Caerphilly County Borough Council

HAFODYRYNYS, CAERPHILLY – WELTAG STAGE THREE REPORT

Consideration of Measures for Nitrogen Dioxide Reduction

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Consideration of Measures for Nitrogen Dioxide Reduction

FINAL PUBLIC

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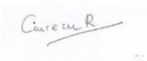
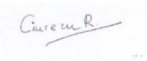
Signature					
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EXECUTIVE SUMMARY

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 only limit values that the UK currently fails to meet are those set-in respect of nitrogen dioxide (NO_2). The A472 Hafodyrynys Road, exceeds the limit value and Caerphilly County Borough Council are investigating measures to bring forward reductions in NO_2 to ensure compliance with the Ambient Air Quality Directive in the shortest possible time. This report presents the findings of WelTAG Stage Three (Full Business Case), for this study.

Since the inception of this study, another year of monitoring data for 2018 is available for the Stage Three assessment. The annual mean concentration for 2018 was 62 µg/m^3, a reduction of 8 µg/m^3 from 2017. While the data for 2018 showed a similar seasonal trend to previous years, the overall concentrations were lower than many of the preceding years. Traffic and Air Quality models were developed to predict the date of compliance with no interventions. The receptor locations are predicted to be compliant in 2025 without any intervention.

This Stage Three study has appraised five of the 6 measures brought forward from WelTAG Stage two, plus two packages of measures which were also discussed at Stage two. These are:

- Air Quality Awareness Campaign
- Change Signal Timings at Crumlin Junction
- Signalise the A472/B4471 Swffryd Junction
- Demolish Dwellings at Woodside Terrace
- Peak Period HGV Bans
- Clean Air Zone / Low Emission Zone
- Traffic Management Package (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction)
- Do Maximum Package (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction & Clean Air Zone / Low Emission Zone)

The air quality awareness campaign has not been modelled in terms of nitrogen dioxide reductions as it is not possible to quantify what effects this measure would have. This is being taken forward as a 'soft measure' to raise awareness and educate people about what can be done to improve air quality.

The appraisals demonstrated that 'Changing the Signal Timings at Crumlin Junction' and 'Signalisation of the A472/B4471 Junction made no reduction in NO_2 levels. Similarly, the cumulative benefits of both measures (the Traffic Management Package) do not bring forward reductions in NO_2. Given that there are no tangible air quality benefits, this measure will not be taken forward for implementation.

The 'Peak Period HGV Bans' reduces NO_2 on the A472 corridor by displacing HGV traffic and smoothing the flow traffic on the corridor, though the air quality benefits are small and the potential adverse impacts of this option on the local economy (including loss of jobs) could be significant. However, this measure does not bring forward compliance which will be achieved in 2025 without the measure.

A 'Clean Air Zone' (CAZ) would result in significant reductions in NO_2 concentrations on the A472 corridor and would likely bring forward compliance with the limit value in the year of implementation (2023). It has been identified that this option would have significant adverse impacts on local communities and businesses. Furthermore, a Clean Air Zone in this location would displace traffic from this corridor, resulting in potential road safety issues and could even lead to increases in NO_2 through areas which already exceed the limit value (M4 J25-26, Newport). The 'Do Max Package' which includes the Clean Air Zone has similar impacts. Consequently, a further feasibility study with detailed modelling would be required to support the implementation of a CAZ, including assessing complementary measures to mitigate the impact of the CAZ on local residents and businesses. This would include the design, assessing the most effective charging structure, construction and enforcement. Following this, the launch of the CAZ would be made at the earliest in January 2023. Compliance with the limit value would therefore be achieved by the end of 2023.

The 'Demolition of Dwellings at Woodside Terrace' would bring forward compliance with the limit value in the year of implementation (2022). This option may have significant impacts on the residents of Woodside Terrace, though the overall impacts on local communities and business is marginal. Given the expected implementation date, this option will bring forward reductions in NO_2, and compliance with the limit value, in the shortest possible time. For this option to be progressed further, topographical and geotechnical surveys are being progressed so that detailed design can be completed. This will minimise any risks associated with this option and mitigate any potential delays to the programme with respect to implementation.

The Air Quality Public Awareness Campaign in the form of school talks and playground monitoring has already commenced and been rolled out to a number of schools within the County Borough. In addition, Year Five pupils from 20 schools within the borough participated in Clean Air Week activities at Caerphilly Castle during June 2019.

The Council will also be launching an anti-idling campaign in the Autumn of this year using schools as the pilot.

The preferred option to bring forward compliance with the NO_2 limit value is the demolition of dwellings at Woodside Terrace and associated re-alignment of the footpath. This is the only measure to bring forward compliance in the shortest possible time. Furthermore, the air quality awareness campaign is being implemented as a short-term option.

1 INTRODUCTION

1.1 CONTEXT

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 (NO_2).

In July 2017, the UK Government published its Air Quality Plan (the 2017 Plan) for tackling roadside NO_2 concentrations[1]. The 2017 Plan set out details of the authorities responsible for delivering air quality improvements including devolved administrations and Local Authorities.

Wales is divided into four 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)

Caerphilly County Borough Council (CCBC) is exploring measures which could be implemented on the A472 to bring forward compliance with NO_2 Limit Values in the shortest possible time.

WSP and Ricardo have been commissioned to undertake a WelTAG Stage Three (Full Business Case) to appraise potential measures deliverable by CCBC for reducing NO_2 levels arising from traffic emissions at this location. This work follows on from the WelTAG Stage One (Strategic Outline case), and WelTAG Stage Two (Outline Business Case) completed by WSP and Ricardo in September 2018. As part of the Stage One appraisal, a long list of 30 measures were put forward. The ten measures that met the criteria of the objective at Stage One were taken forward as part of WelTAG Stage Two. Of the ten measures, six were identified at WelTAG Stage Two to have potential benefits to the reduction of NO_2. The measures were split into short, medium and long-term sub categories. Of the six options from WelTAG Stage Two, the 'soft-measure' (Air Quality Public Awareness Campaign) does not require a detailed assessment as it is not possible to quantify the effects in terms of reduction in NO_2 levels. This Stage Three study presents a full and detailed assessment of the five options and two packages of measures identified at WelTAG Stage Two which were modelled.

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.

The Stage Two WelTAG identified that the following elements need to be undertaken at Stage Three:

[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

- Qualitative analysis of impacts against WelTAG impact areas where appropriate. This should include all relevant traffic and air quality modelling and outline quantifiable benefits in order to determine a Present Value of Benefits (PVB) for each measure assessed;
- Detailed scheme drawings;
- Detailed cost estimates;
- Assessment of Technical, Operational and Financial Feasibility, and Deliverability and Risk;
- Quantitative Value for Money assessment.

This report presents the Stage Three: Full Business Case of the WelTAG process for reducing the levels of NO_2 at A472 Hafodyrynys Road, Caerphilly.

1.2 APPROACH

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 2017[2]) 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.

A summary of the changes to WelTAG from the draft to final release of the 2017 WelTAG guidance is contained within Appendix A.

The objective of this study is to further investigate potential measures and identify a measure or package of measures for implementation by CCBC, to bring forward reductions in NO_2 in the shortest possible time, to ensure compliance with the Air Quality Directive requirements along the A472. Therefore, the Transport Case focuses on air quality and reflects the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

The WelTAG guidance states that the purpose of the Stage Three (Full Business Case) is to:

> *'make a full and detailed assessment of the preferred option to inform a decision as to whether or not to proceed to implementation'.*

As such, this Stage Three (Full Business Case) report:

- Determines whether a transport option exists that can address the issues identified, contributes positively to the well-being goals and objectives, and can be delivered within technical and financial constraints, although is mainly driven by if a measure can achieve compliance in the shortest possible time;

[2] Source: https://beta.gov.wales/sites/default/files/publications/2017-12/welsh-transport-appraisal-guidance.pdf

Accessed February 2018

- Presents the preferred option(s), to be taken forward to procurement and implementation;
- Identifies each dimension of the Five Cases with a level of detail proportionate to scale and/or significance of the impacts and the associated risks; and
- Outlines issues affecting the deliverability of options, the realisation of the anticipated benefits and the mitigation of adverse impacts.

1.3 AIR QUALITY DIRECTION, INDEPENDENT REVIEW PANEL, NOVEMBER 2018

Welsh Government appointed an Independent Review Panel to provide expert advice to the Welsh Government on plans produced by Caerphilly County Borough Council and Cardiff Council to deliver compliance with legal limits for nitrogen dioxide. The review process is intended to ensure that proposed measures are robust, and are likely to bring about compliance.

1.4 REPORT STRUCTURE

The structure of this Stage Three report is as follows:

Chapter 2: Strategic case – Study Overview

This chapter presents a summary of the existing situation presented in WelTAG Stage One and Two studies. It outlines the objective and the EU Air Quality Directive and includes an evidence-based description of the current problem. It identifies the process undertaken and the measures that are included within Stage Three.

Chapter 3: Strategic case – Baseline

This chapter provides a summary of the air quality baseline, traffic baseline and other baseline data.

Chapter 4: Transport case

This chapter provides a summary of the appraisal against the objective through consideration of the key and secondary criteria and appraisal against the aspects of the future generation objectives. Supporting technical information is provided within the WelTAG Stage Three Impact Assessment Report (IAR).

Chapter 5: Financial case

This chapter identifies whether the costs for each of the shortlist of measures appraised at Stage Three are affordable, and the potential funding mechanisms for delivery albeit, the main driver of the preferred option is the measures that is deliverable in the 'shortest possible time'.

Chapter 6: Commercial case

This chapter includes a description as to whether the measures are commercially viable.

Chapter 7: Management case

This chapter identifies the delivery arrangements of the likely measures and then its management during its life time.

The conclusion of this Stage Three report identifies the likely measures that will be implemented to bring forward reductions in NO_2 in the shortest possible time and to do so in a way that reduces personal exposure for the protection of public health as quickly as possible to ensure compliance with the Ambient Air Quality Directive, as per the objective of the study.

2

STRATEGIC CASE - STUDY OVERVIEW

2 STRATEGIC CASE - STUDY OVERVIEW

2.1 OVERVIEW

The Strategic Case 'tells us if we need change and why. It presents an evidence based description of the current situation, describes the likely future situation if no action is taken, and presents the reasons why an intervention is required'.

WelTAG Stages One and Two of this study were finalised in August 2018 and September 2018 respectively, and include a complete Strategic Case. This Stage Three report therefore provides additional and updated information where relevant, and is intended to be read in conjunction with the previous reports.

2.2 STUDY CORRIDOR

The study area has been selected based on data from an air quality monitoring site, which is part of the UK Automatic Urban and Rural Network (AURN). This monitor complies with requirements detailed in the EU Directive (2008/50/EC) to report on the concentrations of particulate pollutants in the atmosphere.

The A472 study corridor is the focus of this WelTAG study, however it is acknowledged that the measures and their subsequent impacts may be realised beyond the identified area with NO_2 exceedances.

Hafodyrynys is a small village community that sits within the Caerphilly County Borough Council boundary between Crumlin and Pontypool on the A472. Woodside Terrace is 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.

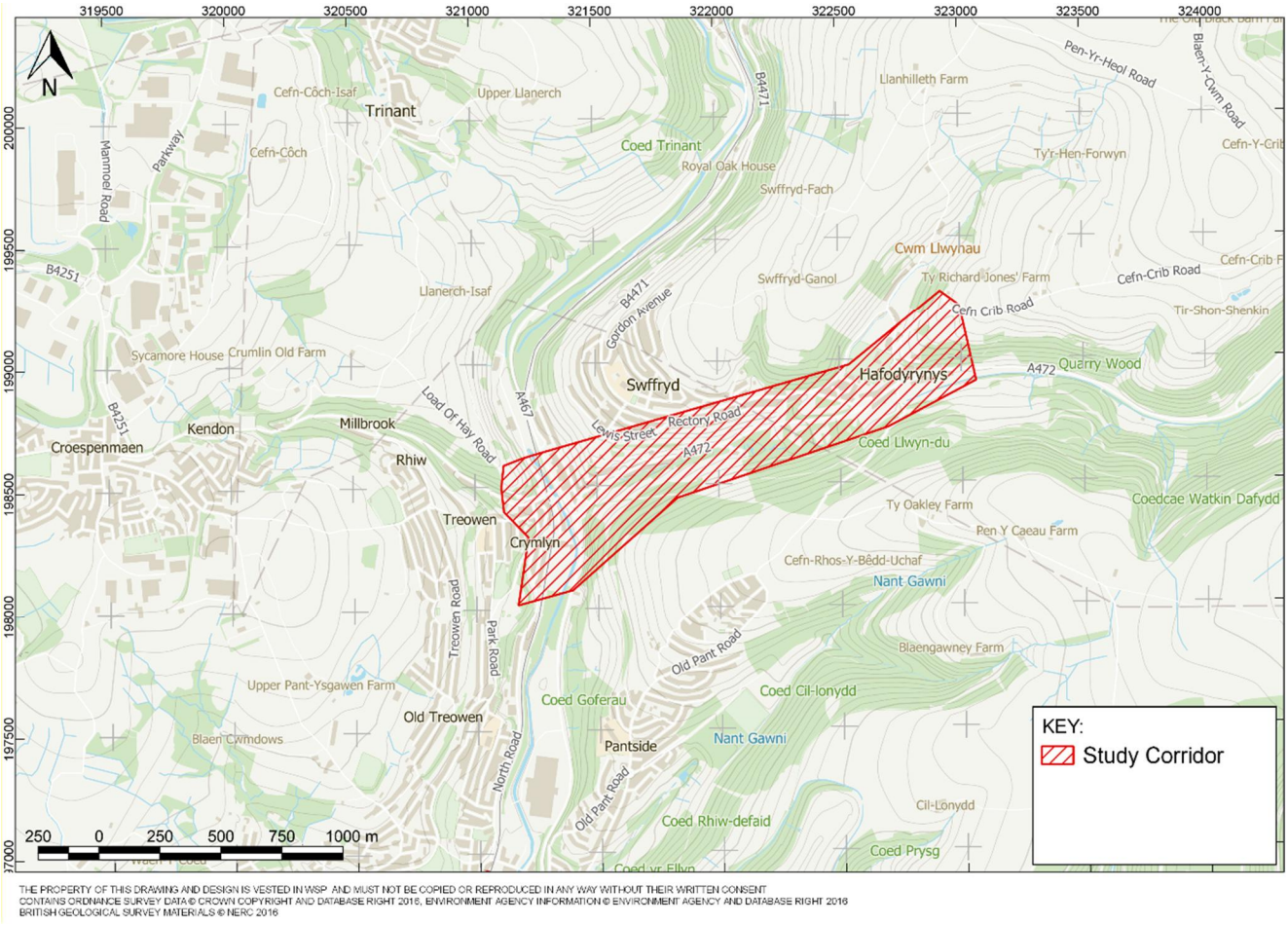
Woodside Terrace is a row of three storey terraced houses with entrances to the first floor from street level and a large supporting wall on the north side. Immediately adjacent to Woodside Terrace and also on the south side of the A472 is Woodside shops, a pair of semi-detached, two-storey properties and 'Yr Adfa', a two-storey detached property.

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 Local Authority's 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.

The study corridor is located on the A472 between the signal controlled junction with the A467 in Crumlin (west) and Hafodyrynys village (east), a distance of approximately 1.6 kilometres. Over this route there is a considerable increase in elevation (approximately 97m). The study corridor is illustrated in Figure 2-1.

Figure 2-1 – Study Corridor



2.3 OBJECTIVE OF THIS STUDY

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

Following on from the WelTAG Stage One and Two reports, the objective of this Stage Three study is to carry out further investigation and identify potential measures that can be implemented by CCBC, which will assist in bringing forward reductions in NO_2 in the shortest possible time to ensure compliance with the Ambient Air Quality Directive requirements on the A472 Hafodyrynys Road, Caerphilly.

2.4 THE PROCESS

This study has been undertaken following the 2017 WelTAG guidance and with due consideration to the goals of the Well-being of Future Generations (Wales) Act 2015.

2.4.1 WELTAG STAGE ONE AND TWO

The WelTAG Stage One identified the issues and objective, and developed a long list of 30 possible measures. The measures were appraised against the key criteria of the objective based on their ability to bring forward the date of compliance with EU Limit Values (Effectiveness, Timescales and Deliverability). This resulted in a short list of ten measures that were taken forward to Stage Two.

The WelTAG Stage Two appraisal examined in greater detail the short list of ten measures for tackling the problem under consideration. The measures were reappraised against the key criteria for the objective, as well as the WelTAG aspects of well-being.

The appraisal of air quality impacts was undertaken quantitively using detailed emission and dispersion modelling, underpinned by assumed changes in traffic flow characteristics and volume for each measure.

WelTAG Stage Two recommended a list of six preferred measures to take forward to Stage Three, differentiating these as long, medium, and short-term options.

The Well-being of Future Generations (Wales) Act 2015 is an integral part of the WelTAG framework. Whilst due consideration was given to the Future Generations Act at Stage One and Two, the Independent Review Panel felt that this needed to be more clearly defined. Therefore, this Stage Three report builds upon the previous two Stages, demonstrating the studies fit with the five ways of working and the consideration of impacts of each option against the seven well-being goals.

WelTAG Stage Two has predicted the maximum NO_2 concentration on the A472 with no interventions, to be compliant by 2029, instead of 2026 as initially indicated by a national assessment. The national assessment was based on 2015 monitoring data and but the analysis within the Stage Two report was based on 2017 monitoring data. The national assessment relied on an improvement in NO_2 concentrations during this time which did not materialise, thus resulting in a delay to achieve compliance to 2029. Analysis into the temporal variation in NO_2 highlighted the highest exceedances to occur in January and February. An investigation in the variation by hour of day and temperature took place to consider all emission sources that are contributing to the high concentrations, such as cold engine starts and domestic heating. A more refined data was used at WelTAG Stage Three to update predictions.

The analysis showed little influence of domestic heating, as high concentrations were not extended into evening hours. An initial first analysis on temperature showed a positive correlation between low temperatures and a high concentration. However, when looking at data between January 2012 – July 2017, no strong correlations were found between the colder winter years and concentrations. Analysis in wind speed identified a positive correlation between low wind speed and higher concentration of NO_2.

2.5 THE FUTURE GENERATIONS FRAMEWORK

'The Future Generations Framework expresses the Five Ways of Working and the seven well-being goals as statutory prompts for consideration to inform thinking and shape the development of major projects, as well as reviewing the effectiveness of projects'. The Five Ways of Working seeks to look at how to develop and run the project, while the seven well-being goals will form part of the strategic case and the options appraisal.

The Five Ways of Working are designed to be the starting point of maximising the contribution to the seven well-being goals. In a short summary, the goals have been identified below:

¡ **Long-term**

- How does the project support long-term well-being of people in Wales?
- Will the project be self-sustaining, or require significant additional or different resources?
- Consider what will happen to the project at the end of its proposed lifespan.

¡ **Prevention**

- The broad consideration of all types of problems that the project can help prevent
- How does the project support the break of negative cycles such as poverty, poor health, environmental damage? Advice to refer to local well-being assessments.
- How can the project minimise its own negative impacts? (resources, emissions, social, community)
-

- Much work is being undertaken with schools at present to raise awareness of the dangers of poor air quality and what everyone can do to help. Air quality monitoring has taken place in a number of schools throughout the borough and have been followed up by air quality talks to Key Stage 2 children. It is intended to repeat these talks on a rolling programme.

Caerphilly Council have also provided activities and hired an interactive theatrical production company called Performance in Education (PIE) to educate and promote messages around air quality for Clean Air Day, albeit activities are taking place throughout an entire week in June 2019 at Caerphilly Castle.

Abbie Ayre and the Shed of Science performed by Performance in Education (PIE) is a theatrical production that educates children about the dangers of air pollution and what we can do to help prevent poor air pollution. This is also complimented with a teaching pack which can be utilised by teachers back at school to embed key messages. Stakeholders such as Healthy Air Cymru, Tenovus, Optare, Stagecoach, Welsh Government and Head for Art are also working with the Council throughout Clean Air Week to provide key messages around air quality, so collaboration features greatly too with respect to this event.

The Council will also be launching an anti-idling campaign in the Autumn of this year, initially concentrating in and around school playgrounds.

¡ **Integration**

- How your project integrates with other public bodies well-being objectives.
- How can your project maximise its contribution to all of the goals by aligning with relevant public body strategies and well-being objectives?
- What measures are in place to ensure that the project continues to positively contribute to the well-being goals throughout its life?

¡ **Collaboration**

- What other stakeholders are working towards similar goals around sustainability and well-being?
- How does the project ensure collaboration will continue throughout the lifetime of the project?

¡ **Involvement**

- How has the project been shaped by key stakeholders affected by the project, and particularly their needs and challenges?
- How will key stakeholders affected by the project continue to influence the project throughout its life?

The well-being goals that are part of the Future Generation Act should be considered as an integrated set and not in isolation. These goals must in turn maximise contribution to the following Seven Well-

being Goals. The Seven Goals form part of a parallel appraisal for the options at Stage Three. More details can be found in the 'appraisal against objectives' section (within the Transport Case).

The Seven Well-being Goals are:

1. A Prosperous Wales;
2. A Resilient Wales;
3. A Healthier Wales;
4. A More equal Wales;
5. A Wales of Cohesive Communities;
6. A Wales of Vibrant Culture and Thriving Welsh Language; and
7. A Globally Responsible Wales.

2.5.1 THE FIVE WAYS OF WORKING

Long-term

The project aims to decrease the air pollution impacts from NO_2 on the people in Wales and the local community by implementing measures for tackling roadside emissions. The WelTAG Stage Two appraisal identified options which have the potential to provide short term implementation timeframes with immediate benefits and those with long-term timeframes which have the potential to bring forward significant reductions in NO_2.

The monitoring and evaluation section describes what will happen to the project after its lifetime.

Prevention

The project aims to bring the NO_2 concentrations on the A472 within compliance before 2025 (the predicted year of compliance with no intervention), through implementation of measures.

The project understands the economic situation of the study area and through the options put forward it aims to overcome the negative cycles associated with poverty, poor health from NO_2 and further damage to the environment and the ecosystem.

This includes involving 'The Caerphilly We Want'[3] in the well-being assessment. Well-being, as expressed by residents is "having access to a personal vehicle, ensuring jobs for their family, ease of commuting and access to local amenities".

As part of the 7 Well-being Objectives, the use of resources for option implementation will be qualitatively appraised to minimise the project's own negative impacts. Considerations are made for the emissions, as well as the social and community impacts of the project.

Integration

The Caerphilly Local Development Plan Up to 2021 created in 2010, included a target for implementing improvements to the existing transport infrastructure through reducing the level of traffic movements and/or congestion, within any identified air quality management area.

[3] Reference: https://your.caerphilly.gov.uk/publicservicesboard/content/what-does-wellbeing-mean-you

The same Plan from 2010 highlighted that air quality standards were failing in some strategic regions of the Council such as Caerphilly and the number of NO_2 monitoring locations which do not comply with the air quality objectives are reported also in the 2012 Annual Monitoring Report. The safeguarding aspect of the report highlighted that an investigation into the sources of the problem and alternative options needed to be undertaken.

Other existing strategies and policies relevant to Air Quality in Caerphilly County Borough that have been examined and identified by WSP or Ricardo and will be supported and not impeded upon are:

- Noise Action Planning Priority Area (NAPPA)
- South East Wales Valleys Local Transport Plan
- Well-being of Future Generations Act (Wales) 2015
- Air Quality Regulations (Wales) Regulations 2010
- Relevant policies in relation to Carbon Reduction Strategy, Housing, and Climate Adaptation Plan for the Borough
- Planning Policy Wales (Edition 10)
- Caerphilly Corporate Plan 2018-2023
- Electric Vehicle Strategy

Collaboration

The project will ensure that collaboration will continue throughout the lifetime of the project through working closely with the stakeholders and taking account of completing mutual goals.

Involvement

A stakeholder workshop and consultation was undertaken in July 2018 and formed part of WelTAG Stage One, with key representatives from Caerphilly CBC and Stagecoach. This consultation identified the challenges and problems.

CCBC has undertaken a 10-week public consultation as part of WelTAG Stage Three. This has allowed the public to inform the study and inform the final outcomes (**Appendix B - Public Consultation Report**.) In addition, throughout the process public meetings have been held with local residents to ensure they are fully informed of the ongoing work and that any concerns they have are address in the study.

2.6 SHORT TERM MEASURES

As part of the WelTAG Stage Two, it was recognised that many of the measures identified within this assessment have the potential for immediate implementation, with potential benefits to the reduction of NO_2. Immediate measures include the low cost, short timeframe measures, and other low to medium costs measures that could be implemented in a trial basis and then considered for longer term use. For the A472 these included:

- **Measure 1**: Change Signal Timings at Crumlin Junction
- **Measure 27**: Air Quality Public Awareness Campaign

By implementing measures on a trial basis, on-site monitoring can be utilised to evidence the effectiveness of these measures before applying them permanently. More information on the measures which underpin the Air Quality Public Awareness Campaign are detailed within the IAR.

2.7 MEDIUM TERM MEASURES

Medium term measures require further consultation and analysis to be undertaken prior to implementation. This includes:

- **Measure 13**: Peak Period HGV Bans

Prior to implementing peak period HGV bans, consideration would need to be given to enforcement of this measure and this may involve consultation with the police. Similarly, some local businesses have been consulted as part of a pilot study questionnaire presented in **Appendix C**, to identify the acceptability of the proposals and further understand the likely impacts as the potential loss of business and subsequent loss of jobs would have significant adverse impacts on the local economy.

2.8 LONG TERM MEASURES

Long term measures can be implemented on a permanent basis and Stage Three (Business Case) will appraise the full impacts of these measures. For the A472 these include:

- **Measure 2:** Signalise A472/B4471 Swffryd Junction and introduce an eastbound queue detector
- **Measure 11:** Demolish Dwellings at Woodside Terrace and re-align footpath.
- **Measure 26:** Clean Air Zone / Low Emission Zone

The Automatic Number Plate Recognition (ANPR) survey carried out on the study corridor in 2018 identified that 58% of articulated HGVs and 38% of rigid HGVs are Euro VI compliant and would therefore not be impacted by a CAZ.

It is considered that for some of the options, there are likely to be perceivable impacts on the local businesses. Consideration will be given to displacement effects of where alternative routes bypass class restrictions or charging zones. Such routes could be via the Pantside, Old Pant Road and the Central Avenue to join the A467.

This Stage Three assessment will explore the effectiveness of the measures above, identifying which measures should be taken forward to implementation.

