



Ricardo
Energy & Environment

Caerphilly County Borough Council



HAFODYRYNYS, CAERPHILLY - WELTAG STAGE ONE REPORT

Consideration of Measures for Nitrogen Dioxide
Reduction





Caerphilly County Borough Council

HAFODYRYNYS, CAERPHILLY - WELTAG STAGE ONE REPORT

Consideration of Measures for Nitrogen Dioxide Reduction

FINAL - PUBLIC

**PROJECT NO. 70046187
OUR REF. NO. 70046187**

DATE: OCTOBER 2018

WSP
1 Capital Quarter
Tyndall Street
Cardiff
CF10 4BZ
Phone: +44 2920 769 200

WSP.com



QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft First Issue	Draft Second Issue	Final	Final
Date	August 2018	September 2018	24 September 2018	29 October 2018
Prepared by	Mike Rosser	Mike Rosser	Mike Rosser	Mike Rosser
Signature				
Checked by	Stephen Hayward	Stephen Hayward	Jason Collins	Jason Collins
Signature				
Authorised by	Jason Collins	Peter Evans	Peter Evans	Peter Evans
Signature				
Project number	70046187	70046187	70046187	70046187
Report number	001	002	003	004
File reference	70046187-001	70046187-001	70046187-001	70046187-001



CONTENTS

1	INTRODUCTION	1
1.1	CONTEXT	1
1.2	STUDY AREA	1
1.3	APPROACH	4
1.4	STUDY OBJECTIVE	5
1.5	REPORT STRUCTURE	6
2	STRATEGIC CASE	8
2.1	CASE FOR CHANGE	8
2.2	INFRASTRUCTURE AND LOCAL FACILITIES	10
2.3	TRAFFIC FLOWS	11
2.4	JOURNEY TIME & RELIABILITY	20
2.5	PERSONAL INJURY COLLISION DATA	24
2.6	PUBLIC TRANSPORT	24
2.7	ORIGIN DESTINATION ANALYSIS	26
2.8	ECONOMY	27
2.9	OTHER RELATED WORK	29
2.10	COMMITTED DEVELOPMENTS	29
2.11	ENVIRONMENT	30
2.12	STAKEHOLDER CONSULTATION	32
2.13	PROBLEM IDENTIFICATION	32
2.14	LONG LIST OF OPTIONS	34
3	TRANSPORT CASE	36
3.1	METHODOLOGY	36
3.2	STAGE ONE APPRAISAL	36
3.3	INDIVIDUAL OPTION SUMMARY	39
3.4	SUMMARY	44

4	FINANCIAL CASE	45
4.1	OVERVIEW	45
4.2	ASSESSMENT	45
5	COMMERCIAL CASE	46
5.1	OVERVIEW	46
5.2	ASSESSMENT	46
6	MANAGEMENT CASE	47
6.1	OVERVIEW	47
6.2	PROJECT PLANNING – GOVERNANCE, ORGANISATIONAL STRUCTURE	47
6.3	COMMUNICATIONS & STAKEHOLDER MANAGEMENT PLAN	47
7	SUMMARY AND NEXT STEPS	48
7.1	OVERVIEW	48
7.2	SHORT LIST OF MEASURES	48
7.3	NEXT STEPS	48

TABLES

Table 1 – Hafodyrynys Objective	6
Table 2 – The Well-being of Future Generations (Wales) Act Goals	9
Table 3 – Average Traffic Growth 2015-2016	11
Table 4 – ATC Count 3 - Volume Analysis	12
Table 5 – ATC Count 3 & 8 – Speed Analysis	14
Table 6 – A472 Peak Hour Flows	14
Table 7 – 7-Day Average Speeds	20
Table 8 – Breakdown of collisions between 2013 and 2017	24
Table 9 – Newbridge and Llanhilleth Train Times	25
Table 10 – Economic Inactivity (2017)	28
Table 11 – Employment & Unemployment	28
Table 12 – Gender and Age	29

Table 13 – B Baseline PCM Predicted Maximum NO ₂ Concentrations at the A472 – No interventions	30
Table 14 – Stakeholders	32
Table 15 – Problems Identified along the A472	33
Table 16 – Long List of Measures	34
Table 17 – Option Outcomes & Summary	37
Table 17 – Option Outcomes and Summary	39
Table 18 – Short Listed Measures	48

FIGURES

Figure 1 – Study Corridor	2
Figure 2 – Hafodyrynys Air Quality Management Area	3
Figure 3 – Non-Compliant Sites (Red – Welsh Government Sites, Blue – Local Authority Sites)	5
Figure 4 – A472/ B4471 Priority Junction	10
Figure 5 – AADF Counter on the A472	11
Figure 6 – ATC Count Locations	12
Figure 7 – Eastbound Daily Volume Count	13
Figure 8 – Westbound Daily Volume Count	13
Figure 9 – Split in Vehicle Class (Bi-directional)	14
Figure 10 – Split in Vehicle Class (eastbound)	15
Figure 11 – Split in Vehicle Class (westbound)	15
Figure 12 – AM Peak (07:45-08:45) at Crumlin Junction	16
Figure 13 – Inter-Peak (15:15 to 16.15) at Crumlin Junction	17
Figure 14 – PM Peak (16:30-17:30) at Crumlin Junction	18
Figure 15 – AM Peak (07:30 - 08.30) at A472/B4471 Swffryd Junction	19
Figure 16 – Inter-Peak (15:15 – 16:15) at A472/B4471 Swffryd Junction	19
Figure 17 – PM Peak (16:30-17:30) at A472/B4471 Swffryd Junction	20
Figure 18 – INRIX Eastbound Speed Analysis	21
Figure 19 – INRIX Westbound Speed Analysis	22
Figure 20 – A472 Bi-directional Speeds by Site (See Figure 5 for Site Locations)	23
Figure 21 – Collision Location Map	24
Figure 22 – Origin/Destination Data from Newbridge	26

Figure 23 – Origin/Destination Data from Cwmbran	27
Figure 24 – Woodside Terrace, Hafodyrynys Road, monitoring locations	31



Executive summary

The European Union Ambient Air Quality Directive (2008/50/EC) sets legally binding limits for concentrations of certain air pollutants in outdoor air, termed 'limit values'. The Directive requires that Member States report annually on air quality within zones designated under the Directive and, where the concentration of pollutants in air exceeds limit values, to develop air quality plans that set out measures in order to attain the limit values. The only limit values that the UK currently fails to meet are those set in respect of nitrogen dioxide (NO₂).

In July 2017, the UK Government published its Air Quality Plan (the 2017 Plan) for tackling roadside NO₂ concentrations. The 2017 Plan set out details of the authorities responsible for delivering air quality improvements including devolved administrations and Local Authorities.

Caerphilly County Borough Council (CCBC) is exploring additional measures which could be implemented on the A472 to bring forward compliance with NO₂ Limit Values in the shortest possible time. With no intervention, the expected compliance date on the A472 is 2029.

The objective of this study is to carry out an initial investigation and identify potential measures deliverable by CCBC which will assist in bringing forward reductions in NO₂ in the shortest possible time to ensure compliance with the Air Quality Framework Directive requirements along the A472. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

This WeITAG Stage One appraisal has been undertaken to achieve a reduction in NO₂ at Hafodyrynys. This WeITAG Stage One assessment considers a long list of 30 measures and appraised the measures based on their ability to meet the objective. In total, 10 measures have been shortlisted for a more detailed appraisal at Stage Two based on their 'effectiveness' at reducing NO₂, their timescales for implementation relative to the expected compliance data, and the feasibility of implementing the measure under the powers available to the highway Authority.

1 INTRODUCTION

1.1 CONTEXT

- 1.1.1 The European Union Ambient Air Quality Directive (2008/50/EC) sets legally binding limits for concentrations of certain air pollutants in outdoor air, termed 'limit values'. The Directive requires that Member States report annually on air quality within zones designated under the Directive and, where the concentration of pollutants in air exceeds limit values, to develop air quality plans that set out measures in order to attain the limit values. The only limit values that the UK currently fails to meet are those set in respect of nitrogen dioxide (NO₂). It should be noted that NO₂ is not only a compliance issue, but it is also a danger to public health.
- 1.1.2 In July 2017, the UK Government published its Air Quality Plan (the 2017 Plan) for tackling roadside NO₂ concentrations¹. The 2017 Plan set out details of the authorities responsible for delivering air quality improvements including devolved administrations and Local Authorities.
- 1.1.3 Wales is divided into 4 zones under the Directive, the Hafodyrynys study falls in to the non-agglomeration zone of south Wales:
- Two urban agglomeration zones (Cardiff and Swansea)
 - Two non-agglomeration zones (North Wales and South Wales)
- 1.1.4 Caerphilly County Borough Council (CCBC) is exploring additional measures which could be implemented on the A472 to bring forward compliance with NO₂ Limit Values in the shortest possible time.
- 1.1.5 The Welsh Transport Appraisal Guidance (WelTAG) provides a framework for appraising changes to the transport network. WSP and Ricardo have been commissioned to undertake WelTAG Stage One (Strategic Outline Case) and WelTAG Stage Two (Outline Business Case) of potential measures deliverable by CCBC for reducing NO₂ levels arising from traffic emissions at this location.
- 1.1.6 Where measures have been considered as not being deliverable by CCBC using its powers as Highway or Traffic Authority for the local road network, these will be considered further in the overarching Welsh Government appraisal which is independent of this study.

1.2 STUDY AREA

- 1.2.1 The study area has been selected based on data from an air pollution monitoring site which is part of the UK Automatic Urban and Rural Network (AURN). This monitor complies with requirements of the UK's EU Directive (2008/50/EC) to report on the concentrations of particular pollutants in the atmosphere.
- 1.2.2 The A472 study corridor has been assumed for the purposes of this WelTAG study but it is acknowledged that the measures and their subsequent impacts may be realised beyond the identified area with NO₂ exceedances.
- 1.2.3 Hafodyrynys is a small village community, which lies just inside the Caerphilly County Borough Council boundary between Crumlin and Pontypool on the A472. Woodside Terrace are the row of houses that are situated in the foot of a high sided valley on the southern side of the A472, between Crumlin junction and Hafodyrynys village. Woodside Terrace is a row of three storey terraced houses with entrances to the first floor from street level and a large supporting wall on the north side. On top of the north side supporting wall there is a mixture of two storey semi-detached and detached housing. The A472 is part of the strategic highway network and is a major commuter and cross-country freight route where traffic is known to become congested along Woodside Terrace, especially during the AM peak.
- 1.2.4 The A472 study corridor is located between the signal controlled junction with the A467 in Crumlin (west) and Hafodyrynys village (east), a distance of approximately 1.6km. Over this route there is a considerable increase in elevation (approximately 97m). The study corridor is illustrated in Figure 1.

¹ UK plan for tackling roadside nitrogen dioxide concentrations; Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf - Accessed 10th November 2017

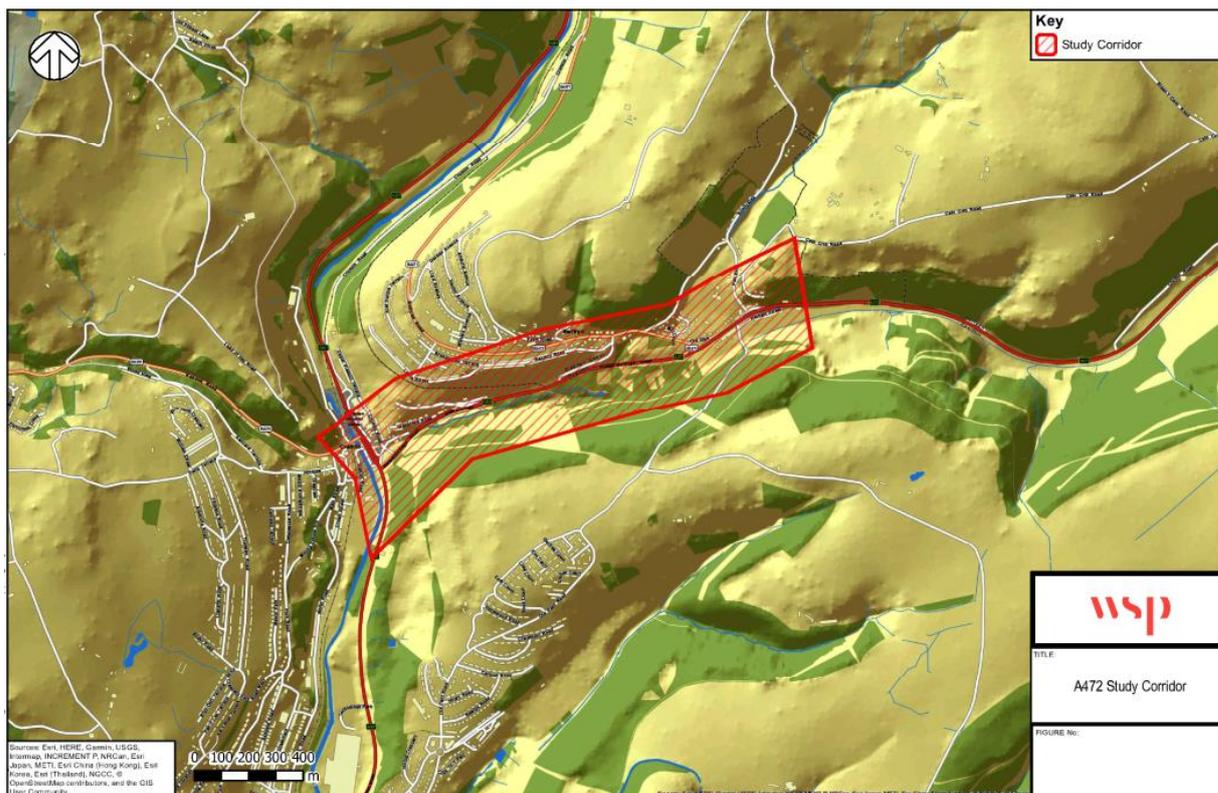


Figure 1 – Study Corridor

- 1.2.5 CCBC designated Hafodyrynys Road (A472) as an Air Quality Management Area (AQMA) in November 2013. The AQMA encompasses Woodside Terrace, those properties that front on to the Hafodyrynys Road.
- 1.2.6 CCBC’s 2017 Air Quality Progress Report details the results of the continuous analyser at Hafodyrynys Road. The measured annual mean for nitrogen dioxide at this site was $69\mu\text{g}/\text{m}^3$ with a data capture rate of 93.3% for 2016. In relation to the hourly mean, there were 122 exceedances recorded over 71 days resulting in an exceedance of both the annual and hourly averages of the air quality objective. Similar levels were measured in 2017 with the annual mean of $70\mu\text{g}/\text{m}^3$, data capture 99% and 132 exceedances of the hourly limit value. The location of the Hafodyrynys road AQMA is illustrated in Figure 2.



Figure 2 – Hafodyrynys Air Quality Management Area

- 1.2.7 Caerphilly Local Development Plan (LDP) acknowledges that improvements to the transport infrastructure must proceed in parallel with development if severe traffic congestion is to be avoided in Caerphilly County Borough. Good transport infrastructure is a key contributor to a successful and clean county; therefore, any proposed schemes should look to contribute to an improvement in air quality.
- 1.2.8 This report presents the Stage One: Strategic Outline Case of the WelTAG process for reducing the levels of NO₂ at Hafodyrynys Road (between Crumlin town and Hafodyrynys village) through potential measures deliverable by CCBC.

1.3 APPROACH

- 1.3.1 WelTAG is the Welsh Transport Appraisal Guidance and provides a framework for appraising changes to the transport network. The latest version of this guidance (WelTAG 2017²) has been used as the basis for this appraisal. As well as embedding the Well-being of Future Generations (Wales) Act 2015, WelTAG combines the principles of the HM Treasury Green Book and the Five Case Model for Better Business Cases, with WebTAG best practice for transport appraisal. The process covers the complete lifecycle of a proposed intervention, from problem identification to scheme design, and implementation and evaluation.
- 1.3.2 The contents of each Stage Report should follow the structure of the Five Cases Model used by the Welsh Government and HM Treasury. The Five Cases, as applied to transport appraisal, are summarised as follows:
- **Strategic case:** the case for change, fit with policies and well-being objectives
 - **Transport case:** does the proposal offer good public value for money and maximise contribution to the well-being goals?
 - **Financial case:** is the proposed spend affordable?
 - **Commercial case:** how can the scheme be procured? Is it commercially viable?
 - **Management case:** is the scheme achievable? Can it be delivered?
- 1.3.3 The WelTAG guidance states that the purpose of the Stage One: Strategic Outline Case is to:
- ‘understand the issues of concern, explore the context and to present a wide list of possible solutions, sufficient to be able to decide whether there are any solutions within the transport sector that are worth pursuing and to select a short list of options (measures) for more detailed consideration ‘*
- 1.3.4 As such, this Stage One: Strategic Outline Case report:
- Identifies the issues that need addressing supported by evidence;
 - Establishes the objective;
 - Identifies a list of possible measures;
 - Assesses a list of possible measures against the objective; and
 - Selects a short list of measures to take forward to the next stage.
- 1.3.5 Whilst WelTAG provides a fixed framework for appraisal, the guidance acknowledges that the level of detail provided in the WelTAG reports should be proportionate to the impacts under consideration. All major impacts and issues that could have a significant influence on delivery should be presented, but the level of detail in any analytical work should be proportionate to the scale and significance of the impact and sufficiently accurate for the decisions that need to be made.
- 1.3.6 This work will align closely with work recently undertaken by WSP on behalf of Welsh Government (WG), to identify measures to reduce NO₂ at five locations on the Welsh trunk road and motorway network. For context, Cardiff City Council are also appraising measures to reduce NO₂ levels in locations where there are exceedances on their network. The locations of the non-compliant sites across Wales are presented in Figure 3. The Welsh Government sites are indicated in red and Local Authority sites in blue.
- 1.3.7 The objective of this study is to **carry out an initial investigation and identify potential measures deliverable by CCBC which will assist in bringing forward reductions in NO₂ in the shortest possible time to ensure compliance with the Air Quality Framework Directive requirements along the A472. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.**

² Source: <https://beta.gov.wales/sites/default/files/publications/2017-12/welsh-transport-appraisal-guidance.pdf>
 Accessed February 2018



Figure 3 – Non-Compliant Sites (Red – Welsh Government Sites, Blue – Local Authority Sites)

1.4 STUDY OBJECTIVE

1.4.1 The study objective has been derived from key issues, constraints, and transport specific objectives relating to air quality as set by CCBC. Developing options that will address this objective will ensure that this study contributes to the strategic priorities of CCBC, and Welsh Government including that of the Well-being of Future Generations (Wales) Act 2015.

1.4.2 The WelTAG guidance states that:

“Under the Act, each public body must work to improve the four aspects of well-being in Wales: **economic, social, environmental** and **cultural**. To do this they must set and publish well-being objectives designed to maximise their contribution to each of the well-being goals.”

