the effects of development on agricultural land these include:

A. The effects on farm size and structure
B. The effects on the efficient use of buildings, fixed equipment and capital investment
C. The effects on drainage, both surface water and land drainage systems

Local Planning Policy (Conwy Local Development Plan)

11.2.7 **Policy DP/2 -Overarching Strategic Approach**: categorises Penmaenmawr as an Urban Area and the LDP provides for the allocation of land for new housing and employment land in the town. The plan states that approximately 85% of the housing and 85% of employment land will be provided within or on the fringes of Urban Areas. However, the LDP Map does not show any allocated land for housing in Penmaenmawr.

11.2.8 Dwygyfylchi is categorised as a Main Village and the LDP provides for the allocation of around 15% of housing and employment land in the village. One area is allocated as Housing Land and a second as mixed-use housing and allotment land, to provide 45 houses. The latter area has now been developed. All of these lie within the Settlement Boundary. Approximately 20% of houses are expected to be Affordable to serve Local Need.

Strategic Policy CFS/1 Community Facilities and Services: *states that the Council will protect and, where possible, enhance community facilities and service. In Penmaenmawr land is allocated for a cemetery extension, in line with Policy CFS/14. This land lies in Green Wedge land to the east of the town.*

Policy CFS/2 Retail Hierarchy: *for shopping centres establishes Penmaenmawr in the second tier of the Heirarchy (Town Centre shopping), below the Sub-regional centre of Llandudno.*

Policy CFS/11- Development and Open Space: *identifies that Penmaenmawr is deficient in open space.*

Policy NTE/2 Green Wedges and Meeting the Needs of the Community: *To prevent the coalescence of settlements and retain the open character of the area, a Green Wedge is designated between Penmaenmawr and Dwygyfylchi.*

Policy NTE/5 The Coastal Zone: *limits development in the designated development zone and this is partly to protect against tidal inundation.*

Policy STR/6 Railfreight: *The Council supports the movement of freight by rail and the existing railfreight facilities at Penmaenmawr are safeguarded for this purpose.*

Policy MWS/3 Safeguarding Hard Rock and Sand and Gravel Resources: *resources and related facilities are included within the Safeguarded Hard Rock or Sand and Gravel designation. These include permitted reserves at Penmaenmawr Quarry, including processing areas, railhead and conveyor link, and Sand and Gravel resources as identified on the Proposals Map in Penmaenmawr and Dwygyfylchi*.

11.3 Consultations

11.3.1 Consultations will be undertaken with all affected agricultural landowners / occupiers, and with the local planning authority. Representatives of the planning authority are invited to attend the quarterly Environmental Liaison Group meetings and these organisations, and the local community stakeholders were invited to respond during the WelTag Stage 2 Statutory Consultation Period.

11.4 Surveys Undertaken to Date and Further Surveys

11.4.1 No surveys of agricultural land or farm units have been completed to date. A land and farm survey will be conducted by an agricultural consultant to provide an Agricultural Land Classification and to assess farm businesses and the impacts of the proposed junction improvements.

11.4.2 A survey of community land and facilities will be conducted as part of the continuing community liaison process.

11.4.3 Desk study will use:

a) OS mapping
b) Point of Interest data
c) Land ownership data from the Land Registry
d) Registers of Common Land, Town and Village Greens.
e) Soil Survey of England and Wales 'Soils of Wales' (1:250,000)
f) British Geological Survey Sheet Information 1:50,000
g) Meteorological Data for Agricultural Land Classification (1989)
h) Conwy County Council at www.conwy.gov.uk
i) Wales NHS at www.wales.nhs.uk
j) Care and Social Services Inspectorate of Wales.
k) Community data available from local authority and web resources

11.5 Assessment Methodology

Data Gathering and Surveys

11.5.1 This chapter will identify and predict the likely effects of the proposed development on agricultural land quality, farm businesses and community land and facilities.

11.5.2 The following baseline survey work will be undertaken in order to inform the assessment:

a) *Community land and facilities*: through contacts with the community all land and facilities will be identified.

b) *Development and local planning aspects* will be researched through the LDP and by contact with the policy unit within Conwy County Council.

c) *Agricultural Land Quality*: a review of the 2004 detailed ALC survey will be undertaken so that a calculation of land take per Grade can be calculated.

d) *Agricultural Businesses*: in order to identify the number of affected agricultural holdings we will undertake a review of Land Registry information provided by the client, with a review of relevant questionnaires provided by the client; and a review of Aerial Photography.

11.5.3 From this work, a detailed knowledge of land ownership and community interests affected by the proposed scheme will be collated.

11.5.4 The main affected agricultural owners / occupiers will be visited and interviewed in order to collect information about their agricultural use of the land. Face-to-face interviews will be held with the occupiers. Where land-take is minimal or limited to field edges the agricultural specialist will view the site and undertake telephone interviews with the occupiers.

Study Area

11.5.5 The study area for Agricultural effects will be defined by the extent of land and farm businesses affected. The study area for community effects will be defined by the extent to which facilities are provided and the distance travelled to access these. For most facilities this will be within the town and immediate surroundings, but with hospitals, for example, the distance will be greater.

Potential Effects

11.5.6 The process of EIA requires various thresholds to be set to determine the levels of significance of impact. There are no universally recognised definitions of what constitutes ‘significant’; this will differ according to the perspective of the stakeholder(s). However, for the purposes of this technical assessment, and to assist in its interpretation, common assessment criteria and terminology have been developed for the analysis of predicted impacts.

11.5.7 The assessment criteria for impacts on agricultural soil resources and businesses as set out below have been agreed previously with the Regional Planning Advisor from the Technical Services Department of the Welsh Government. The criteria are based on the formulaic approach proposed in the Revised DMRB guidance.

Receptors

11.5.8 Community facilities will include village and church halls, public houses, hotels, care

homes, public parks, gardens and sport facilities, filling stations, shops, banks, post offices and dental and GP surgeries, hospitals and emergency services.

11.5.9 The assessment on land resources will be carried out in three stages. First the magnitude, secondly the importance / sensitivity of the receptor, and thirdly the significance of impact will be considered. These have been determined against the criteria set out in Table 11.1 below. There are no defined thresholds for assessing the magnitude of the impact on agricultural land, so thresholds have been agreed in consultation with the Welsh Government.

11.5.10 In respect of effects on agricultural land, this is a resource of national importance and the thresholds reflect both the quantum and quality of the agricultural land affected.

11.5.11 Farm and land-based rural businesses, whether run by owner-occupiers, tenants, licensees or contractors, and whether affected directly or indirectly, are a key receptor. The assessment will consider the physical effects, including land loss, severance, the potential effects on the movement of livestock and machinery, field accesses, drainage and the use of farm buildings. It will also consider, taking a long-term view, the potential effects on the medium to long-term ability for the remaining holding to continue in a beneficial agricultural use.

11.5.12 The effect on occupying and neighbouring land-based businesses is a more transient impact to assess. Such businesses vary from year to year, and even from day to day, affected by many external influences such as management wishes and decisions, market prices, illnesses and diseases, the weather and monetary exchange rates.

Table 11.1: Sensitivity of Receptors

Sensitivity	Receptor
High	Land resources are matters of potentially national importance, as identified in PP(W). The BMV agricultural land (Grades 1, 2 and 3a) is of national importance. The effect on land resources is a combination of the quantum and quality of agricultural land affected, relative to both the national resource and the relative availability of land of that quality locally. Land resources of BMV quality should therefore be classified as being of high environmental value (sensitivity).
Medium	Land that is of poorer quality, Grades 3b, 4 and 5, are of lower sensitivity and are afforded no special protection in PP(W). They are nevertheless a finite resource of local importance and so are regarded as of moderate sensitivity. Full-time farm businesses are of medium sensitivity, as the way that farms are operated will vary over time according to ownership, security of tenure and local and international economic factors. Farm businesses are tolerant of some change without detriment to their character.
Low	Part-time farm businesses are of low sensitivity. The way that farms are operated will vary over time according to ownership, security of tenure and local and international economic factors. Farm businesses are tolerant of some change without detriment to their character.

Courtesy of Kernon Consulting

11.5.13 The Magnitude of Impact is assessed using the criteria set out in Table 11.2.

Table 11.2: Magnitude of Impact Assessment Criteria for Agriculture (Kernon)

Impact Magnitude	Definition	
	Impact on Soils	Impact on Local Agriculture
Major	The proposed scheme would directly lead to the loss of over 20 hectares of "best and most versatile agricultural land" (Grades 1/2/3a).	The impact of the proposed scheme would render a full-time agricultural business non-viable.
Moderate	The proposed scheme would directly lead to the loss of between 5 and 20 hectares of "best and most versatile agricultural land" (Grades 1/2/3a).	The impact of the proposed scheme would require significant changes in the day to day management of a full-time agricultural business.
Minor	The proposed scheme would directly lead to the loss of less than 5 hectares of "best and most versatile	Land take would require only minor changes in the day to day management / structure of a full-time agricultural
	agricultural land" (Grades 1/2/3a) or the loss of any quantity of non "best and most versatile agricultural land" (Grades 3b/4/5).	business or land take would result in the loss or a significant impact on a part-time business.
Negligible	No direct impact upon agricultural land	Land take would require only negligible changes to an agricultural business

11.5.14 The assessment of the Significance of impacts is carried out using the Table 5.5 set out in Section 5.

Assessment Criteria for Impacts on Private Assets and Community Facilities

11.5.15 A qualitative assessment of impacts on community and private assets based on professional judgement has been undertaken to indicate the significance of effects on identified receptors.

11.5.16 The significance of an effect on community and private assets is a function of the value or sensitivity of the resource or receptor and the magnitude of the impact taking into account the permanent or temporary nature of the impact. The criteria for assessing the significance of environmental effects on community and private assets take account of the guidance that is provided on this topic in the DMRB Volume 11, Section 2, Part 5 (HA 205,08) (Highways Agency et al., 2008).

11.5.17 The assessment has placed emphasis on facilities which would be subject to direct land take or where impacts to access during construction and / or operation are likely.

11.5.18 For the purposes of this assessment those effects identified as being of 'Moderate' significance or greater are regarded as being significant in EIA terms. Effects of 'Slight' or lesser significance have been identified but are not considered significant in EIA terms.

Table 11.3: Significance of Effect Categories for Community and Private Assets

Significance category	Typical Descriptors of Effects
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 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 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

11.6 Potential Construction and Operational Effects

11.6.1 Construction would be planned to minimise the disruption of traffic flow, but temporary traffic controls would be required for road safety reasons and to regulate flow.

11.6.2 The improved junction will require land to be taken from farmland to the south of the A55. Part of the land is within the Green Wedge The character of the scheme means that there are unlikely to be severed and inaccessible areas of farm land, but small areas of land will be taken from agricultural use, reducing the area of grazing land available to the affected farm business.

11.6.3 There is potential to increase the area of public open space on land associated with the existing and new road.

11.6.4 There are community facilities in both settlements which could be adversely affected by increased traffic, although some businesses could experience an increase in trade.

11.6.5 The junction improvements could improve access to community facilities in Llanfairfechan and ease access to facilities such as hospitals elsewhere along the A55 corridor.

11.7 Conclusions

11.7.1 An assessment of the effects on community and private assets is required.

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 Proposed Scheme. The assessment will follow the guidance set out in WelTAG and the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07) and subsequent advice notes.

12.2 Legislation, Policy context

European Directives 2008/50/EC and 2004/107/EC

12.2.1 The European Air Quality Directive 2008/50/EC[49] on ambient air quality and cleaner air for Europe (CAFE) 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[50] and are based on recommendations made by the World Health Organisation (WHO).

UK Air Quality Strategy

12.2.2 The Government's policy on air quality within the United Kingdom (UK) is set out in the Air Quality Strategy (AQS)[51]. 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. A draft Clean Air Strategy 2018[52] is currently out to consultation.

Environmental Protection Act 1990

12.2.3 The local authority has powers and duties to address issues arising from dust through the statutory nuisance provisions of the Environmental Protection Act 1990[53]. 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) EPA 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

12.2.4 Part IV of the Environment Act 1995[54], requires the local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM).

12.2.5 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

[49] European Commission. European Air Quality Directive 2008/50/EC. 2008.
[50] European Commission. Directive 2004/107/EC. 2004.
[51] DEFRA. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1). 2007.
[52] https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/
[53] UK Government. Environmental Protection Act 1990 (Section 79(1)(d)). UK Government, 1990.
[54] UK Government. Part IV of the Environment Act 1995. 1995.

areas as Air Quality Management Areas (AQMA) and draw up an Air Quality Action Plan (AQAP) 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

12.2.6 Many of the objectives for pollutants in the AQS were made statutory in Wales with the Air Quality (Wales) Regulations 2000[55], the Air Quality (Wales) Regulations 2010[56] for the purpose of LAQM.