2.9 NEW MEASURE IDENTIFIED POST COMPLETION OF STAGE TWO

Following completion of WelTAG Stage Two, a new measure has been identified by CCBC for consideration at Stage Three. This option put forward the introduction of a new 30mph speed limit and removal of the climbing lane between Woodside Terrace and the B4471 Swffryd Road / A472 Hafodyrynys Road Junction. This option has been introduced post completion of WelTAG Stage Two and was not in the shortlist of options carried forward. However, this option has been modelled for both traffic and air quality modelling and has been given full consideration in a similar way to the other options presented in the Transport Case chapter. Furthermore, the findings show no impact on reducing NO_2 levels or bringing forward compliance. On this basis it fails on the following essential criteria of effectiveness:

- To Deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m^3 legal limit.

This option will not be carried forward throughout the report. However, the results of the modelling will be available in the Impact Assessment Report (IAR).

2.10 STAKEHOLDER CONSULTATION

A stakeholder consultation was undertaken at WelTAG Stage One on 3rd July 2018 at Penalta House, Caerphilly. The attendees included members from CCBC, local Councillors and Stagecoach South Wales. The workshop findings were used to develop the objectives and the initial options. More information on the stakeholder consultation can be found in WelTAG Stage One. In addition, the measures that were included within the 2017 Air Quality Action Plan for Hafodyrynys have been addressed within this study. Those original actions were put forward by a steering group which consisted of officers and members of CCBC, local residents, Public Health Wales and environmental health professionals from neighbouring authorities.

2.11 PACKAGING OF MEASURES

The six preferred measures have been subdivided into 'hard measures' with tangible benefits and 'soft measures' resulting in marginal indirect benefits. The soft measures are those that passively reduce NO_2 levels by increasing peoples' awareness to the problem and encouraging a behaviour change, which positively impacts upon the problem. The soft measures could provide benefits at A472 Hafodyrynys Road, Caerphilly, and potentially across Wales.

Furthermore, the Stage Three appraisal has also considered the cumulative benefits of the packaging of measures. The packaging of measures is as follows:

- **Traffic Management Package** - ***Measure 1***: Change Signal Timings at Crumlin Junction, and **Measure 2**: Signalise A472/B4471 Swffryd Junction and introduce an eastbound queue detector.
- **Do Maximum Package** - ***Measure 1****:* Change Signal Timings at Crumlin Junction, ***Measure 2***: Signalise A472/B4471 Swffryd Junction and introduce an eastbound queue detector, and ***Measure 26:*** Clean Air Zone / Low Emission Zone

2.11.1 COMPLEMENTARY PACKAGE – 'SOFT MEASURE'

- **Measure 27:** Air Quality Public Awareness Campaign

It is expected that the 'soft measure' will be achieved initially with a significant communications campaign using social media and the press as well as delivering air quality talks to schools throughout the borough. This campaign will be reiterated throughout the year at key periods when the air quality is measured to be at a high level from the roadside monitors. The complementary measures will engage and involve the public to prevent the worsening of the problem.

The Pollution Control team within the Council have undertaken monitoring studies in a number of schools throughout the borough and have followed these studies up with talks to Key Stage 2 pupils on air quality. Some of the key messages communicated are:

- Explaining the sources that give rise to air pollution
- Traffic Pollution – the biggest polluter
- How air pollution affects health
- What can be done to improve air quality – use less energy/renewable energy/walk to school/car share etc.
- Promotion of anti-idling whilst stationary

This measure integrates well with the Future Generations Act and other key policies. Due to the expected small-scale intangible benefits of this option, and minimum impacts, this complementary package has not been appraised.

2.11.2 MEASURES TO BE APPRAISED

The WelTAG Stage Two appraisal identified 'slight to large beneficial' benefits to the NO_2 reduction from a number of hard and soft measures. As outlined previously, the measures can be distinguished between short-, medium- and long-term, depending on the implementation period. For the A472 Hafodyrynys Road, the hard measures that have been appraised at Stage Three are presented in **Table 2-1**.

For simplicity, the option referencing notation used at Stage Two has been replaced by a new consecutive referencing at Stage Three. This is presented in the second column of **Table 2-1**.

Table 2-1 – Hard Measures to be Appraised

WelTAG Stage One / Two Reference	WelTAG Stage Three Option Reference	Measure Description	Subdivision
Measure 1	S1	Change Signal Timings at Crumlin Junction	Short-term
Measure 2	S2	Signalise the A472/B4471 Swffryd Junction	Medium-term
Measure 11	S3	Demolish Dwellings at Woodside Terrace	Long-term
Measure 13	S4	Peak Period HGV Bans	Long-term
Measure 26	S5	Clean Air Zone / Low Emission Zone	Long-term
N/A	S6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction	Short to medium-term
N/A	S7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction & Clean Air Zone / Low Emission Zone)	Short to long-term

S1 - Change Signal Timings at Crumlin Junction (A472 Hafodyrynys Road / A467)

To improve the flow of traffic and HGVs travelling Eastbound on the steep gradient A472 Hafodyrynys Road after the A467 junction. This option involves reducing the green time for traffic on the A467 and improves traffic flow eastbound on the A472 Hafodyrynys Road. This option would potentially increase queues on the A467. A drawing of this option is available in **Appendix D**.

S2 - Signalise the A472/B4471 Swffryd Junction

To improve the flow of vehicles travelling on the A472 Hafodyrynys Road by signalising the junction with B4471 Swffryd Road. The current priority junction layout results in vehicles travelling on the A472 Hafodyrynys Road to stop, out of courtesy, letting other vehicles pull out of the B4471 road. This results in traffic backing up and queuing outside Woodside Terrace. The signalisation will give priority to A472 Hafodyrynys Road traffic especially in peak periods, though may increase queuing on B4471. A queue loop or detector can be utilised to manage the queue on the A472. A drawing of this option is available in **Appendix D**

S3 - Demolish Dwellings at Woodside Terrace

To remove the southern properties at Woodside Terrace. The footpath to the south would be realigned by using the GRAL and RapidAIR modelling outputs to help identify by how much the footpath needs to be realigned. There will be a new edging kerb and grass topsoil separating the footpath from the main carriageway can be incorporated into the design. The drawing of this option is available in **Appendix D.**

S4 - Peak Period HGV Bans

To introduce a traffic prohibition order for vehicles exceeding a gross weight of 7.5T. The heavy goods vehicles (HGV) affected are likely to be both OGV1 and the articulated OGV2. The prohibition is likely to be achieved through the usage of regulatory signs and ANPR enforcement. The ban is anticipated to be on both the morning and evening peak periods. The assessment will be required to consider the impacts on alternate routes which HGV traffic may be displaced to. A drawing of this option is available in **Appendix D**.

S5 – Clean Air Zone

To implement a Clean Air Zone (CAZ) for the A472 Hafodyrynys Road corridor, a further feasibility study would need to be undertaken to understand the effects of any displaced traffic and whether any alternative routes would require upgrading / infrastructure works. It is likely the geographical area of any CAZ would extend from the Crumlin Junction to the edge of Hafodyrynys Village with signage for drivers being as far afield as Pontypool so that if drivers wanted to use an alternative route, they are able. A drawing of this option is available in **Appendix D**. The drawing considers the requirement for signage in advance of the CAZ to allow sufficient notice for drivers to utilise alternative routes as required.
Using the Clean Air Zone Framework for Wales, it defines a CAZ as;

"*A geographical target area where a range of co-ordinated actions are applied with the purpose of ensuring, in the soonest time possible, a significant reduction in public an environmental exposure to harmful airborne pollutants from all sources*." [4]

The Clean Air Zone Framework for Wales sets out the general considerations for the design and implementation of a CAZ. The proportion of NOx vehicular emissions (in 2017) in Hafodyrynys Road from diesel passenger cars is estimated at 68% with petrol passenger cars contributing 13%. Consequently, for this measure to be effective these vehicle types should be included in the restrictions. Therefore, Class D[5] CAZ is the option which will be considered within this study..

[4] Clean Air Zone Framework for Wales – April 2018 https://beta.gov.wales/sites/default/files/consultations/2018-04/180424-clean-air-zone-framework-en.pdf

[5] Class A - Buses, coaches, taxis and private hire vehicles (PHVs); Class B - Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs); Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs); Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

3

STRATEGIC CASE – BASELINE

3 STRATEGIC CASE – BASELINE

3.1 OVERVIEW

At WelTAG Stage One and Two, a baseline for the study was established. This has been further developed in light of the preferred options which were brought forward from Stage Two. This updated baseline will further our understanding of the current conditions so that the full impacts of the options can be adequately appraised. For the previous baseline for this study, refer to WelTAG Stage One and Two. The additional baseline information since the completion of Stage Two is presented within this chapter. This information includes up-to-date data on employment, unemployment, workers, earnings and business counts.

3.2 ECONOMY

The Labour Market Profile of CCBC[6] has identified that between October 2017 and September 2018, 75.3% of residents were economically active (for those aged 16-64), which is slightly below the Welsh average of 76.2%. There are 10,900 workless households in CCBC, which equates to 19.1% of households (an increase of 0.5% from 2016), 1.6% higher than across Wales in 2017. Based on 2018 data. The county's average out-of-work benefits claimants are 2.5%, in comparison to the Welsh average of 2.3% (May 2018).

Table 3-1 below shows that Caerphilly has a slightly higher economic inactivity of 24.7% compared to the Welsh average of 23.8%. The majority (33.6%) are made up of Long-term Sick. A higher proportion (26.3%) of residents are classed as wanting a job compared to the Welsh average of 22.3%.

Of the 75.3% residents that are economically active, 63.5% are employees and 5.8% are self-employed. The remaining 5.7% are unemployed. When comparing these figures to the Welsh average, Caerphilly has a higher percentage of both employees and unemployment.

[6] Caerphilly County Borough Council Labour Market Profile
https://www.nomisweb.co.uk/reports/lmp/la/1946157400/report.aspx Accessed January-February 2019

Table 3-1 – Economic Inactivity [4]

All People	Caerphilly	Caerphilly %	Wales %
Total	**27,500**	**24.7%**	**23.8%**
Student	5,600	20.4%	25.4%
Looking After Family/Home	5,400	19.5%	19.7%
Temporary Sick	#	#	1.7%
Long-Term Sick	9,300	33.6%	28%
Discouraged	!	!	0.4%
Retired	4,500	16.5%	14.7%
Other	2,300	8.2%	10.1%
Wants A Job	7,300	26.3%	22.3%
Does Not Want A Job	20,300	73.7%	77.7%

(October 2017 – September 2018 Data)

Source: ONS annual population survey
Sample size too small for reliable estimate
! Estimate is not available since sample size is disclosive

Table 3-2 – Employment & Unemployment [7]

All People	Caerphilly	Caerphilly %	Wales %
Economically Active	85,800	75.3%	76.2%
In Employment	80,000	70%	72.6%
Employees	71,900	63.5%	62.5%
Self Employed	7,000	5.8%	9.5%
Unemployed	4,800	5.7%	4.6%

(October 2017 – September 2018 Data)

Source: NOMIS labour supply – based on the ONS annual population. Figures taken directly from the source.

[7] https://www.nomisweb.co.uk/reports/lmp/la/1946157400/report.aspx?pc=NP11%205ES#tabjobs

There are a high number of workless households in Caerphilly at 19.1% which is higher than both the Wales and Great Britain averages at 17.5% and 14.5% respectively. Data from January to December 2017 shows that there were 10,900 workless households in Caerphilly.

Table 3-3 – Workless Households [4]

	Caerphilly	Wales	Great Britain
Number of Workless Households	10,900	166,000	2,943,800
Percentage of Households That Are Workless	19.1%	17.5%	14.5%
Number of Children in Workless Households	#	67,100	1,280,500
Percentage of Children Who Are in Households That Are Workless	#	12.6	10.7

(January – December 2017)

Source: ONS annual population survey - households by combined economic activity status
Sample size too small for reliable estimate
Notes: Only includes those households that have at least one person aged 16 to 64.
Children refers to all children aged under 16.

The average earning per week for a Caerphilly resident equates to £504, which is lower than the Welsh and Great Britain averages which are £518.60 and £571.10 respectively. The difference between the Caerphilly and Wales full-time workers gross weekly pay is £14.30 lower than the Welsh average. The hourly pay excluding overtime is £12.97 which is in line with the Welsh average of £13, but considerably lower than the £14.36 Great Britain average.

Table 3-4 – Earnings by place of residence [4]

	Caerphilly (£)	Wales (£)	Great Britain (£)
GROSS WEEKLY PAY			
Full-Time Workers	504.30	518.60	571.10
Male Full-Time Workers	550.20	551.90	612.20
Female Full-Time Workers	467.50	474.10	510.00
Hourly Pay - Excluding Overtime			
Full-Time Workers	12.97	13.00	14.36
Male Full-Time Workers	13.46	13.42	14.89
Female Full-Time Workers	12.35	12.32	13.56

(2018 Data)

Source: ONS annual survey of hours and earnings - resident analysis
Notes: Median earnings in pounds for employees living in the area.

The earnings based on the place of work shows a difference of £12.30 per week for full time workers when compared to the place of residence. This highlights that certain residents commute outside of the Caerphilly boundary to access higher paid jobs. The difference between the Caerphilly and Wales full-time workers gross weekly pay based on place of work is of £17.00 in favour of the national average.

Table 3-5 – Earnings by place of work [4]

	Caerphilly (£)	Wales (£)	Great Britain (£)
GROSS WEEKLY PAY			
Full-Time Workers	492.00	509.00	570.90
Male Full-Time Workers	501.40	541.60	611.80
Female Full-Time Workers	463.90	469.50	509.80
Hourly Pay - Excluding Overtime			
Full-Time Workers	12.69	12.67	14.35
Male Full-Time Workers	13.07	13.02	14.88
Female Full-Time Workers	12.31	12.08	13.55

(2018 Data)

Source: ONS annual survey of hours and earnings - workplace analysis
Notes: Median earnings in pounds for employees working in the area.

There were 3,935 registered businesses in Caerphilly as of 2018 and over 4,895 local business units. There is a higher percentage of medium and large enterprises in Caerphilly at 1.9% and 0.5% when compared to the Welsh averages of 1.4% and 0.3% respectively.

Table 3-6 – UK Business Counts

	Caerphilly (Numbers)	Caerphilly (%)	Wales (Numbers)	Wales (%)
Enterprises				
Micro (0 To 9)	3,450	87.7%	92,235	89.1
Small (10 To 49)	390	9.9%	9,550	9.2
Medium (50 To 249)	75	1.9%	1,430	1.4
Large (250+)	20	0.5%	315	0.3
Total	**3,935**	**-**	**103,530**	-
Local Units				
Micro (0 To 9)	3,990	81.5%	105,095	83.1
Small (10 To 49)	725	14.8%	17,665	14
Medium (50 To 249)	150	3.1%	3,210	2.5
Large (250+)	30	0.6%	500	0.4
Total	**4,895**	**-**	**126,470**	**-**

Data from 2018

Source: Inter Departmental Business Register (ONS)
Note: % is as a proportion of total (enterprises or local units)

3.3 AIR QUALITY BASELINE

The WelTAG Stage Two's problem identification section found the elevated concentrations in NO_2 to be associated with the high traffic volumes and congestion with the eastbound morning peak. This is caused by vehicles climbing the A472 towards Hafodyrynys village. A map of this is available in **Figure 3-7**.

As part of WelTAG Stage Two, the Pollution Climate Model (PCM) projections presented in support of the 2017 Plan indicate that annual mean NO_2 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 NO_2 levels. Using national projection factors which account for the effect of improved emissions from the turnover in the vehicle fleet, and traffic count data the estimated year of compliance is 2029 from a 2017 baseline, as reported in the Stage Two Report.

As part of the Stage Three assessment a more detailed and robust `Do Minimum' traffic model was used as a basis for estimating the year of compliance with no interventions.

3.3.1 PREDICTED MAXIMUM NO_2 CONCENTRATIONS AT THE A472 – NO INTERVENTIONS, STAGE THREE UPDATE

WelTAG Stage Two has predicted the maximum NO_2 concentration on the A472 with no interventions, to be compliant by 2029, instead of 2026 as initially indicated by a national assessment. The national assessment was based on 2015 monitoring data and but the analysis within the Stage Two report was based on 2017 monitoring data.

The future of compliance has been re-assessed at Stage Three through modelling. Receptors have been used in the model at residential locations, CCBC monitoring points, locations along the existing north path, existing south path and the new south path. In total 97 receptors have been used. The receptor network is shown as the dots in **Figure 3-1**.

Table 3-7 shows the predicted reduction in concentrations over time and the anticipated compliance date without intervention.

Table 3-7 - Roadside annual mean concentrations of NO_2, µg/m^3 on A472

Measure	NO_2 predicted concentration (µg m^{-3})									
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Baseline	72	68	65	61	57	53	49	45	40	36

Note: Red Box Non-compliant, Green Box compliance achieved

3.3.2 MODEL FORECASTING YEARS

At WelTAG Stage Two it was identified that the compliance year without any local intervention was 2029. The 2029 compliance date at WelTAG Stage Two was based on 2017 baseline monitoring data and used a national projection factor for the vehicle emissions. The implementation year for most of the options is found to be no earlier than 2021. Therefore, the Stage Three assessment utilises 2021 and 2029 as the traffic forecast assessment years. The base traffic model was validated to 2018 data. The most recent annual air quality monitoring data available was for 2017, which was used for the base year along with the forecasting years is as follows:

- 2021 (first implementation year for most of the options)
- 2029 (compliance year for NO_2 without any local intervention as identified at WelTAG Stage Two)

Air quality modellled data were linearly interpolated for each intervening year between 2017, 2021 and 2029.

Figure 3-1 – Receptor Network Location Diagram

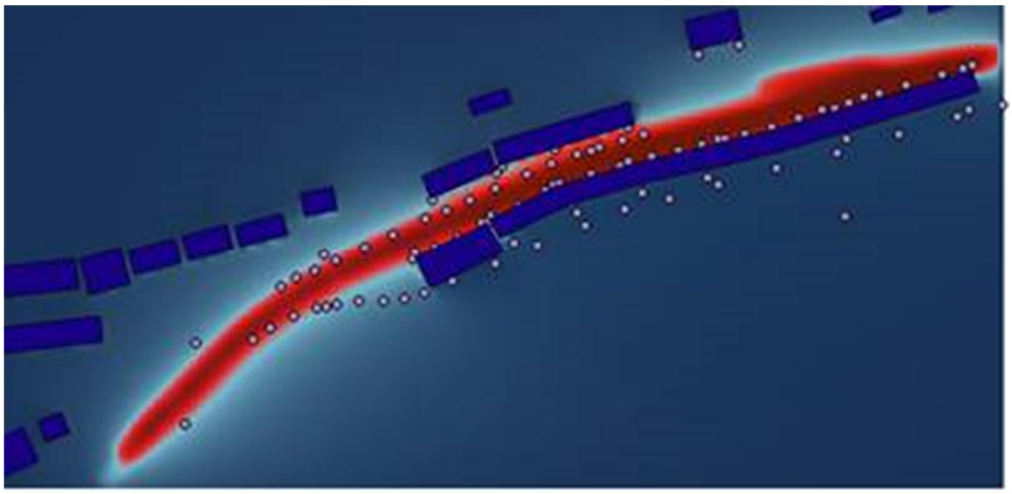


Table 3-8 shows a count the number of points less than or higher than 40µg/m^3 of NO_2. The clear majority of 70 receptor locations are compliant by 2023/2024. **The table shows that by 2025 all receptors will be compliant with the limit of 40µg/m^3 of NO_2.**

Table 3-8 – Future Compliance of NO_2 (Do Minimum)

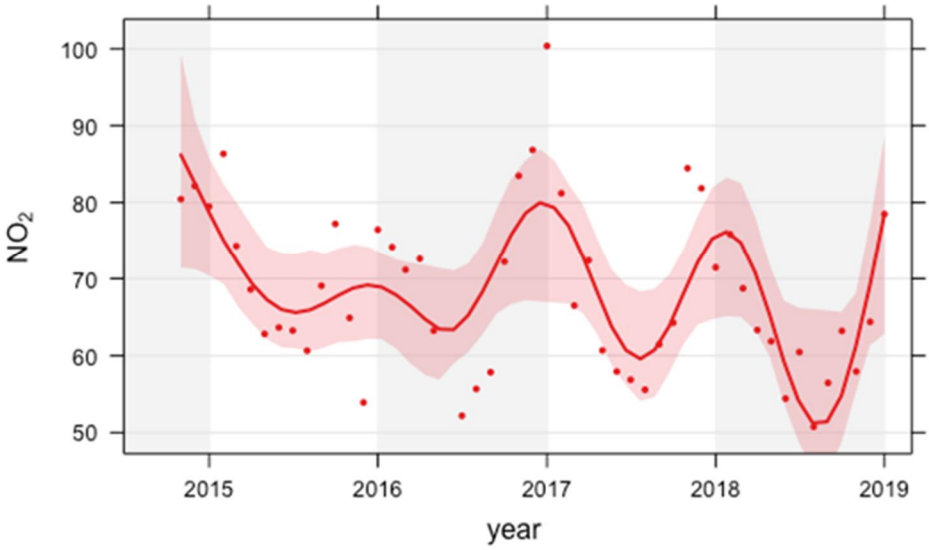
	Total Number of Receptors	
Scenario	NO_2>40	NO_2<40
2017	56	41
2021	35	62
2022	31	66
2023	25	72
2024	10	87
2025	0	97
2026	0	97
2027	0	97
2028	0	97
2029	0	97
This table is the number of receptor points <40, or >40 µg/m^3		

Another year of monitoring data for 2018 is available for the Stage Three report. The annual mean concentration for 2018 was 62 µg/m^{-3}, a reduction of 8 µg/m^{-3} from 2017. While the data for 2018

showed a similar seasonal trend to previous years, the overall concentrations were lower than many of the preceding years. This is shown in **Figure 3-2**. The data values presented are up to 2018 in **Figure 3-2** and **Figure 3-3**.

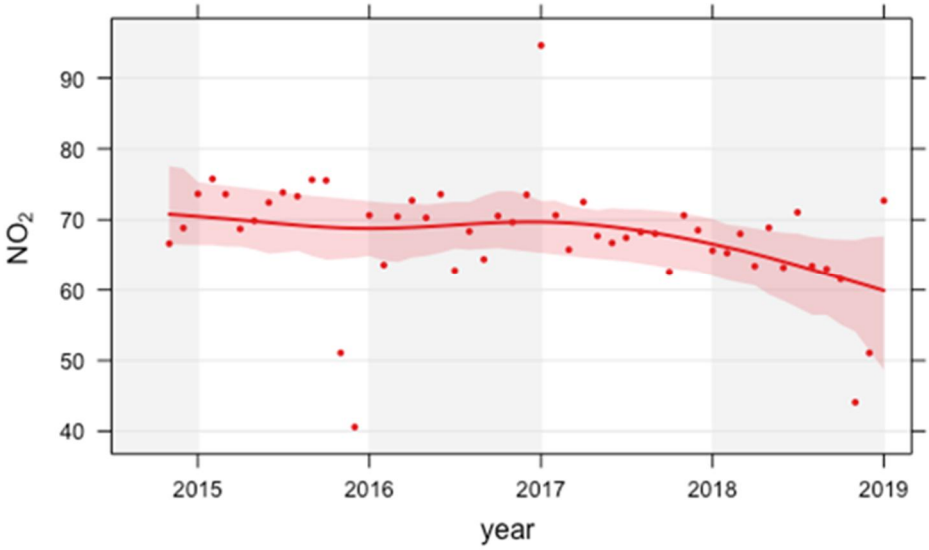
In **Figure 3-3** it is unclear as to why the 2018 concentrations have decreased and there is little evidence, at present to indicate this is a widespread trend.

Figure 3-2 - Seasonal trend in NO_2 at Hafodyrynys automatic monitoring site



Note: The data values presented are up to the end of 2018

Figure 3-3 - Annual trend in NO_2 at Hafodyrynys automatic monitoring site

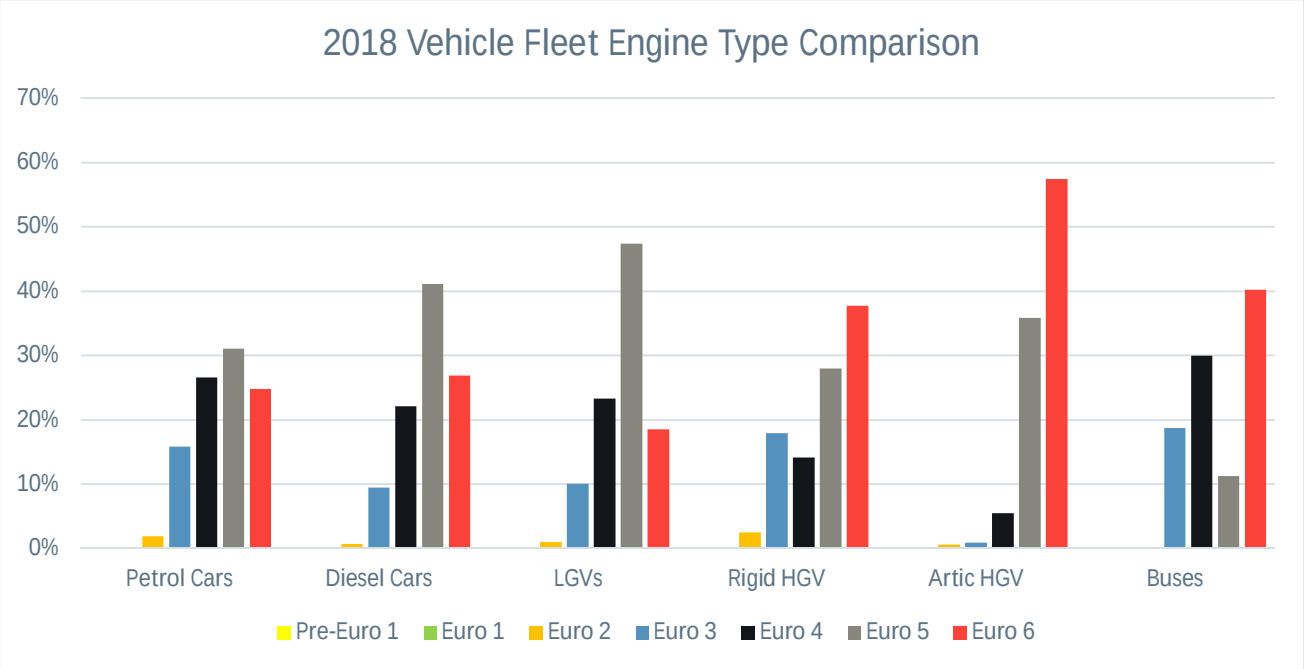


Note: The data values presented are up to the end 2018

3.4 TRAFFIC BASELINE

An Automatic Number-plate Recognition (ANPR) Survey has been carried out on the study corridor, A472 (Crumlin) in 2018. This has identified the emissions standards of the vehicle fleet in this location. This is broken down by European emissions standards, Euro 1 to Euro 6. The **Figure 3-4** identifies that there are no vehicles currently using the A472 on the study corridor which are Euro 1 (passenger vehicles registered from January 1993 up to January 1997), (LGVs registered from October 1994 up to October 1997) and (HGVs & Buses registered between 1992-1995).