1.4.3 The objective for the study is outlined in Table 1.

Table 1 – Hafodyrynys Objective

Well-Being of Future Generations Goal	Objective
A Prosperous Wales & A Wales of Cohesive Communities	<i>To carry out an initial investigation into interventions which will assist in bringing forward reductions in NO₂ in the shortest possible time, to ensure compliance with the Air Quality Framework Directive (2008/50/EC) requirements on the A472 at Hafodyrynys Carriageway</i>
A Resilient Wales	
A Healthier Wales	
A More Equal Wales & A Wales of Vibrant Culture and Thriving Welsh Language	
A Globally Responsible Wales	

1.4.4 In addition to the overall objective in Table 1, there is also a secondary criterion that the options must meet. The following key criteria were described in the Project Brief for the high-level appraisal of the potential measures:

- Effectiveness
- Timescales
- Feasibility

1.4.5 This has been interpreted for the purposes of this appraisal as meaning:

- **Effectiveness** – Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m³ legal limit
- **Timescales** – Can the measure be implemented within timescales that are meaningful (short enough) to have an impact on bringing forward the projected compliance date
- **Feasibility/Deliverability** – Can the measure be delivered in the location involved with the powers available to the Local Authority

1.4.6 For the purpose of this appraisal, the phrase deliverability has been used, instead of feasibility to match more clearly the requirements of WelTAG for delivery.

1.4.7 The Stage One appraisal has focused on these three key criteria.

1.5 REPORT STRUCTURE

1.5.1 The structure of this Stage One report is as follows:

Chapter 2: Strategic case

This chapter presents a baseline of the existing situation, including an overview of legislation and policies and a description of the current EU Limit Value compliance status. It outlines the objective and the EU Air Quality Directive and includes an evidence-based description of the current problem. A brief commentary is provided regarding the development of the long list of measures and how they plan to address the current problem. Information is provided on how the Goals, Objectives and Ways of Working have been considered.



Chapter 3: Transport case

This chapter provides a summary of the appraisal against the objective through consideration of the key criteria. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

Chapter 4: Financial case

This chapter provides a high-level analysis of potential funding mechanisms for delivery.

Chapter 5: Commercial case

This chapter includes a description as to whether the measures are commercially viable and provides an analysis as to whether measures could be packaged together for a phased delivery.

Chapter 6: Management case

This chapter identifies the WelTAG Review Group and the delivery arrangements of any potential measures.

- 1.5.2 The conclusions of this Stage One report include a short list of potential measures deliverable by CCBC to be taken forward to Stage Two (the Outline Business Case), based on their ability to solve the problem and their fit with the objective.

2 STRATEGIC CASE

2.1 CASE FOR CHANGE

2.1.1 LEGISLATIVE AND POLICY CONTEXT

2.1.2 This section provides a brief summary of relevant legislation, policies and plans that are pertinent to the Hafodyrynys WelTAG Stage One appraisal. There are a number of overarching policies that set the context for the study, and those set out below have been used to assess against any potential measures deliverable by CCBC for reducing NO₂ levels along the corridor.

2.1.3 UK and Welsh policies shape and guide respective national, regional and local plans and policies. Reference is made to them as appropriate.

UK and Welsh Legislation and Policy Summary

2.1.4 The requirements of the EU Ambient Air Quality Directive are transcribed into Welsh legislation via the Air Quality Standards (Wales) Regulations 2010 (Welsh Statutory Instrument No 1433 (W.126)). The regulations designate Welsh Ministers as the competent authority for the purposes of the Directive and place duties on Welsh Ministers to draw up and implement air quality plans in relation to achieving the Directive limit values where they are currently exceeded. The latest overarching UK plan for tackling roadside nitrogen dioxide concentrations was published in July 2017³, including zone plans for all four Welsh zones⁴.

2.1.5 National policies highlight commitment within the UK to reduce the amount of airborne pollutants, with the 1995 Environment Act making air quality management a statutory requirement for all local authorities. Thereafter, air quality has been monitored annually with Air Quality Management Areas (AQMAs) being designated and action plans are developed where standards fall below the limits set by the Environment Act and the Air Quality (Wales) Regulations in pursuit of improved air quality. The Environment (Wales) Act 2016 imposes various duties in relation to the sustainable management of natural resources, including the air.

2.1.6 In Wales, national planning policy is comprised of Planning Policy Wales (PPW), Technical Advice Notes (TANs), circulars and policy clarification letters. PPW states “Development plan policies and decisions on planning applications should take into account national air quality objectives, EU limit and target values”. The Local Air Quality Management (LAQM) Policy Guidance in Wales provides guidance for local authorities on how to meet the statutory objectives set within the UK legislation.

2.1.7 Air quality related commitments are included in a number of policy documents, such as The Wales Transport Strategy (which is currently under review and will be published in draft for consultation during 2018), and the National Transport Finance Plan which are designed to promote a shift to more sustainable methods of transport such as walking and cycling and integrated public transport; and supporting highway schemes that are designed to reduce traffic congestion.

2.1.8 The Well-being of Future Generations (Wales) Act strives to improve the social, economic, environmental and cultural well-being of Wales. Its goals, as summarised in The Essentials of the Act⁵, are as follows:

³ Available at <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>

⁴ Available at <https://uk-air.defra.gov.uk/library/no2ten/2017-zone-plan-documents>

⁵ Available at: <https://futuregenerations.wales/wp-content/uploads/2017/01/150623-guide-to-the-fg-act-en.pdf> - Accessed 8th January 2018

Table 2 – The Well-being of Future Generations (Wales) Act Goals

Goal	Description of the goal
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.
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).
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.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio economic background and circumstances).
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
A Wales of vibrant culture and thriving Welsh language	A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.
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.

2.1.9 In addition to the national policy and guidance outlined above, the following documents have also been used to inform the study;

- Taking Wales Forward 2016
- Prosperity for all 2017
- One Wales: One Planet (2009)
- One Wales: Connecting the Nation – The Wales Transport Strategy (WTS) (2008)
- Welsh WFGA National Indicators
- WFGA WG Objectives (November 2017)
- Planning (Wales) Act (2015)
- Highways Act 1980

Regional Summary

2.1.10 The South-East Wales Valleys Local Transport Plan 2015 (LTP) looks to create a sustainable, reliable, efficient and quality integrated transport network across the region. Their vision is for “a modern, accessible, integrated and sustainable transport system for the SE Wales Valleys and beyond which increases opportunity, promotes prosperity for all and protects the environment; where walking, cycling, public transport and sustainable freight provide real travel alternatives.”

2.1.11 The LTP acknowledges that transport is a major source of pollution that can impact on public health and welfare, with 14 Air Quality Management Areas (AQMAs) declared across the SE Wales Valleys area for levels of nitrogen dioxide (NO₂). Traffic is identified as the main source of NO₂. Recognising this, the LTP identified high level measures, such as improvements at key locations on the highway network, as well as schemes, such as Park and Ride, to achieve a reduction in NO₂.

2.2 INFRASTRUCTURE AND LOCAL FACILITIES

- 2.2.1 The A472 has an approximate east to west alignment between Crumlin and Pontypool and is roughly 7.4km in length. The A472 between Crumlin and Pontypool is a single carriageway until it reaches the A4042/A472 roundabout in Pontypool where it becomes 2 lane all-purpose dual carriageway (D2AP) that is divided by a central reservation for approximately 1.6km. After the A472/A4043 roundabout at West Mon Comprehensive School Playing Fields the carriageway (part of the strategic road network) becomes a single lane carriageway once again.
- 2.2.2 This dualled section of the A472 is subject to a 50mph speed limit, until the A472/A4043 roundabout where the speed limit reduces to 40mph. Approximately 1.1km west of the A472/A4043 roundabout the speed limit increases from a 40mph speed limit to a national speed limit (60mph) in a westbound direction. The speed limit reduces from a national speed limit (60mph) to 30mph approximately 300m east of Hafodyrynys village. Similarly, the speed limit returns to a national speed limit (60mph) approximately 300m west of Hafodyrynys village until vehicles approach Crumlin where the speed limit reduces to 30mph once again. From Crumlin to Hafodyrynys village there is provision for approximately 700m of climbing lane for eastbound flows.
- 2.2.3 To the west of the study route, the A472 forms a signalised priority junction with the A467 (main arm). Junction improvements were made in 2016, and the following layout exists. The A467 southern arm of the priority junction provides four lanes for northbound and eastbound movements (two lanes for each direction). The A467 northern arm of the priority junction provides three lanes for southbound (two lanes) and westbound (one lane) movements. The A472 minor arm of the priority junction also provides three lanes, two northbound (right turn) lanes and a single southbound (left turn) lane. Appendix A shows the junction improvements.
- 2.2.4 Immediately west of Hafodyrynys village is the A472/ B4471 priority junction. Figure 4 shows the junction arrangements and layout.



Figure 4 – A472/ B4471 Priority Junction

- 2.2.5 The infrastructure, including structures and junctions, on the A472 study corridor from west to east is summarised as follows:
- Central reservation between the A4042/A472 and A472/A4043 roundabout
 - A472 bypass over Rockhill Road
 - Footbridge over the A472, approximately 260m east of the A472/A4043 roundabout

- Footbridge over the A472, approximately 45m east of the A472/A4043 roundabout
- Speed camera approximately 70m east of the A472 priority junction with Capitol Hire Taxis
- Pelican crossing in Hafodyrynys village with traffic calming in the form of a speed bumps either side
- 2+1 climbing lane from Crumlin to Hafodyrynys village
- Street lighting throughout
- 13 laybys
- 8% gradient for vehicles travelling westbound from Hafodyrynys village to Crumlin

2.2.6 The A472 study corridor is in a reasonably rural area, transecting through the single village of Hafodyrynys and connects Crumlin with Pontypool. However, the corridor serves a much wider area as part of the strategic highway network.

2.3 TRAFFIC FLOWS

2.3.1 Annual Average Daily Flows (AADF) have been extracted from the Department for Transport (DfT). A count point (ID: 78422) is located on the A472 (shown in Figure 5), east of its priority junction with Gladstone Road. AADF along the study corridor in 2016 were estimated as 21,696 from previous DfT counts.



Figure 5 – AADF Counter on the A472

2.3.2 Whilst comparing the latest traffic data from 2015 and 2016 at count point 78422 it is evident that there has been a 3% increase in traffic over the year as shown in Table 3.

Table 3 – Average Traffic Growth 2015-2016

AADF No. 78422 Percentage Change	7 Day Average Two-way AADF - All vehicles	
2012	19,619	-
2013	19,631	0%
2014	20,207	3%
2015	21,017	4%
2016	21,696	3%
TEMPro 2028 - 1.0963	23,785	10%

2.3.3 Automatic Traffic Counters (ATC) were commissioned at 10 locations on the A472, from Crumlin to Hafodyrynys village, as shown in Figure 6. The ATC data was collected over a four-week period from 09.05.18 to 05.06.18.



Figure 6 – ATC Count Locations

2.3.4 The weekday average total traffic and 7-day average traffic have also been analysed using the ATCs undertaken at Count 3 on the A472.

2.3.5 Table 4 shows that the combined weekday average total traffic is larger than the 7-day average traffic during the week commencing 16th May 2018. This is also representative on both eastbound and westbound flows.

Table 4 – ATC Count 3 - Volume Analysis

Direction	Weekday Average Total Traffic (AAWT)	7-Day Average Traffic (AADT)
Eastbound	11,501	10,293
Westbound	11,756	10,579
Combined	23,257	20,872

2.3.6 The data shown in Table 4 is illustrated in Figure 7 and Figure 8.

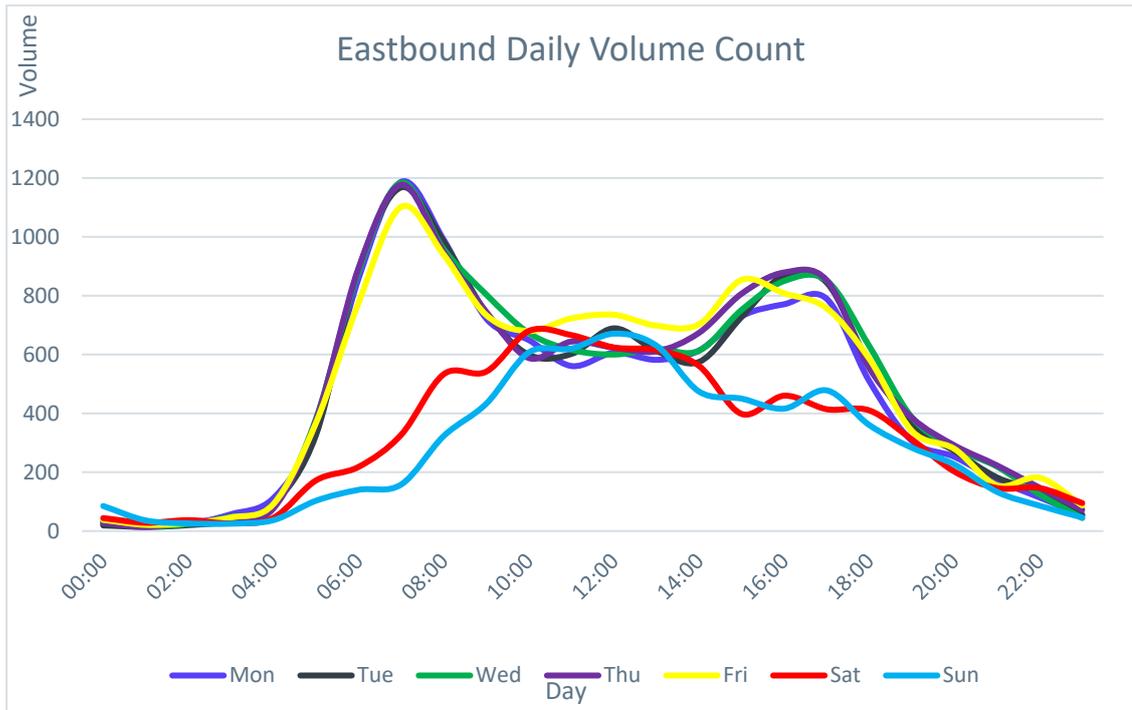


Figure 7 – Eastbound Daily Volume Count

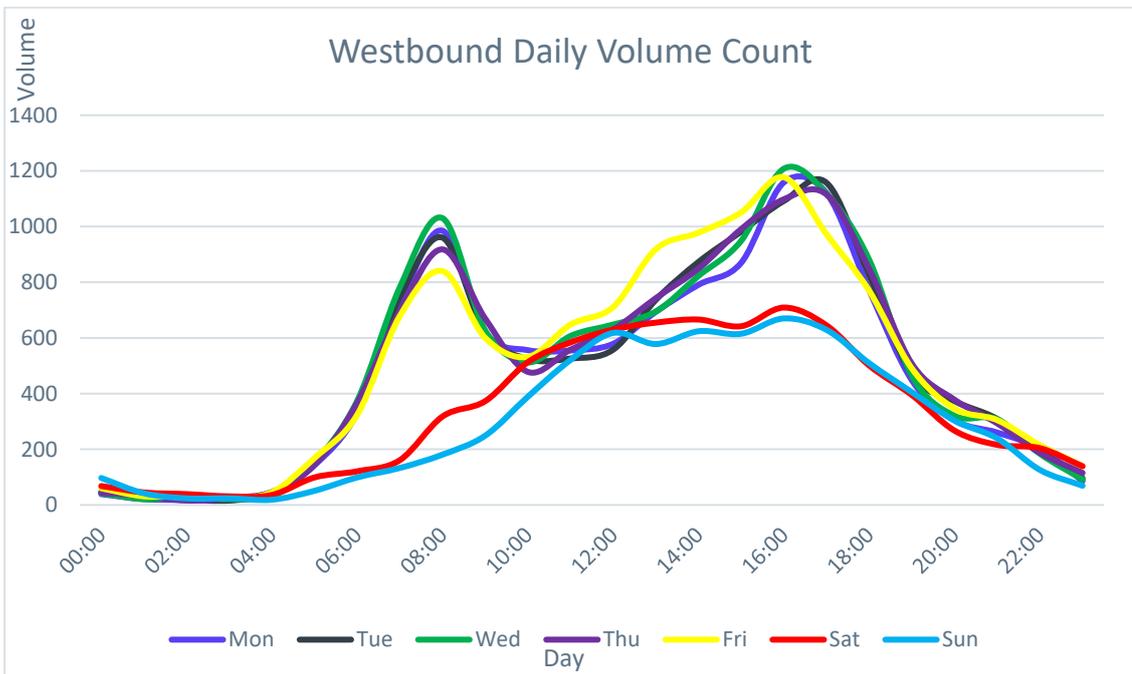


Figure 8 – Westbound Daily Volume Count

2.3.7 Table 5 shows that the 7-day average speed at ATC Count 3, compared to Count 8 (close to the A472/B4471 priority junction). The speed limit at this location is 30mph. The results show that at Count 3 speeds are higher in an eastbound direction by 4mph. This could be due to vehicles accelerating on the uphill gradient, compared to westbound vehicles braking downhill. The highest speeds at Count 8 are reversed, with the highest speeds travelling in a westbound direction, again by 4mph. The slower speed for eastbound vehicles at ATC Count 8 could be due to the congestion issues that are experienced at the A472/B4471 priority junction. Speeds are slight higher (1mph) at ATC Count 3 than 8.

Table 5 – ATC Count 3 & 8 – Speed Analysis

Direction	ATC Count 3	ATC Count 8
	7-Day Average Speed (mph)	
Eastbound	33	28
Westbound	29	32
Combined	31	30

2.3.8 The peak hours and their associated flows have been extracted from the ATC analysis and are presented in Table 6. The flows were taken from the four weeks of weekday data obtained and averaged.

Table 6 – A472 Peak Hour Flows

	AM Peak 07:45-08:45	Inter Peak 15:00-16:00	PM Peak 16:30-17:30
Two Way Flows	1,851	1,616	1,909

2.3.9 The percentage of the combined Heavy Goods Vehicles (HGVs) and Large Goods Vehicles (LGV) along the study corridor (in both directions) can be seen in Figure 9. It should be noted that the percentages have been rounded, resulting in totals falling below 100%. The largest percentage of HGV and LGV compared to the total flow occurs during the Inter Peak (10%). The average HGV and LGV percentage over 24 hours is also 10%.