Conwy Local Development Plan 2007 – 2022

12.2.7 The Local Development Plan (LDP)[57] was adopted in October 2013 and has the following policies relating to air quality:

- **STRATEGIC POLICY NTE/1 – THE NATURAL ENVIRONMENT:** *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.*
- **STRATEGIC POLICY DP/1 – SUSTAINBLE DEVELOPMENT PRINCIPLES:** *2. Development proposals should also where appropriate:*
- *Protect the quality of natural resources including water, air and soil in line with Strategic Policy NTE1;*
- **POLICY STR/3 – MITIGATING TRAVEL IMPACT:** *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.*
- **DP/6 - NATIONAL PLANNING POLICY AND GUIDANCE:** *Development proposals must comply with national planning policy and guidance.*

12.3 Relevant Guidance

Guidance on the Assessment of Dust from Demolition and Construction

12.3.1 The Institute of Air Quality Management (IAQM) Guidance[58] describes risk factors which affect the potential for dust to be created and released from the application site during construction activities and to migrate to, and be deposited on surfaces, potentially resulting in dust soiling nuisance and health effects.

LAQM Technical Guidance (16)

12.3.2 LAQM Technical Guidance[59] 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

[55] The Air Quality (Wales) Regulations 2000 - Statutory Instrument 2000 No. 1940 (W 138).
[56] The Air Quality Standards (Wales) Regulations 2010 - Statutory Instrument 2010 No 1433 (W.126).
[57] http://spp.conwy.gov.uk/upload/public/attachments/629/Conwy_Adopted_LDP_2007__2022_English_.pdf
[58] IAQM. Guidance on the Assessment of dust from demolition and construction. 2016. v1.1.
[59] DEFRA. Local Air Quality Management Technical Guidance (TG16) DEFRA, 2018.

the process of annualisation for short term monitoring studies.

Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) Planning Guidance

12.3.3 The IAQM and EPUK guidance[60] for developers and air quality professionals provides a consistent approach to air quality assessments for the UK.

12.4 Study Area

12.4.1 For construction dust, impacts can potentially affect sensitive receptors within 350m of associated works.

12.4.2 For local air quality impacts, DMRB (HA207/07) provides the following guideline criteria for defining roads affected by a scheme:

1. A change in road alignment of ≥ 5m
2. Change in daily traffic flows of ≥ 1000 Annual Average Daily Traffic (AADT)
3. Change in Heavy Duty Vehicle (HDV) flows of ≥ 200 AADT
4. Change in daily average speed of ≥ 10 km/hr
5. Change in peak hour speed of ≥ 20 km/hr

12.4.3 The study area for operational impacts is proposed to be limited to the proposed junction itself as well as the surrounding roads that interact with the scheme taking into account the Affected Road Network (ARN) (as defined above) and any additional roads that may contribute to pollutant concentrations at discrete receptor locations. .

12.5 Methodology

12.5.1 Construction impacts, including construction vehicle traffic impacts, will be assessed qualitatively using the guidance produced by IAQM. The assessment will take into account the nature of construction activities, the proximity of receptors to these activities and their duration. Where appropriate, mitigation measures will be proposed. It is not considered necessary at this stage to undertake any quantitative assessment of traffic impacts during construction. This requirement will be kept under review throughout the next stage as more traffic data becomes available.

12.5.2 The methodology to assess the operational impacts on Local Air Quality as a result of the proposed Scheme will follow the guidance set out in WelTAG and the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07) and subsequent advice notes.

12.5.3 Operational impacts will be assessed quantitatively using the ADMS-Roads air quality dispersion model and utilising tools available on Defra's website. The dispersion model outputs will require verification against pollutant concentrations monitored by Conwy Council and Ramboll during 2018.

12.5.4 The dispersion modelling will be limited to the main pollutants of concern from vehicular

[60] IAQM EPUK. Land Use Planning & Development Control: Planning For Air Quality v1.2. IAQM EPUK, 2017.

emissions and brake wear and tear, namely nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

12.5.5 Pollutant concentrations at specific worst and typical case receptors (i.e existing residential properties) will be predicted along with set distances within 50m bands (up to 200m) to assess the overall change in the population's exposure to pollution, as required by DMRB and WelTAG.

12.5.6 If required, appropriate mitigation measures would be detailed.

12.5.7 A cumulative assessment of air quality impacts will consider cumulative impacts from other committed schemes through the inclusion of these schemes in the future year traffic models.

12.5.8 The assessment of operational impacts will consider impacts during the opening year of the scheme and the design year. In both cases, the modelling will compare future air quality in a 'Do Minimum' scenario with the 'Do Scheme' scenario.

12.5.9 A regional air quality assessment of carbon will also be undertaken.

12.6 Significance Criteria

12.6.1 In line with DMRB, significant local air quality effects will be determined by following Interim Advice Note 174/1361. The significance of the impacts will also be assessed in relation to potential exceedance of the air quality objectives and the changes in overall exposure to pollution as per the guidance provided by IAQM and EPUK.

12.7 Baseline Environment

12.7.1 The A55 is the main source of pollution in the area. No monitoring by Conwy Council currently takes place in this area.

12.7.2 The designated site Sychnant Pass SSSI is located within 200 m of the A55 centreline. Some features within the designated sites are sensitive to nitrogen.

12.7.3 Sensitive habitats include alpine and subalpine grasslands (nitrogen deposition critical load 5-10 kg/N/ha/yr), moist and wet oligotrophic grassland (nitrogen deposition critical load 5-10 / 15-25 kg/N/ha/yr) and non-Mediterranean dry acid and neutral closed grassland (nitrogen deposition critical load 10-15 kg/N/ha/yr).

12.7.4 Baseline NOX concentrations at the relevant 5km by 5km grid square are predicted to be a maximum of 10.65 µg/m3 which is below the National Objective Level of 30 µg/m3.

12.7.5 Baseline nitrogen deposition rates at the relevant 5km by 5km grid square are predicted to be a maximum of 10.64 kg/N/ha/yr which is above the critical loads detailed above.

12.7.6 Residential properties are located close to the A55, particularly on Maes Y Llan in Dwygyfylchi. Properties on Station Road and Esplanade in Penmaenmawr are also close, but separated from the A55 by the width of the railway.

[61] Highways Agency. Interim Advice Note 174/13. Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07). Highways Agency, 2013.

Air Quality Monitoring

12.7.7 A monitoring survey has commenced in the vicinity of the proposed scheme. Three monitoring sites have been established as follows:

1. Ysguborwen Road (GR: 272794, 377103;
2. Ysguborwen Road (GR: 272938, 377214)
3. Ysguborwen Road (GR: 273129, 377283

12.7.8 The monitoring survey started 4th July 2018 and shall continue until early January 2019. At each site, two diffusion tubes for NO_X, were established at a height of 2m.

12.8 Potential Construction and Operational Effects

12.8.1 The proposed scheme has the potential to affect local air quality during both its construction and operational phases as a result of:

1. Temporary dust and particulate matter emissions from construction activities, as well as emissions from construction vehicles affecting nearby sensitive receptors (human and ecological)
2. Emissions from vehicles due to changes in flows and speeds due to the operation of the proposed scheme, affecting nearby sensitive receptors (human and ecological).

13. NOISE AND VIBRATION

13.1 Chapter Introduction

13.1.1 This chapter discusses in outline, the environment in which Junction 16 sits with respect to potential noise and vibration impacts upon sensitive receptors. It uses this information and the context of the proposed Scheme to propose the scope of assessment that will be taken forward to the Environmental Impact Assessment (EIA).

13.2 Legislation, Policy context

13.2.1 The assessments contained in the ES chapter will consider the following legislation.

a) The Historic Environment (Wales) Act 2016

b) Environment (Wales) Act 2016

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

13.3 Relevant Guidance

13.3.1 The assessments contained in the ES chapter will consider the following guidance:

a) BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise

b) Calculation of Road Traffic Noise (CRTN), 1988

c) The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7 (HD 213/11), Revision 1

13.4 Study Area

13.4.1 The study area, based on DMRB methodology, will be a 600m boundary from any new, bypassed or improved routes, and 600m boundary from affected routes in a one-kilometre radius, where there is a possibility of a change in 1dB in the short-term and 3dB change in the long term. The assessment will include any roads within this buffer that are likely to be affected by any changes in traffic flows.

13.4.2 The nearest noise sensitive receptors to Junction 16 are residential dwellings along and next to Conway Road and Ysguborwen Road.

13.5 Methodology

13.5.1 A baseline noise survey will be completed to establish the existing noise climate representative of the noise sensitive receptors. The baseline noise monitoring will comprise a mixture of:

1. Attended short-term measurements: during daytime to the shortened measurement procedure of CRTN, to obtain samples of noise in three consecutive hours between 10:00 and 17:00. This will also provide a subjective description of the dominant noise sources.
2. Unattended long-term measurements providing baseline data for daytime, evening, night-time and weekend periods for up to one week. The monitoring would be carried out outside of school holidays to obtain representative results of typical conditions.

13.5.2 The methodology will be discussed and agreed with Conwy County Borough Council prior to commencement of the baseline surveys. Noise monitoring will be conducted in suitable weather conditions, by suitably qualified personnel using Class I Sound Level Meters (SLMs).

13.5.3 The likely noise and vibration impacts arising from the construction phase of the scheme will be assessed in accordance with BS 5228:2009+A1:2014 Part 1 Noise and Part 2 Vibration. This standard provides a methodology for the assessment and control of noise and vibration from construction operations. The standard contains detailed information on noise and vibration reduction measures and promotes the 'Best Practicable Means' (BPM) approach to minimise associated impacts on the nearest receptors. Vibration will be assessed in terms of the likelihood for perceivable levels of vibration, based on distances from the vibration sources.

13.5.4 Calculations of road traffic noise will be carried out at receptors within the study area in accordance with A1.25 for:

a) Do minimum conditions in the opening year
b) Do-minimum conditions in the future year, 15 years from the opening
c) Do something conditions in the opening year
d) Do something conditions in the future, 15 years from the opening

13.5.5 Do something conditions in the opening yearThe assessment of operational noise impacts will present potential noise impacts in the:

a) Short-term (in the **opening year**);
b) Long-term (in **15 years after the opening year**).

13.5.6 The assessment will be based on comparison of predicted noise level in each of the assessment scenarios, including the baseline conditions.

13.5.7 The calculations of operational noise will be carried out in accordance with the CRTN method and will be supported by additional guidance presented in the DMRB. The calculations will be facilitated by a proprietary software for 3D noise propagation. The CRTN method requires a good understanding of the traffic flows, percentage heavy goods vehicles (HGVs) and traffic speeds amongst other factors. Traffic data will be provided by the traffic consultants for the proposed Scheme.

13.5.8 The assessment for the operation phase of the scheme will be based upon the detailed assessment methodology set out in Chapter 3 and Annex 1 of DMRB. The effects of flow pattern around junctions will however not be considered in the assessment, as the CRTN prediction method and DMRB guidance assumes engine and braking noise will be offset by lower speeds.

13.5.9 Outputs of the assessment will include:

a) A scheme of mitigation measures, recommended for the construction and operational phases, where necessary
b) A summary of residual effects of implementation, taking account of the recommended mitigation measures

13.6 Significance Criteria

Construction Phase

13.6.1 Significance criteria will be set to the 'ABC' method contained in Annex E of BS 5228-1:2009+A1:2014. Exceedance of the construction noise threshold, set to the noise levels measured during the baseline noise surveys, will be deemed to constitute a significant effect.

Operational Phase

13.6.2 The overall magnitude of short term and long term operational impacts will be reported using the classifications in Table 13.1 and 13.2, and the relevant criteria of TAG Unit A3. Both tables report magnitudes of impact for both increased and decreased traffic volumes. The overall significance of effects will be determined based on an assumption that all the assessment receptors are highly sensitive to changes in noise levels.

Table 13.1: Classification of Magnitude of Operational Noise Impacts in the Short Term

Noise Change $L_{a10, 18hr}$	Magnitude of Impact
0	No Change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

Table 13.2: Classification of Magnitude of Operational Noise Impacts in the Long Term

Noise Change $L_{a10, 18hr}$	Magnitude of Impact
0	No Change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10+	Major

13.7 Consultations

13.7.1 Conwy County Borough Council will be consulted on the methodology and significance criteria outlined in this scoping report. The Environmental Health Officer for CCBC attended the ELG meetings and has been briefed on the route options and the development process and procedures.