Figure 3-4 – Base Year Vehicle emissions standards



In 2018 the following percentage of vehicles which are older than Euro 4 Petrol Car and older than Euro 6 Diesel, would not be compliant and would therefore be impacted by a Clean Air Zone (CAZ):

- Petrol Car – 18%
- Diesel Car – 73%
- Diesel LGVs – 82%
- Articulated HGV – 43%
- Rigid HGV - 62%
- Buses – 60%

Note – this assumes implementation of the CAZ in the base year – a false scenario. The numbers above are likely to reduce over time due to turnover and modernisation of the fleet.

Further to this, data from the National Atmospheric Emissions Inventory (NAEI) has been used to calculate projection factors and then applying this to the local fleet data to give future year annual forecasts up to 2030. The base year vehicle emissions standards are shown is shown in Figure 3-4. The forecast years for Stage Three are 2021, shown in Figure 3-5 and 2029 in Figure 3-6.

Figure 3-5 – 2021 Vehicle Engine Type Forecast Comparison

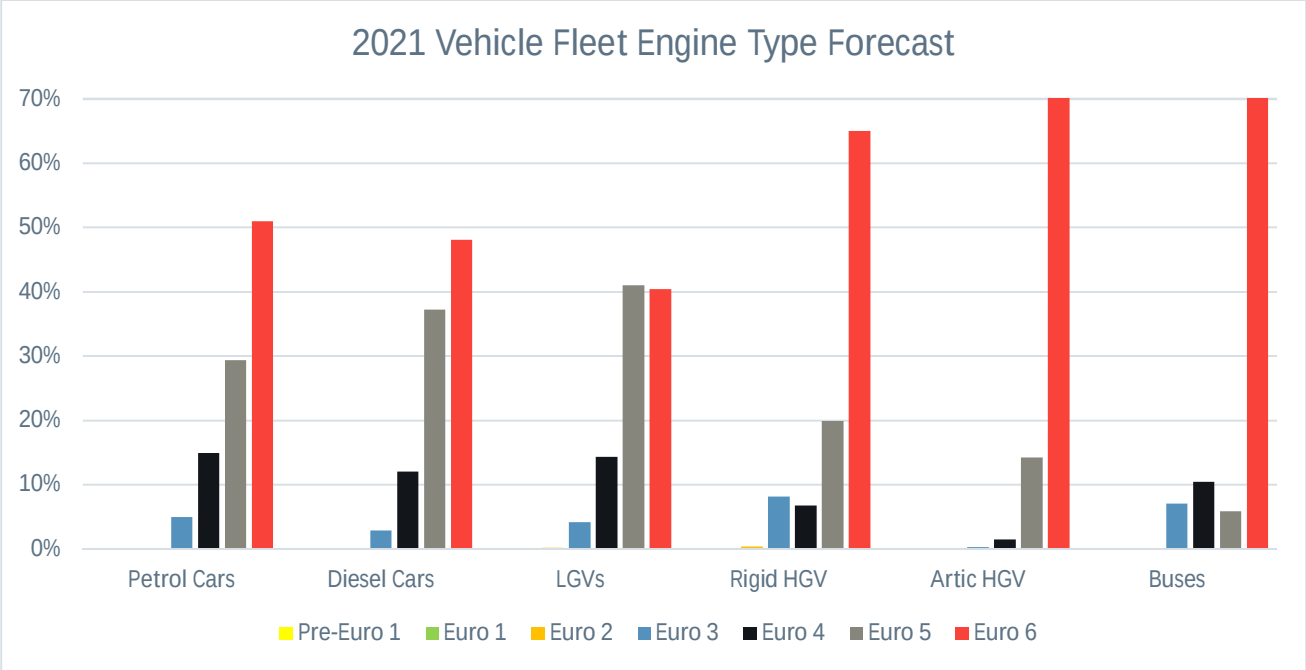


Figure 3-6 – 2029 Vehicle Engine Type Forecast Comparison

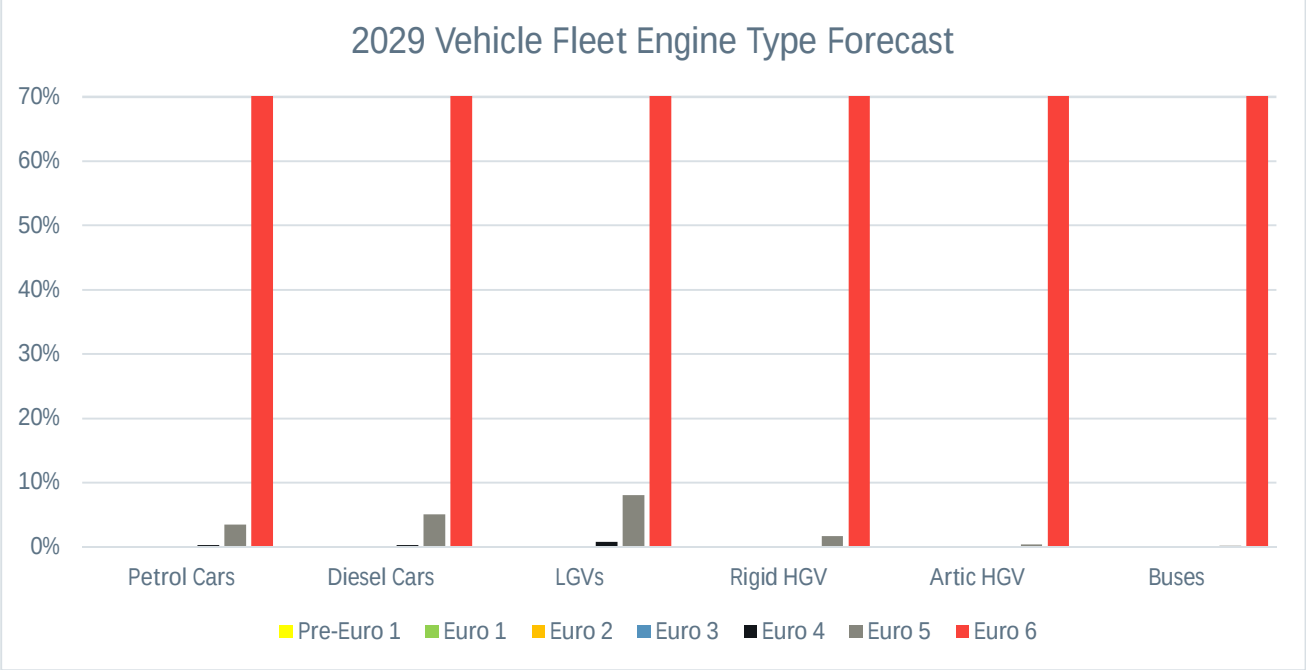


Table 3-9 shows the percentage of vehicles which are older than Euro 4 Petrol and older than Euro 6 Diesel, that are not compliant and would therefore be impacted by a Clean Air Zone (CAZ). The projections show that by 2021, around 5% of petrol cars will not be compliant with the emissions standards and would be subject to a CAZ charge, while just over half of diesel cars in the study area

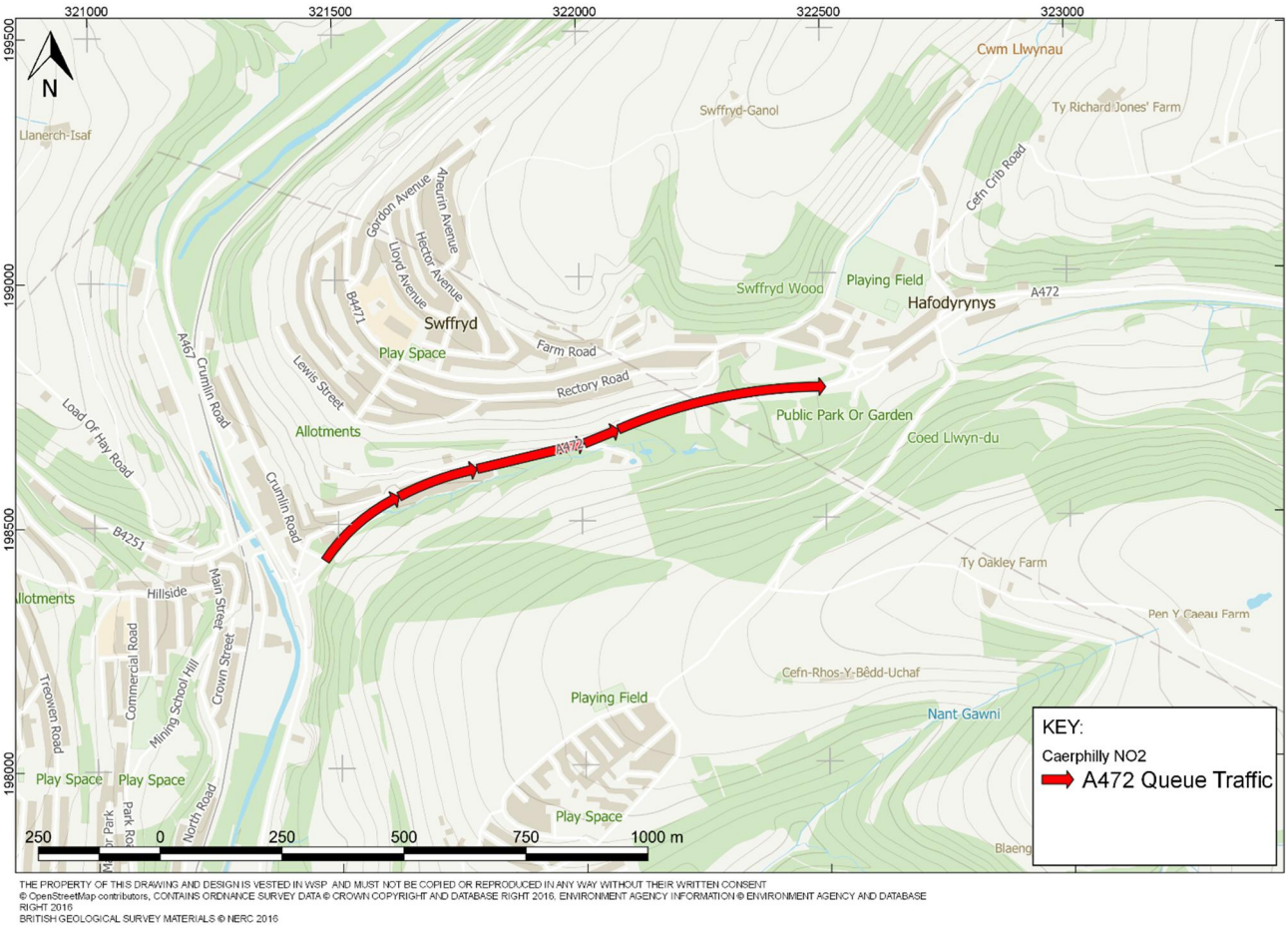
would be affected. By 2029 it is projected that most vehicles will be compliant with the standards, with the highest impact of the CAZ being for diesel car and LGVs users at 5% and 9% respectively.

Table 3-9 – Clean Air Zone (CAZ) Impact (% of total) by Vehicle Type

Vehicle Type	2018 Baseline	2021	2029
Petrol Car	18%	5%	0.3%
Diesel Car	73%	52%	5%
LGVs	82%	60%	9%
Arctic HGV	43%	16%	0.3%
Rigid HGV	62%	35%	2%
Buses	60%	23%	0.2%

The **Figure 3-7** shows the eastbound traffic queue that is currently visible on the A472 towards Hafodyrynys in the morning period.

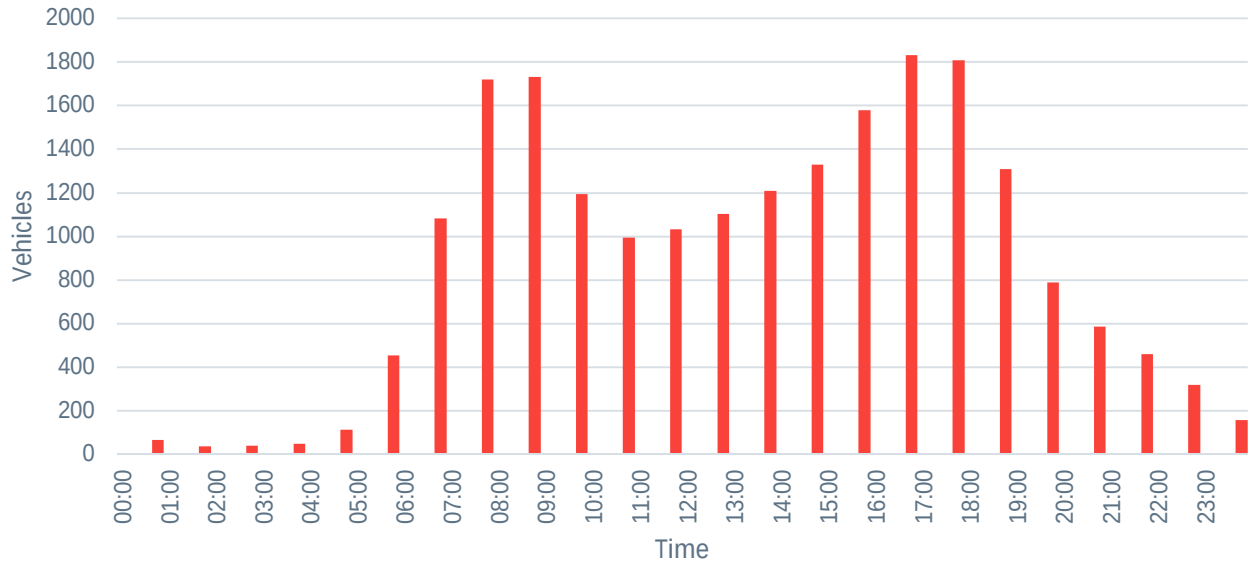
Figure 3-7 – AM Peak Eastbound Traffic Towards Hafodyrynys



An Automatic Traffic Count (ATC) survey has been undertaken on A472 Hafodyrynys Road, in the direct vicinity of Woodside Terrace. The data collected through the survey, collated the vehicle flows with the 15-minute intervals and distinguish the vehicles by their class.

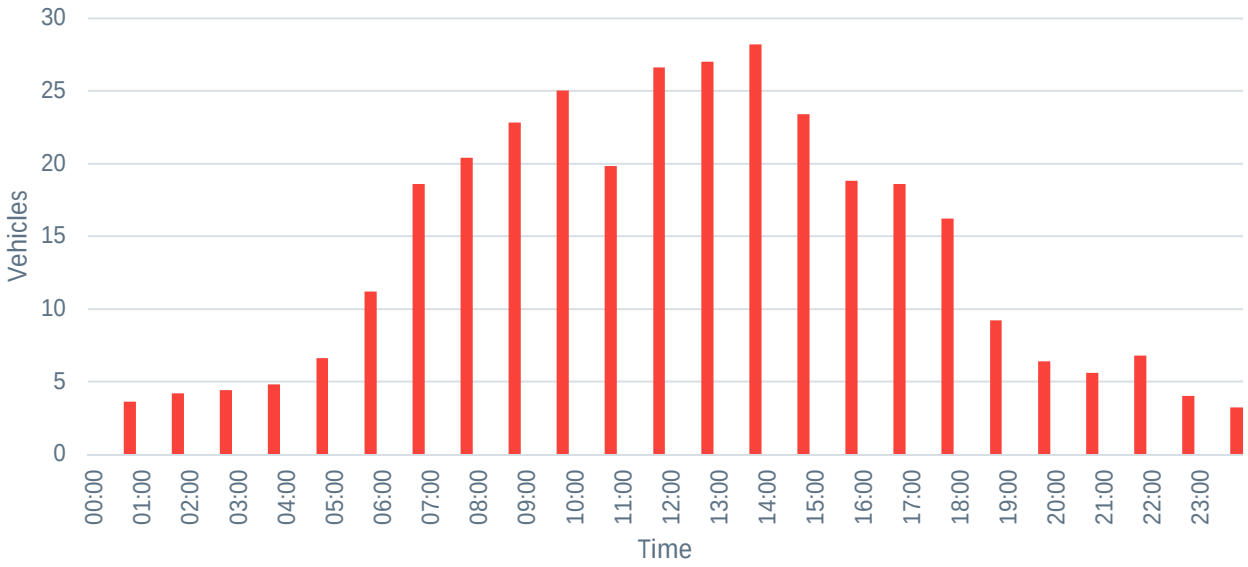
Figure 3-8 and **Figure 3-9** present the 5-day average flow for the light vehicles and HGVs respectively. As it can be observed, the light vehicle flow increases notably between 06:00 and 08:00, reaching approximately 1,800 vehicles per hour. It falls then around 10:00, to increase again gradually between 12:00 and 17:00, when it reaches similar flows to that of the AM peak. From around 18:00 the traffic flow gradually diminishes.

Figure 3-8 – 5 Day Average Light Vehicles Flow



The HGV traffic flow presented in **Figure 3-9**, increases gradually from approximately 05:00 until 14:00 with only a small decrease at 11:00. After reaching its peak at 14:00 of just under 30 vehicles per hour, the HGV flow decreases then gradually until 20:00 and remains constant until the morning increase.

Figure 3-9 – 5-day Average HGVs Flow



The Bluetooth journey time surveys were carried out from 09-05-2018 to 05-06-2018 to assess the journey time during both the weekday peak hours and Saturday peak hour.

Figure 3-10 – Bluetooth Journey Time Survey

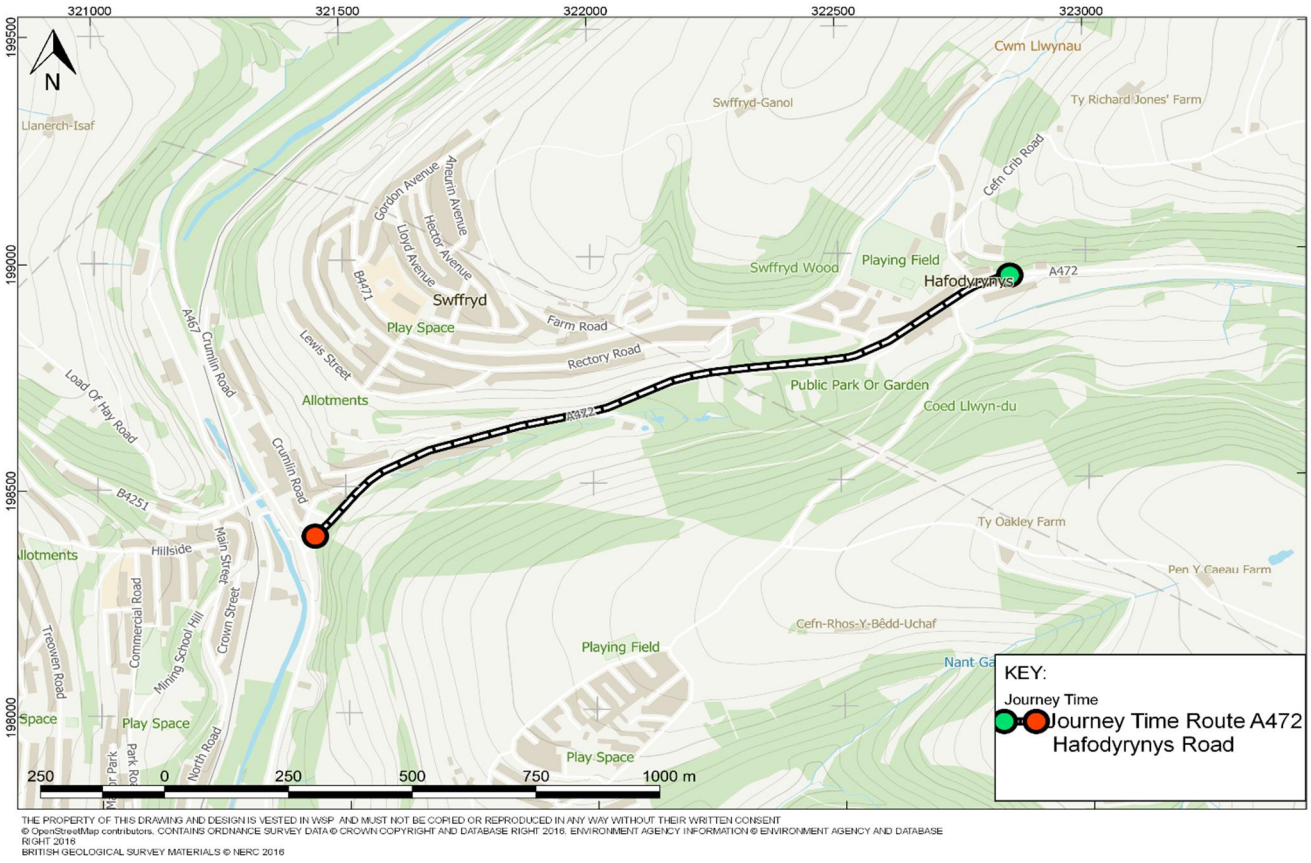


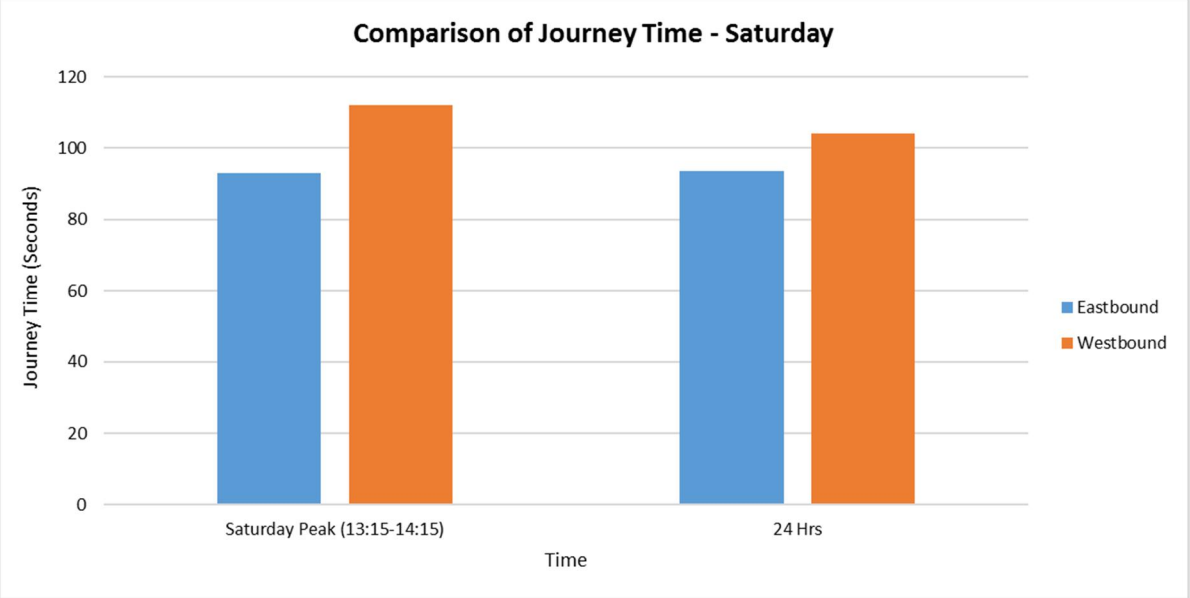
Figure 3-10 shows the extent of the survey route where the Bluetooth journey time data has been collected. The total length of the study route is 1 mile.

Figure 3-11 demonstrates a clear increase in the journey time for eastbound flows during the morning AM Peak. This suggest that there could be localised congestion as the PM, Inter Peak, and 24hr peak journey times are less than the AM peak and the associated westbound journey times.

Figure 3-11 – Comparison of Bluetooth Journey Time - Weekdays

The Saturday journey times are shown in **Figure 3-12** – Comparison of Bluetooth Journey Time - Saturday. It is clear from this figure that journey times are noticeably greater for westbound flows compared to eastbound.

Figure 3-12 – Comparison of Bluetooth Journey Time - Saturday



3.5 ACTIVE TRAVEL

Some of the proposed options are likely to impact on the active travel provision of Hafodyrynys. It is important to know the number of pedestrians using the pathways to also quantify the exposure to NO_2 and the impact on the pathways as a result of any of the proposed options. The largest impact is likely to be on walking on the two pathways adjacent to the Woodside Terrace.