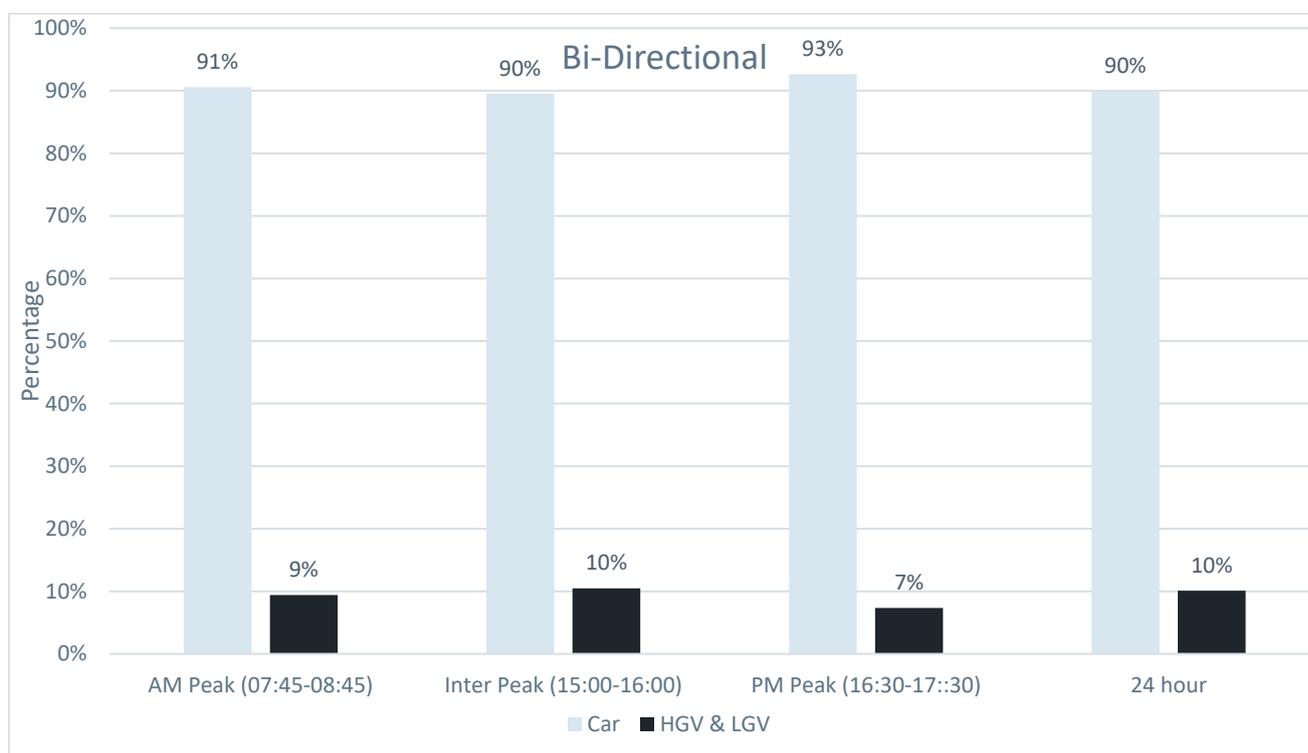


Figure 9 – Split in Vehicle Class (Bi-directional)

2.3.10 Figure 10 shows that the eastbound flows are comparative to those in both directions. However, the volume of HGVs and LGVs is slightly lower during the PM peak.

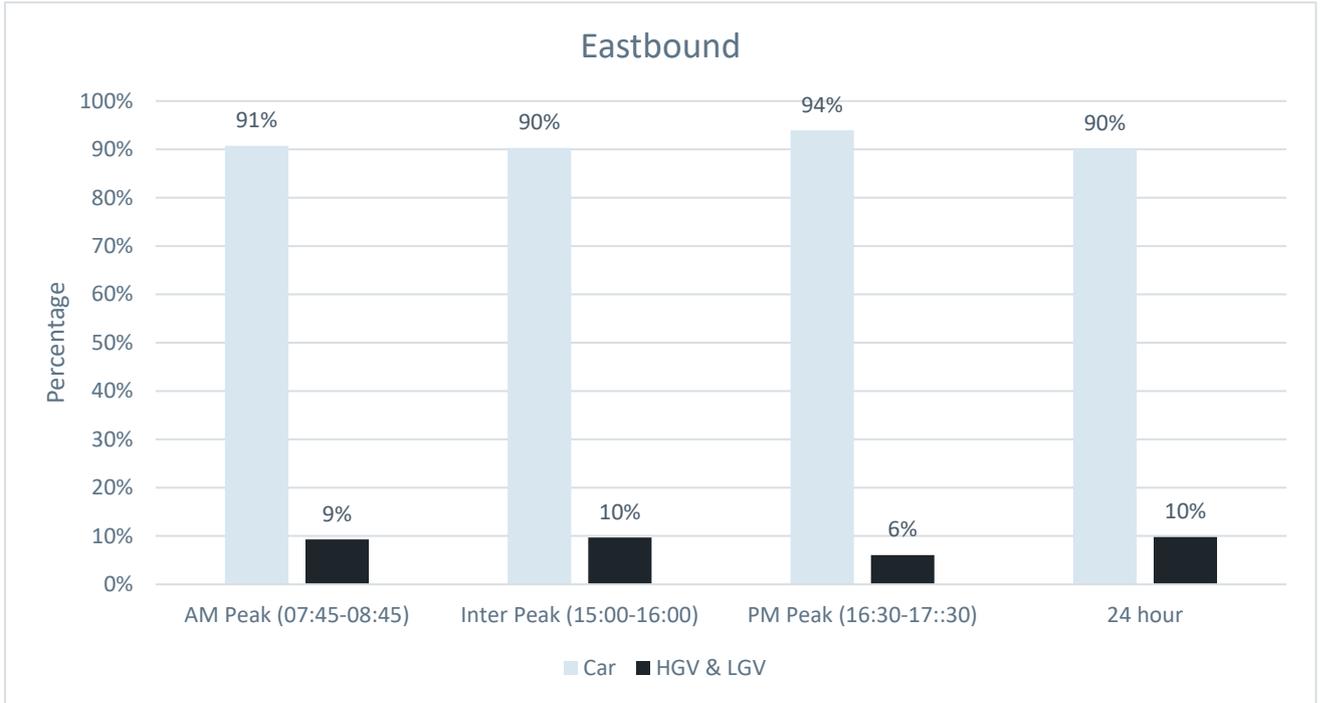


Figure 10 – Split in Vehicle Class (eastbound)

2.3.11 The westbound flows show a similar percentage of HGVs and LGVs as both the bi-directional and eastbound results, as shown in Figure 11. The volume of HGVs and LGVs are greater in the PM peak than the eastbound flow.

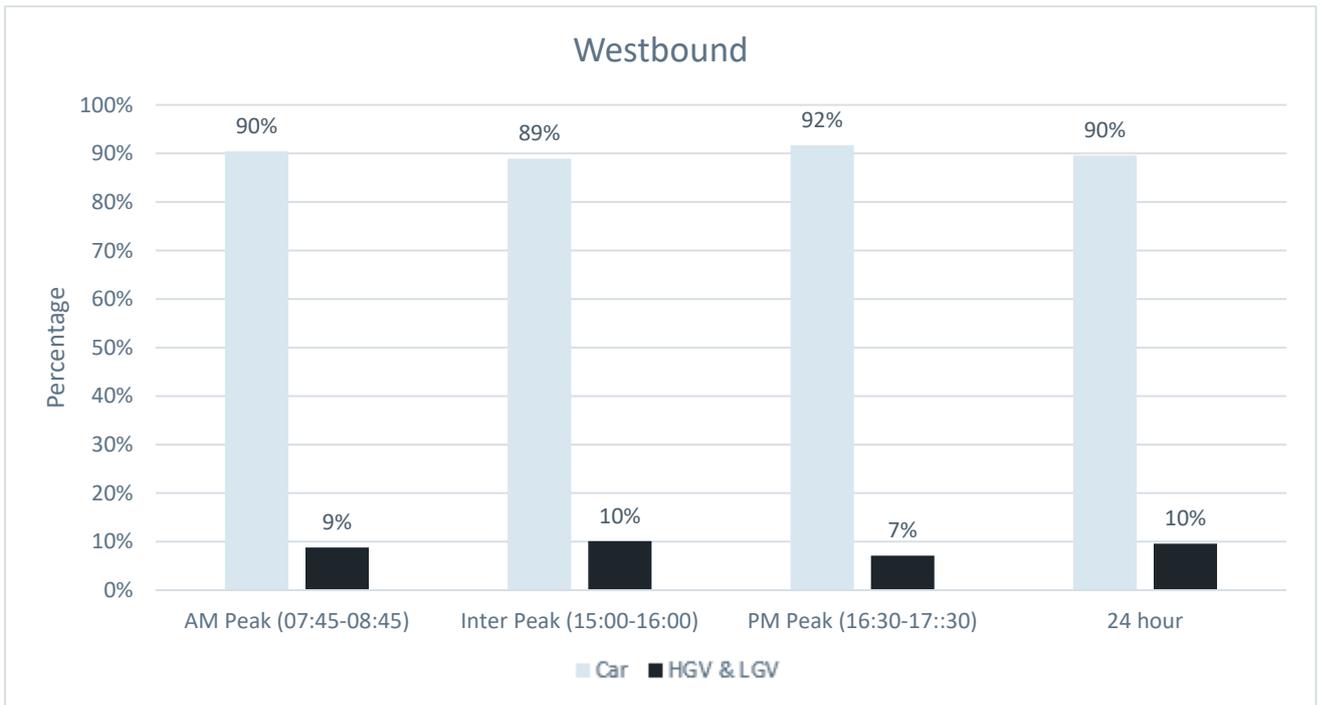


Figure 11 – Split in Vehicle Class (westbound)

2.3.12 In addition to the ATC counts undertaken on the A472, there have also been junction turning counts undertaken at Crumlin junction and on the A472/B4471 priority junction. See below for turning counts during their respective AM, Inter and PM peaks. The survey date chosen for the below data is 09th May 2018, a neutral Weekday (Wednesday). The peak hours are the junctions actual busiest period, as opposed to the combined ATC peak hour discussed above.



Figure 12 – AM Peak (07:45-08:45) at Crumlin Junction

- 2.3.13 Figure 12 shows that arm B (A472) has the highest origin demand during the AM peak, with 1125 vehicles. Arm B is also the arm with the highest demand as a destination arm, with 1086 vehicles turning into the junction.
- 2.3.14 The quietest arm during the AM peak is arm D (B4251), as both an origin (586 vehicles) and destination (622 vehicles) arm.



Figure 13 – Inter-Peak (15:15 to 16.15) at Crumlin Junction

- 2.3.15 Figure 13 shows the arm with the highest origin demand during the Inter-Peak is arm B (A472), with 966 vehicles. Arm C (A467 south) is the arm with the highest demand as a destination arm, with 913 vehicles turning into the junction.
- 2.3.16 The quietest arm during the Inter-Peak is arm D (B4251), as both an origin (511 vehicles) and destination (487 vehicles) arm.

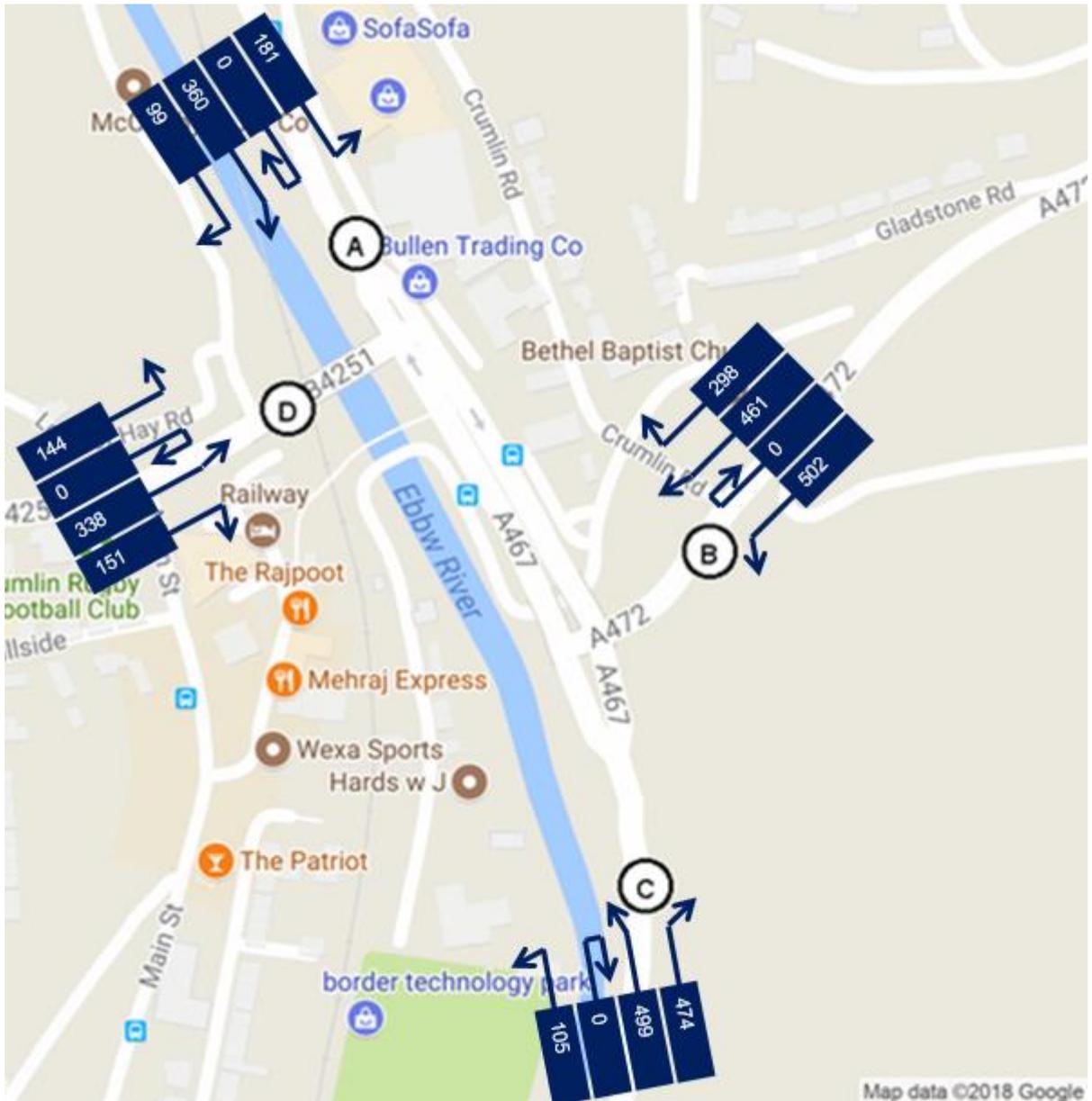


Figure 14 – PM Peak (16:30-17:30) at Crumlin Junction

- 2.3.17 Figure 14 shows the arm with the highest origin demand during the PM peak is arm B (A472), with 1261 vehicles. Arm C (A467 south) is the arm in the highest demand as a destination arm, with 1013 vehicles turning into the junction.
- 2.3.18 The quietest arm during the PM peak is arm D (B4251), as both an origin (633 vehicles) and destination (665 vehicles) arm.

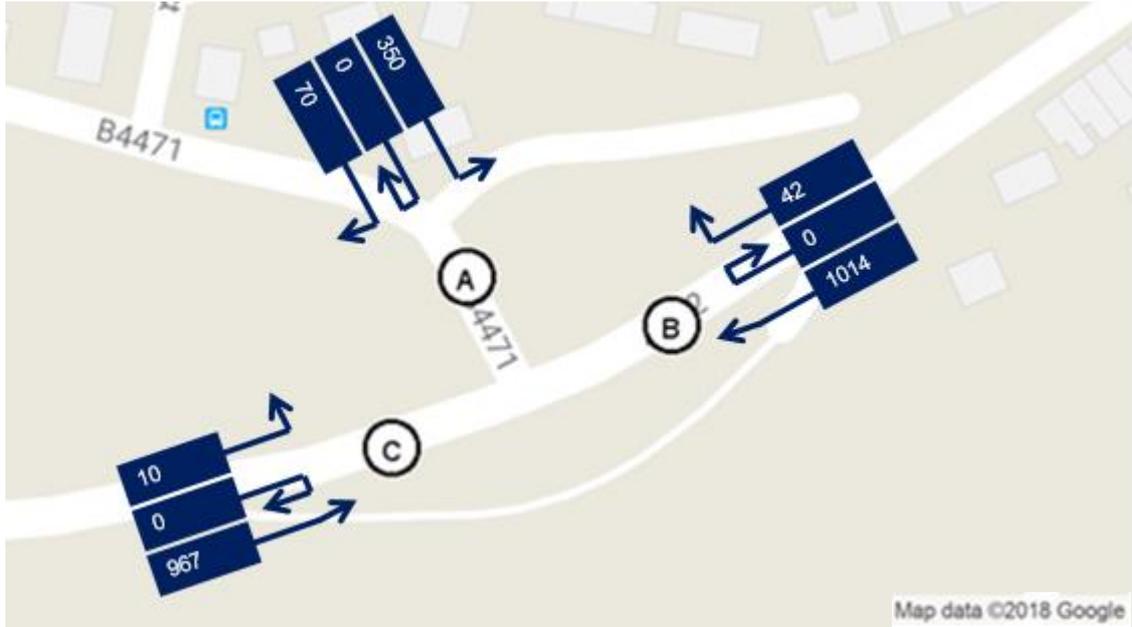


Figure 15 – AM Peak (07:30 - 08.30) at A472/B4471 Swffryd Junction

- 2.3.19 Figure 15 shows the arm with the highest origin demand during the AM peak is arm B (A472 east), with 1056 vehicles. Arm B (A472 east) is also the arm with the highest demand as a destination arm, with 1317 vehicles passing through the arm.
- 2.3.20 The quietest arm during the AM peak is arm A (B4471), as both an origin (420 vehicles) and destination (52 vehicles) arm.

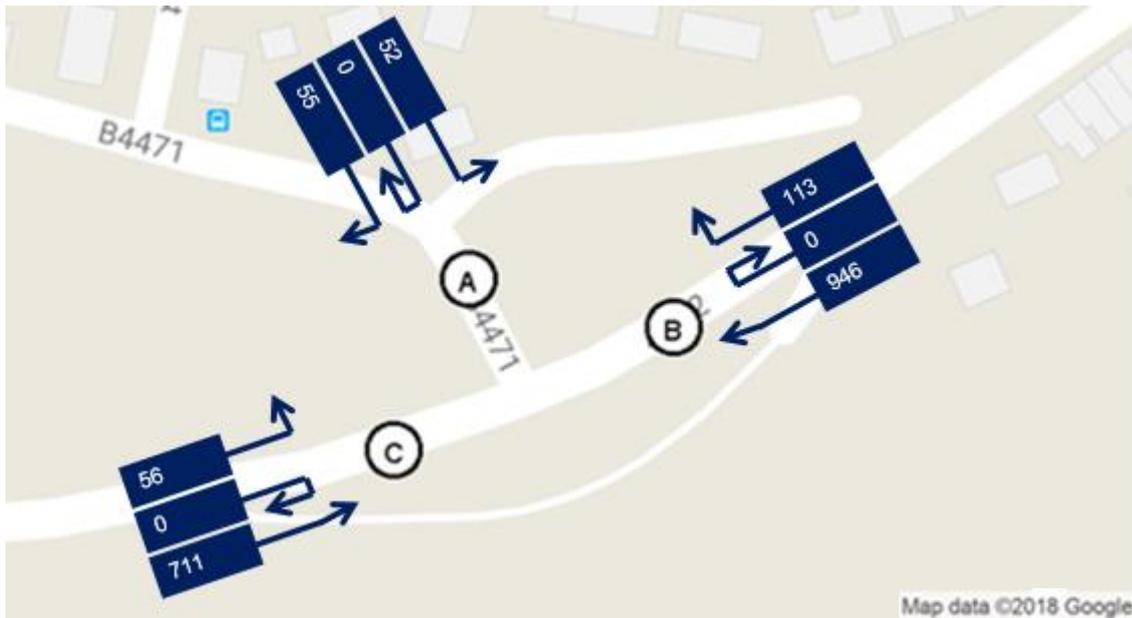


Figure 16 – Inter-Peak (15:15 - 16:15) at A472/B4471 Swffryd Junction

- 2.3.21 Figure 16 shows the arm with the highest origin demand during the Inter-Peak is arm B (A472 east), with 1059 vehicles. Arm C (A472 west) is the arm with the highest demand as a destination arm, with 1001 vehicles passing through the arm.
- 2.3.22 The quietest arm during the Inter-Peak is arm A (B4471), as both an origin (107 vehicles) and destination (169 vehicles) arm.