13.8 Potential Effects Scoped In

13.8.1 The potential effects scoped in:

a) Noise and vibration effects during construction (and demolition, if applicable once the details of the scheme have been developed). Noise and vibration could arise from earthworks, road planning, spreading fill, compaction and movement of heavy goods vehicles

b) Changes in road traffic noise levels during operational phase of the development. The

changes in road traffic noise are expected due to changes in road alignment, traffic flow, traffic speeds and road surfacing, amongst other factors. Changes in road traffic noise levels will be considered for daytime and night-time periods

13.9 Potential Effects Scoped Out

13.9.1 The potential effects scoped out are:

a) Vibration effects on the nearest sensitive receptors during the operational phase if there are no sudden discontinuities in the road surfacing along the chosen route option. There is also an existing railway line running alongside the A55 which would be expected to be the dominant vibration source; and

b) Plant noise/noise from any roadside furniture during the operational phase, and any noise is expected to be masked by noise from the existing and future traffic flows.

13.10 Conclusions

13.10.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in construction noise and vibration effects and operational noise effects. There is a need to assess these further as part of the EIA process.

14. ALL TRAVELLERS

14.1 Subject Introduction

14.1.1 This chapter will address the effects of the scheme on the journeys made by non-motorised users of roads, footpaths, cycleways and bridleways (hereafter collectively referred to as NMU routes) and on vehicle travellers using the public road network. However, the assessment will not cover aspects which are included within the cost-benefit economic analysis.

14.2 Policy Context

14.2.1 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'. This is supported by the proposed Active Travel Action Plan (Welsh Government, 2014a). In addition, the Transport Act 2000 (as amended by the Transport (Wales) Act 2006) is relevant to the All Travellers assessment.

14.2.2 Planning Policy Wales (2016) sets outs the objectives for 'Transport' Technical Advice Note (TAN) 18 (2007): Transport; One Wales: Connecting the Nation (Welsh Assembly Government, 2008) 'The Wales Transport Strategy' and the 'National Transport Plan 2010'.

14.2.3 Planning Policy Wales (2018) sets outs the objectives for 'Active and Social Places' in Chapter 4 'Transport Infrastructure' and 'Tourism'' in Chapter 5 . Also relevant are Technical Advice Note (TAN) 16 (2009): Sport, Recreation and Open Space; Technical Advice Note (TAN) 18 (2007): Transport; One Wales: Connecting the Nation (Welsh Assembly Government, 2008) 'The Wales Transport Strategy' and the 'National Transport Plan 2010'.

Local Policy

14.2.4 The Conwy Local Development Plan (2013) sets out a 'Vision – Conwy in 2020'. Within this it is stated that 'An improved public transport, walking and cycling network will have been secured and a sustainable public transport interchange facility at Llandudno and Colwyn Bay realised.'

14.2.5 Strategic Policy STR/1 Sustainable Transport, Development and Accessibility: indicates that development should be located to minimise travel. Convenient access via footways, cycle infrastructure and public transport should be provided to encouraging these modes of travel and reducing the use of private car. As part of this the council is seeking to provide integrated transport. They will also intend making walking and cycling more attractive, direct and safe through provision of walking and cycling facilities and infrastructure. Quality and convenient pedestrian crossings across busy roads will be promoted and development shall contribute towards these connections.

14.3 Relevant Guidance

14.3.1 The following guidance documents are considered relevant for the All Travellers assessment:

a) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5, HA 205/08 (Highways Agency et al., 2008);

b) 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;

c) DMRB Volume 11, Section 3, Part 9 'Vehicle Travellers' (Highways Agency, 1993b) in respect of the potential effects on driver stress;

d) DMRB Interim Advice Note 125/09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment' (Wales Only) (Welsh Assembly Government, 2009); and

e) Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic'.

14.4 Study Area

14.4.1 DMBR 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 will 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 will increase by more than 30 % (or the number of heavy goods vehicles (HGVs) will increase by more than 30 %); and

b) Include any other specifically sensitive areas where traffic flows will 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 will be assessed.

14.5 Assessment Methodology

14.5.1 The All Travellers topic includes an assessment of the effects on the public rights of way (footpaths, bridleways and restricted byways); cycle routes; permissive non-motorised user (NMU) routes; public highways; public transport; overbridge and underpass crossings.

14.5.2 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.

14.5.3 With respect to non-motorised users (pedestrians, cyclists and equestrians), the requirements of the DMRB Volume 11, Section 3, Part 8 (Highways Agency, 1993a) to be addressed by a qualitative assessment as follows:

a) **Journey length, local travel patterns**: using the method for reasonably straightforward travel patterns. Key community facilities will be identified, together with estimated catchment areas. Vulnerable users will be identified where feasible based upon existing information;

b) Proposed **changes in journey length** and duration as a result of the scheme will be assessed based upon the above;

c) **Changes in amenity** for NMUs; assessing changes in traffic flows that would arise from the proposed scheme (Do Something) compared to the Do Minimum scheme and changes in quality of facilities ie footway width, signage, cycle crossings (or lack of) etc.; and

d) Change in **Community Severance** caused by changes in pedestrians and others ability to travel in the locality of the scheme. The assessment will consider loss of facilities, if applicable, and consider disruption to vulnerable users (ie children, disabled and elderly people).

14.6 Baseline Context

14.6.1 The following well-established Public-Rights of Way in the study area have been identified:

a) National Cycle Network (NCN) Route 5 which extends along the North Wales coast from Chester to Holyhead along the coastline passing Penmaenmawr and Dwygyfylchi.

b) Wales Coast Path from Chester extends along the coast through Llanfairfechan and Penmaenmawr with an optional inland route at Penmaenmawr; and

c) A55 overbridge (near to Shell garage) provides access over the A55 between the coastline and Dwygyfylchi.

14.6.2 Traffic data from the SATURN and Paramics Traffic Models will be used to inform the assessment and to provide baseline traffic flows..

14.7 Significance Criteria

14.7.1 The proposed approach to assessing the significance of impacts on All Travellers is identified below:

Receptors

14.7.2 Categories of receptor sensitivity have been defined from the principles set out in the IEMA Guidelines, 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.

14.7.3 Table 14.1 identifies the sensitivity of receptors.

Table 14.1: Receptor Sensitivity Criteria

Receptor Sensitivity	Criteria
Very High	Individuals, businesses or groups that have no 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.
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 Horse Riders (PCHR) 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 PCHR for recreational / leisure purposes (e.g. local routes)
Negligible	Individuals, businesses or groups that have the 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 not / infrequently used by the pedestrians, cyclists and other PCHR for recreational purposes

Magnitude of Effects

14.7.4 The determination of the importance and sensitivity of the receptors and the magnitude of change specifically relating to road traffic will be informed by the IEMA Guidelines.

14.7.5 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.

14.7.6 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.

14.7.7 The criteria for assessing the impact magnitude is identified in Table 14.2, ranging from major to no effect.

Table 14.2: Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
Major	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 will 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 will 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).
Minor	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 will 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).

Table 14.2: Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
	Small but measurable gain of resource and/or minor improvement in key characteristics, features or elements (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Alteration of a route used by pedestrians, cyclists or other NMU but with no change in journey length / time, or minor change in amenity value (Adverse). Very minor gain or improvement in quality to one or more characteristics, features or elements (Beneficial)
No Effect	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).

14.7.8 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 will 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.

14.7.9 The typical significance of effect categories as detailed in Table 5.5 have been taken from the DMRB guidelines and used in this assessment. For the purposes of EIA, a moderate, large or very large effect is considered significant. In all cases a degree of professional judgement will be applied when determining the magnitude of change and impact, taking into account all local conditions

14.8 Surveys Undertaken to Date and Additional Surveys Required

14.8.1 Surveys and counts of the users of PCHR routes are required to properly understand the relative importance of each route and the significance of impact of any changes that could result from the scheme.

14.8.2 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 (WCAHR). The survey was undertaken by TRL 360 between 08:00 and 20:00. Survey data and locations are identified in Figure 14.1.

14.8.3 The count surveys have been undertaken at the following locations in proximity to J16:

Survey 6 – High Street;

Survey 7 – Beach café;

Survey 8 – Fernbrook Road/Bangor Road/Brymor Terrace/Pant-y-Afon;

Survey 9 – Conway Road/Ysguborwen Road; and,

Survey 10 – A55 Overbridge (near Shell garage).

14.8.4 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 will form the basis of the pedestrian, cyclist and equestrian baseline conditions in the area.

14.9 Consultation

14.9.1 Consultation with the local Planning Authority and North and Mid Wales Trunk Road Agency (NMWTRA) in respect to the Scheme is ongoing and will continue. Consultation with non-statutory consultees including groups representing equestrians, pedestrians and cyclists is also ongoing, and will continue.

Figure 14.1 Survey Locations (6-10)

14.10 Potential Effects

14.10.1 The All Travellers assessment will compare traffic flows from the Do Minimum with the Do Something scenario to identify routes which may be affected by the Proposed Scheme. The assessment will consider the baseline, construction and operational phases, and will consider the cumulative effect of both Junction 15 and Junction 16 being developed at the same time. Where feasible mitigation measures will be proposed to reduce the effect of the Proposed Scheme.

14.11 Conclusions

14.11.1 It is recognised that the Proposed Scheme has the potential to affect routes used by NMUs, this will be assessed in the All Travelers chapter of the A55 Junction 16 Environmental Statement.

15. MATERIALS

15.1 Subject Introduction

15.1.1 This chapter addresses the likely significance of environmental effects from the use of material resources and the generation and management of waste resulting from the Scheme.

15.1.2 For the purposes of this assessment, 'Materials' are defined as comprising the use of material resources; and the generation and management of waste.

15.1.3 The use of material resources and generation of waste will be estimated based on the requirements of the Key Stage 3 scheme design. The assessment will focus on the construction phase as this is where potential significant effects in relation to materials and waste are likely to arise.

15.1.4 While operational impacts, in terms of resource use and waste generation, have been considered, the impacts are dependent on the maintenance regime and the need to replace materials throughout the lifetime of the structure.

15.2 Study Area

15.2.1 It is outside the scope of the guidance to assess the environmental impacts associated with the extraction of raw materials and the manufacture of products which occur off-site. The guidance recognises that these stages of a material's life cycle are likely to have already been subjected to an environmental assessment. These impacts are therefore not addressed in this Environmental Statement chapter. The study area will therefore be determined by the extent to which materials and waste are generated within the scheme footprint.

15.3 Methodology

15.3.1 The assessment has been conducted in accordance with the guidance set out in the DMRB Interim Advice Note (IAN) 153/11 "Guidance of the Environmental Assessment of Material Resources". The above IAN has not been adopted in Wales and since the DMRB has been withdrawn, the IAN remains appropriate as guidance because it reflects current best practice. It is acknowledged that references to the National Planning Policy Framework (NPPF) set out in the above IAN are not relevant in the Welsh context.

15.3.2 The cost for the proposed Scheme is estimated to be greater than the £300,000 threshold included in the guidance. Therefore, it is assumed that the potential exists for environmental impacts and effects to arise from the use of materials and generation of waste. As a minimum, a Simple level of assessment is therefore required in accordance with IAN 153/11.

15.3.3 While a simple level of assessment would be appropriate, and dependent on the outcome of this assessment, a detailed assessment may also be required in accordance with IAN 153/11.

15.3.4 The assessment of environmental effects associated with the use of material resources and the generation and management of waste has considered the following:

a) types and quantities of materials associated with the construction and operational phases of the Scheme;

b) types and quantities of waste arisings associated with the construction and operational phases of the Scheme; and

c) movement of materials during construction (both to and from the site).

15.4 Material Resources

15.4.1 Material resources include both primary raw materials, such as aggregates and minerals, and secondary manufactured products. Many material resources would originate off-site and some, such as excavated soils, would arise on-site.

15.4.2 Road schemes require significant quantities of primary raw materials and secondary manufactured products. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, have the potential to affect the environment adversely. The consumption of significant quantities of materials is likely to result in indirect and direct impacts on the environment which includes embodied carbon emissions associated with a number of stages in the material's life cycle.

15.5 Generation and Management of Waste

15.5.1 Under current legislation and understanding, a material is considered to be a 'waste' in accordance with the common definition given, in the EU Waste Framework Directive (Directive 2008/98/EC), as '*any substance or object which the holder discards or intends or is required to discard*', with the term '*discard*' including the disposal, recovery or recycling of a substance.

15.5.2 Material excavated and reused within the scheme area / planning boundary is not classed as waste, subject to it being suitable for its intended use.

15.5.3 Waste for disposal is classed as hazardous, non-hazardous or inert, depending on the level of harm to human health, and or, the environment.

15.5.4 Once a material has become waste, it remains waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health, at which point it is no longer subject to the controls and other measures required by the Directive.