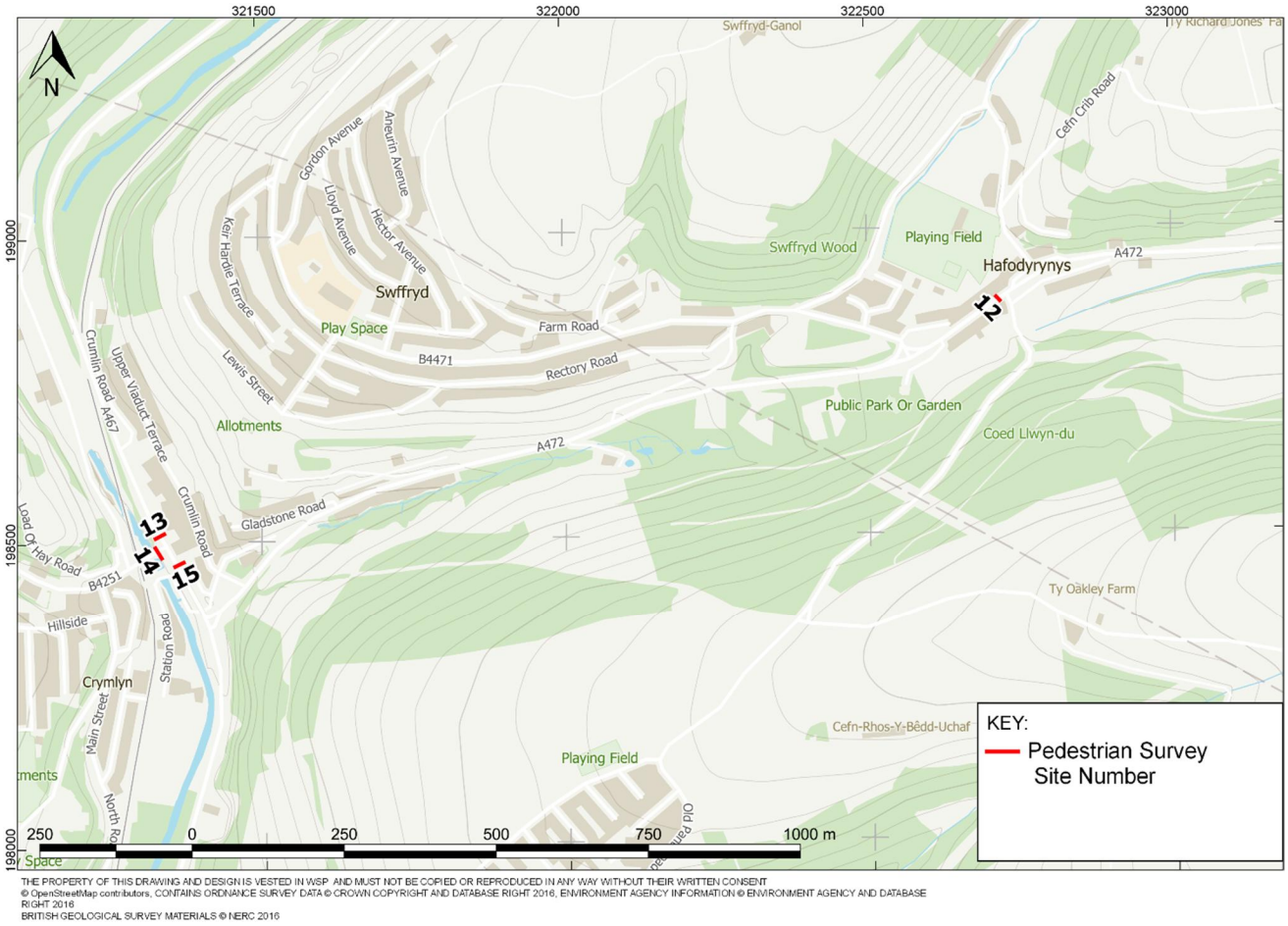
Pedestrian count results are presented in **Table 3-10** from a video survey undertaken on Monday 14th May 2018. On this date there was also a general waste collection service at around 14:15. The figures below show that the south side, directly in front of the Woodside Terrace, is more heavily utilised than the north side. There are 38 pedestrians using the south side and 14 pedestrians using the north side. In total there are 52 pedestrians using both sides of the pathways.

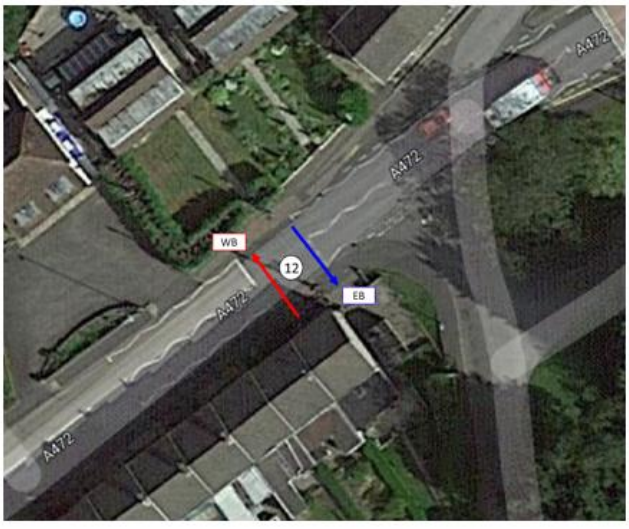
Table 3-10 – Pedestrian Count outside Woodside Terrace, Hafodyrynys

	Pedestrians			
Time	South Side		North Side	
	Uphill	Downhill	Uphill	Downhill
6:30-7:30	1	0	0	1
7:30-8:30	0	4	0	2
8:30-9:30	0	1	2	1
9:30-10:30	0	0	1	2
10:30-11:30	2	0	0	0
11:30-12:30	1	3	0	1
12:30-13:30	1	2	0	0
13:30-14:30	2	4	0	0
14:30-15:30	1	4	3	0
15:30-16:30	6	1	0	0
16:30-17:30	1	0	0	0
17:30-18:30	3	1	1	0
18:30-19:00	0	0	0	0
Total	18	20	7	7
	38		14	
	52			

Pedestrian surveys were carried out from 09-05-2018 to 22-05-2018 to assess the utilisation and demand of pedestrian crossings within the study area during the weekday peak hours and Saturday. The surveyed pedestrian crossing sites are presented in **Figure 3-13**.

Figure 3-13 – Pedestrian Survey Site Number





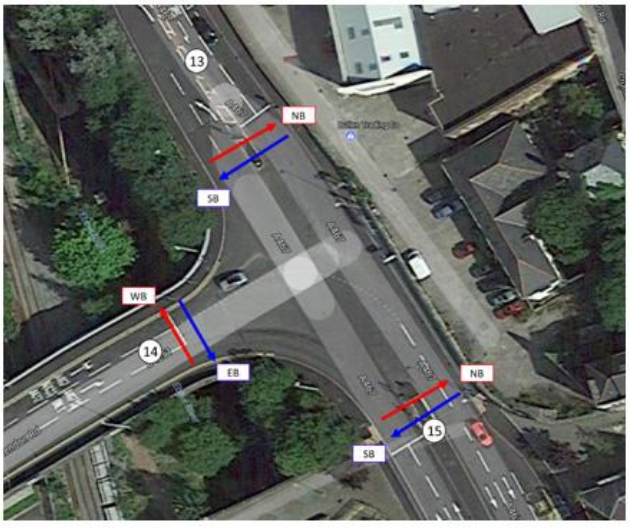


Table 3-11 shows the weekday pedestrian counts for the four sites. Site 12 is used by less than 5 pedestrians during all peaks and directions. There are 16 pedestrians travelling eastbound and 21 westbound over a 12-hour period. Site 13 and 14 have very low utilisation, with no pedestrians using them during all peaks and directions and only marginal usage in the off-peak visible in the 12-hour period column. Site 15 has a considerable high pedestrian demand compared to the other sites. The

majority of demand is for southbound movements during the AM and PM, while in the inter-peak the predominant movement is in the northbound direction.

Table 3-11 – Pedestrian Count - Weekday

Site	Direction	AM Peak (7:30-8:30)		IP (15:00-16:00)		PM Peak (16:30-17:30)		12 Hrs (7:00-19:00)	
		Pedestrian	Cyclists	Pedestrian	Cyclists	Pedestrian	Cyclists	Pedestrian	Cyclists
Site 12	Eastbound	0	0	1	0	2	0	16	3
	Westbound	2	0	2	1	3	1	21	3
Site 13	Northbound	0	0	0	0	0	0	2	0
	Southbound	0	0	0	0	0	0	0	0
Site 14	Eastbound	0	0	0	0	0	0	0	0
	Westbound	0	0	0	0	0	0	1	0
Site 15	Northbound	4	0	23	0	10	0	81	4
	Southbound	22	0	7	0	15	0	113	3

Table 3-12 shows the Saturday pedestrian counts for the four sites. Site 12 has a considerable amount of flow in the 12-hour, with 24 pedestrians travelling eastbound and 30 travelling westbound. Site 13 and 14 have low utilisation, with three pedestrians in each direction at Site 13 and one pedestrian at Site 14. Site 15 has a high pedestrian demand for the 12-hour period, with 72 travelling northbound and 117 travelling southbound.

Table 3-12 – Pedestrian Count - Saturday

Site	Direction	Saturday Peak (13:15-14:15)		12 Hrs (7:00-19:00)	
		Pedestrian	Cyclists	Pedestrian	Cyclists
Site 12	Eastbound	5	1	24	1
	Westbound	4	0	30	3
Site 13	Northbound	0	0	3	0
	Southbound	0	0	3	1
Site 14	Eastbound	0	0	1	0
	Westbound	0	0	0	0
Site 15	Northbound	4	0	72	3
	Southbound	12	0	117	3

3.6 OTHER BASELINE DATA

More baseline data is presented in the Impact Assessment Report (IAR).

Further baseline information is contained within the WelTAG Stage One report for the following areas:

- Infrastructure and Local Facilities;
- Traffic Flows;
- Journey Time and Reliability;
- Personal Injury Collision Data;
- Public Transport;
- Origin and Destination Analysis;
- Economy;
- Demographics;
- Other Related Work; and
- Committed Developments

More baseline information is available also within the WelTAG Stage Two report for the following areas:

- Air Quality Baseline
- Sensitive Environmental Areas
- Water Environment
- Cultural Heritage and Historic Landscape Designations

4

TRANSPORT CASE

4 TRANSPORT CASE

4.1 OVERVIEW

The Transport Case 'tells you what the expected impacts of the project are, how the project will contribute to the well-being goals and whether a project will provide value for public money. This is the equivalent of the 'Economic Case' in HM Treasury's Green Book. This is achieved by considering the social, cultural, environmental and economic costs and benefits of each option.

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. Therefore, the transport case focuses on air quality and reflects the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

4.2 METHODOLOGY

The approach to the Stage Three level of appraisal is intended to examine in greater detail the physical 'hard measures', which have tangible benefits for tackling the problem under consideration. The 'soft measures' included within the complementary package have not been modelled as the direct benefits are expected to be intangible. The general approach to the modelling of measures is outlined in **Table 4-1**.

Table 4-1 – Modelling Approach to Measures

Ref	Measure	Traffic Modelling Requirement	Air Quality Modelling Requirement
S1	Change Signal Timings at Crumlin Junction	Yes, for AM peak hour only	Included
S2	Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector	Yes, for all peak hours	Included
S3	Demolish Dwellings at Woodside Terrace and Re-align Road	No – this option utilises Do-Minimum traffic data.	Included
S4	Peak Period HGV Bans	Yes, for AM and PM peak hour.	Included
S5	Clean Air Zone / Low Emission Zone	Yes, for all Peak hour – Class D[8] (with JAQU Behavioural Response assumptions)	Included

[8] Class A - Buses, coaches, taxis and private hire vehicles (PHVs); Class B - Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs); Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs); Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

Ref	Measure	Traffic Modelling Requirement	Air Quality Modelling Requirement
S6	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swffryd Junction with 2 lanes on A472 EB (Option 2)	Yes, for all peak hours.	Included
S7	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone	Yes, for all peak hours.	Included

4.2.1 ENVIRONMENTAL APPRAISAL

4.2.1.1 Transport Modelling

The emissions and dispersion modelling undertaken at Stage Two was based on the assumed impacts of measures on traffic speeds and volumes. At Stage Three a fully quantifiable approach to appraising the benefits of measures has been undertaken, and this required the 'hard measures ' to be modelled with microsimulation traffic modelling. It was not necessary to undertake traffic modelling for all measures as some measures (e.g. Demolition) are not expected to result in a change in traffic flows. The static VISSIM micro-simulation model has two forecast years, 2021 and 2029.

A static VISSIM micro-simulation model was developed for the morning peak, inter-peak (IP), evening peak and Saturday peak for the A472 Hafodyrynys Road study corridor, utilising demand data from an extensive traffic data collection exercise which was undertaken in 2018. This included 10 automatic traffic counters (ATC) on the A472 Hafodyrynys Road, and the micro-simulation model was calibrated and validated utilising journey time and queue data. Results were output and averaged over several random seeds to ensure the 'daily variability' in traffic flow was accurately modelled. High resolution data was outputted from the model (across 350 data collection points) and included volume, classification and speed data. The ATC data was used to factor the morning, inter-peak evening peak hour flow data to AM, IP, PM, Saturday, and off-peak periods covering 24 hours in total.

Whilst the model was developed for the A472 Hafodyrynys Road corridor of the exceedance area only, general consideration has been given to the wider impacts of displacing traffic in the instance of peak period HGV bans and Clean Air Zones. The full detail on the traffic modelling, including the base model calibration and validation statistics are included within the WelTAG Stage Three Impact Assessment Report (IAR).

The base year for the VISSIM model is 2018. Growth factors were derived from TEMPro 7.2 to growth the traffic data to 2021 and 2029. The TEMPro growth factors for Caerphilly are presented in **Table 4-2**.

4.2.1.2 Strategic modelling

As part of the Stage Three assessment work, the CAZ option has been modelled within the South-East Wales Transport Model (SEWTM) to assess the re-distribution of traffic.

Strategic models operate through repeated iterations of traffic assignment to the network, with costs calculated for the current run and fed forward into the next iteration for re-routing traffic until the model

converges (when there is little change between one iteration and the next). The convergence of the model is controlled by looking at statistics for the model as a whole; this can mean that when running networks with slightly different properties or flow patterns (such as testing schemes that only affect a small part of the model, such as in this case), there is often a difference in the traffic flows that has nothing to do with the specific changes put in but is just because the model has converged with a slightly different answer, and these differences are referred to as 'noise' when comparing two models. Where changes are small because of a scheme it is therefore difficult to separate out the specific changes due to the scheme from any background noise.

Below is a summary of the SEWTM results for a CAZ Option Class D[9] with JAQU Behavioural response[10]. The modelling results are based on a 2026 forecast assessment year. This year has been utilised as the model does not have either the 2021 or 2029 assessment years, whilst 2026 is available and served as a proxy year between 2021 and 2029.

- Morning Peak

  There are approximately 90 vehicles westbound that reroute from along Hafodyrynys Road. Approximately half of these trips were coming from the north, with those trips previously following Swffryd Road before coming down Hafodyrynys Road, while in the Do Something they route directly along the A467. The other half of these trips were routing along the A472 from the east; due to the background traffic in the model it's unclear where these trips may have re-routed to or from.

- Inter-peak

  There are approximately 10 vehicles westbound and 25 vehicles eastbound that re-route from along the Hafodyrynys Road. Most of these flow changes continue to the east along the A472, however similarly to the AM and therefore in combination with the small flows being talked about it's not clear whether there's a specific route that these vehicles re-route on to.

- Evening Peak

  There are approximately 10 vehicles westbound and 10 vehicles eastbound that re-route from along the Hafodyrynys Road. Similarly, to the AM and IP time periods, the small flows being talked about and the background traffic in the model make it unclear where vehicles may be re-routing to.

These results have been used to inform the distributional analysis. However, the results should be treated with caution due to limitations of the South-East Wales Transport Model (SEWTM). More detail on the SEWTM model outputs is contained within the IAR.

[9] Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

[10] JAQU (Defra and Department for Transport Joint Air Quality Unit) provide guidance on the likely behavioural responses to a charging Clean Air Zone. Details are available in the Impact Assessment Report.

4.2.1.3 Traffic Modelling Assumptions

Table 4-2 – Local Growth Figures for A472 Crumlin (TEMPro)

	AM Peak Hour	Inter-Peak	PM Peak Hour	Saturday
2021	1.0492	1.0580	1.0477	1.0490
2029	1.1121	1.1320	1.1094	1.1153

Table 4-3 below shows the weekday conversion factors which have been calculated from a two-week average survey data. The Saturday conversion factors were also calculated from the same survey dataset but only looking at the average Saturday data.

Table 4-3 – Time Conversion Factors

	Weekday Factors
AM Peak Hour to AM 3hr Period	2.6
IP Average hour to IP 6hr Period	6
PM Peak Hour to PM 3hr Period	2.6
AM + PM + IP Peak Hours to OP Period	0.9

As part of the model calibration and validation it was identified that the morning peak hour for the eastbound and westbound direction does not coincide. As a result, the model period was extended to 2 hours to ensure that the complex interactions within the morning peak could be accurately modelled.

4.2.1.4 Air Quality

The air quality modelling can be broadly split into two components:

- Emission modelling
- Dispersion modelling

Emission modelling

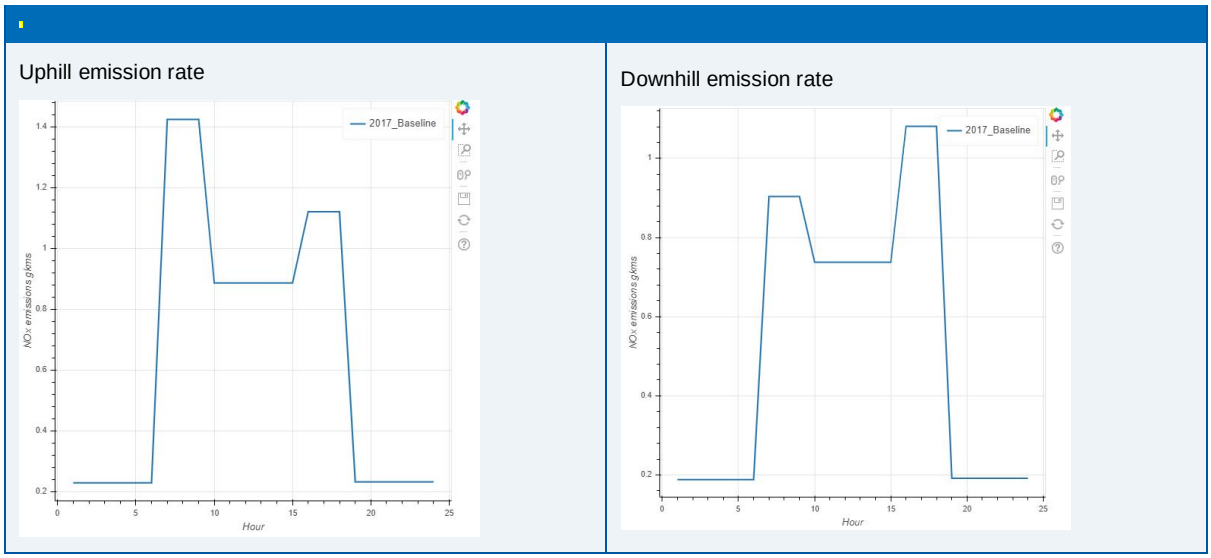
The emission modelling for this study is essentially a translation of the results of the traffic microsimulation described in previous sections- with an emphasis on avoiding loss of temporal variance in the results of the traffic model. The emissions model also makes use of ambient vehicle emission measurements from two campaigns carried out in 2018.

The modelled traffic conditions were passed through our emission model (which is based on COPERT but tuned with the measured vehicle emission data) using discrete values for each hour so that detailed temporal patterns could be captured, and therefore reflected in the annual mean pollutant values reported. This represents a significant enhancement over the Stage 2 work which used average speeds and flows across the day.

In addition to the activity-based traffic scenarios modelled technology changes implied by the CAZ scheme (based on Class D[11], with behavioural responses) have been incorporated into the model. This was done by modelling each link using independent flow, speed and fleet composition for each of the 24 hours in a typical day. The detailed temporal allocation of emissions also enabled the modelling of the HGV scheme impacts specific to the time of the day affected.

An example of the temporal allocation of emissions is provided in **Table 4-4** where the effect of both the tidal traffic pattern and the uphill/downhill effect can be observed in the emission curves.

Table 4-4 - Daily NOx emission profile through street canyon (note higher values uphill)



The emission modelling approach was written into a series of python programs to enable the modeller to vary the flow, speed, fleet mix and gradient for each link, for each hour of the day. This represents a significant enhancement over simple daily average-based methods.

Air quality modelling

The Hafodyrynys Road location presents a set of topographical factors which complicate air quality modelling at the location. These can be summarised thus:

1) The road transects an obvious street canyon which is asymmetrical- the north elevation is higher than the south
2) The street canyon lies within a valley. The wider topography of the area comprises many hills and valleys.
3) The street canyon has an upwards gradient running from West to East

[11] Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

In isolation each of these factors would present a challenge for dispersion models commonly used in the UK. The confluence of all of these factors has led us to select the GRAL modelling suite which is well suited to deal with these additional challenges.

The air quality modelling for the Woodside Terrace corridor was undertaken in the GRAL dispersion model, supported by meteorological modelling undertaken in the GRAMM processor. Much of the detail around this method remains unchanged from the Stage Two report so is not reproduced here (a full methodological report is provided in the Impact Assessment Report).

The GRAL/GRAMM modelling system (hereafter called 'GRAL') was developed by the Graz University of Technology, Institute for Internal Combustion Engines. GRAL is a sophisticated, non-steady state air quality model which has been used extensively in Europe.

For the purposes of this study we have followed the advice set out in the guidance note by the developers of GRAL which is circulated with the model code.

The air quality modelling was carried out using wind and cloud data from the Cardiff Airport station in 2017, which was used to provide boundary conditions to the regional domain represented in the GRAMM met model. Subsequently GRAMM provides the meteorological boundary conditions to the GRAL dispersion model. The GRAMM domain covers an area of around 9km x 9km centred on the GRAL domain.

Each hour was modelled individually by averaging the meteorology across the year for the hour- e.g. all 1am hours are grouped and modelled as an average, all 2am hours are grouped and so on. This means that the temporally detailed emissions can be presented to the appropriate meteorology in each hour.

The GRAL domain covering the Woodside Terrace corridor is comprised of 378 x 177 x 12 cells in the x, y and z axes, set to a horizontal resolution of 1m (Figure 4-1).

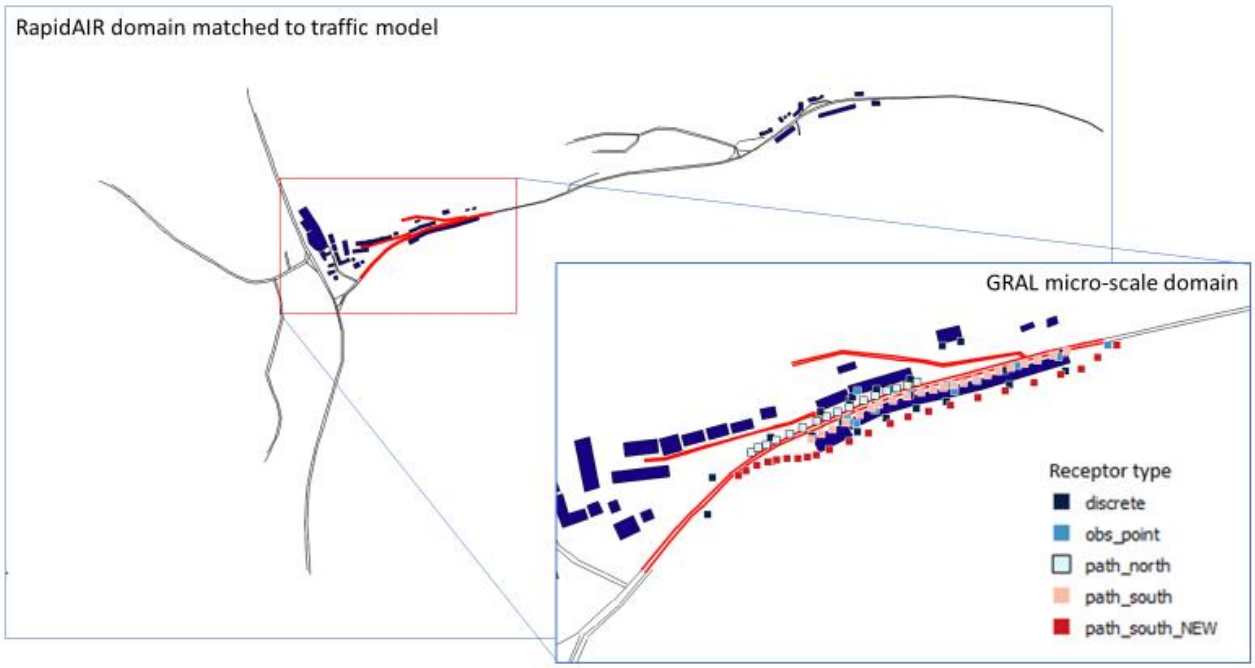
Two further grids were also modelled (mainly to support the economic and health impact appraisals) using the Ricardo RapidAIR model. The RapidAIR domain shown below was also prepared at 1m resolution and a further larger domain was modelled for the distributional analysis at 3m resolution (see Table 4-2). RapidAIR is Ricardo Energy & Environment's propriety modelling system developed for urban air pollution assessments. The model is based on convolution of an emissions grid with dispersion kernels derived from the USEPA AERMOD[12] model. The physical model parameterisation (release height, initial plume depth) closely follow guidance provided by the USEPA in their statutory road transport dispersion modelling guidance[13].AERMOD provides the algorithms which govern the dispersion of the emissions and is an internationally accepted model for traffic studies. Further

[12] https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod

[13] https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses

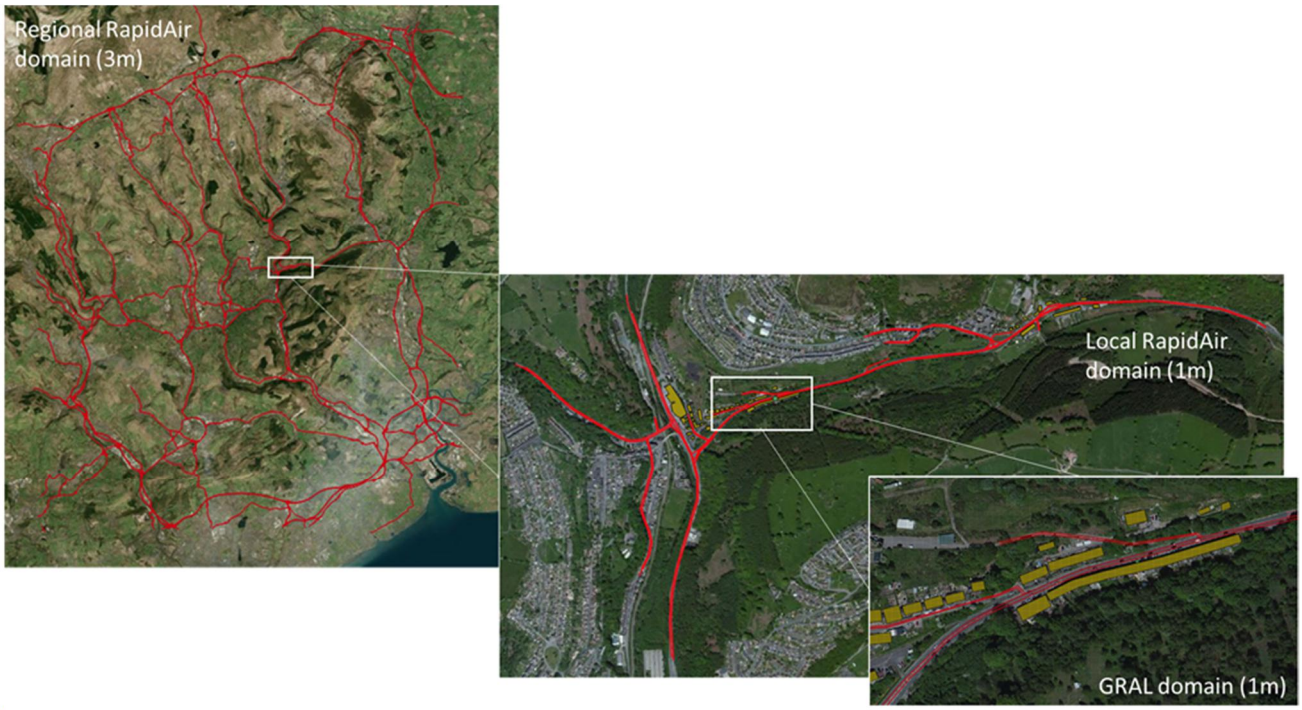
details about the RapidAir model, including results of a validation study in London, has been published in a peer-reviewed academic journal[14].