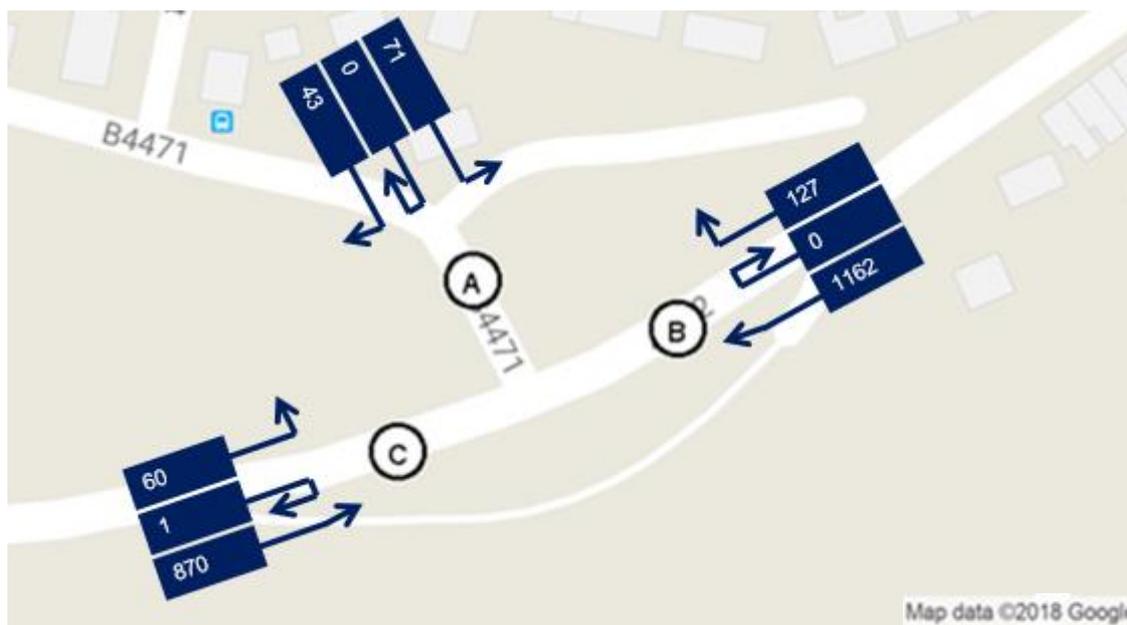


Figure 17 – PM Peak (16:30-17:30) at A472/B4471 Swffryd Junction

2.3.23 Figure 17 shows the arm with the highest origin demand during the PM peak is arm B (A472 east), with 1289 vehicles. Arm C (A472 west) is the arm with the highest demand as a destination arm, with 1206 vehicles passing through the arm. The quietest arm during the PM peak is arm A (B4471), as both an origin (114 vehicles) and destination (187 vehicles) arm.

2.4 JOURNEY TIME & RELIABILITY

2.4.1 The 85th percentile speeds at Count 3 have been used as a comparison to INRIX data that has also been used to analyse the traffic speeds. The ATC Count 3 has been recorded during the week commencing 16th May 2018. The 7-day 85th percentile speeds at this location is 40mph for eastbound flows and 35mph for westbound flows. Table 7 below shows the percentage of vehicles that are travelling over the Posted Speed Limit (PSL).

Table 7 – 7-Day Average Speeds

Eastbound	68%	38%	5%
Westbound	41%	23%	1%
Combined	54%	25%	3%
	of vehicles are travelling over PSL	of vehicles are traveling 10% +2 over PSL (35mph)	of vehicles are 15mph over PSL (45mph)

2.4.2 INRIX software has been used to analyse the difference in annual average weekday vehicle speeds during the 24-hour day for eastbound and westbound flow. The INRIX data uses the section A472 between the A472/A467 and A472/B4471 priority junctions as it's study area.

2.4.3 The INRIX data shown in Figure 18 demonstrates a clear rise in speed between 02:00 and 06:00 for eastbound flows and a drop-in speed from approximately 06:00 until 10:00. The eastbound speeds drop to approximately 30kph (19mph) during the AM peak and level back to approximately 50kph (31mph) for the remainder of the day.

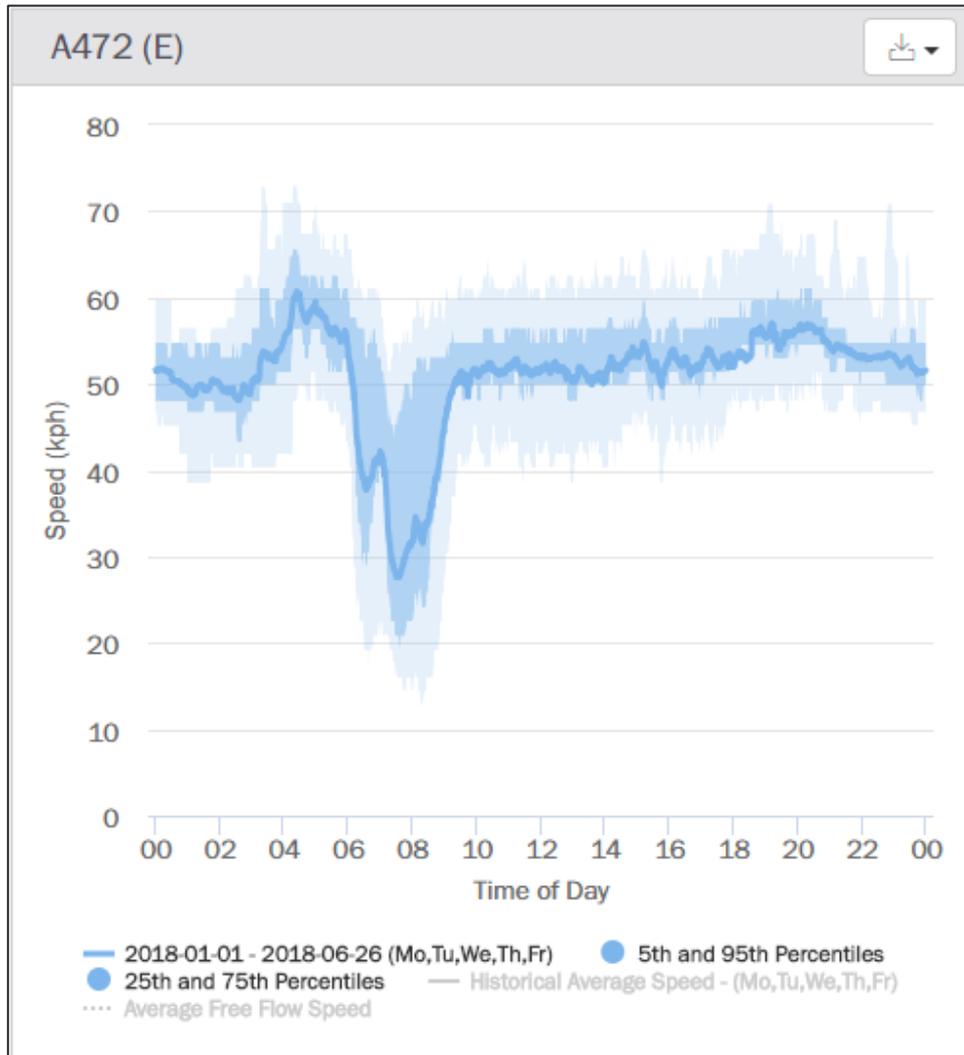


Figure 18 – INRIX Eastbound Speed Analysis

2.4.4 Figure 19 demonstrates that the westbound speeds have two slight declines which coincide with the peak hours of 07:45-08:45 and 16:30-17:30. The speed during these peak hours falls to approximately 40kph (25mph) before returning to speeds of between 45kph-55kph (28mph-34mph).

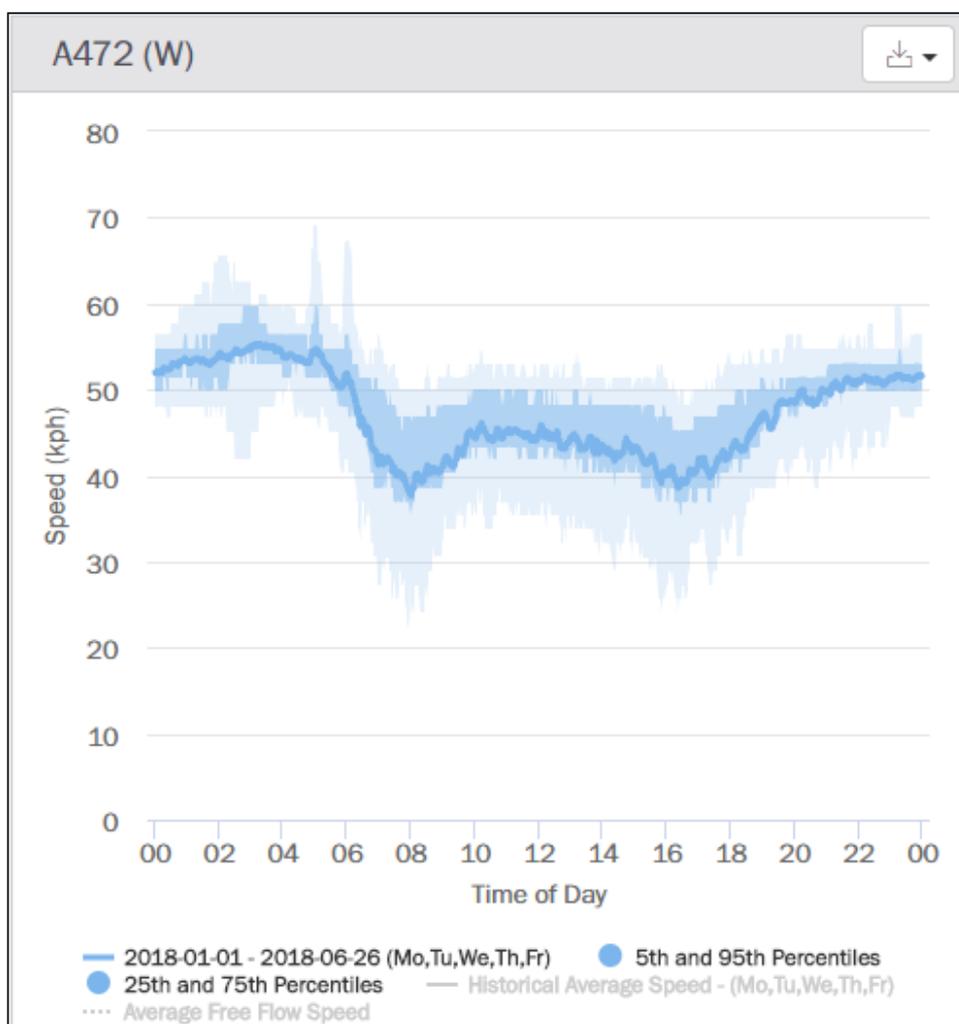


Figure 19 – INRIX Westbound Speed Analysis

- 2.4.5 In addition to INRIX data that shows details of speeds over the study route from Crumlin to Hafodyrynys village, speed analysis has also been undertaken over 10 sites using ATC counts over a 12-hour period (07:00 - 19:00), as shown in Figure 20.
- 2.4.6 Generally, Figure 20 shows that eastbound speeds are greater than westbound during the first 6 sites with the exception of site 2 (as shown in Figure 5). This may be a result of westbound flows breaking downhill due to the 8% gradient and eastbound flows accelerating uphill and utilising the climbing lane.
- 2.4.7 Sites 7 to 10 then reverse and the westbound speeds become the greater of the two. From local knowledge and site visits, it is clear that eastbound vehicles are subject to delays on approach to the A472/B4471 priority junction. This reflects the data shown in Figure 20, with speeds dropping to approximately 27mph at Sites 8 and 9.

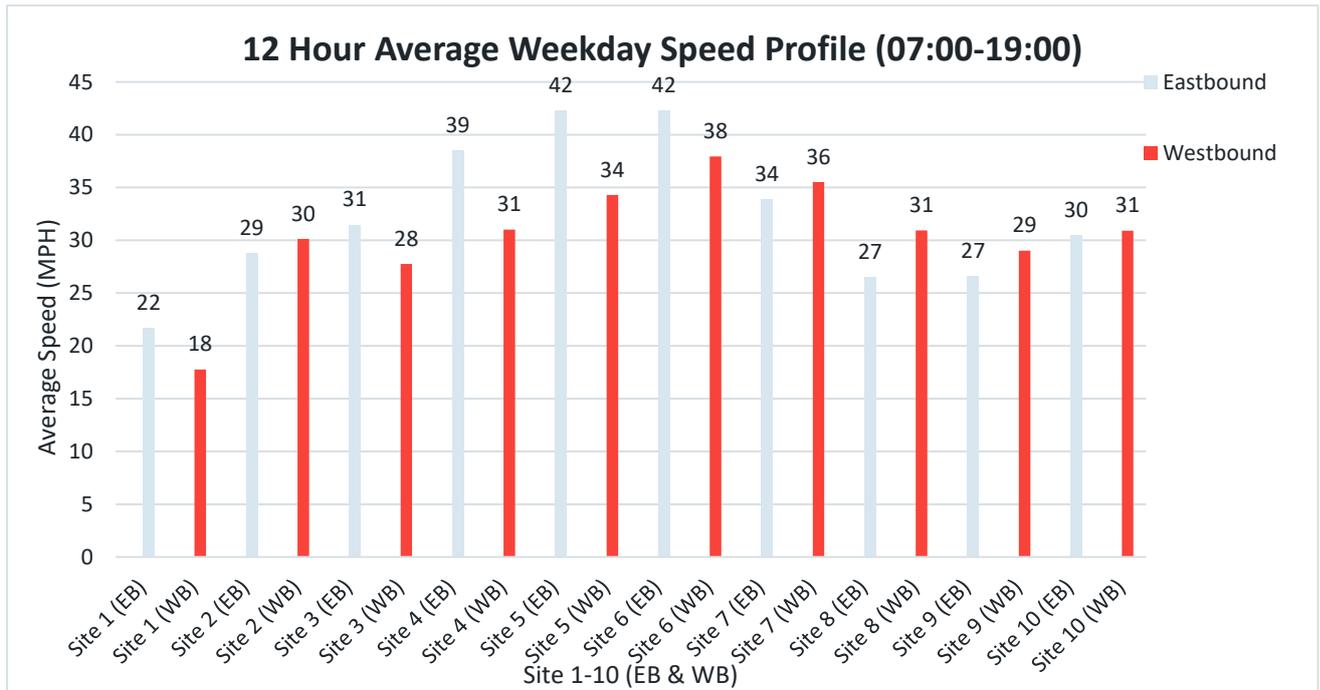


Figure 20 – A472 Bi-directional Speeds by Site (See Figure 5 for Site Locations)

- 2.4.8 As presented by the INRIX and ATC data, the evidence suggests that there is localised congestion, particularly for eastbound AM flows. However, reduced speeds are evident for westbound flows too.
- 2.4.9 The survey undertaken on the A472 also captured queue data along the route on the 09th May 2018. The following section identifies queues at Crumlin junction and the A472/B4471 priority junction. The queue data is limited up to 500m on all arms.
- Crumlin junction**
- 2.4.10 Crumlin junction experiences the largest queues from the two junctions. Arm A (A467 north) identifies that during the AM peak, there are recorded queues of 27 vehicles at 07:30 on the nearside lane. The offside lane does not experience many queues in comparison, with a maximum queue of 5 vehicles throughout the day.
- 2.4.11 Arm B (A472) experiences large queues over all three lanes during the AM peak. The largest queue on the nearside lane is 16 vehicles at 08:25. The middle lanes largest queue was 34 vehicles, also recorded during the AM peak at 07:50, however does not block the nearside lane access. The offside lanes largest queue was recorded at 08:15 and was verified at 11 vehicles.
- 2.4.12 Three out of the four lanes at Arm C (A467) were logged during the AM peak. The nearside lane recorded a queue of 8 vehicles at 07:55. The middle nearside lane logged its worst queue of 8 vehicles at 16:15 and 17:45. The middle offside lane had a queue of 33 at 07:25, with the offside lane experiencing a queue of 11 at 07:45.
- 2.4.13 The nearside lane of Arm D (B4251) has a queue of 15 at 07:40 with the offside lane experiencing far less queuing, with its largest queue of 5 vehicles at 12:00, 17:25, and 18:30.
- A472/B4471 Priority Junction**
- 2.4.14 Arm A (B4471) does not experience significant queues throughout the day, with no queues on the nearside and a maximum queue of 4 vehicles on the offside lane at 16:50 and 16:55. Arm B (A472 east) and Arm C (A472 west) do not show consistent levels of queueing as observed on site. Arm B shows a maximum queue of 3 vehicles at three separate times during the day, and Arm C shows a maximum queue of 5 vehicles at 08:35.
- 2.4.15 Despite there being limited recorded queues on the A472 outside of the B4471 junction, it is clear from video footage on the 09th May 2018 that eastbound vehicles on the A472 give way to right turning vehicles out of the B4471 minor road. This causes congestion in both directions on the A472 as westbound vehicles slow to give-way.

2.5 PERSONAL INJURY COLLISION DATA

2.5.1 Collision data has been analysed during the most recent five-year period (2013-2017) along the main section of the A472 study corridor. The locations of each collision can be seen in Figure 21.



Figure 21 – Collision Location Map

2.5.2 The breakdown of collisions between 2013 and 2017 are shown in Table 8.

Table 8 – Breakdown of collisions between 2013 and 2017

	A472	A467
Fatal	1	0
Serious	1	2
Slight	3	5
Total	5	7

2.5.3 There have been 12 collisions recorded over a 5-year period along the A472 and A467, eight slight collisions, three serious, and a single fatal. The fatality took place in 2013, involved three vehicles, resulted in one casualty who was a cyclist. The fatality involved a young driver.