15.5.5 The generation of large quantities of waste in road schemes has the potential to impact on available waste management infrastructure through occupying landfill space, limiting short-term use of available waste storage and impacts of the scheme upon relevant waste policies and plans.

15.6 Legislation and policy Context

15.6.1 The legislation and policies that are relevant to waste and mineral resources.

EU Waste Framework Directive 2008/98/EC

The Waste (England and Wales) Regulations 2011 (as amended)

15.6.2 In addition to the above, reference has been made to the following legislation and policy documents relating to material resources and waste management:

a) The Controlled Waste (England and Wales) Regulations 2012
b) The Hazardous Waste (England and Wales) Regulations 2005
c) The Well-being of Future Generations (Wales) Act 2015
d) Environment (Wales) Act Part 1: "Sustainable management of natural resources" 2016
e) The Environmental Permitting (England and Wales) Regulations 2016
f) National Policy: Planning Policy Wales (Edition 10), December 2018
g) National Policy: Minerals Planning Policy Wales (MPPW), 2001
h) National Policy: Towards Zero Waste, One Wales: One Planet 2010 (Welsh Assembly Government, 2010)
i) National Policy: Welsh Government (2012) Construction and Demolition Sector Plan
j) Technical Advice Note 21: Waste, 2014
k) Minerals Technical Advice Note (Wales) 1: Aggregates
l) WRAP Cymru Delivery Plan: 2011-15 For a World Without Waste
m) Climate Change Strategy for Wales 2010
n) Conwy Local Development Plan

15.7 Scoping Assessment

Baseline

15.7.1 The baseline conditions will be identified from desk-based studies and information from ground investigations. This information will be used to determine the nature of existing materials on site that will be used in the earthworks. The potential locations of material sources and disposal sites have also been considered.

15.7.2 The desk study will use published sources such as the 1:50,000 scale Geological Plans for Drift and Solid geology published by the British Geological Survey, and any reports prepared previously in the development of route options. The Minerals Resource Maps and Aggregate Safeguarding Maps for the area will be used.

15.7.3 The results of a ground investigation will also be considered. This investigation will be undertaken during Key Stage 3 and the results incorporated into a factual report.

15.7.4 Searches will be undertaken to establish the location of waste management facilities within the study area, if any. A preliminary review has already been undertaken.

15.7.5 The Natural Resources Wales Public Register of Operational Waste Management Facilities, based on data downloaded from the Lle Geo-portal62 will be used.

Assessment of Impacts

[62] Lle Geo-Portal http://lle.gov.wales/home?lang=en

15.7.6 A Simple Assessment will be carried out in accordance with IAN 153/11, comprises the assembly of data and information that is readily available to address potential effects, to reach an understanding of the likely environmental effects to inform the final design, or to reach an understanding of the likely environmental effects that may result in the need for Detailed Assessment.

15.7.7 The Simple Assessment is a qualitative exercise which aims to identify the following:

a) The materials required for the project and where information is available, the quantities.
b) The anticipated waste arisings from the project, and where information is available, the quantities and type (eg, inert, hazardous).
c) The impacts that will arise from the issues identified in an initial scoping exercise in relation to materials and waste.
d) The results of any consultation.
e) A conclusion about whether this level of assessment is sufficient to understand the effects of the project or whether a Detailed Assessment is necessary.

15.7.8 The assessment also identifies the measures needed to mitigate impacts and will provide a commentary on the likely effectiveness of this mitigation, in addition to a description of how the measures will be implemented, measured and monitored. Details of environmental management including the Register of Environmental Action and Commitments (REAC), Method Statements, Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP), will be provided in the Appendices to Chapter 21 of the ES.

a) The assessment of the impacts will be based on estimated material requirements and will include a review of material volumes, sources and movements.
b) Vehicle movements required for delivery and export of materials will be considered.
c) Effects due to operation of the scheme will be considered based on likely maintenance requirements.

Significance Criteria

15.7.9 There is currently no specific defined methodology for assessing the environmental significance of a material resource or for determining the magnitude of the impact on such a resource. Professional judgement will be used to assess environmental value/sensitivity of the resource as set out in Table 5.2. The Magnitude of impact will be assessed based on Table 5.3. The Significance will be determined using Table 5.4 in Section 5 of this document.

15.8 Conclusions

15.8.1 The Simple Assessment method is suitable for the scheme assessment and with mineral reserves affected and the potential to disturb contaminated land it is considered appropriate to undertake an assessment of Materials.

16. HEAT AND RADIATION

16.1 Subject Introduction

16.1.1 The EIA regulations of 2017 require an assessment of the likely significant effects of a project on the environment resulting from heat and radiation. This Section examines whether there are likely to be any significant effects. It is anticipated that the generation of heat or radiation is unlikely to be relevant to the scope of this project.

Heat

16.1.2 There are two sources of heat that have the potential to affect the environment:

a) Waste heat from internal combustion engines (in vehicles during construction, operation and maintenance) which is dispersed into the atmosphere;

b) Waste heat arising from plant and materials used in carriageway construction;

c) Heat used in the manufacture of products and materials used in construction of the road, manufacture of vehicles and fuels.

16.1.3 The heat and radiation generated in manufacturing would be covered in an assessment of the production processes associated with the factory. On this basis (c) is scoped out of this assessment.

16.1.4 Waste heat in construction, maintenance and operation of the road will be of short duration and low intensity. Local atmospheric conditions will dissipate the localised concentrations of heat of heat when they occur. The effects of heat arising from the scheme are considered likely to be similar to the current road, although the gradual conversion of the national vehicle fleet from internal combustion engines to electric propulsion is likely to result in a significant reduction in waste heat generated by traffic.

Radiation

16.1.5 During construction and maintenance of the Scheme no sources of radiation are likely to be present on site. During operation it is possible that radiation sources could be transported along the road in accordance with accepted use of radioactive materials such as in hospitals. The Scheme is not thought likely to present an increased risk of spillage of radioactive materials. For this reason, radiation is scoped out of this assessment.

16.1.6 Overall, the Scheme is not considered to result in any significant increase in heat or radiation that could give rise to significant effects on the environment.

16.2 Conclusion

16.2.1 An assessment of the effects of heat and radiation on the environment will not be required.

17. CLIMATE CHANGE

17.1 Introduction

17.1.1 The *Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations* 2017 require an assessment of the likely significant effects of a project on Climate and *vice versa*. This Section outlines the proposed approach to identify which aspects of a climate assessment should be considered and whether there are likely to be any significant effects associated with climate and climate change.

17.1.2 There are three aspects that could potentially be considered as part of a climate assessment:

1. **In-combination climate change impact (ICCI) assessment** – evaluates the combined effect of the preferred option and potential climate change impacts on the receiving environment during construction and operation.
2. **Climate change risk (CCR) assessment** – evaluates the effectiveness and feasibility of adaptation measures integrated into the preferred option to avoid or reduce hazards and/or increase resilience of the preferred option to climate change impacts;
3. **Greenhouse gas (GHG) emissions assessment** – Quantifies the potential GHG emissions associated with the construction and operation of the preferred option and identifies mitigation measures to reduce these emissions;

17.2 Study area

17.2.1 For Climate Change and Greenhouse Gases, three separate assessments could be undertaken if scoped in. 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:

In-combination climate change impact (ICCI) assessment

17.2.2 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;

Climate Change Risk Assessment

17.2.3 The study area for this assessment will not go beyond the boundary of the preferred option. This is to capture only the risks to the preferred option itself from climate change; and

Greenhouse gases (GHG)

17.2.4 In principle, the study area for the GHG assessment would include the boundary of the preferred option as well as the transport network utilised for transport of waste and materials, the embodied carbon associated with the relevant construction materials and the emissions arising during operation of the scheme. However, both the construction and operational phase emissions have been scoped out. This is discussed further in section 17.9.

17.3 Baseline Conditions

17.3.1 Scientific data shows that the climate is changing, however, there remain uncertainties in terms of the magnitude, frequency and spatial occurrence of these changing climatic conditions.

17.4 Baseline Climate Conditions

17.4.1 To determine the likely future climate conditions there is a need to apply climate projections to understand what local conditions are likely to be during the lifetime of the preferred option. Climate projections are a prediction of the response of the climate system to a given concentration of GHG emissions or atmospheric GHG concentration scenarios. Good practice in the UK uses projections based on United Kingdom Climate Projections 2018 (UKCP18). Projections are generated from climate modelling. Different emissions scenarios can be applied with more extreme changes occurring at higher emission scenarios.

17.4.2 Table 17.1 outlines key general climate trends for North Wales, showing the impact of climate change on different climate parameters. The change in arrow size reflects the predicted extent of the change for each climate change trend. Generally, the trends become more pronounced over time with more extreme trends arising by 2080. It should also be acknowledged that extreme events will be considered as part of the assessment baseline, where changing climate patterns can result in more frequent extreme events occurring e.g. extended periods of drought or extreme rain events.

Table 17-1: Climate Change Trends for North Wales based on UKCP18 climate projections

Climate Parameter	2020	2050	2080
Summer Mean Temperature			
Summer Mean Daily Maximum Temperature			
Winter Mean Temperature			
Winter Mean Precipitation			
Summer Mean Precipitation			

17.5 Consultations

17.5.1 No consultation with statutory or non-statutory consultees is considered necessary.

17.6 Potential Sources of Impacts

17.6.1 Potential sources of impact are considered limited but could include:

Project Carbon

17.6.2 Project carbon associated with the delivery of the project, including:

a) Embodied carbon. Further information can be found in Section 15 Materials.

b) Vehicle emissions, during the construction and demolition phases.

c) If ground gases such as methane, which is a potent greenhouse gas, are encountered. Further information with respect to potential ground contamination can be found in Section 6, which describes the ES Scoping for the Geology and Soils Chapter.

Operational Carbon

17.6.3 Operational Carbon in emissions associated with the annual operation, activities and services of the scheme, once the project is completed. This would include the Operational energy usage, such as the network lighting.

Proposed Scheme Climate Vulnerability

17.6.4 The design life of the preferred option means that it could be vulnerable to climate change, for example from fluvial, tidal flooding and surface water flooding. This impact is discussed further in Section 17.7.

In-Combination Climate Change Impacts

17.6.5 Climate change can also result in additive effects for the other topics assessed in the EIA.

17.7 Proposed Methodology Including Significance Criteria

17.7.1 In addition to the national and local policy listed in Section 3 of this report, the assessments will refer to the guidance documents set out below.

ICCI Assessment Guidance and Policy Documents:

International

a) There are no relevant international legislation or policies that affect the ICCI Assessment within EIA.

European Level

b) Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment; and

c) Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the

assessment of the effects of certain public and private projects on the environment

National Level

d) Climate Change Act 2008;
e) The National Adaptation Programme: Making the country resilient to a changing climate (July 2013);
f) UK Climate Change Risk Assessment: Government Report (January 2012);
g) Environment Agency Guidance on Flood Risk Assessments for Planning Applications; and
h) IEMA – the IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

Local Level

i) There are no additional relevant local polices beyond those listed in Section 3 of this report

17.7.2 **Climate Change Risk Assessment Guidance and Policy Documents**:

International

a) There are no relevant international legislation or policies that affect the Climate Change Risk Assessment within EIA.

European Level

b) Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

National Level

c) IEMA – the IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation.

Local Level

d) There are no additional relevant local polices to those listed in Section 3 of this report

17.7.3 **Greenhouse Gases Guidance and Policy Documents**:

International

a) Kyoto Protocol to the United Nations Framework Convention on Climate Change; and the
b) Paris Agreement.

European Level

c) Kyoto Protocol to the United Nations Framework Convention on Climate Change; and
d) 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);

National Level

e) The Climate Change Act 2008; and
f) IEMA – Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance;

Local Level

g) There are no additional relevant local polices to those listed in Section 3 of this report

17.8 Proposed Assessment Approach

17.8.1 The following assessments will be undertaken:

a) An in-combination climate change impact assessment (ICCI);

b) Climate Change Risk Assessment; and

c) A construction phase greenhouse gas assessment will be undertaken, however, an operational greenhouse gas assessment is proposed to be scoped out (See Section 17.9).

17.9 Climate Assessment Effects: Scoped In

In-Combination Climate Change Impact Assessment – Methodology

17.9.1 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.

17.9.2 Rather than presenting a range of potential trends based on the different low, medium and high greenhouse emissions scenarios, generalised trends will be presented which would be observed across all scenarios. Future trends will be identified specifically for North Wales where the scheme is located. This will take account of trends including summer and winter mean temperatures and mean daily maximum temperatures and summer and winter mean precipitation, as well as changes in frequency and/or magnitude of extreme weather events.