Figure 4-1 Air quality simulation domain



[14] Masey, Nicola, Scott Hamilton, and Iain J. Beverland. "Development and evaluation of the RapidAir® dispersion model, including the use of geospatial surrogates to represent street canyon effects." *Environmental Modelling & Software* 108 (2018): 253-263.

Figure 4-2 Regional simulation domain



Non-road background concentrations of NOx for 2017 were obtained from the Defra UK-Air website. The component from road traffic was removed to avoid double counting. The background air pollution climate in Hafodyrynys is quite low, with an average value at the model domain of around 9 µg/m^3. The low background value further reinforces the very dominant effect of local traffic on the NO_2 climate in the area.

The GRAL results require conversion with an empirically derived equation. A formula is provided by the model developers, but it is based on conditions in Europe, so a conversion function specific to the study was derived. The default values for f-NO_2 in the NOx to NO_2 calculator were used (0.28 in 2017 for 'All UK Traffic').

The background value was input into the Defra NOx to NO_2 calculator along with the diffusion tube results provided by CCBC to obtain a conversion curve to be applied to the modelled NOx concentrations. A 3rd order polynomial expression was obtained which explains 99.999% of the variance in the relationship between total NOx and total NO_2. The expression is provided in Equation 1 below.

Equation 1

$$NO2 = 0.00000089x^3 - 0.00079666x^2 + 0.52084404x + 3.7371263$$

where x = total annual mean NOx (sum of traffic NOx and background)

4.3 AIR QUALITY APPRAISAL

The options appraised for their air quality effects are as follows:

Table 4-5 – Option Description

Reference	Measure Description
1	Change Signal Timings at Crumlin Junction
2	Signalise the A472/B4471 Swffryd Junction
3	Demolish Dwellings at Woodside Terrace and realignment of the southern footpath
4	Peak Period HGV Bans
5	Clean Air Zone / Low Emission Zone
6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction
7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction & Clean Air Zone / Low Emission Zone)

The section 4.3.1 Scenario Results below presents plots and numerical values for the following scenarios:

1) Baseline 2017
2) Do-minimum 2021
3) Scenario 3 - Do-minimum 2021 emissions with demolition and south path realignment
4) Scenario 4 - 2021- HGV ban in peak period
5) Scenario 5 - 2021 Class D[15] CAZ with Behavioural Response

The three scenarios in the list above yielded material changes in concentrations whereas scenarios 1, 2 and 6 in **Table 4-5** had no effect on concentrations. Scenario 7 yielded the same results as scenario 5.

In addition to modelling NO_2, results for $PM_{2.5}$ are presented as required by the Health Impact Assessment.

[15] Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

Agreement between the modelled values and the observed values was very good. The relationship between observed road NOx and modelled values was best explained by a 2nd order polynomial, which was subsequently used to adjust the road NOx component. After applying the polynomial, the relationship is linear and there is a good match between observed vs modelled values. Following that the NO_2 expression above to convert total NOx to annual mean NO_2 was applied, before calculating the RMSE- which in this case is 3.9 µg/m^3. The modelled concentrations explain 84.4 % of the variance in the measured NO_2 values.

Table 4-6 – Model Validation Data for Annual Mean NO_2

Site	Site description	Measured NO_2 (µg/m^3)	Modelled NO_2 (µg/m^3)
CCBC48	1 Woodside Shops, Hafodyrynys	42.8	47.2
CCBC50	Past Woodside Terrace, Hafodyrynys	51.5	57.1
CCBC60	3 New Houses, Hafodyrynys	36.5	37.7
CCBC79	20 Woodside Terrace, Hafodyrynys	61.2	64.0
CCBC83	10 Woodside Terrace, Hafodyrynys	58.9	59.4
CCBC84	La Loma, Hafodyrynys	41.4	34.9
CCBC86	Telegraph pole outside 16 Woodside Tce	66.9	70.0
CCBC87	16 Woodside Tce, Hafodyrynys	66.5	70.0
CCBC88	13 Woodside Tce, Hafodyrynys	53.6	58.8
CCBC89	Hafodyrynys AQE 1	70.3	65.8
CCBC90	Hafodyrynys AQE 2	69.5	65.8
CCBC91	Hafodyrynys AQE 3	72.5	65.8
CCBC93	3 Woodside Tce, Hafodyrynys	58.0	63.4
CCBC94	Bus stop outside 1 Woodside Tce	59.4	60.6
CCBC95	1 Woodside Tce, Hafodyrynys	42.9	41.2
Auto site	Automatic analyser site	70.0	64.0
Root mean square error = 3.9 µg/m^3			

4.3.1 TIMESCALES FOR MEASURE IMPLEMENTATION AND COMPLIANCE ASSESSMENT

In determining the measure(s) that could bring forward compliance in the shortest possible time a detailed assessment has been undertaken on the timescale for the full implementation of each measure.

Scenario 1: Change signal timings at Crumlin Junction; This measure is not difficult to implement and requires a traffic engineer to alter the existing traffic light sequence. However, as this will result in longer traffic queues on the A467, a safety assessment is required of whether further warnings signs of extended queues on the A467 would be necessary. Additionally, the Kendon Road junction requires a safety assessment. However, given that there are no tangible air quality benefits, this will not be taken forward for implementation.

Scenario 2: Signalise the A472/B4471 Swffryd Junction: This scenario requires a detailed engineering option design as it includes the introduction of new traffic control signals and associated road infrastructure. Planning permission is required, including public consultation which can then be followed by a construction period. However, as this measure has no tangible air quality benefits, this will not be taken forward for implementation.

Scenario 3: Demolition of dwellings at Woodside Terrace and realignment of the footpath: As part of the WelTAG studies, engagement with the local residents has been on-going (**Appendix B – Public Consultation Report**). Following the findings of this study and topographical surveys along with property valuations have been carried out. However, before this measure can be implemented further detailed engineering designs are required, a geotechnical survey needs to be undertaken, a consensus with the residents needs to be reached, planning permission is required, residents need to be relocated, demolition of the dwellings and construction of the new re-located footpath can then be completed. The earliest date for full completion is expected to be December 2021 (within 2.5 years).

Scenario 4: Peak Period HGV bans: Further engagement with the business community operating HGVs is necessary to consult on this option to determine behavioural responses. Within the analysis to date assumptions have been used to determine how many of the HGV trips would be reallocated to an inter or off-peak period and how many would use an alternative route. Appropriate notice of the scheme launch is needed to provide drivers with a reasonable period to adjust their business journeys (6 months). Should this option be deemed effective the earliest implementation date which includes consultation, erection of signage and enforcement cameras, and appropriate notice is December 2021.

Scenario 5: Clean Air Zone: Before such a measure can be introduced, further assessment is needed to explore potential impacts of displacement. This study sought to utilise the South-East Wales Transport Model to identify the likely rerouting impacts. Due to limitations of the model this has not been possible at this stage. Further assessment work would be required, including the development of a bespoke strategic model, to understand the impacts of rerouting and mitigate these routes accordingly. This would ensure no adverse impacts on safety and/or other areas of poor air quality. A local stated preference survey to find out how vehicle owners would behave by either paying the charge, avoiding the zone by using alternative routes or using a different form of transport e.g. public transport or cancelling their trip would be required. This information will inform the choice of supporting mitigation measures and check the expected reduction in NO_2 is commensurate with that used in the current analysis based on the generic behaviour assumptions (see section 4.5.3). This will also inform the right balance for the charging fees to ensure they are effective but not punitive (1.5 years). The

region of impact of a CAZ is likely to be extensive affecting a significant number of drivers. Time is required for the design and communication of mitigation measures such as access to retrofit abatement. installation of further EV charging infrastructure and technical approval, consultation and installation of an enforcement system (1.5 years). Following this, to allow sufficient notice of the arrangements for the introduction of a CAZ a reasonable period of time between the scheme launch and implementation is needed to allow road users to adjust (6 months). With these combined timescales the earliest date that this measure could become operational is December 2022 (3.5 years' time) providing that no major upgrading infrastructure work is required along alternative routes. Further details of the tasks to be complete prior to the launch of a CAZ are presented in the Impact Assessment Report).

The earliest implementation dates are provided in **Table 4-7**. It should be noted that the Peak Period HGV Bans at WelTAG Stage Two was categorised as a medium-term measure. However, due to the limitations of the South-East Wales Transport Model (SEWTM), it was unable to assess the redistribution of HGVs on the wider highway network. This has resulted in additional time and resources being necessary for implementation, due to a further assessment being required to assess and understand the redistribution of HGVs. This will enable mitigation strategies for alternate routes to be developed accordingly.

Table 4-7 - Expected earliest implementation timescales

Measure	Earliest Implementation Timescale
Change Signal Timings at Crumlin Junction	**December 2019**
Signalise the A472/B4471 Swffryd Junction	**December 2021**
Demolish Dwellings at Woodside Terrace and realignment of the southern footpath	**December 2021**
Peak Period HGV Bans	**December 2021**
Clean Air Zone / Low Emission Zone	**December 2022**
Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction	**December 2021**
Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction & Clean Air Zone / Low Emission Zone)	**December 2022**

4.4 AIR QUALITY MODELLING - SCENARIO RESULTS

The following section presents the results of each scenario that has been modelled.

4.4.1 DO MINIMUM - AIR QUALITY MODELLING RESULTS

4.4.1.1 Baseline 2017

Figure 4-3 shows the modelled NO_2 climate along Hafodyrynys Road in 2017. As we can see there are areas of significant exceedance of the NO_2 annual mean limit value along the road (the yellow line is the exceedance boundary). **The baseline in 2017 does not comply with the annual mean NO_2 limit value.**

Figure 4-3 Modelled concentrations of annual mean NO_2 for 2017 baseline

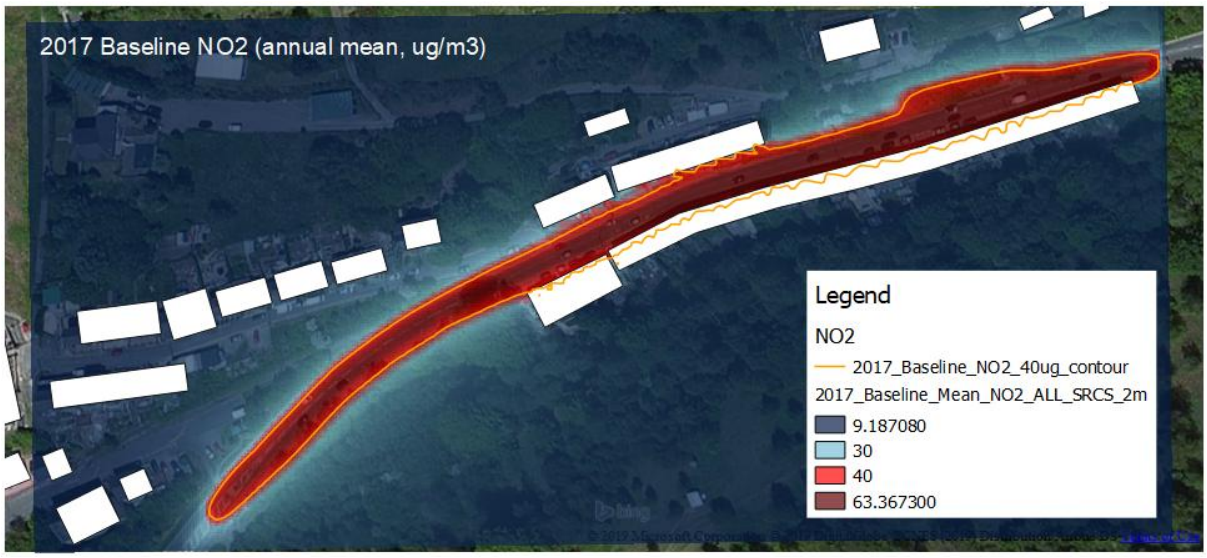


Figure 4-4 NO_2 exceedance / compliance plot for 2017 baseline (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

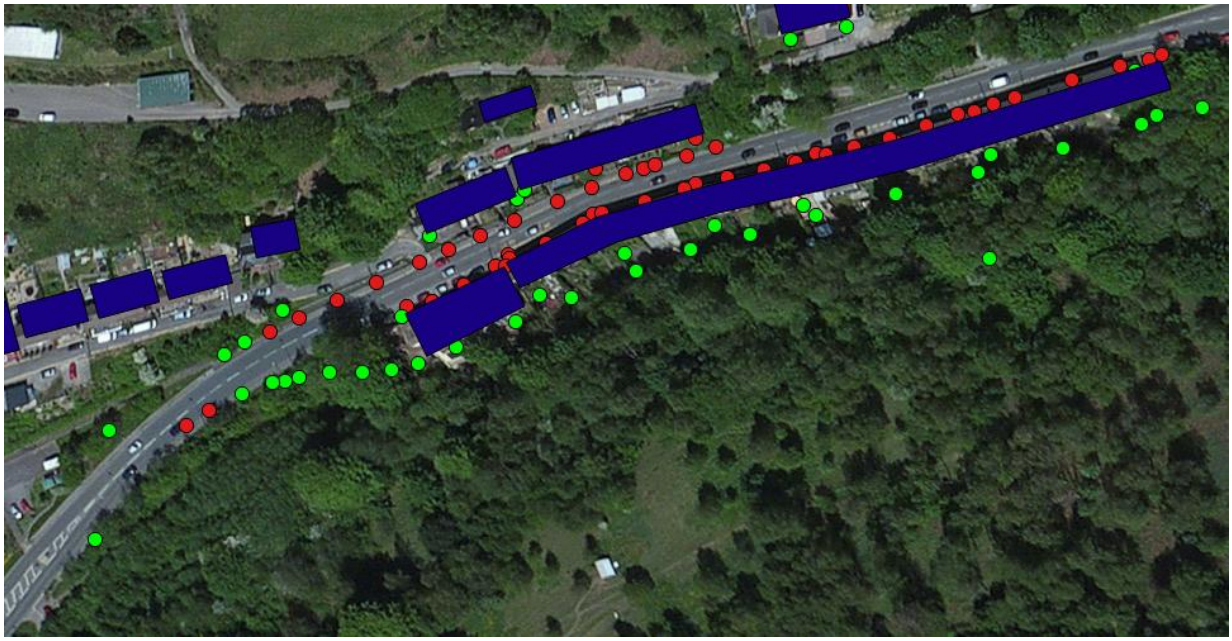
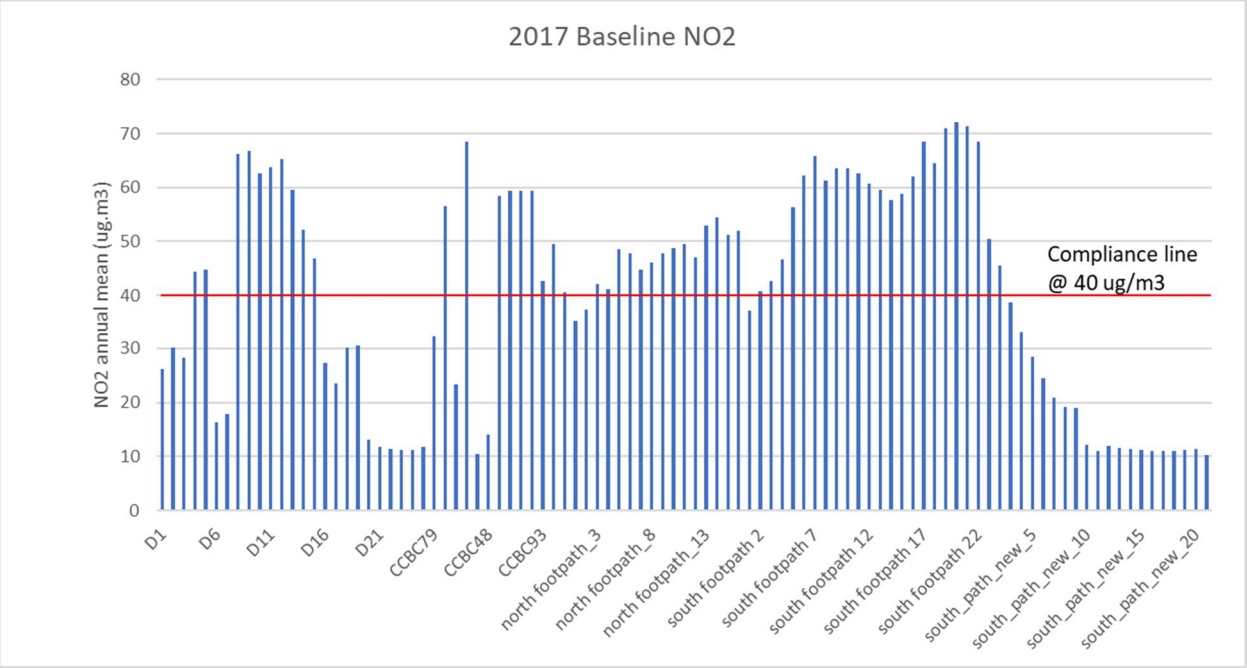


Figure 4-5 NO_2 at receptor locations for 2017 baseline



4.4.1.2 Baseline 2021

Figure 4-6 shows the modelled NO_2 climate along Hafodyrynys Road in 2021. As we can see there are areas of significant exceedance of the NO_2 annual mean limit value along the road (the yellow line is the exceedance boundary). **The baseline in 2021 does not comply with the annual mean NO_2 limit value.**

Note - *Any reference to compliance or non-compliance in 2021 is based on the results of the 2021 forecast modelling. For many of the options this is before the year of implementation. Where this is the case, the year of compliance should be taken as the year of implementation.*

Figure 4-6 Modelled concentrations of annual mean NO_2 for 2021 do minimum

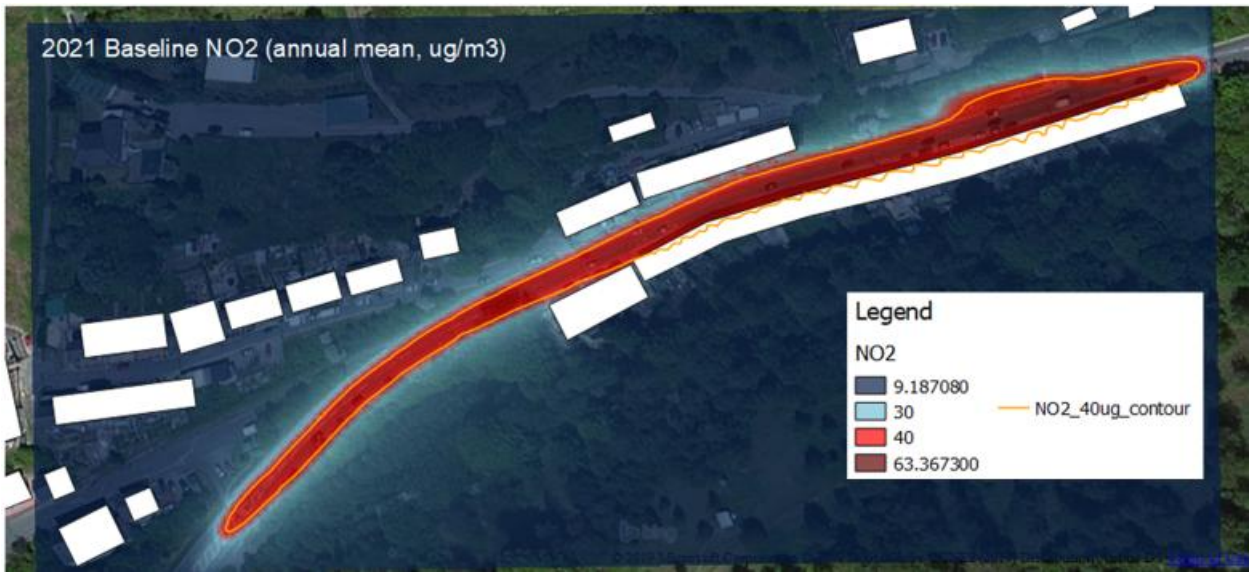


Figure 4-7 shows there is large NO_2 exceedance on the southern, northern and western footpath at Woodside Terrace in 2021 identified by the red dots

Figure 4-7 NO_2 exceedance / compliance plot for 2021 baseline (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

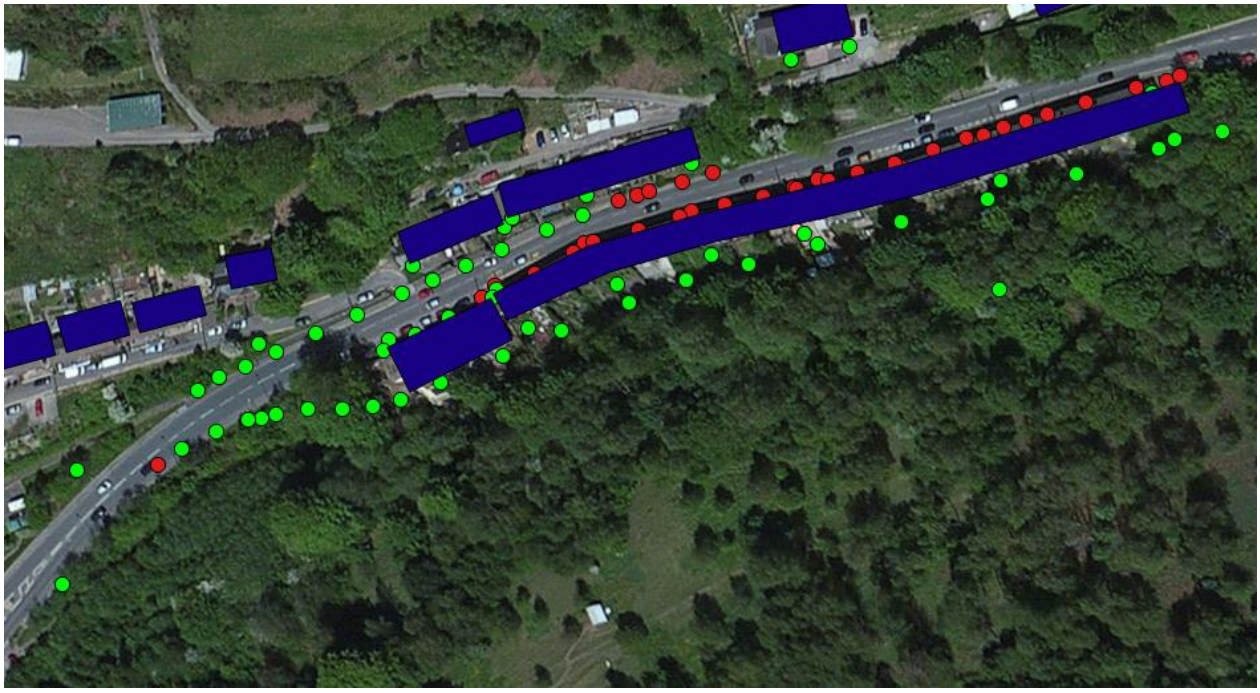
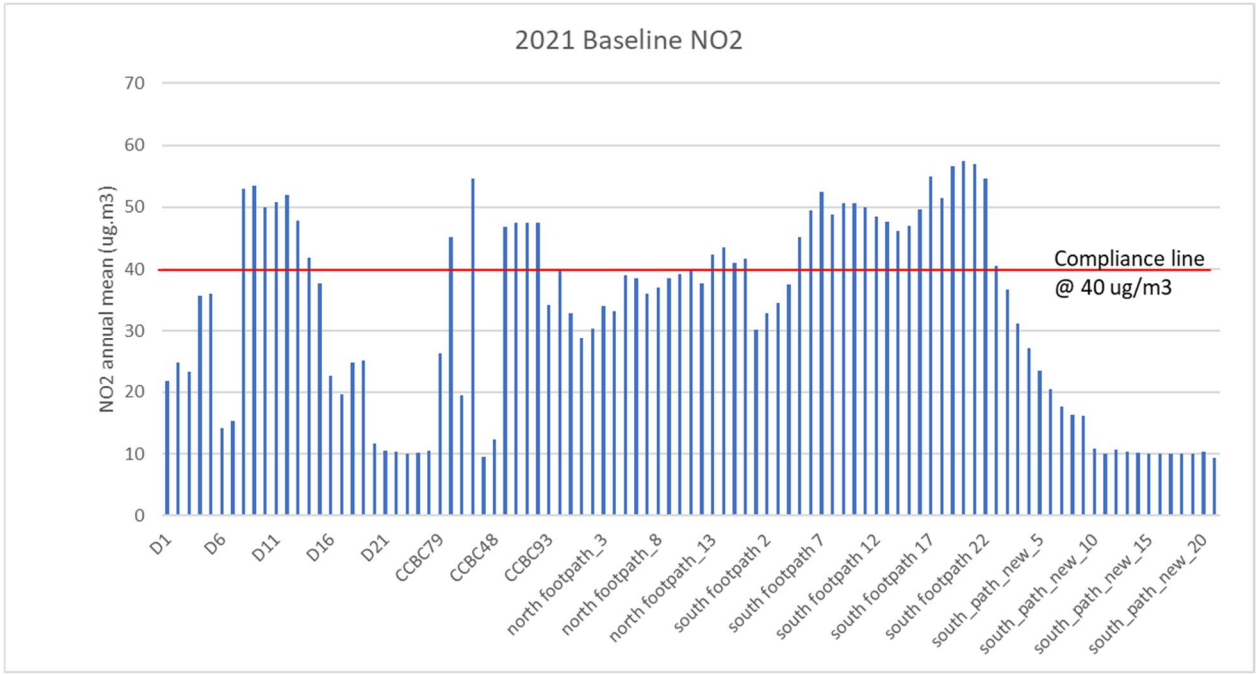


Figure 4-8 NO_2 at receptor locations for 2021 baseline



4.4.2 DO MINIMUM - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with no intervention (the Do Minimum scenario), compliance will be achieved in 2025. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-8**.