2.5.4 The A472/A467 Crumlin junction improvements were completed in October 2015. Therefore, only the single serious collision (2017) can be used for analysis

2.5.5 There are no key cluster sites identified from the collision data that has been captured. A cluster site is defined as a site where 4 or more Personal Injury Collisions (PICs) have occurred over a three-year period within a 100m radius.

2.6 PUBLIC TRANSPORT

Rail

2.6.1 The closest railway stations to the study corridor along the A472 are at Newbridge, located approximately 2.5m south of the A472/A467 priority junction and Llanhilleth, located approximately 3km north of the A472/A467 priority junction. The stations lie on the Ebbw Valley line that connects Ebbw Vale to Cardiff, serving communities in Blaenau Gwent, Caerphilly and Newport. From October 2018, operational responsibility for these stations will transfer to KeolisAmey, following the award of the new Wales and Border rail franchise. Transport for Wales (TfW) have planned infrastructure and service improvements, such as



doubling the Ebbw Vale Railway service frequency and aspirations for the wider Metro improvements. This could see a mode shift towards public transport in the future.

2.6.2 The station provides public with the following weekday direct journeys as shown in Table 9.

Table 9 – Newbridge and Llanhilleth Train Times

Newbridge Railway Station	From Newbridge (06:30 to 09:00)	To Newbridge (16:00 to 18:00)
	No. of Services	
Cardiff	3 (approximately 45 min)	2 (approximately 40 min)
Ebbw Vale Town	2 (approximately 20 min)	2 (approximately 20 min)
Llanhilleth Railway Station	From Llanhilleth (06:30-09:00)	To Llanhilleth (16:00-18:00)
	No. of Services	
Cardiff	2 (approximately 50 min)	2 (approximately 45 min)
Ebbw Vale Town	2 (approximately 15 min)	2 (approximately 15 min)

2.6.3 Parking provision is reasonable at both Stations. Newbridge has 71 car parking spaces (plus 5 accessible spaces). Llanhilleth with 52 car parking spaces (0 accessible spaces), there are also 4 secure cycle parking spaces.

2.6.4 Analysis⁶ shows that there was an annual increase of 3.5% in the number of station entries/exits across Wales in 2015-16 compared to the year before. The number of entries/exits at Newbridge increased from 127,100 in 2015-16 to 135,866 in 2016-17 (6.9% growth). Llanhilleth increased from 80,090 in 2015-16 to 87,736 in 2016-2017, (9.5% growth). The actual passenger numbers have greatly exceeded forecasts on the Ebbw Valley Railway service. Passenger journeys had exceeded 55,000 per month by May 2009, and by October 2009, over one million passenger journeys had been made on the line in the 20 months since its opening, comfortably exceeding the fourth-year target of 453,000.

Buses

2.6.5 There are 3 bus routes which serve the study corridor along the A472:

- The X1 service, operated by Phil Anslow Coaches, which connects Cwmbran to Brynmawr via Abertillery. It runs directly between Brynithel and Hafodyrynys via Swffryd, so does not serve Crumlin Junction and Hafodyrynys Road. (Hourly frequency Mondays to Saturdays – daytime only)
- The X15 service, operated by Stagecoach in South Wales, which connects Brynmawr with Newport via Abertillery, Swffryd, Newbridge and Risca. (Hourly frequency Mondays to Saturdays daytime, with less frequent evening and Sunday journeys).
- The 21 service, operated by Stagecoach in South Wales, which connects Cwmbran with Blackwood via Pontypool, Swffryd, Crumlin and Newbridge. (Hourly frequency Mondays to Saturdays daytime only).
- The bus stops on Hafodyrynys Road, served by the X15 and 21 routes within the study corridor are located adjacent to the residential properties east of the A472/Gladstone Road priority junction. The bus stop facilities consist of a flagpole, there are no lay-bys, shelters or easy access kerbing. A full breakdown of bus timetables has been provided within Appendix B.

Public Transport Provision

2.6.6 The strongest public transport corridors tend to run from the north to the south, due to the topography of the area and are focussed on the strong regional centres of Newport and Cardiff. Whilst the X1 and 21 bus routes provide a cross valley link to Pontypool and Cwmbran, travel patterns are diverse and more difficult to serve effectively by public transport.

⁶ Source Location: <http://gov.wales/docs/statistics/2017/170510-rail-station-usage-2015-16-en.pdf> - Accessed 13th November 2017

2.7 ORIGIN DESTINATION ANALYSIS

2.7.1 To highlight flow patterns that represent the A472, the urban centres of Newbridge and Cwmbran have been selected using DataShine Commute. These locations have been used as a proxy for a nearby residential (Newbridge) and employment (Cwmbran) centre. It should be noted that DataShine Commute has several limitations. Such as limiting data to specific nodes (areas), not knowing routes taken to and from the origin and destination and only showing flows with 6+ people included (data is only displayed for 6 or more trips to remove minor movements for presentational purposes).

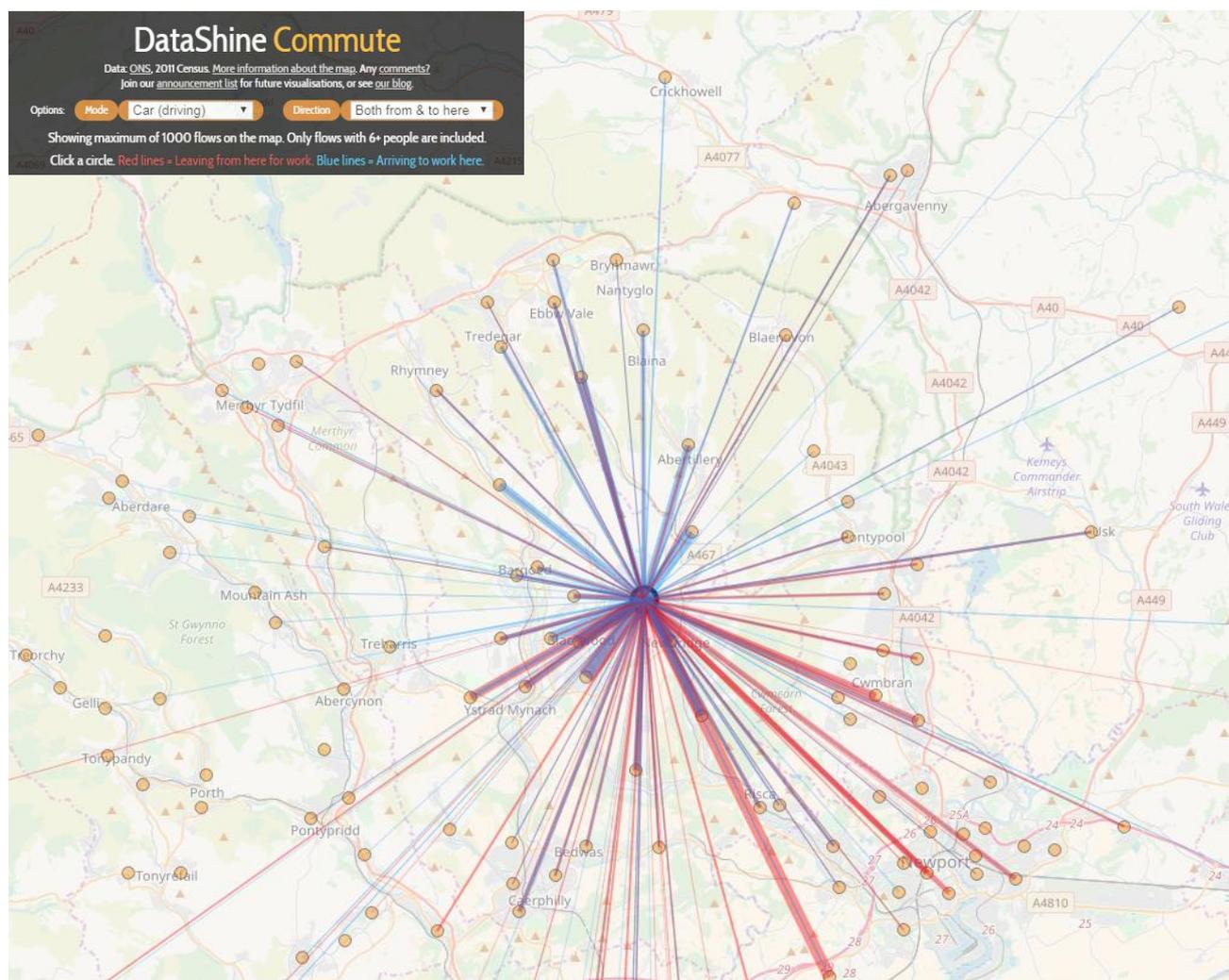


Figure 22 – Origin/Destination Data from Newbridge

2.7.2 Figure 22 shows that there is an approximate even split of commuters (using cars) that travel to and from Newbridge. It is clear that a large proportion of commuters from Newbridge travel to the south east (Newport and Cwmbran). In comparison, commuters travelling to Newbridge are distributed evenly, however travel from closer to home.

2.7.3 As shown in Figure 23, the majority of commuting trips (using car) are made to Cwmbran (arriving to work here). This indicates that commuting trips are shared between both residents living close by and from further afield.

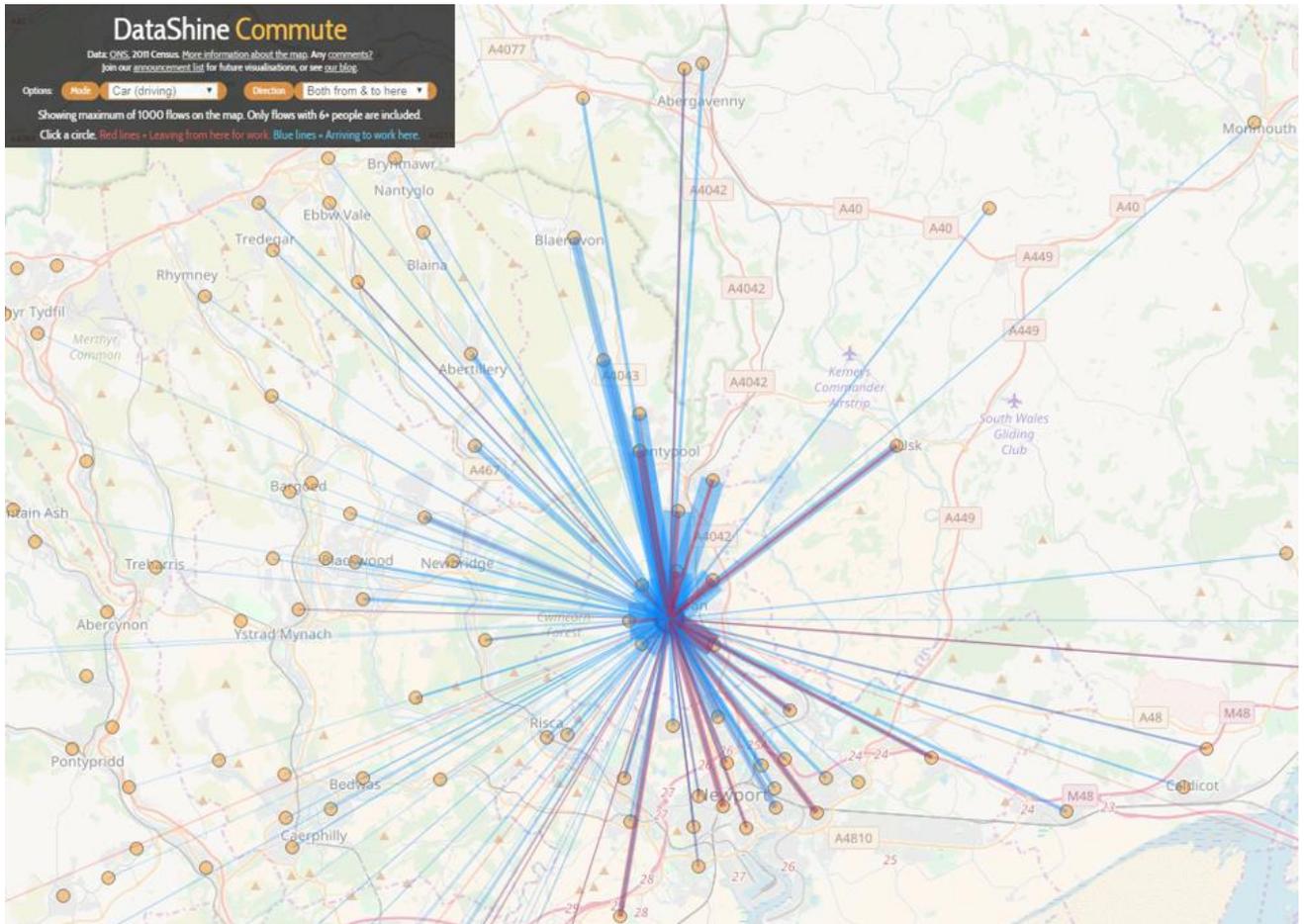


Figure 23 – Origin/Destination Data from Cwmbran

2.8 ECONOMY

2.8.1 The Labour Market Profile of CCBC⁷ has identified that in 2017, 75.3% of residents were economically active (for those aged 16-64), which is slightly below the Welsh average of 76%. There are 10,700 workless households in CCBC, which equates to 18.6% of households, 0.8% higher than across Wales in 2016. Based on 2017 data, CCBC has gross weekly earnings of £488.8, which is lower than the Welsh average earnings of £505.9. The counties average out-of-work benefits claimants are 2.5%, in comparison to the Welsh average of 2.3% (May 2018).

Table 10 shows that Caerphilly has a slightly higher economic inactivity compared to the Welsh average of 24%. The majority (32.8%) are made up of Long-term Sick. A higher proportion (29.3%) of residents are classed as wanting a job compared to the Welsh average of 23.7%.

⁷ Nomisweb.co.uk – Accessed on 9th November 2017

Table 10 – Economic Inactivity (2017)

All people (male & female)	Caerphilly	Caerphilly %	Wales %
Total	27,600	24.7%	24%
Student	5,000	18.2%	27.1%
Looking after family/home	6,000	21.8%	19.3%
Temporary sick	#	#	1.5%
Long-term sick	9,100	32.8%	27.8%
Discouraged	!	!	0.4%
Retired	3,800	13.6%	14.3%
Other	2,800	10.3%	9.5%
Wants a job	8,100	29.3%	23.7%
Does not want a job	19,500	70.7%	76.3%

- Sample size too small for reliable estimate

! - Estimate is not available since sample size is disclosive

- 2.8.2 Of the 75.3% residents that are economically active, 62.7% are employees and 6.6% are self-employed. The remaining 6.2% are unemployed. There are a higher percentage of employees in Caerphilly when comparing to the Welsh average, however the remaining Welsh averages are higher than Caerphilly's, including unemployment.

Table 11 – Employment & Unemployment

All People	Caerphilly	Caerphilly %	Wales %
Economically Active	86,800	75.3%	76.0%
In Employment	80,700	69.9%	72.4%
Employees	71,500	62.7%	62.3%
Self Employed	8,000	6.6%	9.6%
Unemployed	5,300	6.2%	4.8%

- 2.8.3 Most labour supply data comes from the Annual Population Survey (APS). As APS estimates are based on samples, they are subject to sampling variability. As such, the values in Table 11 do not sum exactly.
- 2.8.4 Of the 75.3% residents that are economically active, 62.7% are employees and 6.6% are self-employed. The remaining 6.2% are unemployed. There are a higher percentage of employees in Caerphilly when comparing to the Welsh average, however the remaining Welsh averages are higher than Caerphilly's, including unemployment
- 2.8.5 The Caerphilly LDP identifies that rural diversification and development can contribute to the rural economy, can sustain rural communities, can provide tourism opportunities for the borough and continue to protect the rural landscape and character.

2.8.6 DEMOGRAPHICS

2.8.7 The Local Area Report for CCBC⁸ has been used to obtain demographic data for Caerphilly and covers the characteristics of people and households in Caerphilly Local Authority in Wales (GSS code W06000018) with information sourced from the 2011 Census key statistics.

2.8.8 Of the 178,806 usual residents, 49% are male and 51% are females. 99.4% of the usual residents live in households and 0.6% live in communal establishments. Furthermore, the average (mean) age of residents is 39.5 years, which is younger than the national average of 40 across Wales.

2.8.9 Of all people aged 16 and over in households within CCBC, 98.8% have English or Welsh as a main language. 0.5% makes up the remaining households that have no residents with English or Welsh as a main language.

Gender and Age

2.8.10 On comparing the population of Caerphilly and Wales in Table 12, it is clear that the female population is slightly higher than male population, which is comparable with Wales. It is also evident that there is a greater male population between the ages of 16 and 64.

Table 12 – Gender and Age

Population Demographic		Caerphilly	Wales
Population	Male	49%	49%
	Female	51%	51%
	Total	180,800	3,125,200
Age Ranges Demographic		Caerphilly	Wales
Aged 16 to 64	Male	62.2%	62.2%
	Female	61.8%	60.9%
	Total	62.1%	61.5%

2.9 OTHER RELATED WORK

2.9.1 WSP have been informed by Caerphilly County Borough Council that there are no plans for highway improvements or other related work that is likely to impact on the study.

2.10 COMMITTED DEVELOPMENTS

2.10.1 WSP have been informed by Caerphilly County Borough Council that the following developments can be considered as committed in proximity to the A472 study route.

Ton-y-Felin near Penyfan Industrial Estate

2.10.2 It has been agreed that a package deal to develop 60 residential dwellings at Ton-Y-Felin (near Penyfan Industrial Estate) will be developed. The scheme will comprise of mixed tenure which will include social rent, open market sales and rent to own. The site is located to the north west of Crumlin, and north of Croespenmaen.

2.10.3 The construction of the site was proposed to begin in May 2018.

Oakdale golf Course – residential development of up to 150 houses

2.10.4 The Oakdale development is similarly located outside of Croespenmaen, as is Ton-Y-Felin. It is proposed 150 residential dwellings will be developed on the Oakdale Golf Course plot following the approval from the Welsh Government cabinet secretary Lesley Griffiths. The plans include a combination of 2, 3, and 4 bed houses.

⁸ Nomisweb.co.uk – Accessed on 8th January 2018

Former Axiom Overflow Car Park – residential development of 95 houses

2.10.5 The planning application for the former Axiom overflow car park has been approved. The plans show that planning permission is granted for a 95-dwelling residential development at Former Car Park, Aiwa Technology Park, Newbridge. The plot is located between Newbridge and Crumlin, south of the Crumlin junction and west of the A467.

Croespenmaen – residential development of 50 houses

2.10.6 Planning permission has been granted for land at Ty Mawr, near the Schulman’s factory in Croespenmaen (south). The plans include for a 50-dwelling development to be built at the plot.

Other

2.10.7 There is currently a submitted application with CCBC for a large industrial unit at Penyfan Industrial Estate. However, at this stage there is a lack of available information.

Summary

2.10.8 The committed developments set out above are likely to have an impact on the congestion/air quality through the A472 corridor. With increased development there is likely to be an associated increase in local vehicular trips.