17.9.3 The assessment will be qualitative using information presented in other environmental assessments carried out applying objective professional judgement. A review will be 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 residual effect;

d) The implications for climate change;

e) Additional mitigation that may be required to address the effects of climate change;

f) The residual effect taking account of climate change.

17.9.4 All environmental topics will be considered within the in-combination climate change impact assessment.

17.9.5 Residual impacts will be derived from the long-term residual impacts identified in each topic, where this is specified. It is assumed that for significant effects identified in each topic, the appropriate mitigation recommended will be implemented effectively and will result in the identified residual effect.

17.9.6 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 Risk Assessment – Methodology

17.9.7 The scheme is potentially vulnerable to climate change, for example due to fluvial, surface water and tidal flooding. The design will need to take account of the potential effects of extreme weather events. Consideration should also be given to these events during construction.

17.9.8 Potential risks relating to climate change which might affect the scheme will be identified. 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 phase, although extreme weather events during construction will also be considered. Proposed design measures and/or mitigation measures will be identified to address these risks.

Construction Phase Greenhouse Gas Assessment – Methodology

17.9.9 Greenhouse gas emissions are an inevitable product of the construction of any infrastructure project and emissions will occur both directly and indirectly during the construction stage. Direct emissions relate to activities that take place specifically as part of the construction of the scheme, for example, operation of plant and machinery, transportation of materials and waste and any associated activities. Indirect emissions relate to the materials that are used during construction of the project and the greenhouse gases that have been emitted during the manufacturing process, taking into account any extended supply chains.

17.9.10 The construction phase greenhouse gas assessment will apply standardised carbon emissions for each tonne of material, in relation to the bill of quantities developed by the design team. GHG emissions associated with each tonne of material used can then be determined by applying the standardised emissions figures. Direct emissions will be estimated using of key activity data for likely vehicle/plant to be used, applying standard emissions rates for each vehicle.

Significance Criteria: In-combination climate change impact (ICCI) assessment

17.9.11 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 will 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.

Significance Criteria: Climate Change Risk Assessment

17.9.12 Potential vulnerabilities which might affect the preferred option 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 development. 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 preferred option is significant or not in this context.

Significance Criteria: Construction Phase Greenhouse Gas Assessment

17.9.13 IEMA principles on climate change mitigation and EIA consider all GHG emissions contributing towards the global carbon budget to be significant. However, IEMA guidance also requires assessments to be proportional to the size of the development and avoid placing un-due responsibility on the developer or assessors.

17.9.14 Therefore, the assessment of significance for construction GHG emissions will be determined by comparing the total scheme construction emissions with the local and regional carbon budgets, to ensure a more proportionate comparison is applied. The overall contribution from the scheme in relation to those budgets will then be assessed, applying professional judgement to determine if a significant effect has arisen.

17.10 Potential Effects: Scoped Out of further assessment

Operational Phase Greenhouse Gas Emissions

17.10.1 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 emissions, these are considered likely to have a negligible effect on human and ecological receptors.

17.10.2 In this instance, it is therefore considered that operational GHG emissions will be negligible, and therefore also scoped out.

17.11 Conclusion

17.11.1 An assessment of the effects of climate change should be carried out, to take account of In-combination climate change impacts (ICCI) and Climate Change Risk (CCR). Greenhouse gas (GHG) emissions associated with construction phase for the scheme will also be assessed.

18. RISKS OF ACCIDENTS OR DISASTERS

18.1 Subject Introduction

18.1.1 The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017, require an assessment to be completed of 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 or disasters which are relevant to the project concerned.

18.1.2 Neither the regulations nor the EU Directive define the scope or method to be used in the assessment. However, IEMA provide useful outline guidance in a EIA Quality Mark Article[63]. 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; man-made sources such as escalation of a fire from an adjacent facility, dam collapse etc.*

18.1.3 EIA should always be proportionate and so the intention is that this chapter of the ES will address the major risks that are actually relevant to the scheme, where the resilience of the A55 is of importance to the region. For example, flood risk from the sea, major rail or road accidents, landslides and road or tunnel closures are relevant, while volcanic eruptions, famine and plagues of pests are not. Table 17.1 sets out a long list of potential major accidents and disasters and highlights those that are most relevant.

18.1.4 Emerging EIA practice excludes health and safety matters from this assessment as they are covered elsewhere by detailed legislation.

18.2 Study Area

18.2.1 The study area is definable only after any potential major accident or disaster that could arise have been identified as relevant to the project and which could result in serious danger to the environment. However, in each case the project is either the source or is subjected to the of the accident or disaster resulting in adverse effects on the environment.

18.3 Completed and Planned Surveys

18.3.1 No surveys are required for this assessment, which will be completed using the results of consultations and desk study.

[63] https://www.iema.net/assets/uploads/EIA%20Articles/AMEC%20What%20is%20this%20MADness.pdf | Amec Foster Wheeler. 2018

18.4 Consultations

18.4.1 Consultation with statutory or non-statutory consultees will be required to obtain data on sources of risks and consequences. The Local Authority, Natural Resources Wales and Traffic Wales are important sources of data and advice.

18.5 Methodology

18.5.1 The Method of assessment has several stages:

a) **Screening of relevant threats**: based on the National Risk Register of Civil Emergencies[64])
b) **Consideration of vulnerabilities:** how site location and adjacent landuse makes the project vulnerable to the risk of accidents and disasters
c) **Scoping of low and high risks to the project**: using source-pathway-receptor risk matrix approach where the project becomes a pathway that increases risk as a result of the changes brought about)
d) **Consideration of high risks:** based on risk factors, avoidance, prevention and mitigation
e) **Cross referencing** of identified risks to other ES chapters, as appropriate
f) Examination of remaining risks

18.5.2 The aim of the EIA is to introduce mitigation measures that:

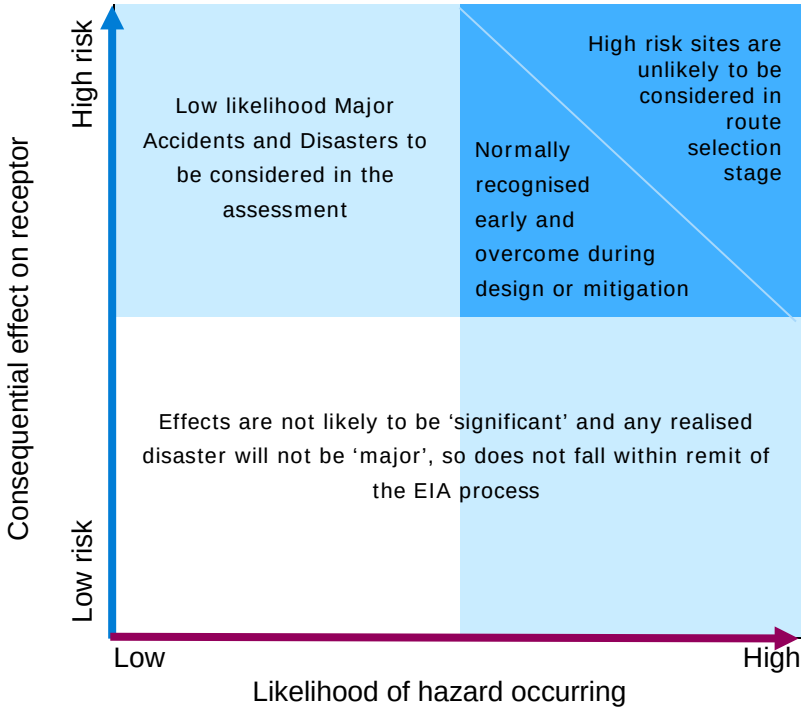
a) Reduce the likelihood of hazard
b) Reduce the magnitude of the hazard on the development if it is realised
c) Break the pathway between the hazard and the development
d) Increase the resilience of the development to the hazard
e) Reduce the magnitude of the triggered effect
f) Reduce the vulnerability of the receptor to the triggered effect
g) Break the pathway between the development and the receptor

18.5.3 The EIA process will evaluate the exposure and vulnerability of the development to each of the hazards on the list, identify the potential major accidents or disasters associated with each, and assess the risk of likely significant environmental effects that would be caused. Figure 18.1 shows how these potential impacts are considered. The result is that the assessment will address high risk, but low likelihood events; however, there are no defined thresholds above or below which an event is not considered.

18.6 Significance Criteria

18.6.1 Significant adverse effects are considered to mean: 'The loss of life or permanent injury, and/or permanent or long-lasting damage to an environmental receptor.[65]'
Figure 18.1: Assessment of risk of Major Accident and Disaster

[64] Cabinet Office 2015
[65] IEMA (2017) EIA Quality Mark Webinar: Major Accidents and Natural Disasters in EIA. 13th July 2017



18.7 Potential Effects

18.7.1 Table 18.1 shows a checklist of hazards that is broadly based on the list provided in the UK National Risk Register 2015[66], with those that are likely to be relevant to the Junction Improvements scheme highlighted.

Table 18.1: Checklist of Hazards

Type of hazard		Type of hazard	
Geophysical	Earthquake **Landslide** Tsumani Volcanic eruption	**Biological**	Infectious animal disease epidemic Infectious human disease epidemic Pest plague
Hydrological	**Coastal Flood** **Riparian/Surface water flood**	**Manmade**	Conflict, war and terrorism Cyber-attack on critical services Displaced population Disruptive industrial action Famine and food insecurity Industrial accidents Poor air quality events Public disorder Electricity failure **Transport accidents** Widespread failure of services
Climatological	Drought Extreme temperatures **Wildfire**		
Meteorological	**Heavy snow** **Hurricane, storms and gales** Severe space weather **Storm surge**		

[66] National Risk Register Of Civil Emergencies 2017 edition, Cabinet Office

18.7.2 The potential effects of the scheme will be those that arise from the highlighted hazards in Table 18.1. In particular, the effects of severe weather, landslides or transport accidents that could result in closure of the road or the adjacent A55 road tunnels are considered of greatest concern to the potentially isolated community in the town and to the wider travelling public.

18.7.3 The potential consequences of coastal or riparian flooding will be addressed in the Road drainage and Water Environment Chapter.

18.8 Conclusion

18.8.1 An assessment of the potential effects of Major Accidents and Disaster should be carried out to address the highlighted hazards for construction and operation.

19. POPULATION AND HUMAN HEALTH

19.1 Chapter Introduction

19.1.1 This chapter discusses potential impacts on population and human health resulting from the construction and use of the preferred option for Junction 15, as compared to the 'do-minimum' current scheme. It uses this information and the context of the proposed Scheme to define the scope of assessment that will be taken forward in the development of the Environmental Impact Assessment (EIA).

19.1.2 The Population and Human Health Chapter of the EIA considers how the proposed Scheme may effect the population's health (and well-being), including for example the risks to human health due to water contamination, air pollution or accidents/disasters. Consequently, although for convenience, the assessment covered by this chapter is referred to as a Health Impact Assessment (HIA) the scope is wider than solely health aspects.

19.1.3 he World Health Organisation defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.' [67] These are factors which span environmental, social and economic aspects. In Wales, there is also a statutory duty to consider well-being and in particular the well-being of future generations. Therefore, the assessment will need to be sufficiently broad to cover the potential determinants of good health and not just focus on environmental hazards.

19.2 Legislation, Policy Context

19.2.1 The following legislative and policy guidance has been considered in assessing impacts on population and health:

2014 EIA Directive

19.2.2 A Population and Human Health chapter is required by EU Directive 2014/52/EU (itself amending Directive 2011/92/EU) to evaluate impacts on human health. A prospective desktop or rapid Health Impact Assessment (HIA) will be performed in order to assess the impacts of both chemical and non-chemical stressors on human health.

The Environmental Impact Assessment (Miscellaneous) Amendments Relating to Harbours, Highways and Transport) Regulations 2017

19.2.3 Schedule 2 of The Environmental Impact Assessment (Miscellaneous) Amendments Relating to Harbours, Highways and Transport) Regulations 2017 amended 'Part VA Environmental Impacts' of the Highways Act 1980. The scoping amendments include a wider list of potential issues to be considered, though not necessarily a list of topics to include in an EIA, including the addition of "Population and Human Health." Each of these parameters needs to be considered in the light of the nature of the proposed development, the nature of the site and any interactions with other systems, processes, or sites. Scoping should be used to remove issues that are not likely to result in significant environmental effects and focus the assessment on the issues that may result in significant effects.

[67] http://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1

Public Health (Wales) Act 2017

19.2.4 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.

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

19.2.5 The Well-Being of Future Generations (Wales) Act 2015 puts in place the legislation needed to make public bodies listed in the Act think more about the long-term, work better with people and communities and each other, and look to prevent problems by taking a more proactive, sustainable and joined-up approach.