Table 4-8 - Predicted concentrations and compliance year of the Do Minimum Scenario

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

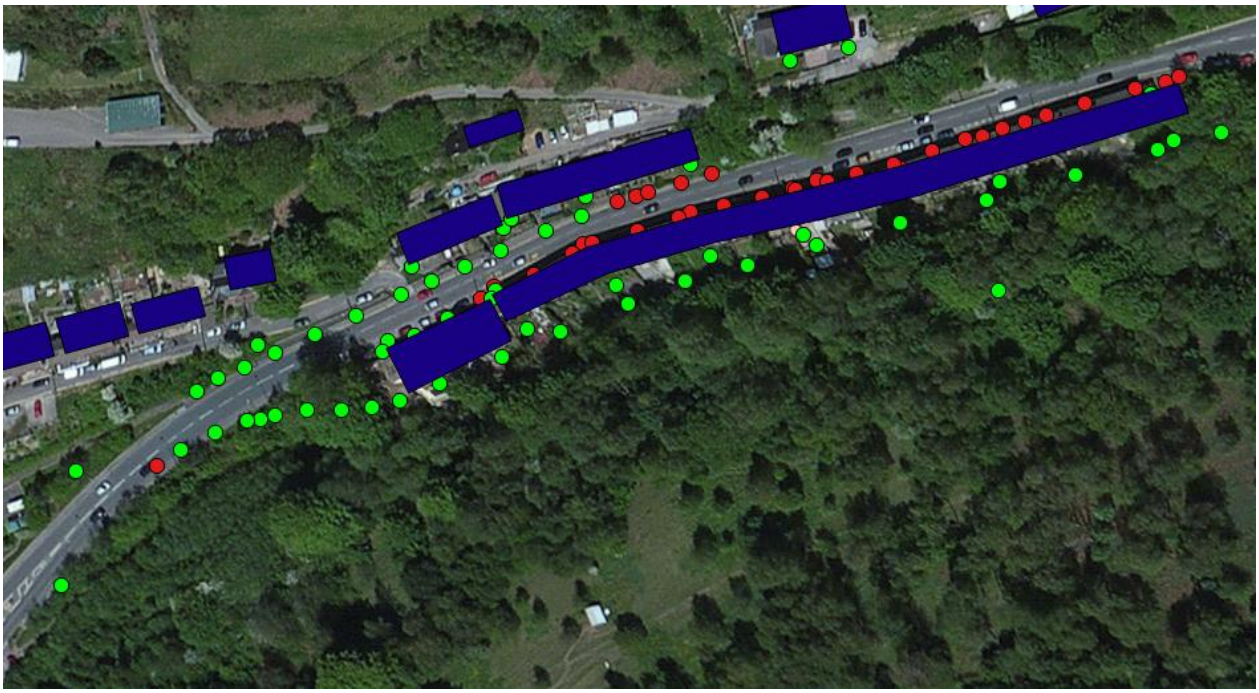
4.4.3 SCENARIO 1 (CHANGE SIGNAL TIMINGS AT CRUMLIN JUNCTION) - AIR QUALITY MODELLING RESULTS

This option involves reconfiguration of signal timings at the Crumlin junction. **The signal retiming option in 2021 does not comply with the annual mean NO_2 limit value at relevant locations**.

Figure 4-9 - Modelled concentrations of annual mean NO_2 for 2021 Scenario 1

Figure 4-10 shows there is large NO_2 exceedance on the southern, northern and western footpath at Woodside Terrace in 2021 identified by the red dots.

Figure 4-10 - NO_2 exceedance / compliance plot for 2021 S1 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)



4.4.4 SCENARIO 1 (CHANGE SIGNAL TIMINGS AT CRUMLIN JUNCTION) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with retiming of the Crumlin Junction A467/A472 traffic signals (Scenario 1), compliance will be achieved in 2025. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-9**. Furthermore, **Table 4-9** shows that Scenario 1 does not reduce concentrations of NO_2 in the year of implementation, and does not bring forward compliance from 2025.

Table 4-9 - Predicted concentrations and compliance year of Scenario 1

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S1 Change Signal Timings at Crumlin Junction	0				61	57	53	49	45	40	36

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.5 SCENARIO 2 (SIGNALISE THE A472/B4471 SWFFRYD JUNCTION) - AIR QUALITY MODELLING RESULTS

This option involves the signalisation of the A472/B4471 Swffryd junction. **The signalisation option in 2021 does not comply with the annual mean NO_2 limit value at relevant locations.**

Figure 4-11 - Modelled concentrations of annual mean NO_2 for 2021 Scenario 2

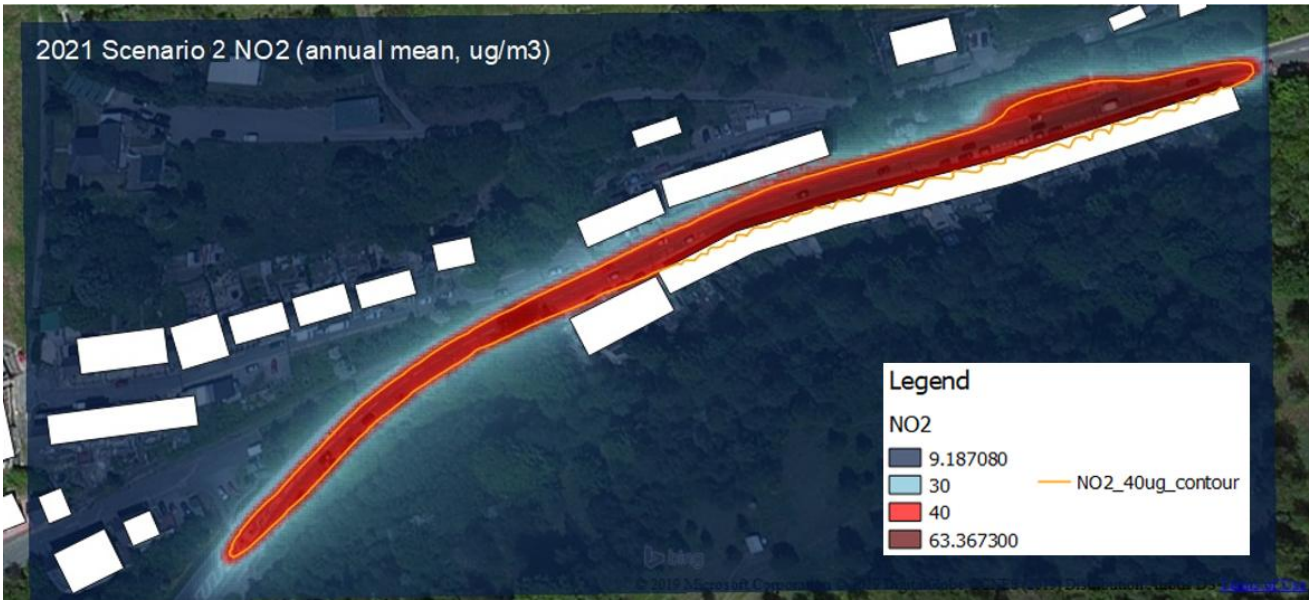
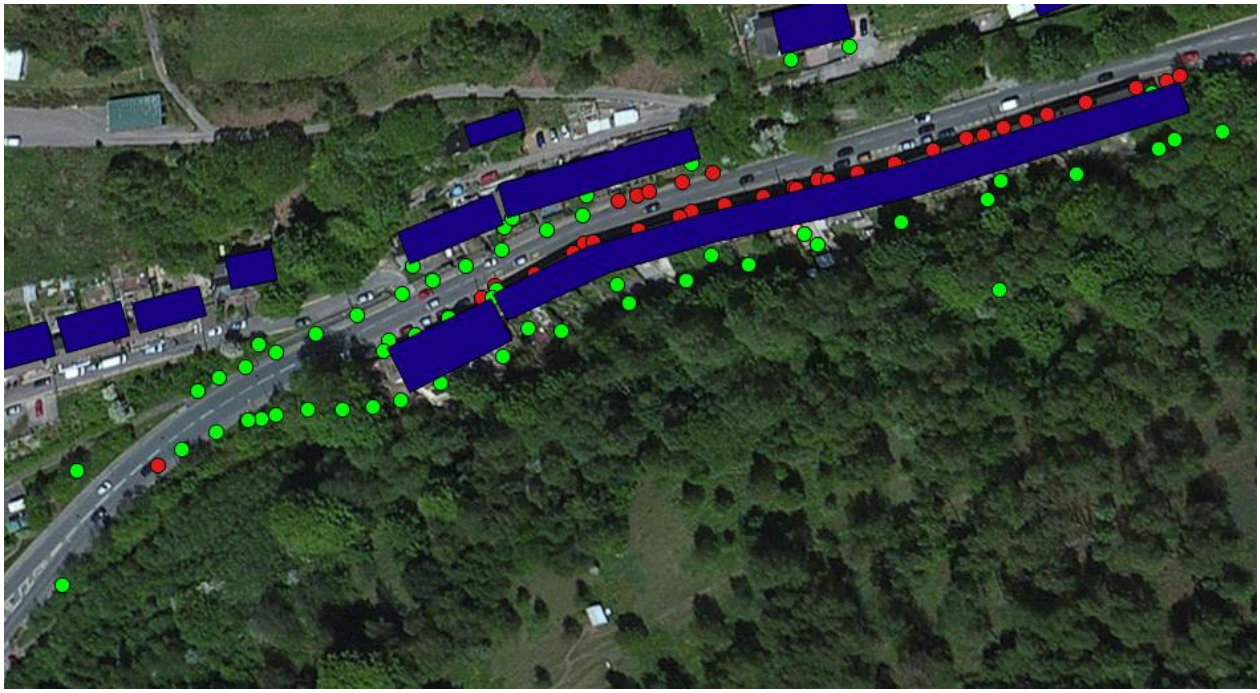


Figure 4-12 shows there is large NO_2 exceedance on the southern, northern and western footpath at Woodside Terrace in 2021 identified by the red dots.

Figure 4-12 - NO_2 exceedance / compliance plot for 2021 S2 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)



4.4.6 SCENARIO 2 (SIGNALISE THE A472/B4471 SWFFRYD JUNCTION) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with signalisation of the A472 Swffryd junction (Scenario 2), compliance will be achieved in 2025. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-10**.Furthemore, the table shows that Scenario 2 does not reduce concentrations of NO_2 in the year of implementation, and does not bring forward compliance from 2025.

Table 4-10 - Predicted concentrations and compliance year of Scenario 2

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S2 Signalise the A472/B4471 Swffryd Junction	0						53	49	45	40	36

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.7 SCENARIO 3 (DEMOLITION AND REALIGNMENT OF THE SOUTHERN FOOTPATH) - AIR QUALITY MODELLING RESULTS

This option involves removing the southern residential properties from the dispersion model, whilst leaving the emissions set to the 2021 Do-minimum values. The option also realigns the southern side footpath further south away from the existing road alignment. Hence the receptors representing the original south path are no longer relevant and are removed. - **The demolition option in 2021 does comply with the annual mean NO_2 limit value at relevant locations.**

Figure 4-13 Modelled concentrations of annual mean NO_2 for 2021 Scenario 3

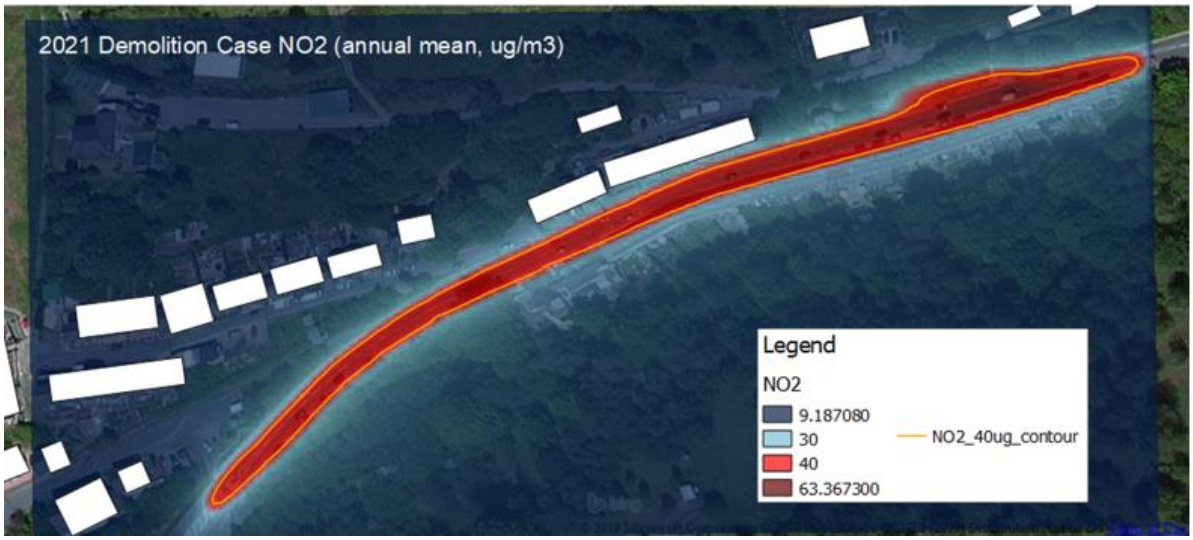
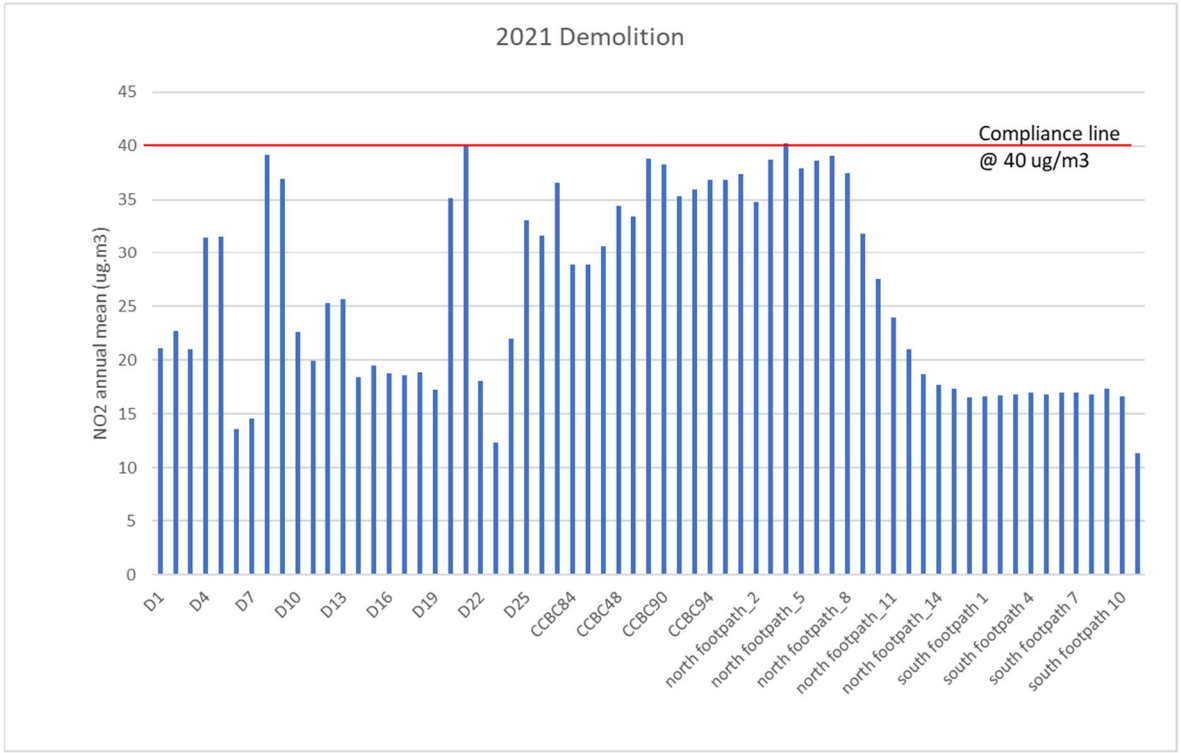


Figure 4-14 shows all receptors are compliant in 2021, with no exceedances. This is presented by the green dots in both the southern, northern and western footpaths at Woodside Terrace.

Figure 4-14 NO_2 exceedance / compliance plot for 2021 Scenario 3 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

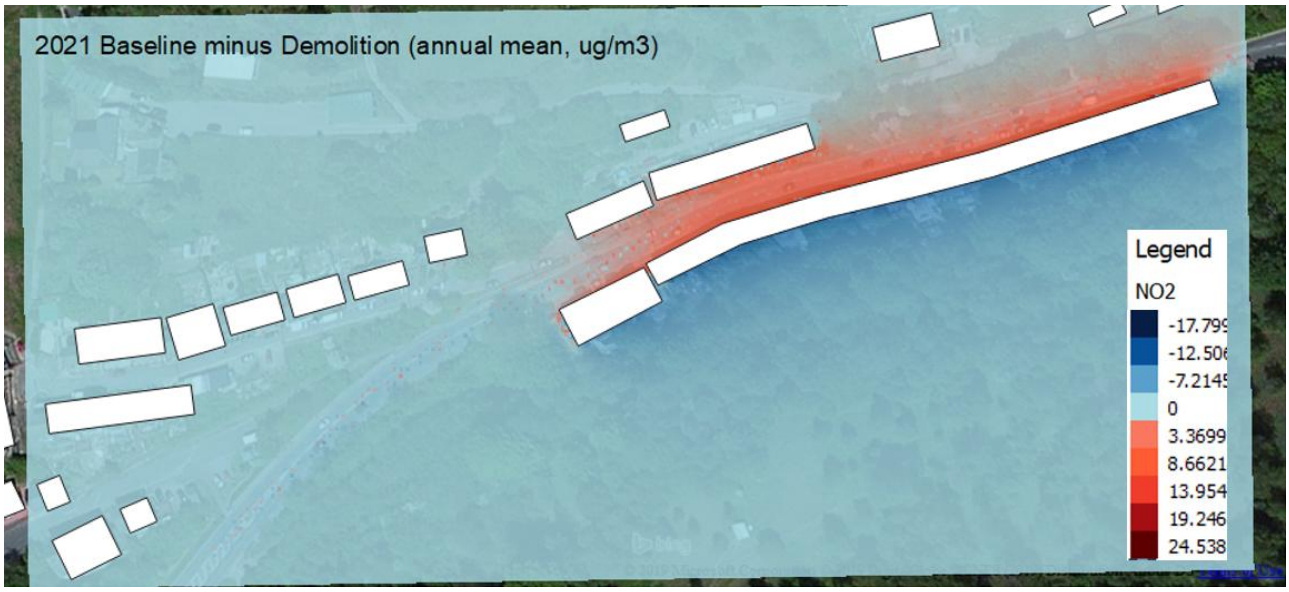
Figure 4-15 shows that all the receptors are below the compliance levels of 40-µg m^{-3}.

Figure 4-15 NO_2 at receptor locations for 2021 S3



To further underpin the analysis **Figure 4-16** shows the difference between the 2021 baseline scenario and the demolition scenario. It can be clearly seen that demolition reduces concentrations in the canyon, most likely due to the reduction in recirculation of emissions.

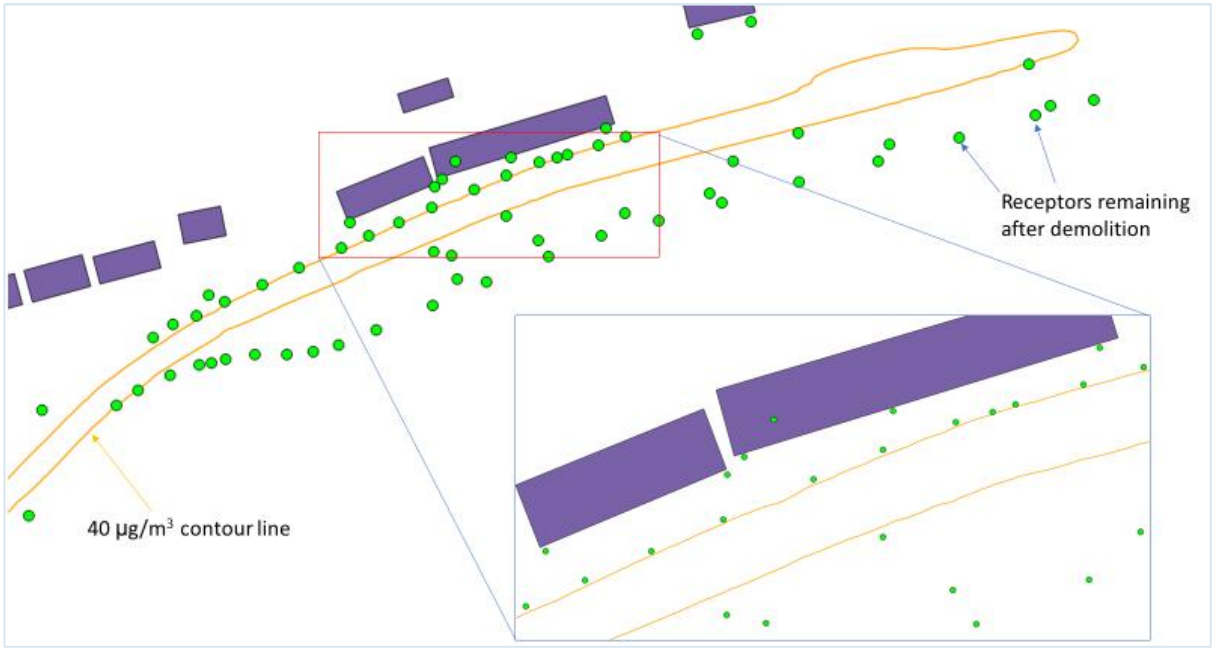
Figure 4-16 NO_2 difference plot for 2021 Scenario 3 (red areas = lower NO_2 concentrations, blue = higher)



Note: existing building footprints are retained deliberately to avoid artefacts in the plot

As the margin of compliance is slight, **Figure 4-17** presents the plotted 40 µg/m^3 contour line and shown its alignment with receptors remaining after the demolition would be completed.

Figure 4-17 Close up of NO_2 exceedance line along north path receptors (Scenario 3)



4.4.8 SCENARIO 3 (DEMOLITION AND REALIGNMENT OF THE SOUTH FOOTPATH) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with Demolition of the properties on Woodside Terrace and realignment of the southern footpath (Scenario 3). The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-11**. Furthermore, **Table 4-11** shows that Scenario 3 reduces concentrations of NO_2 by 16-µg m^{-3} in the year of implementation, and brings forward compliance to 2022 (from 2025).

Table 4-11 - Predicted concentrations and compliance year of Scenario 3

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S3 Demolish Dwellings at Woodside Terrace and realignment of the southern footpath	-16						37	34	31	28	25

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.9 SCENARIO 4 (HGV BAN IN PEAK PERIOD) - AIR QUALITY MODELLING RESULTS

The HGV peak period ban reduces concentrations of NO_2 along the corridor by a few µg/m^3. Significant exceedances still persist with the measure in place. **The HGV ban option in 2021 does not comply with the annual mean NO_2 limit value.**

Figure 4-18 Modelled concentrations of annual mean NO_2 for 2021 Scenario 4

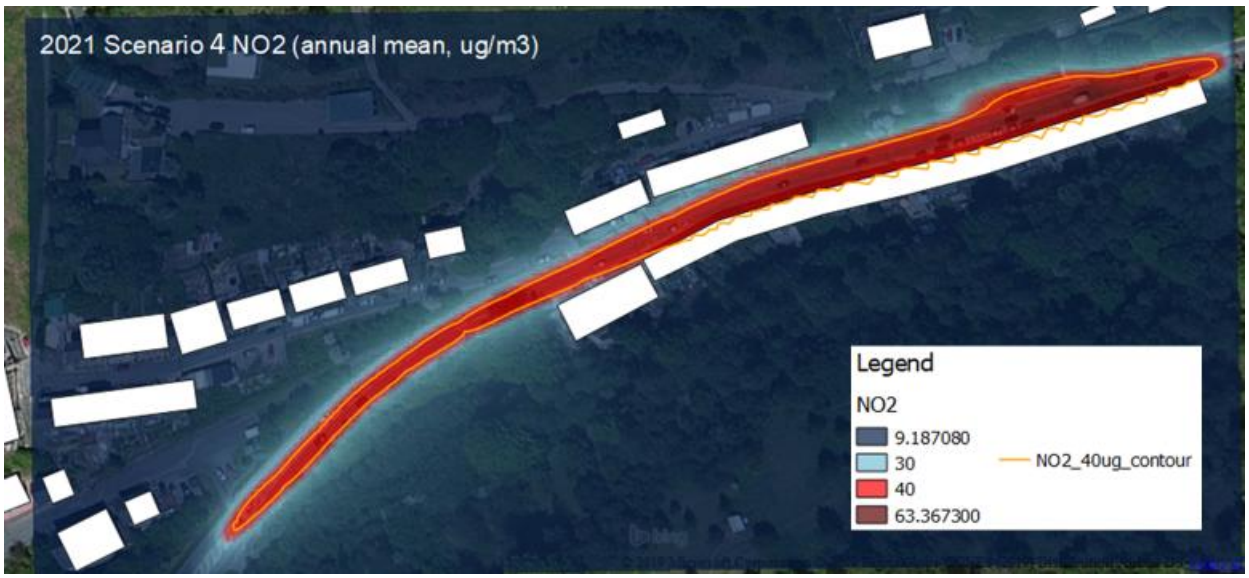


Figure 4-19 shows there is large NO_2 exceedance on the southern, northern footpath at Woodside Terrace in 2021 identified by the red dots.