2.11 ENVIRONMENT

Air Quality

2.11.1 In 2013 the air quality in the area was the subject of a Detailed Assessment⁹. The monitoring data was used to feed into a modelling assessment which showed that in 2012 there were 32 properties predicted to have exceeded the NO₂ annual mean encompassing all houses on the south side of the A472 at Woodside Terrace and all houses on the north side of the A472 directly opposite Woodside Terrace. The conclusions of this assessment was to proceed to designating the area as an Air Quality Management Area (AQMA).

2.11.2 The area was formally designated as an AQMA for nitrogen dioxide in November 2013 for exceedances of both the NO₂ annual mean and hourly mean. A further assessment was conducted in 2014 to revisit the results of the detailed assessment and to carry out a source apportionment and scenario modelling in the study area based on 2013 monitoring results. The results of the further assessment indicated that the NO₂ annual mean and 1-hour mean objectives were also exceeded during 2013 and 2014 in the AQMA. The study confirmed the results of the detailed assessment and the area of exceedance remained unchanged.

The PCM model projections presented in support of the Air Quality Plan (2017) indicate that annual mean NO₂ concentrations on the section of the A472 under consideration will reach compliance with air quality limit values by 2026. However, this was based on 2015 monitoring data and since then there has been no reduction in NO₂ levels. Using national projection factors which account for the effect of improved emissions from the turnover in the vehicle fleet, the estimated year of compliance is 2029 from a 2017 baseline, as shown in Table 13 (i.e. projected concentrations at or below 40µg/m³).

Table 13 –Predicted Maximum NO₂ Concentrations at the A472 – No interventions

Site Location	NO ₂ Predicted Baseline Concentration (µg/m ³)				
	2017	2020	2023	2026	2029
A472 (Woodside Terrace)	70	61.1	51.8	44.8	39.7

2.11.3 Air quality baseline data for the A472 has been derived from both local authority and UK air quality reports.

⁹ http://www.caerphilly.gov.uk/CaerphillyDocs/Pollution/Air_Quality_Assessment_Hafodyrynys_2013.aspx

- 2.11.4 Specifically, baseline and future baseline air quality NO₂ concentrations has considered outputs from the Pollution Climate Mapping (PCM) model developed by Ricardo on behalf of Defra. The NO₂ concentrations monitored within the AQMA on the A472 between Crumlin and Hafodyrynys village were identified within the UK Air Quality Plan in July 2017 as exceeding the EC limit value set out in the Air Quality Directive 2008/50/EC. Compliance is not predicted to be achieved until 2026 according to the national pollution climate model (PCM). However, based on more recent monitoring data, NO₂ levels were higher for the annual 2017 period compared to the PCM model, and compliance is not likely until 2029 without any intervention.
- 2.11.5 Caerphilly County Borough Council monitors NO₂ on Woodside Terrace using a network of three diffusion tubes and a continuous analyser (see Figure 24). The continuous analyser is situated on the footpath outside of houses on Woodside Terrace.

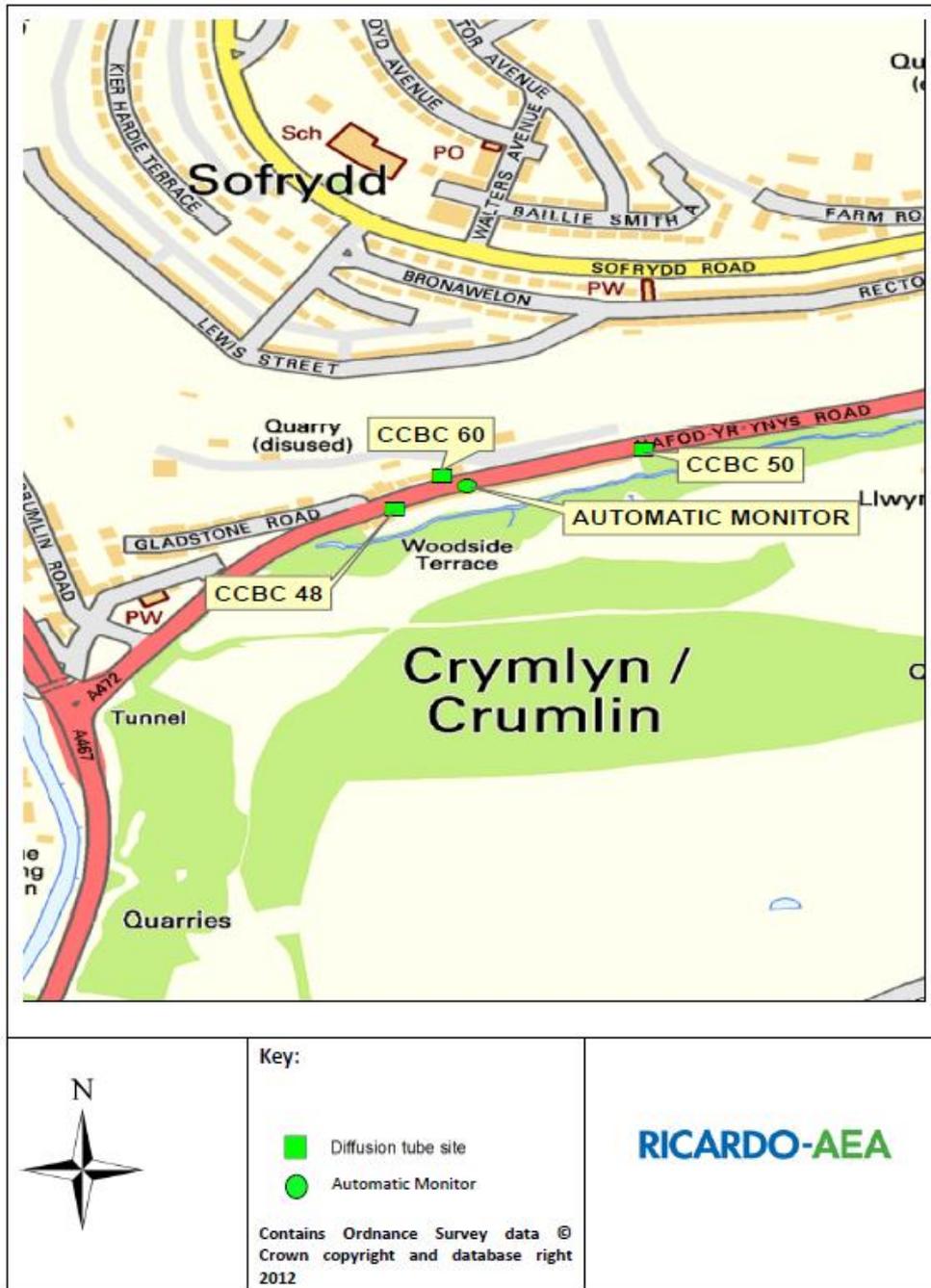


Figure 24 – Woodside Terrace, Hafodyrynys Road, monitoring locations

Cultural Heritage, Historic and Landscape Designations

2.11.6 There is a cluster of Listed Buildings, Historic Parks and Gardens, Designated Areas, and 16 Conservation Areas within Caerphilly County Borough Council. However, none are close enough to the A472 study corridor to be affected.

2.12 STAKEHOLDER CONSULTATION

2.12.1 A stakeholder workshop was undertaken on 3rd July 2018 at Tredomen House, Caerphilly. Key representatives from CCBC and Stagecoach attended the workshop to inform the study. The following key stakeholders were in attendance:

Table 14 – Stakeholders

CCBC Planning Officer	CCBC Fleet Management
CCBC Traffic Management	CCBC Highway Development Control
CCBC Int. Transport Unit	CCBC Infrastructure
Stagecoach South Wales	CCBC Environmental Health
CCBC Crumlin Councillor	

2.12.2 The workshop identified the following:

- Key issues, constraints, opportunities, objectives, options and overtaking opportunities

2.12.3 The findings of the workshop formed a key part of issue identification, development of objectives and initial option development. Comments and notes recorded from the workshop can be found in Appendix C.

2.13 PROBLEM IDENTIFICATION

2.13.1 The national assessment¹⁰ of roadside NO₂ undertaken for the South Wales zone indicates that the annual limit value was exceeded in 2015 but it is likely to be achieved by 2026. More recent roadside monitoring data for 2017 suggests that the compliance date in this location is now predicted to be 2029. The compliance date of the South Wales zone is, in current projections, determined by the compliance of the A472 in Hafodyrynys.

2.13.2 Elevated concentrations of NO₂ on this study corridor are due to a combination of high traffic volumes, periods of congestion and the severe and continuous incline along the highway.

2.13.3 A number of further problems have been identified within the study area. Due to volume of issues identified from stakeholders and a degree of overlap, these can be grouped into the following key themes:

- Public Transport
- Rail
- HGV & LGV Presence
- Speed
- Existing Transport Infrastructure
- Topography
- Congestion

¹⁰ Source: https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0041.pdf

2.13.4 Following the review of baseline information and consultation with stakeholders during a workshop, the identified problems that require addressing are summarised in Table 15.

Table 15 – Problems Identified along the A472

Problems	Description of Problem
Public Transport	As 24% ¹¹ of households within Caerphilly do not have access to a car, the provision for public transport is critical. Public transport use within Caerphilly is low; 1% commute by train and 4% commute by bus, minibuss or coach. Therefore, current provision and demand is not sufficient to prevent car reliance and more needs to be done to improve the uptake of public transport alternatives. There is a current lack of alternative local transport modes.
Existing Transport Infrastructure	74% of commuter trips in Caerphilly are made by car. The A472 carriageway plays a key role in the movement of people and goods. Vehicles travelling eastbound are restricted by congestion on approach to the priority junction of the A472 and B4471 resulting in poor journey time and journey time reliability on the A472 during peak hours. The A472 is the main cross valleys strategic route and therefore restricts opportunities for alternative routes
Rail	The Ebbw Valley Rail line is currently exceeding it's capacity based on forecasts. A further issue is that there is no rail station in Crumlin to serve the town.
Active Travel Infrastructure	The existing footway provision along the A472 is of poor quality. The footways are narrow and front on to the busy carriageway. The NCN route 466 does not link to Crumlin itself and only connects to the A472 at Hafodyrynys village. The gradient of the A472 between Crumlin and Hafodyrynys village may be a contributing to discouraging the uptake of walking and cycling as a viable transport alternative.
HGV & LGV Presence	The A472 acts as a strategic route for longer distance trips from east to west. Analysis has been undertaken on the split between cars and HGVs/LGVs on the A472 using ATC data. The bidirectional percentage of HGVs and LGVs during the AM peak is 9%, 10% during the inter-peak and 7% during the PM peak. The 24-hour percentage is 10%.
Speed	Due to the constrained study corridor, perceived vehicle speeds could be greater than actual vehicle speeds. The distance between pedestrians and the live carriageway may reduce journey quality for pedestrians. During the peak hours the AM peak vehicle speeds drop to approximately 30kph (19mph), however the speeds peak at around 60kph (37mph) during the early hours of the morning. Westbound speeds are less sporadic and have peaks between 55kph (34mph) during the early hours of the morning and 40kph (25mph) during the peak hours. The posted speed limit adjacent to Woodside Terrace is 30mph.
Congestion	There are clear congestion issues associated with the eastbound flow of vehicles on approach to the A472/B4471 priority junction. A combination of visibility issues, speed limits, high volumes of vehicles and driving behaviour contributes to a tailback of traffic.
Topography	Topography on the A472 study section is considered to be a major factor contributing to the poor air quality. The topography is causing a 'canyon effect' which is preventing the dispersion of pollutants.

¹¹ Source: 2011 Census Data

2.14 LONG LIST OF OPTIONS

2.14.1 Following the identification of the objective and through consultation with stakeholders, potential interventions were identified that address the problems identified in Table 15. The option numbers are the order that they have been appraised in and do not refer to an order of priority.

Table 16 – Long List of Measures

1 - Change Signal Timings at Crumlin Junction
2 - Signalise the A472/B4471 as a Priority Junction and introduce an eastbound queue detector
2a* - Signalise the existing A472/B4471 as a Roundabout Junction
3 - Remove left turn movement in to the B4771 from the A472
4 - Scrappage Scheme
5 - Banning Slow Moving Vehicles (HGVs) from the Climbing Lane of the A472
6 - Introducing a Minimum Speed Enforcement
7 - Reclassify National Speed Limit to 50mph on the A472 Hafodyrynys Road
8 - Create offline bus laybys
8a - Improve the facilities of the existing bus stop so that they are more desirable and attractive
8b - Relocate bus stops off the A472
9 - New Road Configuration
10 - Pedestrian Ski Lift
11 - Demolish Dwellings at Woodside Terrace and Re-align Road
12 - Variable Message Signage (VMS)
13 - Peak Hour HGV Bans
14 - Signage to Redirect Vehicles to the Heads of the Valleys Road
15 - Emissions Barrier
16 - NO₂ Absorbing Photocatalytic Paint
17 - NO₂ Absorbing Tarmac
18 - Driver & Vehicle Standards Agency (DVSA) Emissions Testing
19 - Travel Plans
20 - Rear Access to Properties and Install NO₂ Filtration

21 - Off-street Residential Car Parking/Landscaping

22 - Off-peak Traffic Management – One-way shuttle working

23 - Temporary Evacuation

24 - New Railway Station at Crumlin

25 - Travellator

26 - Clean Air Zone / Low Emission Zone

27 - Air Quality Public Awareness Campaigns

28 - Bypass

*This option has been removed prior to the appraisal process for the following reason; a roundabout would give priority to right turn movements travelling westbound and turning in to the B4471. This would further disrupt eastbound vehicles on the A472.

3 TRANSPORT CASE

3.1 METHODOLOGY

3.1.1 The WelTAG guidance states that the purpose of the Stage One: Strategic Outline Case is to:

“...understand the issue of concern, explore its context and to present a wide list of possible solutions, with sufficient clarity and depth for the review group to be able to decide whether there are any possible solutions (measures) within the transport sector that are worth pursuing and to select a short list of options (measures) for more detailed consideration”.

3.1.2 Whilst WelTAG provides a fixed framework for appraisal, the guidance acknowledges that the level of detail provided in the WelTAG report should be proportionate to the impacts under consideration.

3.1.3 The objective of this study is to carry out an initial investigation and identify potential measures deliverable by CCBC which will assist in bringing forward reductions in NO₂ in the shortest possible time to ensure compliance with the Air Quality Framework Directive requirements at the A472. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

3.1.4 The approach of the Stage One level of appraisal is intended to screen and test the measures against the objective of this study to ensure that measures address the problem identified. The key criteria for the high-level appraisal have been identified as follows:

- **Effectiveness** – Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m³ legal limit
- **Timescales** – Can the measure be implemented within timescales that are meaningful (short enough) to have an impact on bringing forward the projected compliance date
- **Deliverability** – Can the measure be delivered in the location involved with the powers available to CCBC

3.1.5 This Stage One appraisal will consider each of the measures on the long list of measures against these identified key criteria for the objective using a simple two-point scoring system (pass or fail). Only those measures that pass all three criteria will be taken forward to Stage Two.

3.1.6 Additional measures that may provide reductions in NO₂ which are not deliverable by CCBC will be considered as part of an overarching Welsh Government appraisal of measures.

3.2 STAGE ONE APPRAISAL

3.2.1 The Stage One process has extended the initial review undertaken by WSP of the CCBC measures by including consideration of the specific conditions (baseline, geography, likely cause of poor air quality, compliance dates, level of non-compliance etc.) on the A472.

3.2.2 A summary of the A472 Stage One option appraisal has been included as Table 17.

Table 17 – Option Outcomes & Summary

Measure ID	Measure	Key Criteria (Pass/Fail)			
		Effectiveness	Timescales	Deliverability	Yes/No
		Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m ³ legal limit	within timescales that are meaningful (short enough) to have an impact on bringing forward the projected compliance date	Can the measure be delivered in the location involved with the powers available to the CCBC as Highway or Traffic Authority	Take Forward to Shortlist (Stage 2)?
1	Change Signal Timings at Crumlin Junction	Pass	Pass	Pass	Yes
2	Signalise the existing A472/B4471 Priority Junction and introduce an eastbound queue detector	Pass	Pass	Pass	Yes
3	Remove left turn movement in to the B4771 from the A472	Fail	Pass	Pass	No
4	Scrappage Scheme	Pass	Pass	Fail	No
5	Banning Slow Moving Vehicles (HGVs) from the Climbing Lane of the A472	Fail	Pass	Pass	No
6	Introducing a Minimum Speed Enforcement	Fail	Pass	Pass	No
7	Reclassify National Speed Limit to 50mph on the A472 Hafod Yr Ynys Road	Pass	Pass	Pass	Yes
8	Create offline bus laybys	Fail	Pass	Pass	No
8a	Improve the facilities of the existing bus stop so that they are more desirable and attractive	Fail	Pass	Pass	No
8b	Relocate bus stops off of the A472 corridor	Fail	Pass	Pass	No
9	New Road Configuration	Fail	Pass	Fail	No
10	Pedestrian Ski Lift	Fail	Pass	Fail	No
11	Demolish Dwellings at Woodside Terrace	Pass	Pass	Pass	Yes
12	Variable Message Signage (VMS)	Fail	Pass	Pass	No
13	Peak Hour HGV Bans	Pass	Pass	Pass	Yes
14	Signage to Redirect Vehicles to the Heads of the Valleys Road	Fail	Pass	Pass	No
15	Emissions Barrier	Pass	Pass	Pass	Yes
16	NO ₂ Absorbing Photocatalytic Paint	Fail	Pass	Pass	No
17	NO ₂ Absorbing Tarmac	Fail	Pass	Pass	No
18	Driver & Vehicle Standards Agency (DVSA) Emissions Testing	Pass	Pass	Fail	No
19	Travel Plans	Fail	Pass	Pass	No
20	Rear Access to properties and installation of NO ₂ filtration	Pass	Pass	Pass	Yes
21	Off-street Residential Car Parking/Landscaping	Fail	Pass	Pass	No
22	Off-peak Traffic Management - One way shuttle working	Fail	Pass	Fail	No
23	Temporary Evacuation	Fail	Pass	Pass	No
24	New Railway Station at Crumlin	Fail	Pass	Fail	No
25	Travellator	Fail	Pass	Fail	No
26	Clean Air Zone / Low Emission Zone	Pass	Pass	Pass	Yes
27	Air Quality Areas	Pass	Pass	Pass	Yes
28	Bypass	Pass	Pass	Pass	Yes

3.3 INDIVIDUAL OPTION SUMMARY

3.3.1 A summary behind each options appraisal outcome is outlined in Table 18 with green indicating a pass, and red indicating a fail.