Equality Act 2010

19.2.6 The public sector equality duty created by the Equality Act 2010 came into force in April 2011. It requires public sectors to have due regard to the need to eliminate discrimination, advance equality of opportunity, and foster good relations, when making decisions and setting policies. To do this, it is necessary for them to understand the potential effects of its activities on different people. Where these are not immediately apparent, it may be necessary to carry out some form of assessment or analysis, in order to understand them.

The Equality Act 2010 (Statutory Duties) (Wales) Regulations 2011

19.2.7 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 Children's Act 1989

19.2.8 The Children Act 1989 allocates duties to ensure children are safeguarded and their welfare is promoted.

19.2.9 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 supports a consideration of health and well-being at a local level and is supplementary guidance to Planning Policy Wales for large planning applications and Local Development Plans (LDPs);

b) The Welsh Transport Appraisal Guidance (WelTAG) 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.

19.2.10 However, the amended EIA Directive[68] requires that population and health factors should be considered as part of the EIA process, although the Directive itself (as well as the transposed UK legislation) does not define how it should be addressed.

19.2.11 National strategies, such as the Clean Air Strategy 2019, that are relevant to population and Human Health are referenced in the appropriate sections.

19.2.12 At a local level, the scheme has links to a number of policies contained in Conwy Local Development Plan 2007-2022, which was adopted in 2013. These include (not exclusively):

Spatial Objective S013: To protect and improve accessibility to essential services and facilities, including open space, allotments, health, education and leisure.

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[69].

Strategic Policy STR/1: Sustainable transport, development and accessibility to support healthy lifestyles.

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.'

19.3 Relevant Guidance

19.3.1 Although there is no formal guidance on how population and health should be addressed in an EIA the chapter must include information which, considering current knowledge and methods of assessment, is reasonably required by the project authority to reach a reasoned conclusion about the significant effects. As the population and human health chapter overlaps with many of the EIA topics (for example air quality and noise) described in the Design Manual for Roads and Bridges (DMRB) Volume 11[70], to avoid duplication, reference will be made to the relevant DMRB guidance as appropriate.

19.3.2 The following guidance will be 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

b) Material provided by the Wales Health Impact Assessment Support Unit (WHIASU)[71]. 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.

[68] Environmental Impact Assessment (EIA) Directive 2011/02/EU as amended by 2014/52/EU
[69] 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]
[70] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section1.htm
[71] https://whiasu.publichealthnetwork.cymru/en/

c) IEMA Health in Environmental Impact Assessment, A Primer for a Proportionate Approach, 2017[72].

d) Guidance provided by the World Health Organization (WHO)[73]

e) Guidance provided by the World Bank International Finance Corporation (IFC) Introduction to Health Impact Assessment[74]

f) Guidance provided by the Society of Practitioners of Health Impact Assessment (SOPHIA)[75]

19.4 Assessment Methodology

Study Area

19.4.1 A description of the proposed development can be found in Section 2.1. The broader study area includes the A55 corridor between Junction 14 and Junction 16A, which runs parallel to the railway in close proximity to the centres of Llanfairfechan, Penmaenmawr and Dwygyfylchi. The overall study area therefore includes the residential areas between Junction 14 and Junction 16A, including the towns of Llanfairfechan, Penmaenmawr and the village of Dwygyfylchi. Although the geographical scope of the assessment will vary between different health factors being assessed, the data will generally be assessed at a ward level. Depending on the health factors being considered, the buffer(s) will be defined in accordance with the relevant topic's study area and will be applied proportionately.

Local community

19.4.2 The assessment will consider the health and well-being status of all people within the local community, and particularly any specific vulnerable and/or disadvantaged groups that may be particularly affected (such as young children, young people, older people and people with disabilities). A review of the groups identified during the preliminary scoping review for the Penmaenan and Capelulo wards will be undertaken, considering the impact of the preferred option on equality (for example in relation to protected characteristics, such as disability, religion or belief under the Equality Act 2010), diversity and/or human rights.

19.4.3 The nearest sensitive receptors to direct impacts from Junction 16 are residential dwellings along Ysguborwen Road and Maes-y-LLan. The locations of a selection of local amenities used by the local community are shown in Figure 19.1.

[72] https://www.iema.net/assets/newbuild/documents/IEMA%20Primer%20on%20Health%20in%20UK%20EIA%20Doc%20V11.pdf
[73] https://www.who.int/hia/en/
[74] http://documents.worldbank.org/curated/en/437491468331191255/pdf/522150WP0Healt10Box345555B01PUBLIC1.pdf
[75] https://hiasociety.org/

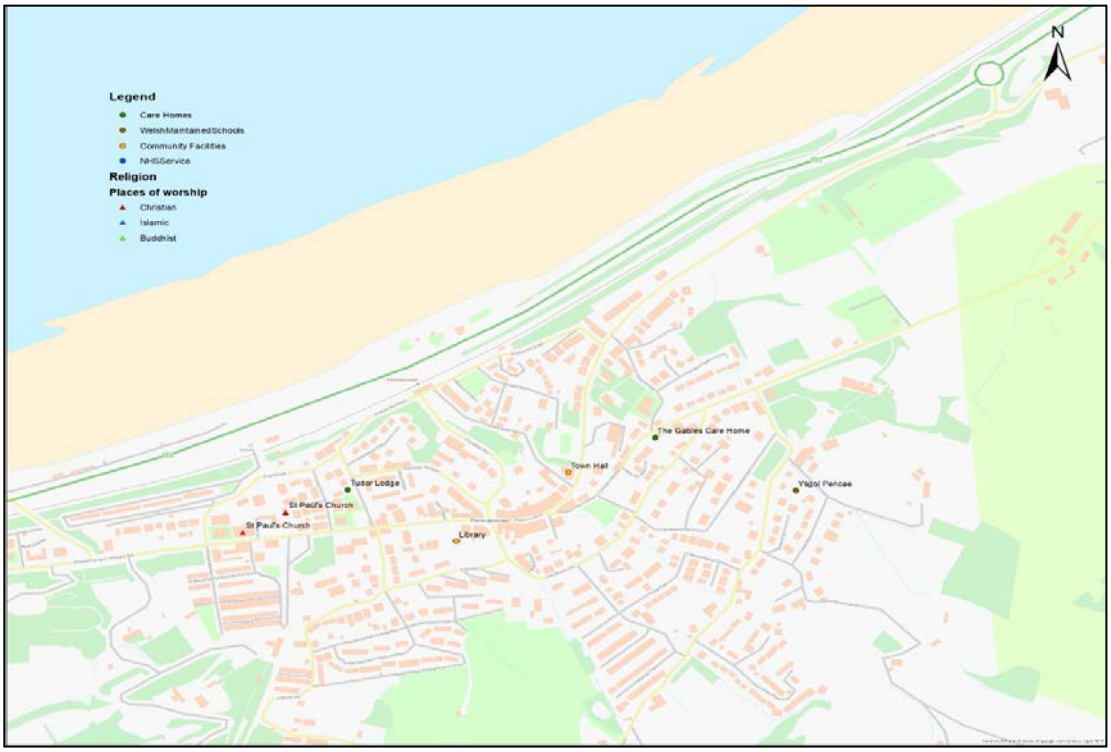


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Figure 19-1: Locations of the local amenities in Penmaenmawr

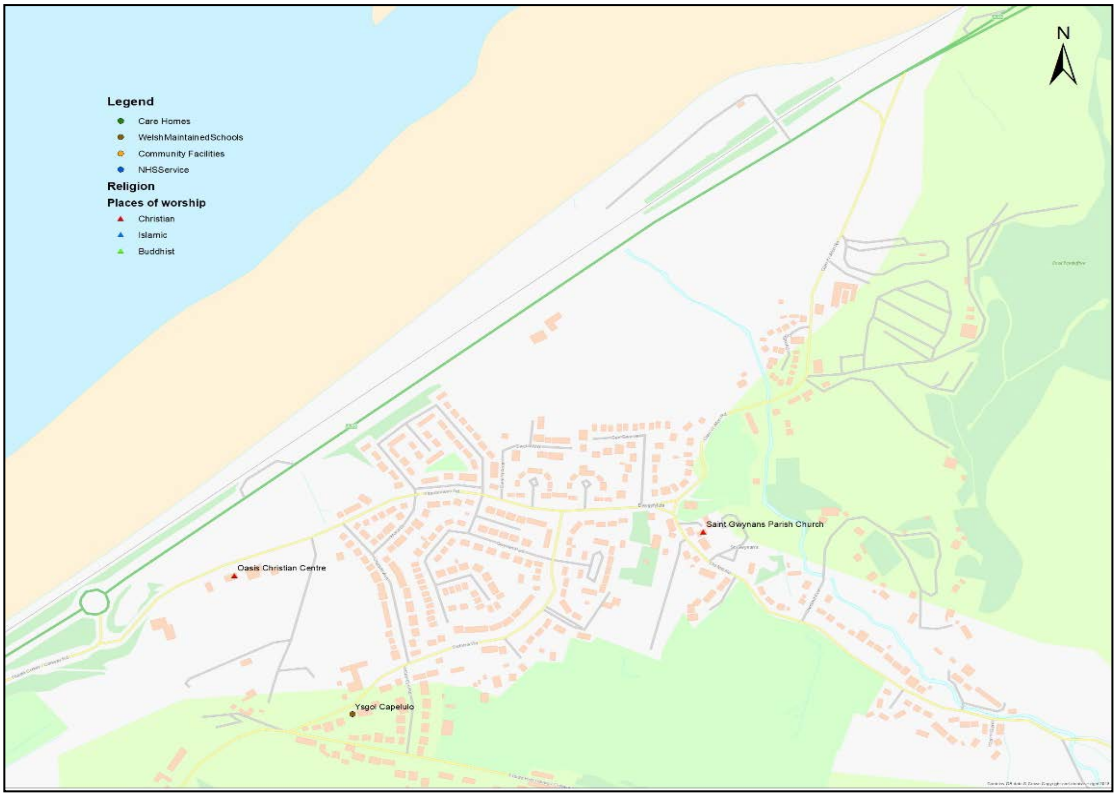

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Figure 19-2: Locations of the local amenities in Dwygyfylchi

Baseline Conditions

19.4.4 Baseline conditions have been established through a preliminary scoping review based on expert judgement, taking into account publicly available baseline data (such as the statistical population profiles for wards published by Conwy CBC[76] and the Welsh Index of Multiple Deprivation (WIMD) 2014 data[77]) and findings from the Welsh Transport Appraisal Guidance (WelTAG) and the associated distributional impact assessment.

19.4.5 This baseline data will be reviewed and supplemented with additional information (held by relevant authorities) during the development of the design, consultations with relevant bodies and the in coordination with other technical specialists during the preparation of the EIA, for example:

Chapter 9.	Landscape, Townscape and Visual Effects
Chapter 11.	Community and Private Assets
Chapter 12.	Air Quality
Chapter 13.	Noise and Vibration
Chapter 14.	All Travellers
Chapter 17.	Climate Change
Chapter 18.	Risks of Accidents or Disasters

Determinants of health and well-being

19.4.6 As defined by the World Health Organisation:

Determinants of health are factors which influence health status and determine health differentials or health inequalities. They are many and varied and include, for example, natural, biological factors, such as age, gender and ethnicity; behaviour and lifestyles, such as smoking, alcohol consumption, diet and physical exercise; the physical and social environment, including housing quality, the workplace and the wider urban and rural environment; and access to health care. (Lalonde, 1974; Labonté 1993) All of these are closely interlinked and differentials in their distribution lead to health inequalities.[78]

19.4.7 The health determinants identified during the preliminary scoping review (with reference to the WIAHU Health and Well-Being Determinants Checklist) as being relevant to the scheme are shown in the table below. These may be amended.

Table 19.1: Health and well-being determinants identified during the preliminary scoping review

[76] http://www.conwy.gov.uk/en/Council/Statistics-and-research/Profiles-and-summaries/Statistical-profiles-for-wards-electoral-divisions.aspx
[77] http://wimd.wales.gov.uk/explore?lang=en#domain=overall&z=13&lat=53.252&lng=-3.943
[78] https://www.who.int/hia/about/glos/en/

Health and Well-Being Determinants	Preliminary assessment of relevant factors (not exclusively)	Relevant to Construction	Relevant to Operation
Lifestyles	Physical activity	✓	✓
Social and community influences on health	Family organisation and neighbourliness (including the impact due to the potential loss of residential properties), social support networks (such as midwifes, health visitors, social services), community identity, other social exclusion, including severance (where barriers to pedestrian movement are introduced or removed). These impacts are linked to those associated with access to services (eg. safe routes to schools or child care centres).	✓	✓
Living / environmental conditions affecting health	Built environment, noise, air and water quality, attractiveness of area, green space and play areas, community safety (including road hazards).	✓	✓
Economic conditions affecting health	Access to employment and affordability of transport (including public transport or fuel costs). How the preferred option impacts an individual may depend on where people live relative to services.	✓	✓
Access and quality of services	Access to amenities, including health care (eg GP surgery or hospitals), training / education and shops. This is linked to any increase in journey length / cost of travel compared to the do minimum scenario.	✓	✓
Macro-economic, environmental and sustainability factors	Climate	✓	✓

Consultation

19.4.8 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 stakeholders views on the options and general environmental information; and not specifically to discuss health issues.