Figure 4-19 NO_2 exceedance / compliance plot for 2021 Scenario 4 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

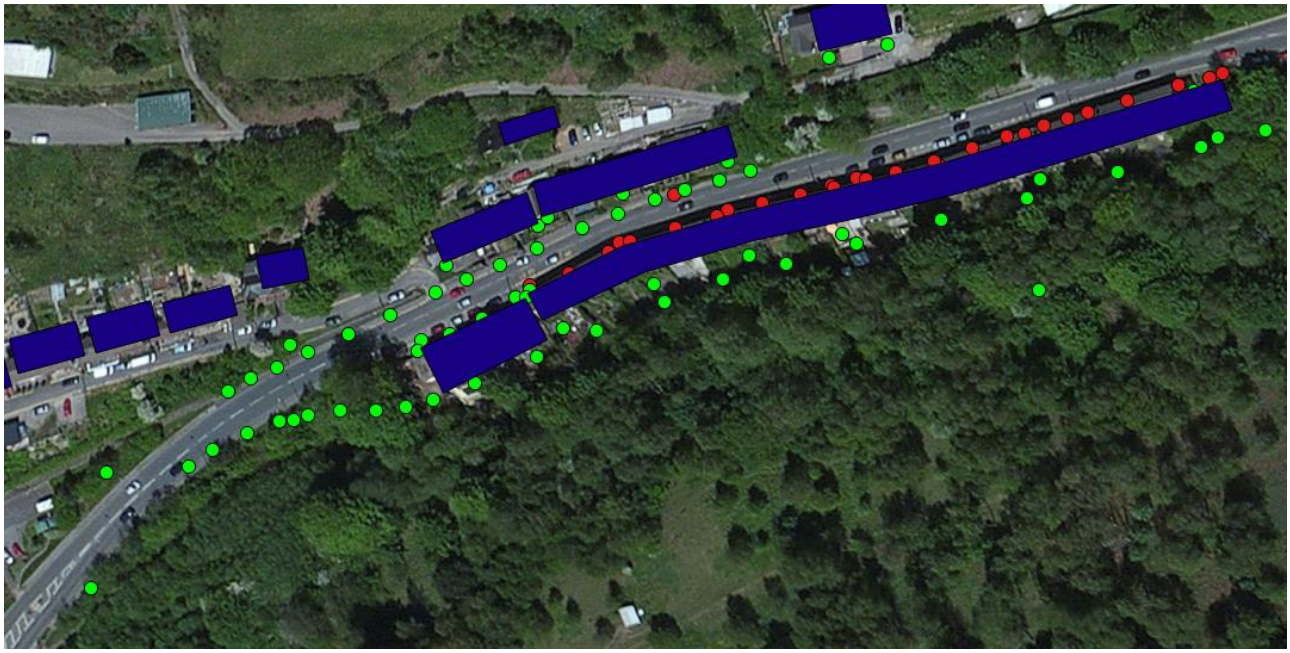
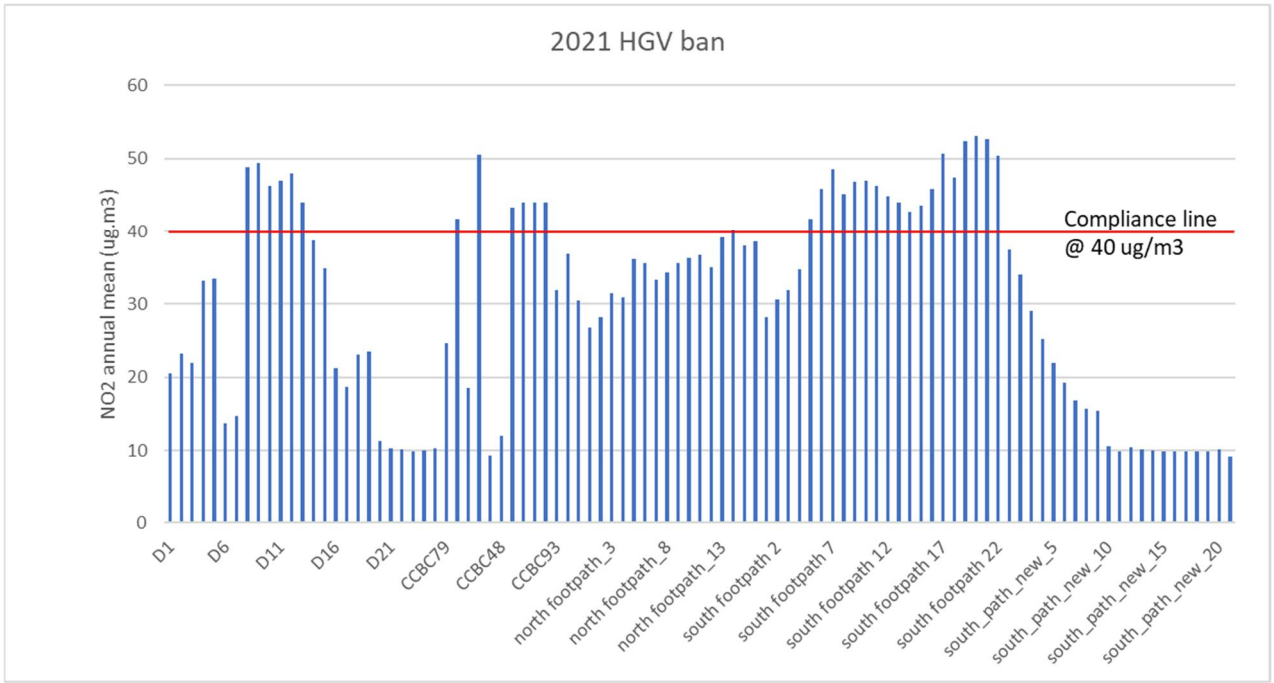


Figure 4-20 shows that a majority of the receptors are above the compliance levels of 40-µg m^{-3}.

Figure 4-20 NO_2 at receptor locations for 2021 S4



4.4.10 SCENARIO 4 (HGV BAN IN PEAK PERIOD) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with a peak period HGV ban on the A472 (Scenario 4), compliance will be achieved in 2025. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-12**. Furthermore, **Table 4-12** shows that Scenario 4 reduces concentrations of NO_2 by 4 µg m^{-3} in the year of implementation, though does not bring forward compliance from 2025.

Table 4-12 - Predicted concentrations and compliance year of Scenario 4

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S4 Peak Period HGV Bans	-4						49	45	41	38	34

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.11 SCENARIO 5 (CLASS D CLEAN AIR ZONE) - AIR QUALITY MODELLING RESULTS

The CAZ option has a large effect on NO_2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily because of Euro 6/VI vehicles with lower emissions in the fleet. **The CAZ option in 2021 does comply with the annual mean NO_2 limit value**

Figure 4-21 Modelled concentrations of annual mean NO_2 for 2021 Scenario 5

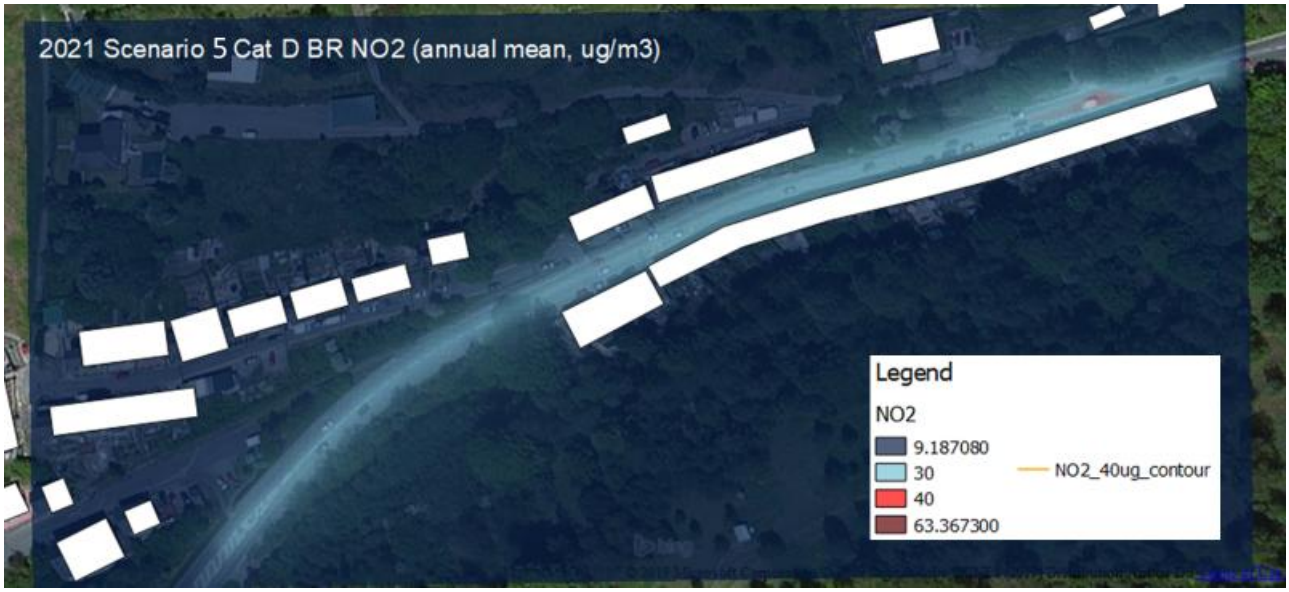


Figure 4-22 shows all receptors are compliant in 2021, with no exceedances. This is presented by the green dots in both the southern, northern and western footpaths at Woodside Terrace

Figure 4-22 NO_2 exceedance / compliance plot for 2021 Scenario 5 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

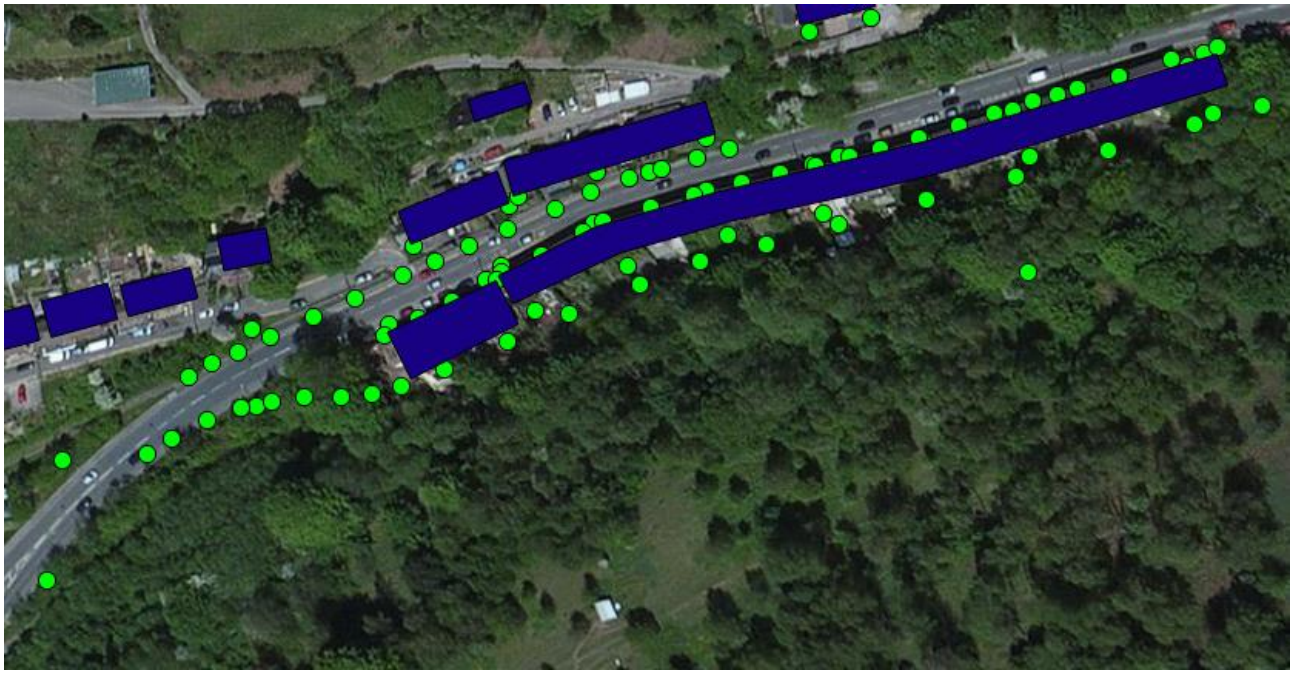
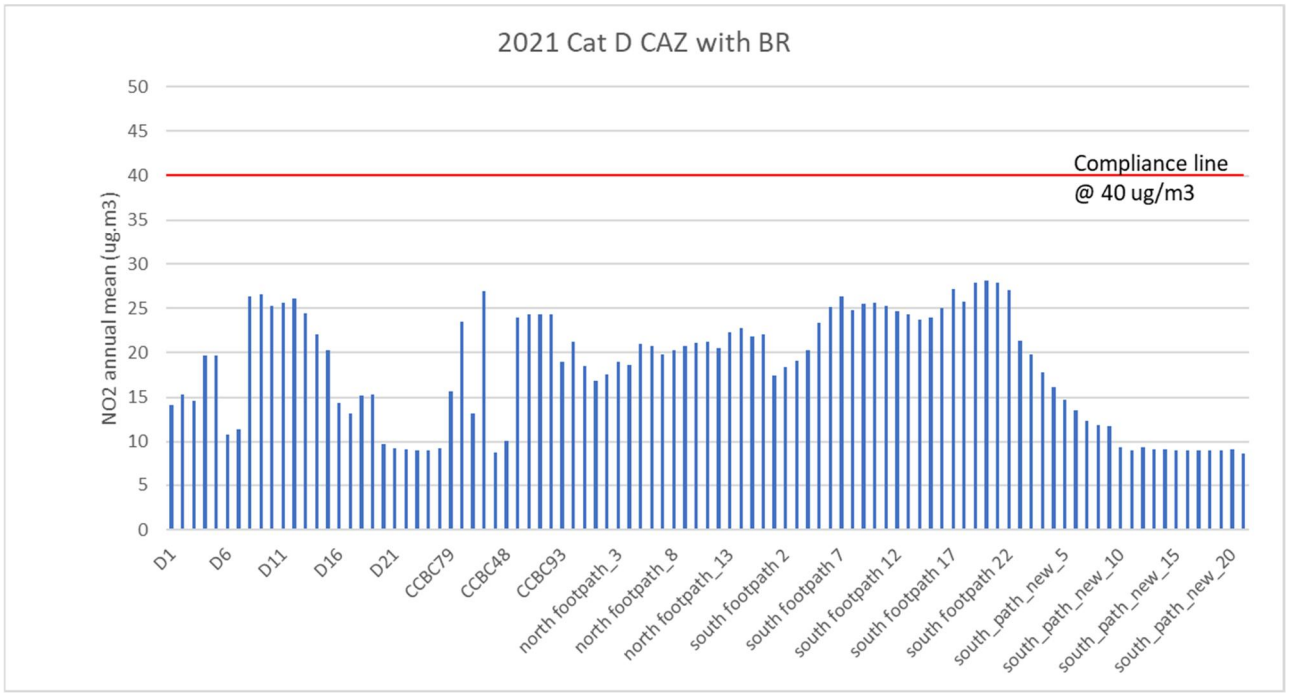


Figure 4-23 shows that all of the receptors are below the compliance levels of 40-µg m^{-3}.

Figure 4-23 NO_2 at receptor locations for 2021 S5



4.4.12 SCENARIO 5 (CLASS D CLEAN AIR ZONE) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with a Class D Clean Air Zone (Scenario 5), compliance will be achieved in 2023, the year of implementation. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-13**. Furthermore, **Table 4-13** shows that Scenario 5 reduces concentrations of NO_2 by 22-µg m^{-3} in the year of implementation, and brings forward compliance to 2023 (from 2025).

Table 4-13 - Predicted concentrations and compliance year of Scenario 5

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S5 Clean Air Zone	-22							27	26	25	24

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.13 SCENARIO 6 (TRAFFIC MANAGEMENT PACKAGE) - AIR QUALITY MODELLING RESULTS

This is a combined scenario which has the cumulative impacts of Scenario 1 and 2. **Scenario 6 in 2021 does not comply with the annual mean NO_2 limit value.**

Figure 4-24 - Modelled concentrations of annual mean NO_2 for 2021 Scenario 6

Figure 4-25 shows all receptors are compliant in 2021, with exceedances in both the southern, northern and western footpaths at Woodside Terrace presented by the red dots.

Figure 4-25 - NO_2 exceedance / compliance plot for 2021 Scenario 6 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

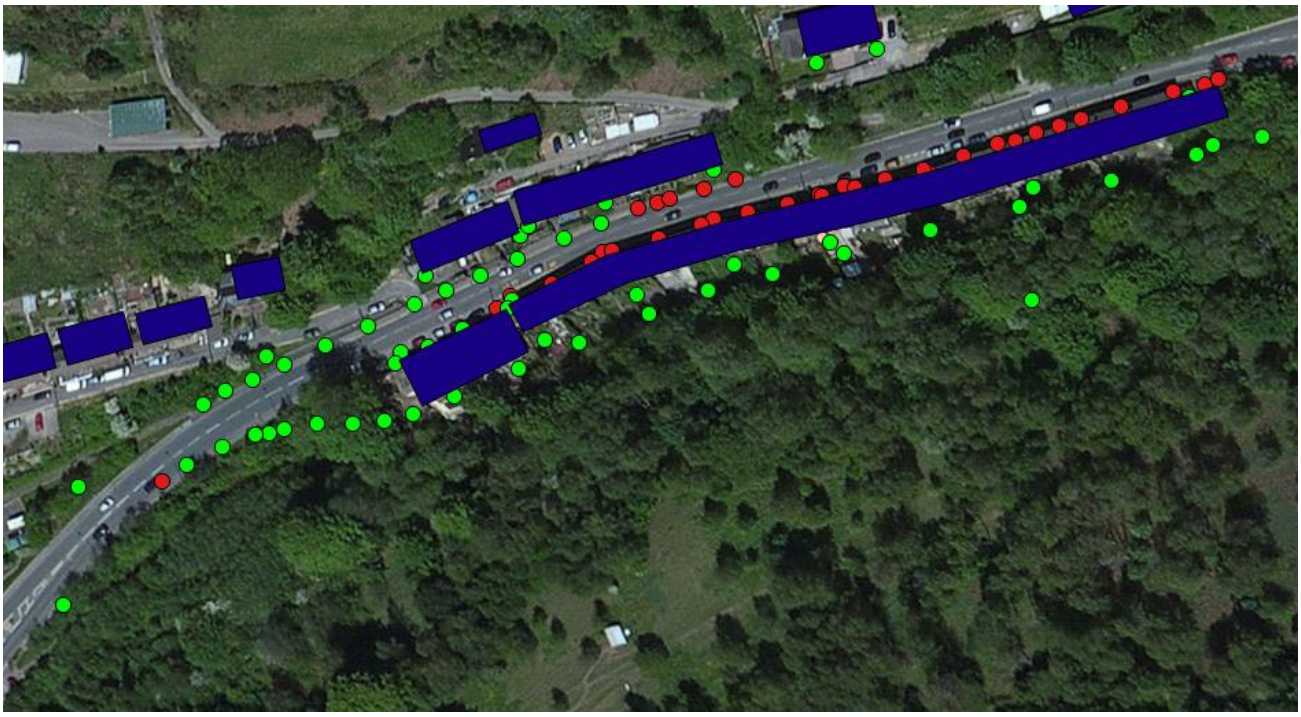
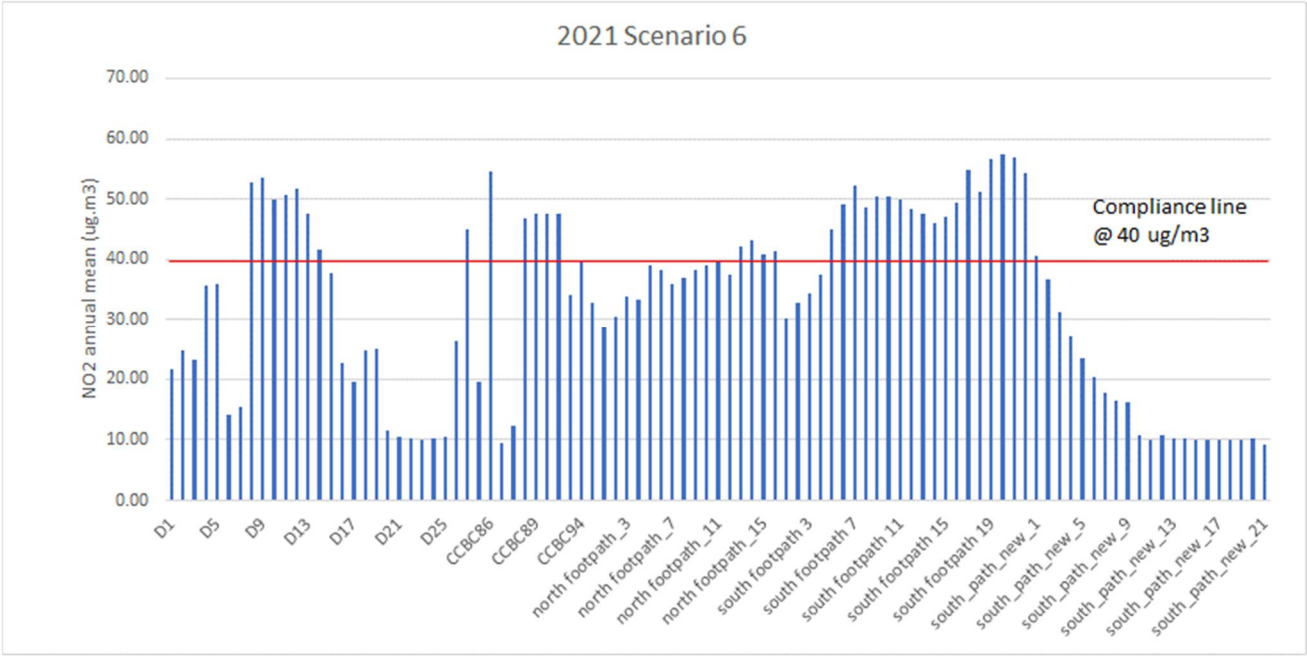


Figure 4-26 shows that the majority of the receptors are above the compliance levels of 40-µg m^{-3}.

Figure 4-26 - NO_2 at receptor locations for 2021 S6



4.4.14 SCENARIO 6 (TRAFFIC MANAGEMENT PACKAGE) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with the Traffic Management Package (Scenario 6), compliance will be achieved in 2025. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-14**. Furthermore, **Table 4-14** shows that Scenario 6 does not reduce concentrations of NO_2 in the year of implementation, and does not bring forward compliance from 2025.

Table 4-14 - Predicted concentrations and compliance year of Scenario 6

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S6 Traffic Management Option	0						53	49	45	40	36

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.4.15 SCENARIO 7 (DO MAXIMUM PACKAGE) - AIR QUALITY MODELLING RESULTS

Scenario 7 reflects the impacts of the CAZ D based scheme in Scenario 5 along with the traffic management options in Scenarios 1 and 2. Extrapolation between modelling years has demonstrated that with Scenario 7, compliance will be achieved in 2023, the year of implementation for the CAZ scheme which delivers most of the air quality improvements. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-15**.

Figure 4-27 - Modelled concentrations of annual mean NO_2 for 2021 Scenario 7

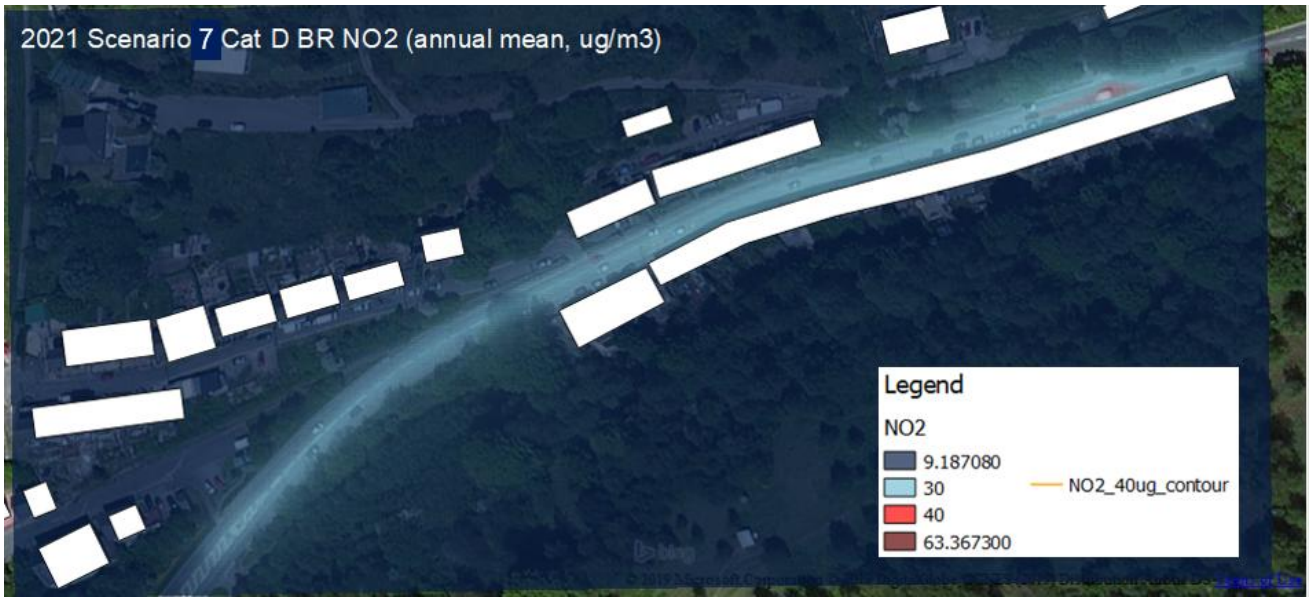


Figure 4-28 shows all receptors are compliant in 2021, with no exceedances. This is presented by the green dots in both the southern, northern and western footpaths at Woodside Terrace.