Table 18 – Option Outcomes and Summary

<p>1 - Change Signal Timings at Crumlin Junction</p> <p>The signals at Crumlin junction can be altered to alleviate congestion for eastbound flows on the A472</p>
<p>Summary</p> <p>It is believed that changing signal timings at Crumlin Junction will be effective by controlling the volume of vehicles travelling eastbound on the A472. However, this can be modelled and quantified during the Stage 2 study.</p>
<p>2 - Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector</p> <p>Signalise the junction as a priority junction and introduce an eastbound queue detector with a signal relationship with the A472/A467 priority junction. When queues are detected at a certain point on Hafodyrynys Road, lights at the A472/B4471 are to become green and the A472/A467 junction signals switch to red. This removes the potential of queueing on the A472.</p>
<p>Summary</p> <p>Signalising the A472/B4471 as a priority is believed to be effective by increasing the east/west flow on the A472. Currently, movements in and out of the B4471 are interfering with the main flow. However, this can be modelled and quantified during the Stage 2 study. The eastbound queue detector will manage queueing for eastbound movements towards Hafodyrynys village.</p>
<p>3 - Remove left turn movement in to the B4771 from the A472</p> <p>Allow for all left turners to use the left turn further west of the A472/B4471 priority junction that leads to Rectory Road. Carriageway improvements would also need to be made to the unclassified road.</p>
<p>Summary</p> <p>It is not believed that altering the location of left turn movements will be effective enough to justify taking through the option to Stage 2. CCBC have previously undertaken a trial closure at this junction, though the measure proved ineffective.</p>
<p>4 - Scrappage Scheme</p> <p>Introduce a government incentivised car scrappage scheme to remove vehicles that do not meet air quality standards.</p>
<p>Summary</p> <p>A car scrappage scheme is deemed as non-deliverable by CCBC as it is a national rather than a county scheme.</p>
<p>5 - Banning Slow Moving Vehicles (HGVs) from the Climbing Lane of the A472</p> <p>This will restrict HGVs from blocking the overtaking lane and causing congestion.</p>
<p>Summary</p> <p>There is no clear evidence that HGVs use the climbing lane from the recent traffic surveys and observations.</p>

6 - Introducing a Minimum Speed Enforcement

A minimum speed of 20mph to be introduced and enforced.

Summary

Enforcing a minimum speed along the A472 is considered to be ineffective due to negative changes in driving behaviour and enforcement issues. NO_x emissions are generally higher at lower speeds (up to 50mph). Whilst increasing vehicle speeds may be beneficial to air quality, this measure may have the unintended consequence of increasing emissions during non-peak hours or impacts on safety.

7 - Reclassify National Speed Limit to 50mph on the A472 Hafodyrynys Road

Remove the 585m of national speed limit west of the A472/B4471 priority junction to enable consistency and more control over driver behaviour.

Summary

There could be a benefit to reducing the speed limit to 50mph. Vehicle emission curves indicate that emissions for cars increase at speeds over 50mph, the traffic data identifies that some vehicles do exceed 50mph.

8 - Create offline bus laybys

Relocate bus layby's on the A472 so that buses do not need to stop in the live carriageway.

Summary

It is believed that for the level of service and demand, creating offline bus laybys would not make sufficient benefits to the local modal shifts or bus use. Therefore, this measure is considered to be ineffective.

8a – Improve bus stop facilities

Improve the facilities of the existing bus stop so that they are more desirable and attractive

Summary

It is believed that improving bus layby facilities would not make sufficient benefits to the local modal shifts or bus use. Therefore, this measure is considered to be ineffective.

8b – Relocate bus stops away from the A472

Relocate bus stops off the A472

Summary

It is believed that relocating bus laybys would not make sufficient benefits to the local modal shifts or bus use. Therefore, this measure is considered to be ineffective.

9 - New Road Configuration

Reconfigure the A472 to use the historic junction to the north of Bethel Baptist Church.

Summary

It is considered that altering the A472/A467 configuration to the historic route will not be effective. This option does not reduce traffic flows at Woodside Terrace, and is therefore not considered to be effective.

10 - Pedestrian Ski Lift

A pedestrian ski lift will segregate those that use the A472 as a walking route from the poor air quality corridor.

Summary

This scheme is not considered to be deliverable due to the constraints over space alongside the A472. The scheme is also considered as ineffective

11 - Demolish Dwellings at Woodside Terrace and Re-align Road

Demolish the residential houses on the southern side of the A472 to include Woodside Shops and Yr Adfa on Hafodyrynys Road so that air quality is no longer detrimental to the health of the residents.

Summary

There is potential that demolishing dwellings and the removal of public access including footpaths on this road could reduce the public exposure to NO_x emissions. This will be investigated further during a modelling exercise at Stage 2 study.

12 - Variable Message Signage (VMS)

VMS signage to be used on the A472 to give travellers information. Such signs warn of traffic congestion, accidents, poor air quality zones, roadwork zones, or speed limits on a specific highway segment. They may also ask vehicles to take alternative routes, limit travel speed, warn of duration and location of the incidents, or just inform of the traffic conditions.

Summary

This scheme is not likely to be effective as a standalone option. A reduction in NO₂ is not likely to be achieved.

13 - Peak Hour HGV Bans

Restrict HGVs from travelling through the A472 corridor at peak hours

Summary

Peak hour HGV bans can be delivered but would need to be enforced. This can be modelled and quantified during the Stage 3 study.

14 - Signage to Redirect Vehicles to the Heads of the Valleys Road

Introduce signage at the A472 access junctions to encourage the alternative routes to the A472 corridor.

Summary

Signage to redirect vehicles to the alternative Heads of the Valleys route is likely to be ineffective. Given the difference in trip length from the alternative route, it is possible that road users would ignore the signage, especially when trips are using navigation aids.

15 - Emissions Barrier

Introduce an arching barrier on the southern side of the A472 Hafodyrynys Road that restricts NO₂ from drifting to the residential houses at Woodside Terrace.

Summary

An emissions barrier will restrict air pollutant dispersion and hence it would be expected that pollutant levels at the dwellings at Woodside Terrace would be reduced. This can be modelled and quantified during the Stage 2 study.

16 - NO₂ Absorbing Photocatalytic Paint

Application of house paint that absorbs NO₂.

Summary

Previous studies have shown that this scheme is ineffective. This assumption is based on the findings of the Effectiveness Review undertaken by WSP for WG in relation to Consideration of Interventions on the Welsh Government Trunk Road and Motorway Network for Nitrogen Dioxide Reduction.

17 - NO₂ Absorbing Tarmac

Resurface the A472 Hafodyrynys Road and replace with NO₂ absorbing tarmac.

Summary

Previous studies have shown that this scheme is ineffective. This assumption is based on the findings of the Effectiveness Review undertaken by WSP for WG in relation to Consideration of Interventions on the Welsh Government Trunk Road and Motorway Network for Nitrogen Dioxide Reduction.

18 - Driver & Vehicle Standards Agency (DVSA) Emissions Testing

Ensuring that fleet vehicles on the network meet the national air quality standards. Emissions can be tested as part of a roadside check.

Summary

DVSA emission testing is considered to be undeliverable as Caerphilly Council cannot fine or take action as NO₂ is not part of MOT testing.

19 - Travel Plans

Promote travel plans amongst major employers to positively alter bad driving habits and characteristics.

Summary

Travel plans for employers are unlikely to be effective in significantly reducing NO_x emissions. The effect is dependent on the proportion of commuters and business trips on the Hafodyrynys Road.

20 - Rear Access to Properties and Install NO₂ Filtration to the Dwellings

Block up the existing front access and replace with rear access for residents on the southern side of the A472, Hafodyrynys Road. Vehicle parking would be relocated to the rear of the properties along with pedestrian access.

Summary

Rear access to properties and the use of NO₂ filtration is expected to cut down the exposure of poor air quality to residents at Woodside Terrace. This can be considered further during the Stage 2 study.

21 - Off-street Residential Car Parking/Landscaping

Replace resident on-street parking and create provision to the east/west of Woodside Terrace. Introduce landscaping in the form of trees in place of the on-street parking.

Summary

Introducing landscaping in place of existing on-street car parking is unlikely to meet the air quality target.

22 - Off-peak Traffic Management – One-way shuttle working

Shuttle working refers to the use of traffic signals to alternate flows on a one-way section of road. Most typically found at roadworks, but can also be used to create attractive conditions for cycling on, say, bridges.

Summary

This scheme is not considered as deliverable on the grounds that two-lanes are needed during peak hours. The peaks are also the main issue, making it ineffective.

23 - Temporary Rehoming

Residents to be temporarily rehomed to provide immediate benefits to residents when the level of NO₂ exceeds the government standards.

Summary

Temporary rehoming will be challenging as the annual average limit value is persistently exceeded and therefore a more permanent solution should be sought to protect public health.

24 - New Railway Station at Crumlin

Develop a new train station at Crumlin to encourage a modal shift.

Summary

A new railway station at Crumlin is likely to only be attractive to trips travelling north and south, not for the cross-valley route of the A472. Whilst this may result in overall mode shift benefits towards public transport, it is unlikely to reduce demand on the A472, and is therefore ineffective. Similarly, CCBC cannot deliver this scheme independently, Network Rail maintain the line and would need to be consulted on the scheme.

25 - Travellator

A vehicle travellator is proposed so that vehicles can turn their engines off and make the journey along the A472, Hafodyrynys Road by a conveyor belt, thus reducing emissions within the AQMA..

Summary

The lack of space is a constraint and therefore it is considered that a travellator is not deliverable. This scheme is not effective on the grounds that it is not a proven scheme.

26 - Clean Air Zone / Low Emission Zone

Promotion of Clean Air Zones and/or Low Emission Zones - implement with use of ANPR cameras/GPS/Bluetooth. Negotiate new vehicle emissions standards, establish a bus operator NOx Euro standards emissions cap, and determine specific targets in terms of vehicle type and journeys taken to inform measures focussed on specific effects on traffic in locations of interest. Including requirement to display stickers on vehicles showing emissions category - higher emission vehicles banned during periods of high pollution levels (as in France). Could involve limiting HGV weight or emission, and zone charging.

Summary

Clean air zones could be an effective way to reduce emissions by restricting or charging vehicles with higher emissions. This can be modelled and quantified during the Stage 2 study.

27 - Air Quality Public Awareness Campaign

A public awareness raising campaign aims to communicate the problem and encourage travel behaviour change to sustainable modes.

Summary

Awareness raising campaigns could provide passive intangible benefits, as such it would not be possible to quantify these benefits at Stage Two. However, the measure is typically viewed as a complementary measure and consideration must be given to the benefits of raising public awareness.

28 - Bypass

A bypass to the south of the A472 will alleviate congestion and air quality on the existing corridor.

Summary

A bypass is deemed as effective in that it will reduce the volume of vehicles/poor air quality on the A472. This can be modelled and quantified during the Stage 2 study.

3.4 SUMMARY

- 3.4.1 The analysis and appraisal has demonstrated that 20 of the schemes have failed the appraisal and the remaining 10 have passed. The leading contributing factor as to why the options scored poorly are against effectiveness. The impacts will be reviewed in more detail during the Stage Two appraisal.
- 3.4.2 Appraisal of the options has resulted in 10 offering an overall benefit against the three appraisal areas, and are therefore considered feasible at this stage and form part of the overall strategy. It is recommended that all 10 options should be taken forward for further appraisal at Stage Two.

4 FINANCIAL CASE

4.1 OVERVIEW

4.1.1 The financial case 'presents information on whether an option (measure) is affordable in the first place and long term financial viability. It covers both capital and annual revenue requirements over the life cycle of the project and the implications of these for the balance sheet, income and expenditure accounts of public sector organisations.'

4.2 ASSESSMENT

4.2.1 The WelTAG report represents a Stage One: Strategic Outline Case and the details to inform the financial case are of a preliminary nature at this stage. No lifetime costs have been calculated at this stage. The Stage One appraisal has only been undertaken on the key criteria identified herein.

5 COMMERCIAL CASE

5.1 OVERVIEW

5.1.1 The commercial case covers 'whether it is going to prove possible to procure the scheme and then to continue with it in the future'.

5.2 ASSESSMENT

5.2.1 It is not considered possible at this stage to determine the commercial case of each measure, given the preliminary information available.

6 MANAGEMENT CASE

6.1 OVERVIEW

- 6.1.1 The Management Case 'covers the delivery arrangements for the project and proposed management during its life time'. The WeITAG guidance states that in the Stage One report the Delivery Case needs to 'set out which organisation and groups within that organisation will sit on the Review Group that meets at the end of each WeITAG stage'.

6.2 PROJECT PLANNING – GOVERNANCE, ORGANISATIONAL STRUCTURE KEY PROJECT PARTIES & ROLES

Caerphilly County Borough Council (CCBC)

- 6.2.1 Ultimate client commissioning the study and part of the Project Board overseeing delivery.

Welsh Government (WG)

- 6.2.2 Directing CCBC in the delivery of this study.

RICARDO / WSP

- 6.2.3 Project consultants, delivering the study.

REVIEW GROUP

- 6.2.4 A Project Review Group has been set up to guide the WeITAG process and have met regularly to discuss the project. This group will take on the role of the Review Group and its members are as follows:

- Caerphilly County Borough Council
- Third party consultants (Ricardo /WSP at Stage One and Two)

6.3 COMMUNICATIONS & STAKEHOLDER MANAGEMENT PLAN

- 6.3.1 Key stakeholders for the current stage of the study are:

Caerphilly County Borough Council (CCBC)

- 6.3.2 Ricardo and WSP will consult with CCBC staff who currently manage and operate the network to capture views on current processes, issues and potential measures. Consultation will be carried out informally throughout the study. These also form the Review Group and their comments have been incorporated into the Report.

Other Third-Party Stakeholders

- 6.3.3 Third party stakeholders were not consulted to support the development of the study. Third party consultation will be carried out in a later stage of the WeITAG process.

The Public

- 6.3.4 CCBC have previously consulted local residents in work preceding the WeITAG Stage One appraisal, in relation to the production of the LAQM Air Quality Action Plan for Hafodyrynys. The views of local residents with regards to problems and potential solutions have been captured within this assessment as a result of that prior work. Residents are also being communicated to via update letters and drop-in sessions throughout the Stage One and Two appraisal process.

7 SUMMARY AND NEXT STEPS

7.1 OVERVIEW

- 7.1.1 The European Union Ambient Air Quality Directive (2008/50/EC) sets legally binding limits for concentrations of certain air pollutants in outdoor air, termed 'limit values'. The Directive requires that Member States report annually on air quality within zones designated under the Directive and, where the concentration of pollutants in air exceeds limit values, to develop air quality plans that set out measures in order to attain the limit values.
- 7.1.2 The national assessment¹ of roadside NO₂ undertaken for the South Wales zone indicates that the annual limit value was exceeded in 2015 and it is likely to be compliant by 2026. However, more recent monitoring of NO₂ in Hafodyrynys in 2017 were higher than that estimated in the national assessment and consequently compliance is not predicted until 2029 without further mitigation.
- 7.1.3 This report has presented the Stage One: Strategic Outline Case of the WelTAG process for reducing the levels of NO₂ on the A472 dual carriageway network in South Wales. Elevated concentrations of NO₂ on this study corridor are due to a combination of high traffic volumes and periods of eastbound congestion adjacent to Woodside Terrace.
- 7.1.4 In total, 30 measures have been appraised for the A472 study corridor, of which 10 measures have been shortlisted and will be taken forward to Stage Two.

7.2 SHORT LIST OF MEASURES

- 7.2.1 The short list of measures to be taken forward to Stage Two (the Outline Business Case), based on their ability to bring forward the date of compliance with EU Limit Values on the A472 against the key criteria (Effectiveness, Timescales, and Deliverability), are shown in Table 19.

Table 19 – Short Listed Measures

1 - Change Signal Timings at Crumlin Junction
2 - Signalise the A472/B4471 as a Priority Junction and introduce an eastbound queue detector
7 - Reclassify National Speed Limit to 50mph on the A472 Hafodyrynys Road
11 - Demolish Dwellings at Woodside Terrace and Re-align Road
13 - Peak Hour HGV Bans
15 - Emissions Barrier
20 - Rear Access to Properties and Install NO₂ Filtration
26 - Clean Air Zone / Low Emission Zone
27 - Air Quality Public Awareness Campaign
28 - Bypass

7.3 NEXT STEPS

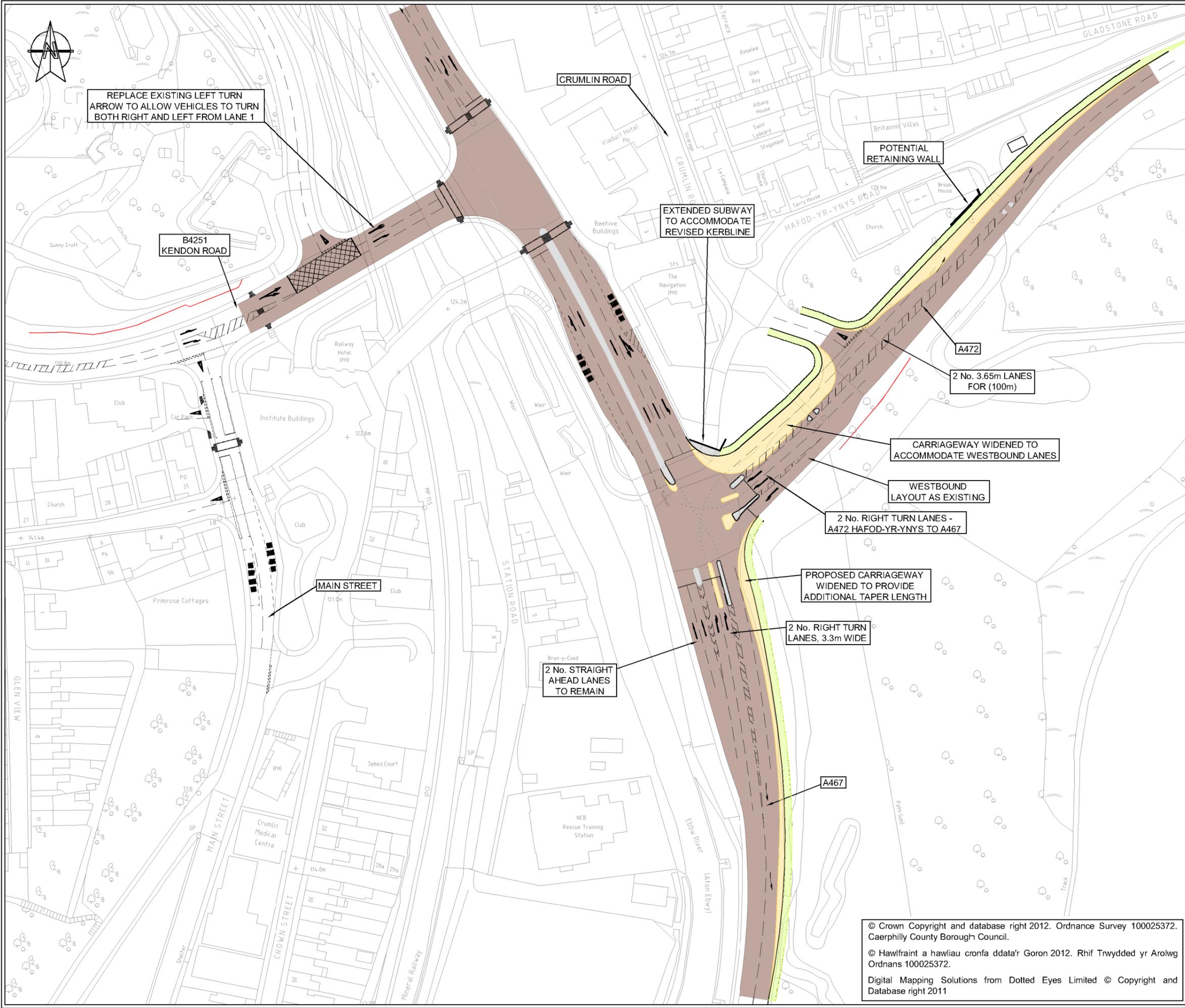
This study has taken the development of measures and appraisal through WelTAG Stage One. This has identified measures that are likely to bring forward the date of compliance with EU Limit Values. Stage Two will consider these measures in greater detail, as well as appraise the measures further against the three key criteria, the relevant WelTAG impact areas, and the secondary criteria of the study objective.