19.4.9 Written consultation will be carried with key bodies whilst preparing the population and human health assessment. It is anticipated that this will be focussed on Public Health Wales, including the Conwy CBC 'Social Care and Wellbeing' team, the Local Public Health Director[79], together with the Conwy CBC Environmental Health team. If deemed necessary as part of the HIA scoping exercise, meetings could be held. A detailed consultation exercise beyond these organisations is not proposed but other parties that may be contacted to provide comment, include:

a) Betsi Cadwaladr University Health Board[80]

b) Board of Community Health Councils[81]

c) Conwy and Denbighshire Public Services Board[82]

d) Dewis Cymru[83]

e) Conwy People's Partnership[84]

f) Community and Voluntary Support Conwy[85]

Approach to Identification and Assessment of Effect on Sensitive Receptors

19.4.10 The identification of sensitive receptors and the methodology to assess the effect of the proposed development on them, will follow that outlined by WHIASU, with additional guidance provided by WHO, ICF, and SOPHIA, as referenced above.

19.4.11 Considering the overall project requirements and available data, evaluation of the significance of the Population and Human Health effects will be described in the HIA either qualitatively or semi-quantitatively and based on expert judgement. As described in the WHIASU guidance, HIA's follow a five-step process:

- Review of the HIA Screening – Deciding whether to undertake a HIA
- HIA Scoping exercise – Determining the focus, methods and work plan
- HIA Appraisal of Evidence/Assessment – Identifying the health impacts
- HIA Reporting and Recommendations
- HIA Monitoring and Evaluation

19.4.12 The population and human health assessment will involve consultation to establish with any wider health issues. The key issues and affected populations will be identified, and consideration will be given to the extent to which significant effects are likely to arise. The scope and approach to the HIA will be guided by responses to consultation. In addition to factors such as regulatory considerations (which are described in Section

[79] http://www.wales.nhs.uk/sitesplus/888/page/43778
[80] http://www.wales.nhs.uk/sitesplus/861/home
[81] http://www.wales.nhs.uk/sitesplus/900/home
[82] http://www.conwy.gov.uk/en/Council/Conwy-and-Denbighshire-Public-Services-Board.aspx
[83] https://www.dewis.wales/
[84] http://www.conwy.gov.uk/en/Resident/Social-Care-and-Wellbeing/Children-and-families/Family-Support-Services/Conwys-Peoples-Partnership/Conwy-People's-Partnership-%e2%80%93-About-Us.aspx
[85] http://cvsc.org.uk/en/

19.2), the geographic extent, community concerns, methods and parameters.

19.4.13 The assessment will incorporate a review of available data, including initial feedback from the WelTAG Stage Two Public Consultation process, and a critical review of possible health impacts by the project team; with a focus on establishing where significant effects could arise. It will take into account other relevant activities described elsewhere in this Environmental Impact Assessment Scoping document, including the air quality and noise review and consideration of effects on all travellers.

19.4.14 Based on the overall project considerations identified during the preliminary scoping review and the findings of the assessment carried out under the Welsh Transport Appraisal Guidance (WelTAG), it is initially envisaged that a prospective desktop/rapid HIA, that will compare no-change option with the preferred option, will be appropriate. The study will be based on readily available data.

19.4.15 Typically, a prospective desktop/rapid HIA would involve a suitable investigation of health impacts, including a short desk-top review of evidence and the gathering of further information from key stakeholders. Although consultation will be carried out with statutory consultees, no additional consultation will take place with members of the public.

Assessment of Potential Effects

19.4.16 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).

19.4.17 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.

19.4.18 After construction and during operation, the impacts can potentially affect nearby communities, either through direct or indirect of the new highway configuration. The impact of the operational period will be assessed up to 15 years after opening.

19.4.19 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 Section 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

19.4.20 There is no specific guidance on the assessment of significance in EIA in relation to health effects. The evaluation of the Population and Human Health effects presented in the HIA will broadly follow the approach described in Section 5.2 and will characterize the heath impacts as follows:

a) It will describe the nature of the impact – explaining how the proposal will affect health and whether the impact will be positive or negative.

b) It will assess the likelihood of the impact - indicating if the likelihood of the impact of the proposal is definite, probable or speculative.

c) It will assess the scale and significance of the impact – it will consider what proportion of the population is likely to be affected, and how severe or beneficial the impact will be.

d) It will look at the timing and duration of the impact - it will seek to assess whether short-term risks to health may be worth the long-term benefits.

e) It will review the distribution of the effects – for example, whether the proposal will 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.

19.4.21 The assessment will report only the potential significant effects from the project and will be based on professional judgement, as described in the IEMA Primer on Health Impact Assessment. The assessment will be undertaken on a qualitative and where appropriate a semi-quantitative basis.

19.5 Scoping Assessment

Potential Effects Scoped Out

19.5.1 Based on the preliminary scoping review described above and subject to consultation with relevant parties it is anticipated that the following effects will be 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 will therefore not be 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 will therefore not be examined.

c) Workplace conditions should not differ between do-minimum and preferred options. They will therefore not be 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 will therefore not be 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).

Potential Effects – Scoped In

19.5.2 Based on the preliminary scoping review as described above, it is anticipated that the following effects are likely be scoped in. However subject to consultation with the

relevant parties, they may be amended depending on the findings of the HIA scoping exercise. To avoid duplication, reference will be made to the relevant chapters as appropriate.

a) Impacts on individuals, including lifestyle factors such as physical activity, risk-taking activities, and impact on access to health care services.

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 Project has the most potential to impact community severance and degree of isolation for those options where properties are located within slip road 'islands' or along-side roads that form part of the proposed Scheme.

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 (eg. those associated with changes to the landscape/townscape). The proposed scheme has the potential to impact during both its construction and operational phases.

i) Impacts on employment, occupation, and income.

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 EIA 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.

19.6 Conclusions

19.6.1 Based on the above scoping assessment it is concluded that the Scheme has the potential to result in significant effects on the population and human health and there is therefore a need to assess these further as part of the EIA process. A qualitative and semi-quantitative approach to the HIA will be undertaken, comparing relative risks between the do-minimum scenario and the preferred option scenario.

20. CUMULATIVE EFFECTS

20.1 Subject Introduction

20.1.1 Cumulative effects result from multiple actions on receptors or resources occurring in combination over time. There are generally considered to be two types of cumulative effect associated with a project of this kind:

Type 1: inter-related and arise from the same scheme and impact on receptors or receptor groups, such as local residents, users of local rights of way or services, which may be affected simultaneously or concurrently by different environmental effects;

Type 2: arise from the proposed scheme together with any other developments that are either proposed or are reasonably foreseeable. Cumulative effects may occur where there is the potential for impacts from the separate developments that overlap.

20.1.2 There are also topic-specific cumulative effects. These would be covered within each of the ES topic chapters where appropriate.

20.2 Legislation and Policy Context

Legislation

20.2.1 The Environmental Impact Assessment (EIA) Directive (1999) requires the EIA to consider cumulative effects. The European Commission describe cumulative impacts as'*…impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*.' (European Commission 1999).

Policy

20.2.2 The adopted Conwy Unitary Development Plan (UDP) 2001 – 2016 and the adopted Eryri Local Development Plan (LDP) 2007-2022 highlight the importance of considering cumulative effects of development in Conwy in relation to onshore wind turbines and other developments.

20.3 Methodology

20.3.1 DMRB Volume. 11, Section 2, Part 5 (HA 205/08) (Highways Agency et al., 2008) sets out the approach to assessing cumulative impacts and draws on guidelines for assessing indirect, cumulative and impact interactions, published by the European Commission. Interim Advice Notes (IAN) 125/09(W) states that *'as yet there is no industry standardised approach*' to the assessment of cumulative effects but, the cumulative assessment should nevertheless *'differentiate between permanent, temporary, direct, indirect and secondary effects, positive and negative'*.

20.3.2 The DMRB has been withdrawn as a whole in 2017, but the replacement is still not available for use in 2018. A draft form does not give any advice on the assessment of Cumulative Effects.

20.3.3 In the absence of guidance, this assessment will use apply HA 205/08, which recognises

two principle types of cumulative impacts to be addressed in EIAs, as set out in Section 21.1:

Type 1: Cumulative impacts from a single project (e.g. combined effects of differing environmental impacts on a single receptor or resource). The IAN states that in for Type 1 the impacts arise from the '*combined action of a number of environmental topic specific impacts upon a single receptor/resource*'.

Type 2: Cumulative impacts from different projects (in combination with the project being assessed). The IAN states that '*For the purposes of this guidance, 'reasonably foreseeable' is interpreted to include other projects that are 'committed'*. These should include (but not necessarily be limited to):

A. **Trunk road and motorway projects** which have been confirmed (i.e., gone through the statutory processes); and

B. **Development projects with valid planning permissions** for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken.

20.3.4 To ensure effective coverage for this assessment, different development projects in 'B' above have also been taken to include the following categories

a) Application(s) permitted but which are not yet implemented

b) Submitted applications not yet determined, but which if permitted, may add cumulative effects to the project

c) Development identified in the adopted and emerging development plan (with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited

20.3.5 Data about developments would be gathered by reference to the Local Development Plan, the Planning Authority and the Planning Inspectorate. The assessment would not assign a level of significance effect to any of the cumulative effects identified. Rather, a judgement has been made on whether the cumulative effects are likely to be more or less significant than the effects identified for the Scheme alone.

Receptors

20.3.6 The assessment would look at:

a) The interrelated effects for people living near the scheme

b) Potential inter-related effects for people using public rights of way (prow) and other routes

c) The cumulative effects on European sites would be covered by the assessment of impacts on European sites

20.4 Potential Effects

20.4.1 Cumulative effects could arise between the construction and operation of Junctions 15 and 16, both of which would be constructed at the same time, or at least with a staggered commencement and completion. The most likely cumulative effects are the following temporary effects during construction of both junctions are heightened air quality impacts, including dust and vehicle emissions, visual and noise impacts, traffic

impacts;

20.4.2 Permanent effects could include changes to public rights of way and other NMU routes, visual and noise impacts, traffic impacts, visual and landscape and townscape changes.

20.4.3 The other source of cumulative effects could be housing developments in the town or setting. The most likely cumulative effect of these relatively minor schemes with the A55 Junction15 Improvements is likely to be traffic related with increases in construction traffic from multiple schemes.

20.5 Conclusions

20.5.1 A cumulative Impact assessment will be required because the separate effects of more than one scheme could have a significant effect on receptors.

21. MANAGEMENT OF ENVIRONMENTAL EFFECTS

21.1 Introduction

21.1.1 This chapter of the Environmental Statement sets out how:

a) The information contained in the ES will be communicated to the contractor who will build the Scheme;

b) The contractor's activities will be carried out to comply with legislation, national standards and policy;

c) The environment will be protected by management of construction activities;

d) The environment will be protected, by mitigation proposed in the ES, in the period after construction;

e) The effectiveness of proposed mitigation will be monitored for effectiveness.

21.2 Environmental Management

21.2.1 Ensuring compliance with environmental commitments is a process known as Environmental Management which is delivered through the operation of an Environmental Management System (EMS). The EMS is a procedure run by an organisation to ensure that its activities are carried out in a manner that is complaint with legislation and its own environmental policy and commitments

21.2.2 The requirements of the EMS are applied to a specific construction project through a Construction Environmental Management Plan (CEMP). Of key importance in a CEMP is the identification of specific project objectives and the many commitments that apply to that project. The contractor will be expected to ensure that the project is effectively managed and environmental impacts 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.

21.2.3 The EMS sets out:

a) Commitments to continuous improvement, sustainable construction objectives, prevention of pollution and waste, compliance with legislation and requirements of Statutory Environmental Bodies;

b) The framework for setting and reviewing objectives and targets;

c) A monitoring and review process that audits and reports on compliance;

d) The basis for the future operation and maintenance of the completed Scheme.

Construction Environmental Management Plan (CEMP)

21.2.4 For a construction project these matters are set out in a Construction Environmental Management Plan (CEMP), which will be prepared in a pre-construction draft as part of

the ES. This will be taken by the contractor and used throughout construction and aftercare. At the end of the contract it will be handed on top the organisation responsible for maintenance.