Appendix A

JUNCTION IMPROVEMENTS



Login: Smith, Graeme
 Plot Date: 28/03/2013 11:31:28
 File Name: H:\H\H\JOBS\3512356A-HHC Gwent Consultancy Framework\2.0 Caerphilly\2.4 Task Orders\3512356F-HHC A467_A472 Crumlin Junction\5 Drawings\Sketches\Option 7.dwg
 3512356F OPTION 7



- KEY**
- PROPOSED CARRIAGEWAY
 - PROPOSED FOOTWAY / ISLAND
 - PROPOSED VERGE
 - CARRIAGEWAY RESURFACING
 - EXISTING ROCK CUT

- NOTES:**
- 1.) THE COST ESTIMATE FOR OPTION 7 INCLUDES FOR ADDITIONAL ITEMS NOT SHOWN ON THE DRAWING. THESE ITEMS INCLUDE:
 - NEW SIGNAL INSTALLATION (WHOLE JUNCTION)
 - ROAD LIGHTING
 - DRAINAGE
 - EARTHWORKS
 - ROAD SIGNS &
 - LANDSCAPING
 - 2.) THE LAYOUT IS INDICATIVE ONLY
 - 3.) REFER TO 3512356A-HHC/FIGURE 3 FOR EXISTING STATUTORY UNDERTAKERS APPARATUS (INDICATIVE ONLY)
 - 4.) OPTION 7 INCLUDES ROAD MARKING AMENDMENTS SHOWN ON DO MINIMUM DRAWING
 - 5.) ESTIMATED COST OF OPTION 7 (CONSTRUCTION & DESIGN) - £1,119,000 (INDICATIVE ONLY)

Rev	Date	Description	By	Chk	App
REPORT					
PARSONS BRINCKERHOFF					
29 Cathedral Road Cardiff CF11 9HA Tel: 44-(0)29-2082-7000 Fax: 44-(0)29-2082-7001					
Client: CAERPHILLY COUNTY BOROUGH COUNCIL					
Site/Project: A467 / A472 CRUMLIN JUNCTION IMPROVEMENT					
Title: OPTION 7 COMBINATION OF OPTIONS 1 & 2					
Drawn:	GE	Checked:	GS		
Designed:	GS	Approved:	GS		
Date:	26/02/2013	Scale:	1:1250	A3	Sheet: 1 OF 1
Project Number:	3512356F	Drawing Number:	OPTION 7	Revision:	
© Copyright Parsons Brinckerhoff					

© Crown Copyright and database right 2012. Ordnance Survey 100025372. Caerphilly County Borough Council.
 © Hawfraint a hawliau cronfa ddata'r Goron 2012. Rhif Trwydded yr Arolwg Ordans 100025372.
 Digital Mapping Solutions from Dotted Eyes Limited © Copyright and Database right 2011

Appendix B

BUS TIMETABLES



Cwmbran - Blackwood

Monday to Friday (Excluding Bank Holidays) (Inbound)

Cwmbran, Bus Station, Stand E	--	0805091010101110121013101410151016101720
Sebastopol, Wellfield Lane	--	0813091810181118121813181418152016201730
Griffithstown, Panteg House	--	0816092110211121122113211421152416241734
Pontypool, Market Square	07050825093010301130123013301430153416341744	
Old Furnace, Finers' Arms	07070829093410341134123413341434154116391749	
Hafodyrnyns, Mill Court	07150837094210421142124213421442154916471757	
Swffryd, Soifydd Schools	07200842094710471147124713471447155416521802	
Crumlin, The Square	07250847095210521152125213521452160017001810	
Newbridge, Co-operative	07270849095410541154125413541454160317021812	
Pentwynmawr, Three Horseshoes	07300852095710571157125713571457160717051815	
Pontlanfraith, Council Offices	07340857100211021202130214021502161217101820	
Blackwood, Interchange, Stand 4	07370900100511051205130514051505161517131823	

Service 21 (CPBO021)

Timetable valid from 2nd January 2018 until further notice

Blackwood - Cwmbran

Monday to Friday (Excluding Bank Holidays) (Outbound)

Blackwood, Interchange, Stand 4	0742	--	0910101011101210131014101510162017201830
Pontlanfraith, Council Offices	0745	--	0913101311131213131314131513162317231833
Pentwynmawr, Three Horseshoes	0750	--	0918101811181218131814181518162817281838
Newbridge, Co-operative	0753	--	0921102111211221132114211521163117311841
Crumlin, The Square	0755	--	0923102311231223132314231523163317331843
Swffryd, Soifydd Schools	0800	--	0928102811281228132814281528163817381848
Hafodyrnyns, Mill Court	0805	--	0933103311331233133314331533164317431853
Old Furnace, Finers' Arms	0818	--	0941104111411241134114411541165117511901
Pontypool, Crane Street Loop (Arr)	0825	--	0944104411441244134414441544165417541904
Pontypool, Crane Street Loop (Dep)	--	--	0944104411441244134414441544165417541904
Pontypool, Market Square	--	--	08450945104511451245134514451545165517551905
Griffithstown, Panteg House	--	--	08530953105311531253135314531553170318031913
Sebastopol, Wellfield Lane	--	--	08560956105611561256135614561556170618061916
Cwmbran, Bus Station	--	--	09051005110512051305140515051605171518151925

Service 21 (CPBO021)

Timetable valid from 2nd January 2018 until further notice

Cwmbran - Blackwood

Service 21 (CPBO021)

Timetable valid from 2nd January 2018 until further notice

Saturday (Inbound)

Cwmbran, Bus Station, Stand E	--	0805091010101110121013101410151016101720
Sebastopol, Wellfield Lane	--	0813091810181118121813181418152016201730
Griffithstown, Panleg House	--	0816092110211121122113211421152416241734
Pontypool, Market Square	07100825093010301130123013301430153416341744	
Old Furnace, Finers' Arms	07120829093410341134123413341434154116391749	
Hafoodyrnys, Mill Court	07200837094210421142124213421442154916471757	
Swffryd, Sofrydd Schools	07250842094710471147124713471447155416521802	
Crumlin, The Square	07300847095210521152125213521452160017001810	
Newbridge, Co-operative	07320849095410541154125413541454160317021812	
Pentwynmawr, Three Horseshoes	07350852095710571157125713571457160717051815	
Pontlanfraith, Council Offices	07390857100211021202130214021502161217101820	
Blackwood, Interchange, Stand 4	07420900100511051205130514051505161517131823	

Blackwood - Cwmbran

Service 21 (CPBO021)

Timetable valid from 2nd January 2018 until further notice

Saturday (Outbound)

Blackwood, Interchange, Stand 4	0752	--	0910101011101210131014101510162017201830
Pontlanfraith, Council Offices	0755	--	0913101311131213131314131513162317231833
Pentwynmawr, Three Horseshoes	0800	--	0918101811181218131814181518162817281838
Newbridge, Co-operative	0803	--	0921102111211221132114211521163117311841
Crumlin, The Square	0805	--	0923102311231223132314231523163317331843
Swffryd, Sofrydd Schools	0810	--	0928102811281228132814281528163817381848
Hafoodyrnys, Mill Court	0815	--	0933103311331233133314331533164317431853
Old Furnace, Finers' Arms	0823	--	0941104111411241134114411541165117511901
Pontypool, Crane Street Loop (Arr)	0825	--	0944104411441244134414441544165417541904
Pontypool, Crane Street Loop (Dep)	--	--	0944104411441244134414441544165417541904
Pontypool, Market Square	--	--	08450945104511451245134514451545165517551905
Griffithstown, Panleg House	--	--	08530953105311531253135314531553170318031913
Sebastopol, Wellfield Lane	--	--	08560956105611561256135614561556170618061916
Cwmbran, Bus Station	--	--	09051005110512051305140515051605171518151925



Cwmbran - Brynmawr via Abertillery

Monday to Friday (Excluding Bank Holidays) (Inbound)

Cwmbran Bus Station H	--	0900	1000	1100	1200	1300	1400	1500	1600	1700
Croesyceiliog (Edlogan Square)	--	0905	1005	1105	1205	1305	1405	1505	1605	1705
Pontypool (opp Town Hall)	0809									1720
Hafodrynyys Hotel	0817	0917	1017	1117	1217	1317	1417	1517	1617	1728
Sw Fryd School	0819	0919	1019	1119	1219	1319	1419	1519	1619	1730
Llanhilleth Central Hotel	0824	0924	1024	1124	1224	1324	1424	1524	1624	1735
Aberbeeg Square	0828	0927	1027	1127	1227	1327	1427	1527	1627	1738
Six Bells Post Office	0832	0932	1032	1132	1232	1332	1432	1532	1632	1743
Abertillery High Street	0836	0936	1036	1136	1236	1336	1436	1536	1636	1747
Arael View	0840	0940	1040	1140	1240	1340	1440	1540	1640	1751
Post Office	0842	0942	1042	1142	1242	1342	1442	1542	1642	1753
Blaina High Street	0844	0944	1044	1144	1244	1344	1444	1544	1644	1755
Nantyglo Garn Cross	0849	0949	1049	1149	1249	1349	1449	1549	1649	1800
Brynmawr Bus Station	0854	0954	1054	1154	1254	1354	1454	1554	1654	1805

Service X1 (GWAX001)

Timetable valid from 14th May 2018 until further notice

Brynmawr - Cwmbran via Abertillery

Monday to Friday (Excluding Bank Holidays) (Outbound)

Brynmawr Bus Station	0745	0900	1000	1100	1200	1300	1400	1500	1600	1702
Nantyglo Garn Cross	0750	0905	1005	1105	1205	1305	1405	1505	1605	1707
Blaina High Street	0755	0910	1010	1110	1210	1310	1410	1510	1610	1712
Bourneville	0757	0912	1012	1112	1212	1312	1412	1512	1612	1714
Rose Heyworth	0759	0914	1014	1114	1214	1314	1414	1514	1614	1716
Abertillery Foundry Bridge	0805	0920	1020	1120	1220	1320	1420	1520	1620	1722
Six Bells	0809	0924	1024	1124	1224	1324	1424	1524	1624	1726
Aberbeeg Square	0813	0928	1028	1128	1228	1328	1428	1528	1628	1730
Llanhilleth Central Hotel	0817	0932	1032	1132	1232	1332	1432	1532	1632	1734
Sw Fryd School	0822	0937	1037	1137	1237	1337	1437	1537	1637	1739
Hafodrynyys Hotel	0824	0939	1039	1139	1239	1339	1439	1539	1639	1741
Pontypool (opp Town Hall)	0836									1749
Croesyceiliog (Edlogan Square)	0847	0951	1051	1151	1251	1351	1451	1551	1651	--
Cwmbran Bus Station	0850	0954	1054	1154	1254	1354	1454	1554	1654	--

Service X1 (GWAX001)

Timetable valid from 14th May 2018 until further notice

Cwmbran - Brynmawr via Aberillery

Service X1 (GWAX001)

Timetable valid from 14th May 2018 until further notice

Saturday (Inbound)

Cwmbran Bus Station H	--	0900	1000	1100	1200	1300	1400	1500	1600	1700
Croesyceiliog (Edlogan Square)	--	0905	1005	1105	1205	1305	1405	1505	1605	1705
Pontypool (opp Town Hall)		0809								1720
Hafoodyrnys Hotel		0817	0917	1017	1117	1217	1317	1417	1517	1617
Swffryd School		0819	0919	1019	1119	1219	1319	1419	1519	1619
Llanhilleth Central Hotel		0824	0924	1024	1124	1224	1324	1424	1524	1624
Aberbeeg Square		0827	0927	1027	1127	1227	1327	1427	1527	1627
Six Bells Post Office		0832	0932	1032	1132	1232	1332	1432	1532	1632
Aberillery High Street		0836	0936	1036	1136	1236	1336	1436	1536	1636
Arael View		0840	0940	1040	1140	1240	1340	1440	1540	1640
Post Office		0842	0942	1042	1142	1242	1342	1442	1542	1642
Blaina High Street		0844	0944	1044	1144	1244	1344	1444	1544	1644
Nantyglo Garn Cross		0849	0949	1049	1149	1249	1349	1449	1549	1649
Brynmawr Bus Station		0854	0954	1054	1154	1254	1354	1454	1554	1654

Brynmawr - Cwmbran via Aberillery

Service X1 (GWAX001)

Timetable valid from 14th May 2018 until further notice

Saturday (Outbound)

Brynmawr Bus Station		0800	0900	1000	1100	1200	1300	1400	1500	1600
Nantyglo Garn Cross		0805	0905	1005	1105	1205	1305	1405	1505	1605
Blaina High Street		0810	0910	1010	1110	1210	1310	1410	1510	1610
Bourneville		0812	0912	1012	1112	1212	1312	1412	1512	1612
Rose Heyworth		0814	0914	1014	1114	1214	1314	1414	1514	1614
Aberillery Foundry Bridge		0820	0920	1020	1120	1220	1320	1420	1520	1620
Six Bells		0824	0924	1024	1124	1224	1324	1424	1524	1624
Aberbeeg Square		0828	0928	1028	1128	1228	1328	1428	1528	1628
Llanhilleth Central Hotel		0832	0932	1032	1132	1232	1332	1432	1532	1632
Swffryd School		0837	0937	1037	1137	1237	1337	1437	1537	1637
Hafoodyrnys Hotel		0839	0939	1039	1139	1239	1339	1439	1539	1639
Pontypool (opp Town Hall)										1749
Croesyceiliog (Edlogan Square)		0851	0951	1051	1151	1251	1351	1451	1551	1651
Cwmbran Bus Station		0854	0954	1054	1154	1254	1354	1454	1554	1654

Appendix C

STAKEHOLDER WORKSHOP LONG LIST OF ISSUES



Stakeholder Exercise

Note: x2/3/4 refers to the amount of duplicate issues from stakeholders

Key Issues	Key Solutions
Vehicular	
HGVs (MD)	Redirect to heads of the valleys (MD)
Strategic mid valleys route that supports businesses & employment (HM)	Encourage newer vehicles (scrappage)/grants for hauliers/bus operators – encourage investment EU6 (HM)
x5 Congestion/delays during peak hours (BC-CE-GM-DS-ABo)	Consider alternative modes (CE) Sustainable vehicles? (GM) Localised highway improvements to improve traffic flow (DS) Introduce French ticketing option-older cars banned 8am-8pm (ABo)
x10 A472 is the main cross valley's strategic route (CE-GM-MN-CC-ML-DS-SP-ABo-MG-MP)	x4 Diversions? Bypass? (CE-MN-DS-SP) Provide more routes (GM) Improve link/infrastructure (ML) One-way system (ABo)
Cost to HGV companies (DL)	SUBSIDIES OR TOUGH!!! (DL)
Statuary deadline for action (CC)	Strong project management and planning (CC)
Understand how much traffic needs to be removed (CC)	Vehicle bans/exclusions (CC)
Understand key trip attractors (CC)	Travel planning for modal shift (CC)
Financial constraints (SP)	UK/WG funding (SP)
x3 Volume of traffic (AB-KJ-MG)	Remove houses (KJ) Work with business to reduce staff and delivery journeys (MG)
Public Transport	
x7 Lack of alternative transport (MD-CE-ML-SP-ABo-KJ-MG)	x2 Increase public transport (MD-CE) Invest more (MD) Review options/construct solution & promote car usage horm (ML) Make it cost effective (ML) More efficient cheaper alternatives (SP) Educate/encourage behavioural change with incentives (MG)
Diverse journey patterns – difficult to achieve modal shift (HM)	Metro – improve east-west PT – bus based but long term – light rail (HM)
Diverse destinations (BC)	Government funding (BC)
Cost (BC)	

x2 Limited scope for modal shift (DL-MN)	Reinstate Crumlin viaduct + railway/train (DL) Improve public transport alternatives (MN)
Not viable for public transport (GM)	Incentives for companies (GM)
Understanding what the metro could offer (CC)	Review business case modelling (CC)
Lack of green travel provision (AB)	To improve fleets/invest in infrastructure for sustainable travel (AB)
Limited public transport (AB)	To invest in more frequent bus/travel (AB)
Important route for employment at Oakdale (ABo)	Encourage business use of PT (ABo)
Non-Motorised Users	
Not safe for pedestrians or cyclists (MD)	Survey to find alternative (MD)
Lack of sustainable routes (AB)	Introduce alternative travel routes and cycle paths (AB)
Highway Design & Speed Limit	
Speeding (MD)	Redesign road to slow traffic speed (MD)
x12 Topography / canyon effect (HM-BC-CW-DL-GM-CC-ML-DS-SP-ABo-MG)	x9 Demolish houses/widen road/improve traffic flows (HM-CE-DL-CC-ML-DS-ABo-MG) x3 Build more diversions/roads (BC-GM-ML) Widen Route (SP) WAG incentives for cleaner travel , PT (KJ)
x3 Proximity of properties (MN-DS-SP)	Remove houses (MN-SP)
Air Quality	
Aging bus diesel engines (BC)	Invest in cleaner engines (BC)
Reduce Diesel increase green greenhouse gas (DL)	Maintain Euro6 Diesel usage (DL)
x3 Aging diesel engines (CE-MN-DS-MP)	Invest in newer cars, electric car, and charging points (CE-MP) Car scrappage scheme (MN) Welsh scrappage scheme/congestion charging (DS)
Air quality it a temporary problem (MN)	Wait for technology and EVs. Use temp management of traffic, road charging to deter weight limits etc. (MN)
High levels of NO2 (ML-MG)	Reduce traffic/improve corridor (ML) Provide better PT (MG)
Proximity of properties (AB)	Remove houses (AB)
Poor guidance from National Government (diesel) (KJ)	Diesel scrappage scheme Make cleaner travel more appealing
Insufficient infrastructure for alternative vehicles (MP)	Improve infrastructure to encourage purchase of electric vehicles (MP)



1 Capital Quarter
Tyndall Street
Cardiff
CF10 4BZ

wsp.com