Environmental Masterplan (EMP)

21.2.5 The spatial arrangements for the environmental design of the Scheme will be set out in an Environmental Masterplan. The masterplan would form an integral part of the CEMP and will be updated during construction and aftercare. On completion of the construction contract the EMP will be handed over to the organisation responsible for maintenance to provide them with the details necessary to understand the arrangements for mitigation and the kinds of vegetation management they will need to apply to ensure long term compliance with the objectives of proposed mitigation.

Staff responsible for implementation of the CEMP

21.2.6 The Contractor will be responsible for providing the following key staff who will be responsible for the CEMP:

a) Project Manager: a construction expert who will be responsible for managing the construction contract as a whole and for ensuring that the construction team adhere to the requirements of the contract, and the Construction Environmental Management Plan (CEMP);

b) Environmental Coordinator (ECO) will work alongside the Project Manager to ensure that environmental commitments set out in that document are fulfilled.

c) The Environmental Clerk of Works (ECoW), will support the ECO during pre-construction and construction to ensure compliance with environmental management systems and plans.

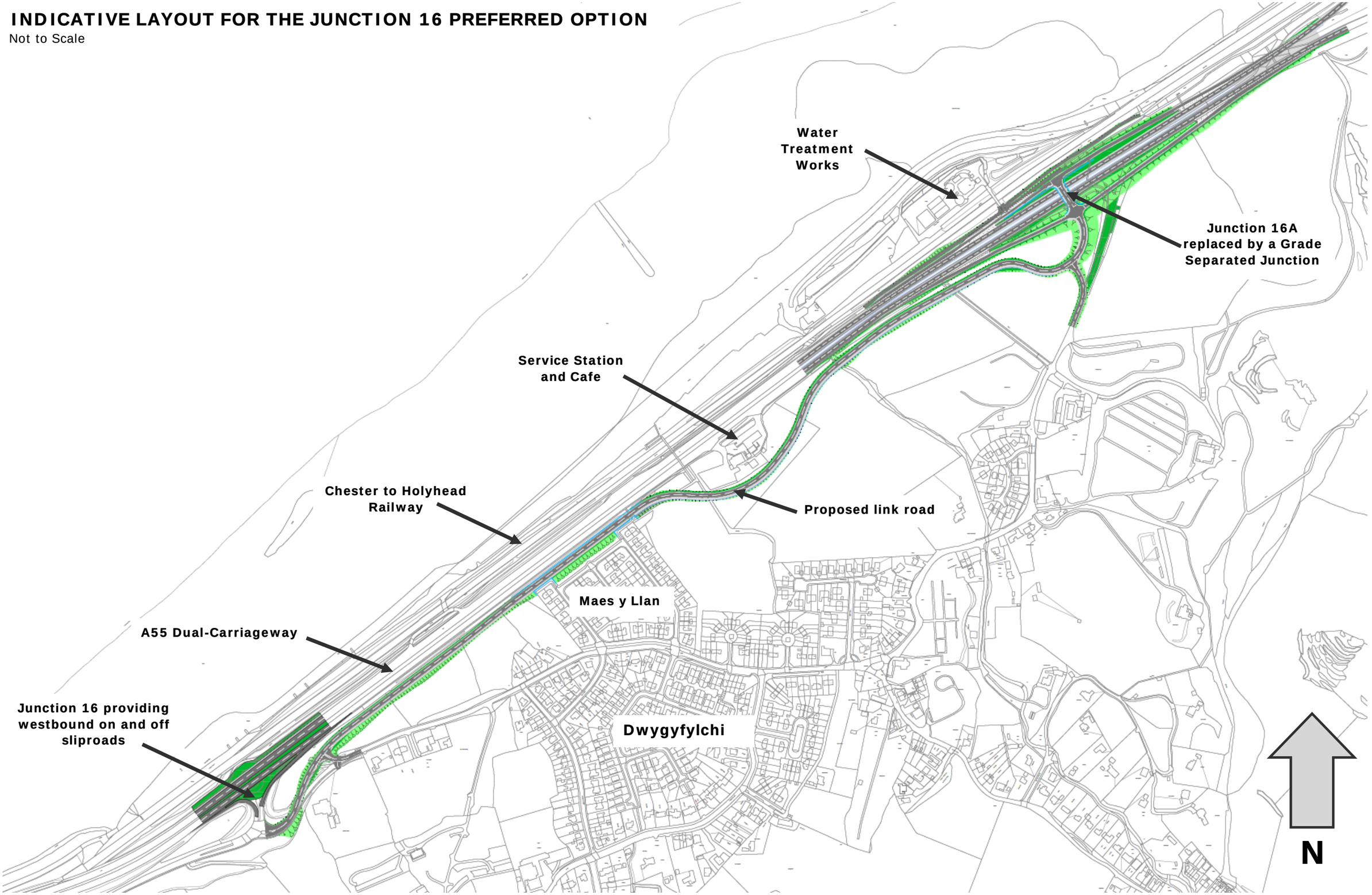
21.3 Conclusions

21.3.1 The complex construction project requires effective environmental management not only to deal with foreseen events, but also to be adequately prepared for the unforeseen events so that undue environmental impacts are caused. A chapter on Environmental Management will be required in the Environmental Statement supported as necessary by appendices.

APPENDIX 1
THE PROPOSED SCHEME

INDICATIVE LAYOUT FOR THE JUNCTION 16 PREFERRED OPTION

Not to Scale



APPENDIX 4.4
RECORD OF DETERMINATION

Record of Determination, Welsh Assembly Government, Transport, Housing and Regeneration.

For use with Annex II relevant projects only

Name of project: **A55 Junction 15 Improvements**	**Location** (including national grid reference): Junction 15 on the A55 Trunk Road approximately 10km west of the Conwy Tunnel. **OS Grid Ref: SH685755**

Qualifying criteria for Annex II relevant project: (please tick which are relevant)

Improvement element of project is >1ha	√	Project is located within 'sensitive' area		Other with potential for significant effect (e.g. adjacent to sensitive site)	√

A. Description of project: The A55 in north Wales forms part of Euroroute 22 from Dublin to Isham in Russia. Junction 15, which serves Llanfairfechan, is one of the two remaining at-grade junctions on this strategic route in the UK. It is considered to be a constraint on the smooth flow of traffic, and to increase journey times. Backing up of traffic into Pen y Clip Tunnel can occur and this is considered to be a safety hazard. The proposed improvements will replace the existing roundabout with slip roads and bridges. Providing an alignment that meets standards will result in the existing dual carriageway being re-aligned slightly to the south of the existing route, with side roads and junctions modified.

B. Description of local environment, including statutory and non-statutory designations: Between Conwy and Llanfairfechan the A55 follows a coastal route where mountainous terrain abuts the coast. The road tunnels through headlands at Penmaenbach and Pen-y-Clip. On the seaward side of Junction 15 is the mainline railway from Chester to Holyhead, then the foreshore, with the Llanfairfechan Coastal Promenade and terraced residential properties to the west and shingle beaches to the east of the junction.

Conwy Bay is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA) and a Site of Scientific Interest (SSSI). To the south of the A55 is a narrow coastal plain partly occupied by residential areas, some of which are in the Llanfairfechan Conservation Area. The remainder is pastureland rising steeply to a mountainous ridge around 550 metres above sea level. The mountains are within the Snowdonia National Park (SNP), with the park boundary passing to the south of the developed areas of Llanfairfechan. Wern Isaf and Bryn y Nueadd are two Listed sites on the Cadw Register of Parks and Gardens. The whole site is covered by the North Arllechwedd Historic landscape. There are a number of Ancient Monuments on the surrounding hills and listed buildings in the town.

Summary of main environmental effects of project: With mitigation, the scheme is expected to have some significant adverse effects on residential receptors as a result of traffic noise, visual impact and the loss of some seaward views. There will be a potential adverse impact on the setting and key view from Wern Isaf Historic Park and Garden and listed building. The north east end of the Llanfairfechan Conservation Area will be affected by changes to the alignment of Penmaenmawr Road. Travellers using the A55 and county road network as well as local communities would be adversely affected during construction, but once the junction is in operation the effect would be beneficial. Demolition of one or more residential

buildings near the junction is likely. There are unlikely to be any significant adverse effects on the marine nature conservation designations.

Details of extent of environmental impact assessment work undertaken and summary of any consultation undertaken with the statutory consultation bodies: Previous work on the scheme has included desk studies and reports completed between 2005 and 2015, with a number of environmental studies, based on records between 2005 and 2011 that including a WelTAG Stage 1 Environmental Appraisal of various route options in 2009. An Extended Phase 1 Habitats Survey was carried out by TACP in October 2015. A list of these reports and the dates of publication are set out in Section F.

During WelTAG Stage 2 Appraisal between October 2017 and May 2018, some additional desk study and field surveys have been conducted. These have included an update Extended Phase 1 Habitat survey, a landscape winter survey, an over-wintering bird survey and a drone aerial photographic survey. Further and more detailed environmental surveys will be carried out once a Preferred Route has been identified. Environmental baseline data has also been obtained for various environmental topics including flood mapping, species records from COFNOD, Wales Landmap, records of previous land uses, Historic Environment Record and designated sites.

Consultations have included Cadw and Gwynedd Archaeological Trust, Natural Resources Wales, Conwy County Council and North and Mid Wales Trunk Roads Agency. The relevant predicted impacts are assessed on a precautionary basis but take account of mitigation which would typical be applied.

E. Determination decision, statement of case in support of this decision as to whether EIA is/is not required: It has been identified that there are a number of sites that are subject to Article 6 (3) of the Habitats Directive. The scheme could have significant effects in relation to Natura 2000 sites (in line with Annex III of the EC Directive). Views from Snowdonia National Park will include the scheme from a short distance. There would be the potential for significant further environment impacts in relation to a number of topics, including (but not exhaustively) ecology, cultural heritage, landscape and townscape, motorised and non-motorised users and community impacts. The proposed project is therefore an 'EIA Development'.

File references of supporting documentation for future reference: 2008 Preliminary Planning Report- Environmental: Atkins

2009 Environmental Report: Atkins (including Appendices D2, D3 and D4

2015 Ecological Statement: TACP

2017 Environmental Surveys Scoping Report: Ramboll/ RML

2018 Environmental Appraisal Report: Ramboll /RML

I have determined, following discussions with the Welsh Assembly Government's /Trunk Road Agent's Environmental Advisor that a statutory Environmental Impact Assessment is/is not required for this project.

Signature Project Director: Dated:

Authorisation to publish Notice of Determination:

Signature Welsh Ministers' Nominee: Dated:

ES Chapter 5 Appendices	
5.1	J16 Policies

APPENDIX 5.1
J16 POLICIES

4.6.6 The Coastal Zone

POLICY NTE/5 - THE COASTAL ZONE

A Coastal Zone is defined on the Proposals Map. Development in the Coastal Zone, outside settlement boundaries, will only be permitted where the development:

a) Specifically requires a coastal location;
b) Does not adversely affect the open character of the zone;
c) Does not adversely affect the nature conservation value of the zone with any effects identified mitigated for;
d) Does not detract from the tourism value or facilities;
e) Does not interfere with natural coastal processes;
f) Does not impede the function of any existing coastal defence structures;
g) Accords with the Development Principles of the Plan.

"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."

4.6.6.1 The need to control development along coastlines is important for environmental and economic reasons. Coastlines warrant special protection as they are often sensitive to development due to their open character and they also provide habitats for certain species of plants, mammals and birds. In addition, development should not interfere with natural coastal processes such as erosion and deposition. TAN14 states that "it is for each LPA to consider and define the most appropriate coastal zone in its area". From an economic point of view, the coast can be an important tourist and leisure attraction. Employment opportunities can be provided from other coast related activities such as fishing and marinas. Coastal areas may also be susceptible to flooding and, therefore, there may be a need to carry out defence works to protect areas from such risks.

4.6.6.2 A high proportion of Conwy's coastline is protected from flood risk although breaching from the sea is a continual risk. Large areas of Conwy's eastern coastline have previously been breached and the central Bay of Colwyn has suffered undermining to the seafront and storm damage, although further defence work began in 2011. To the west, Llanfairfechan seafront has also suffered from over-topping. TAN14 states that "Planning Authorities need to be aware of coastal issues on two scales; the site and its immediate environs and in terms of the wider setting".

4.6.6.3 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. The LDP will also offer opportunities for safeguarding land and routes for Emergency Planning scenarios.

4.6.6.4 Much of the coastal land resource in the Plan Area has already been developed, with the main centres of the population in the Plan Area located on the coast. The remaining undeveloped coast is considered to be one of Conwy's major environmental assets.

4.6.6.5 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.