Figure 4-28 - NO_2 exceedance / compliance plot for 2021 Scenario 7 (green dots <= 40 µg/m^3, red dots > 40 µg/m^3)

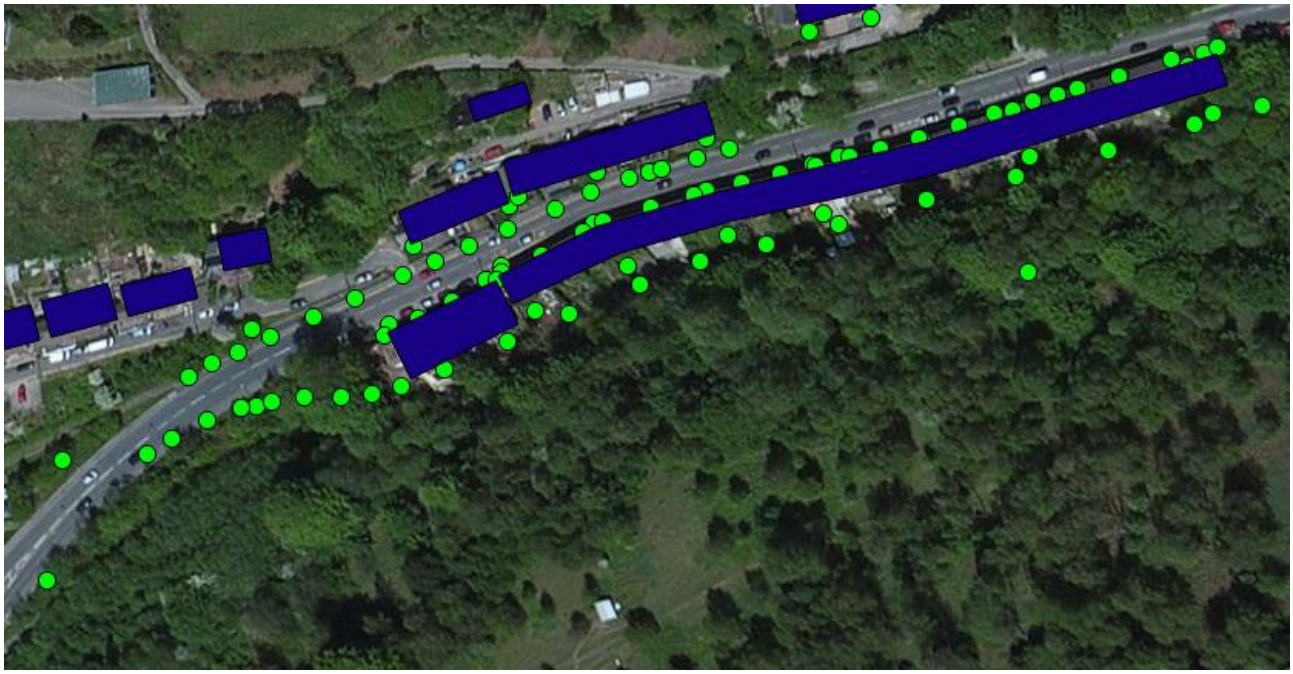
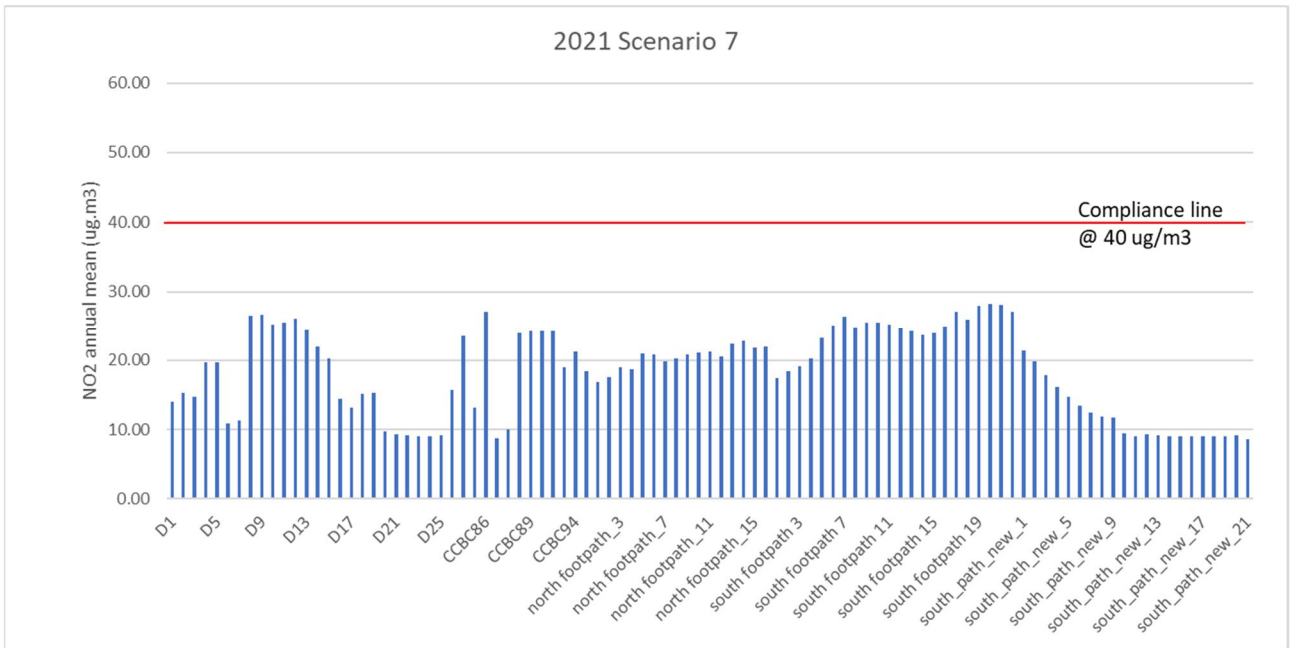


Figure 4-29 shows that all of the receptors are below the compliance levels of 40-µg m^{-3}.

Figure 4-29 - NO_2 at receptor locations for 2021 S7



4.4.16 SCENARIO 7 (DO MAXIMUM PACKAGE) - AIR QUALITY MODELLING SUMMARY

Extrapolation between modelling years has demonstrated that with the Do Maximum Package (Scenario 7), compliance will be achieved in 2023. The predicted NO_2 concentrations by year and the anticipated compliance date are shown in **Table 4-15** . Furthermore, **Table 4-15** shows that Scenario 7 reduces concentrations of NO_2 by 22-µg m^{-3} in the year of implementation, and brings forward compliance to 2023 (from 2025).

Table 4-15 - Predicted concentrations and compliance year of Scenario 7

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S7 Do Maximum Option	-22							27	26	25	24

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

4.5 AIR QUALITY MODELLING SUMMARY

4.5.1 DO MINIMUM

Fleet renewal in years to come will deliver air quality improvements without local intervention. **Table 4-16** shows the total number of modelled receptors that comply with the NO_2 limit value for future modelled years (based on linear interpolation between 2021 and 2029). Modelling indicates that the NO_2 limit value can be met in 2025 without local action- though this is contingent on later iterations of Euro standards delivering predicted NO_x emission reductions.

Table 4-16 – Do Minimum Compliance

Scenario	Total Number of Receptors	
	NO_2>40	NO_2<40
2017 Baseline	56	41
2021 Baseline	35	62
2022	31	66
2023	25	72
2024	10	87
2025	0	97
2026	0	97
2027	0	97
2028	0	97

Scenario	Total Number of Receptors	
	NO_2>40	NO_2<40
2029	0	97
This table is the number of receptor points <40, or >40 µg/m^3		

Table 4-16 shows the total number of receptors' compliance against the 2017 data and the 2021 Baseline.

4.5.2 OPTION MODELLING

Table 4-17 shows that by the 2021 forecast year, the CAZ (S5) and the Do Maximum Option which includes a CAZ (S7), result in all 97 receptors below the 40 µg/m^3 level. The demolition option (S3) also results in 97 compliant receptors below the 40µg/m^3 level in 2021. The next ranked option with a compliant number of 67 receptors below the 40µg/m^3 level is the peak hours HGV peak period bans (S4).

Table 4-17 – Do Something Options Compliance

Scenario	Total Number of Receptors	
	NO_2>40	NO_2<40
2017 Baseline	56	41
2021 Baseline	35	62
2021 Signal Timings S1	35	62
2021 Swffryd Road S2	35	62
2021 Demolition S3	0	97
2021 HGV Ban S4	30	67
2021 CAZ S5	0	97
2021 Traffic Management S6	35	62
2021 Do Maximum S7	0	97
This table is the number of receptor points <40, or >40 µg/m^3		

Comparison of the compliance year for the Do Minimum with the measures in 2021 shows that both the demolition and CAZ options have the potential to bring forward compliance from 2025. An additional assessment of a CAZ class C was included to quantify the impact of a less onerous measure. A CAZ C includes emission restrictions on buses, coaches, taxis and LGVs but does not include passenger cars. However, the maximum concentration of NO_2 in 2021 was 47/µg m^{-3}

compared to 28 µg/m^{-3} for a CAZ D. A CAZ C only brought forward compliance by one year to 2024 and therefore a CAZ C was not included in any further analysis.

Table 4-18 shows the modelled impact of the measures selected through the WelTAG 3 process. The table illustrates the impact of the various measures starting in 2017 (2017 is included for comparative purposes) with the baseline.

Table 4-18 - Impact of measures on roadside annual mean concentrations NO_2 Concentration, µg/m^3 on A472

Measure	Impact µg m^{-3}	NO_2 predicted concentration (µg/m^{-3})									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Do Minimum		72	68	65	61	57	53	49	45	40	36
S1 Change Signal Timings at Crumlin Junction	0				61	57	53	49	45	40	36
S2 Signalise the A472/B4471 Swffryd Junction	0						53	49	45	40	36
S3 Demolish Dwellings at Woodside Terrace	-17						37	34	31	28	25
S4 Peak Period HGV Bans	-4						49	45	41	38	34
S5 Clean Air Zone	-22							27	26	25	24
S6 Traffic Management Option	0						53	49	45	40	36
S7 Do Maximum Option	-22							27	26	25	24

Note: Red Box Non-compliant, Green Box compliance achieved, Grey Box before implementation timeframe

1. The measure identified by the modelling as achieving the objective in the shortest possible time is the demolition of dwellings at Woodside Terrace and realignment of the southern footpath. Although the emissions do not decrease with this measure, the demolition of the dwellings removes the street canyon and significantly increases dispersion of the pollutants. In addition, residents will be relocated earlier so their personal exposure to the levels of NO_2 will be reduced during 2020. As concentrations of NO_2 at most other monitoring locations across the borough are low, it is reasonable to expect alternative accommodation will be found in areas in compliance with the limit value.
2. While it is expected that the majority of the residents can be relocated in 2020, this is expected to be complete with the dwellings demolished and the footpath relocated away from the carriageway by end of December 2021. Compliance with the limit value will be achieved by the end of 2022.

3. The Clean Air Zone brings the greatest concentration reduction (22µg/m^3). However, given the further work needed prior the implementation of a CAZ, as outlined above, it is not expected that a CAZ could be operational prior to December 2022. Compliance with the limit value would be achieved by the end of 2023 and therefore this is not a measure which will mean compliance is achieved any sooner than demolition of the dwellings alone. The A472 at Hafodyrynys is an integral part of the main cross valley link between Caerphilly and Torfaen County boroughs and introducing a charging scheme or vehicle prohibition would have a significant effect on the economy of both county boroughs. In addition, as the report previously states, the effects of a CAZ are not yet known and could result in air quality problems elsewhere within the CCBC or exacerbate existing poor air quality areas, such as the M4.

The traffic management measures do not bring improvement to annual average NO_2 concentrations and do not bring forward compliance.

4.6 VALUE FOR MONEY ASSESSMENT

As part of the WelTAG Stage Three study, consideration has been given to the Value for Money (VfM) of the proposed schemes. Outputs from the micro-simulation traffic modelling have informed a TUBA (Transport User Benefit Appraisal) economic assessment for the measures under consideration.

The aim of TUBA is to carry out economic appraisal in accordance with the DfT's Transport Analysis Guidance as set out in Unit A1-1 'Cost-Benefit Analysis'[16] and the associated WebTAG Data Book (v1.10) published in May 2018[17].

The benefit to cost ratio (BCR), net present value (NPV), present value of benefits (PVB) and present value of costs (PVC) will be represented for each option. The detailed breakdown of the Value for Money assessment is presented within the IAR. The BCR analysis has only calculated benefits and dis-benefits on the A472 Hafodyrynys Road, A467/ A472 Crumlin Junction and B4251 Kendon Road. Any additional benefits or dis-benefits as result of vehicles rerouting is not included and is a limitation of the value for money assessment.

4.7 SENSITIVITY TESTING

4.7.1 UNCERTAINTY IN THE AIR QUALITY MODELLING

Air quality modelling carries uncertainty at all stages- from the input meteorological data to the emission estimates, through to the physical treatment of dispersion in the domain. All of these factors contribute to uncertainty. The main way to reduce the effect of these uncertainties is to validate the modelled concentrations against ambient measurements of the pollutants under consideration. Then the relationship between the two is used to derive model scaling factors and reduce error estimates.

[16] https://www.gov.uk/government/publications/webtag-tag-unit-a1-1-cost-benefit-analysisdecember-2017

[17] https://www.gov.uk/government/publications/webtag-tag-data-book-may-2018

We have used standard methods for this derived from Defra guidance. The model has a Root-Mean-Square-Error (RMSE) of 3.9 µg/m^3 which can be interpreted as an acceptable measure of overall uncertainty.

All air quality modelling presented in this Stage Three report is based on core scenarios to underpin decision making. Sensitivity tests based on high and low traffic forecasts have been modelled for the impact on annual average NO_2. Results are presented in the Impact Assessment Report.

4.7.2 UNCERTAINTY IN TRAFFIC GROWTH FORECASTS

As part of the sensitivity tests undertaken for this study, consideration has been given to the uncertainty in traffic growth forecasts. This has been done in line with WebTAG Unit M4 'Forecasting and Uncertainty'.

The high and low growth demand sets are developed due to uncertainty around annual forecasts from the National Transport Model (NTM), based on the macro-economic variables that influence the main drivers of travel demand.

The high / low growth scenario should consist of forecasts that are based on a proportion of base year demand added / subtracted to the demand from the core scenario. This is done based on:

$$2.5\% \times \sqrt{(number\ of\ years\ between\ base\ and\ forecast\ year)}$$

Whilst these uncertainty test have been undertaken, the core scenario is intended to be the best basis for decision-making given current evidence. As such, all sensitivity tests are wholly contained within the IAR.

4.7.3 BEHAVIOURAL RESPONSE TO THE CLEAN AIR ZONE

The impact of any measure in addressing air quality is dependent upon the extent to which it alters the mix or behaviour of transport within an area. This could be, for instance, by altering the number of journeys undertaken, encouraging more efficient journeys or by altering the mode or technology used for the journey.

As part of this specific sensitivity testing, different behaviour responses are expected by motorist users of the A472 corridor because of a charging CAZ. This is a continuation of the initial Stage Two assessment which assumed all non-compliant vehicles are removed from the corridor with motorists either rerouting or cancelling their trip. The core scenario of the Clean Air Zone assessment assumes the following behavioural responses to a CAZ:

- Continue and pay charge
- Avoid the Clean Air Zone
- Cancel planned journeys
- Upgrade/ replace their vehicle
- Change transport mode

Table 4-19 – Behavioural Response to CAZ (Modelling)

Behavioural Response	How to model?
Replace vehicle	Vehicle still within model (not removed) though will increase the overall percentage of compliant vehicles.
Cancel trip	Remove vehicle from network completely.
Change mode	Remove vehicle from network completely
Avoid zone	Remove vehicle from A472 corridor as per the assignment assumptions done for the CAZ option to date.
Pay charge	Vehicles to remain within the CAZ despite being non-compliant.

The core assessment for the CAZ assumes a Class D[18] charging zone based on the above assumptions. Sensitivity tests have been undertaken assuming a Class C[19] charging zone and total displacement of non-compliant vehicles. These results are presented within the IAR.

4.8 APPRAISAL AGAINST OBJECTIVES

At Stage Two, the options were re-appraised against the key criteria for the objective as further evidence emerged. This has been done again at Stage Three to ensure that the options are effective, can be delivered in meaningful timeframes and are deliverable.

The Stage Three appraisal procedure is a full independent quantitative approach. For the environmental appraisal everything except the net present value (NPV) has been populated.

4.8.1 KEY CRITERIA

The following key criteria for the appraisal were established in Stage One, updated in Stage Two, and has been re-evaluated in Stage Three:

Effectiveness – Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m^3 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 the Local Authority.

[18] Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

[19] Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs)

4.8.2 SECONDARY CRITERIA

In addition to bringing forward compliance against the Limit Vales, the study contributes to the strategic priorities of the Welsh Government, including that of the Well-being of Future Generations (Wales) Act 2015. As such, the following were considered as secondary criteria in the appraisal process at Stage Three:

Will the measure deliver an overall reduction in NO_2 emissions to air?

This is a qualitative appraisal based on the likelihood of overall reduction to NO_2 resulting from the measure. This will enable the differentiation of measures which simply redistribute the impacts rather than seeking to reduce overall NO_2 emissions to air.

Will the measure result in unintended consequences or other environmental impacts?

This is a qualitative appraisal that considers whether there will be any other adverse environment impacts resulting from the measures. This will summarise the findings of the appraisal against the environmental aspects of well-being.

Will the measure contribute to well-being?

This is a qualitative appraisal which considers the seven goals of the Well-being of Future Generations (Wales) Act 2015, with the following criteria:

Will the measure impact equally across multiple vehicle classes and journey types?

Will the measure have a positive impact on wider public health and inequalities?

4.8.3 THE SEVEN WELL-BEING GOALS (FUTURE GENERATIONS FRAMEWORK)

This section aims to provide a summary to the well-being goals and has been used as part of a parallel appraisal process at Stage Three.

'*The well-being goals must be considered as an integrated set of seven, and the well-being objectives (considered above) should maximise contribution to all seven.*'

Each of the measures has been appraised against the seven Well-being Goals and this is presented as part of the Appraisal Summary Table for each measure.

Table 4-20 – The Seven Well-being Goals

Well-being Goal	Well-being Areas	Meeting goals at a Strategic Level	Designing our proposal
Prosperous	Green growth, growing deprived business areas, social reasons for poor health, support to local communities and economy, environmental sustainability. Need for skills development, innovative economy and adapted to future change. Source materials locally and working with other public	Open opportunities for businesses and public goods production. Support the local supply chains and low-carbon sectors. Ways to address future needs.	How can negative impacts on the local economy be reduced? How can it support productivity? Can it be adapted to a changed Wales in the future. Thinking about the 'long-term' in the Ways of Working?

Well-being Goal	Well-being Areas	Meeting goals at a Strategic Level	Designing our proposal
	bodies in pursuit of shared goals.	Push infrastructure provision in a sustainable innovative way. Have less resource intensive alternatives been looked at? Does the project propose a responsible solution in terms of ecological, financial and material resources? Consider the role of employment in reducing inequality.	What behaviours does this project encourage or discourage? How will this project help or impede people to live low-carbon lifestyles? How will the design of this project use resources efficiently and proportionately? Will this project create jobs in places with high levels of unemployment and underemployment?
Resilient	Cohesive communities, need to adapt to environmental trends.	Enhance or reduce access to, and quality of, green and open spaces?	How will this project protect and enhance ecosystems which support economic activity in Wales? How will this project directly impact ecosystems?
Healthier	Unequal distribution of environmental problems. Broader factors to physical and mental health; connectedness, good jobs, access to opportunities and services. Income inequalities, opportunities for active travel and exercise	Address the determinants of mental and physical health and well-being of people of all ages?	How will this project address the social, economic, environmental and cultural determinants of health and well-being? Consider the Public Health Outcomes Framework. How will this project protect and improve local access to quality outdoor spaces for revival, restoration and exercise?
More equal	Creating vibrant culture; relationship between health and inequality; developing jobs and skills Need to involve local people meaningfully (refer to 'Involvement' under the Five Ways of Working) Improve education and tackling low pay.	Fairer society. Supporting disadvantaged groups in sustainable long-term ways. Ensure public resources and assets are not transferred to a small group of organisations or individuals	Where decisions are made and which groups have access to decision-makers? Is the area in priority need of investment? Will the scheme bring opportunity to deprived areas? Who benefits most from this? And who is negatively

Well-being Goal	Well-being Areas	Meeting goals at a Strategic Level	Designing our proposal
			impacted. Can these impacts be avoided? Impacts on marginalised groups. Consult the Public-Sector Equality Duty Engagement with social enterprises, co-operatives and employee-owned businesses?
Cohesive communities	Attractive places to live, need for local jobs, opportunities to develop local arts, music and culture	How will this project support communities to be more cohesive, locally viable, well-connected, safe and attractive?	Impact on access to and availability of amenities? Long-term jobs creation. How will this project support local amenities and strengthen social relationships?
Vibrant culture	Employment provided by heritage sites, equal access to heritage. Building social ties to support activities for a lively public life.	How will this project contribute to a culturally vibrant Wales, recognising the potential direct and indirect impacts on Welsh communities and the Welsh language?	Opportunities are accessible to all, e.g. affordable, public transport accessible, have disability access.
Globally responsible	Low-carbon economies and lifestyles. Proportionate uses of resources. Understanding the impact of our own lifestyle on the rest of the word. Reducing greenhouse gas emissions both in production and use.	Global leadership or innovation. Follow national or international innovative models? How can greenhouse gas emissions be brought down? Build on the best practice in sustainability.	What Wales is bringing in from the rest of the world? e.g. sustainable purchasing, Fairtrade, global supply chains. What Wales is putting out into the world based on our unique qualities? e.g. low-carbon technology, sustainable developing, positive example on infrastructure projects.

Reference: https://futuregenerations.wales/wp-content/uploads/2018/11/FGCW-Framework.pdf p12-p25

4.8.4 OTHER ISSUES

Further potential issues with each measure have been explored and considered accordingly in the instance that they have not been covered under any of the other appraisal areas. These include:

Overall Acceptability

A qualitative appraisal has been undertaken to assess the receptivity of the public, local authorities and key stakeholders, both groups and individuals to the measure. The appraisal has been undertaken on a measure by measure basis.

Technical, Operational and Financial Feasibility

Where appropriate a qualitative appraisal has been undertaken to assess measures on the following criteria:

- Technical: The extent to which the measure is technically feasible within the specified budget and timeframe
- Operational: The extent to which the measure is operationally feasible within the specified budget and timeframe
- Financial: The extent to which the measure is financially feasible

Deliverability and Risk

At this stage issues regarding deliverability and risk have been taken into consideration. This has been included as part of the Appraisal Summary Tables at WelTAG Stage Three.

4.8.5 IMPACT DISTRIBUTIONAL ANALYSIS (IDA)

4.8.5.1 Air quality: Summary

Changes in NO_2 concentrations from traffic management options and demolition options deliver smaller improvements relative to other options, in particular with regards to the spatial area of impact. Air quality will change very differently depending on the proposed measure. Sensitive receptors within the CAZ domain (a nursery and three nursing homes) will therefore see only limited change in their NO_2 concentrations under these options. Furthermore, because the area of impact is small, one link in one Lower Supper Output Area (LSOA) it is not possible to pick out a distributional analysis from a methodology which uses an LSOA grid.

The CAZ Class D and HGV ban have wider impacts on NO_2 concentrations and thus, the results of the distributional analysis are based on a larger, regional domain. A CAZ Class D would reduce average concentrations by almost 0.35 $\mu g/m^3$ compared to baseline for 2021 across the entire regional domain, whereas an HGV Ban will only reduce it by 0.018 $\mu g/m^3$. A HGV ban would cause potential winners and losers as some areas see an increase in air pollution due to re-routing of traffic, but this effect is not observed for the CAZ Class D which only sees reductions in concentrations across all LSOAs and therefore only winners.

For these scenarios (CAZ Class D and HGV Ban) a quintile analysis following WelTAG guidance was carried out in relation to household income and children population. Across both scenarios and against both vulnerable characteristics, this analysis suggests there will be no distributional pattern to the effects, either regressive or progressive. That said it is interesting to note that for the HGV Ban the least deprived quintile will achieve a smaller benefit compared to other quintiles in proportion to its population, as other quintiles do (hinting at a potential progressive effect). However, this WelTAG analysis only considers the numbers of winners and losers and does not account for the relative size of the win or loss. When we assess average change in concentration by quintile, under both the HGV ban and CAZ option greater reductions in pollutants accrue to the least

deprived areas (no trend is observed for children). This suggests in fact that both options may have a marginal regressive impact. **Table 4-21** summarises the main findings from the air quality IDA.

Table 4-21 – IDA for Air Quality

CAZ	Scenario	Direct Impacts	Indirect Impacts	IDA
1	**Change Signal Timings at Crumlin Junction**	No distributional impact because the change in emissions is localised.	Potential impact on air quality while commuting through the CAZ area	**0**
2	**Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector**	No distributional impact because the change in emissions is localised.	Potential impact on air quality while commuting through the CAZ area	**0**
3	**Demolish Dwellings at Woodside Terrace and realignment of the southern footpath**	No distributional impact because there is no change in emissions is localised.		**0**
4	**Peak Period HGV Bans AM & PM**	Reduce average concentrations within the regional domain by 0.018 µg/m^3 compared to baseline for 2021 Potential winners and losers as concentrations increase in other areas due to re-routing No distributional impact is observed from the quintile analysis counting winners and losers Highest positive relative changes in reduction of NO_2 concentrations in areas with least deprived population Sensitive receptors within the CAZ domain will benefit from a decrease in NO_2 concentrations	Potential winners and losers High income households and households with average children population would be most affected Highest positive relative changes reduction on NO_2 concentrations on areas with least deprived population Sensitive receptors within the AQ 1 domain will benefit from a decrease in NO_2 concentrations	**++**
5	**CAZ Class D with behavioural response**	Reduce average concentrations within the regional domain by almost 0.35 µg/m^3 compared to baseline for 2021 No distributional impact is observed from the quintile analysis counting winners and losers Highest positive relative changes in reduction of NO_2 concentrations in areas with least deprived population	Potential winners Air quality improvements highest for most deprived households and households with an average children population Highest positive relative changes reduction on NO_2 concentrations on areas with least deprived population	**++**

CAZ	Scenario	Direct Impacts	Indirect Impacts	IDA
		Sensitive receptors within the AQ 1 domain will benefit from a decrease in NO_2 concentrations.	Sensitive receptors within the AQ 1 domain will benefit from a decrease in NO_2 concentrations in the AQ 1 domain.	
6	**Traffic Management Option (Scenario 1,2)**	No distributional impact because the change in emissions is localised.	Potential impact on air quality while commuting through the AQ 1 domain area	**0**
7	**Do Maximum (Scenario 1,2,5)**	No distributional impact is observed from the quintile analysis counting winners and losers Highest positive relative changes in reduction of NO_2 concentrations in areas with least deprived population Sensitive receptors within the CAZ domain will benefit from a decrease in NO_2 concentrations.	Potential impact on air quality while commuting through the AQ 1 domain area	**++**

Note: Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.8.5.2 Affordability for businesses: Summary

The traffic management and demolition options will only have very marginal impacts on businesses. Short-term negative impacts due to roadblocks related to construction works would be followed by the potential for long-term direct positive impact on businesses due to the improvement in access to/from affected business locations. Furthermore, indirect positive impact may arise due to cost decreases for deliveries and easier access for customers and employees.

The HGV Ban and CAZ measures would have much greater and negative impacts. The extent to which businesses will be affected by either a CAZ D or an HGV ban during peak hour will depend on the type of business, its location, size and price sensitivity. Most of the actions that businesses can take to respond to the proposed measures will incur costs, which will place an additional burden on the business. Where these burdens are significant, businesses could choose to scale down operations, re-locate or even close altogether with a consequent impact on local employment and economic activity. CAZ D will also impact:

- Taxi drivers, who are among the lower income households in society;
- Buses, with a potential reduction or removal of services to marginal areas;
- Cars, and hence commuters and other businesses that use cars for their business travel.

Smaller firms and sole traders are usually more price sensitive and therefore are likely to be the most affected if these measures are in place: smaller businesses tend to operate older vehicles and cannot redistribute their fleets. At the same time, LGVs (also affected under the CAZ) are predominantly used by small businesses such as self-employed tradesmen. Any additional cost in relation to owning and operating LGVs, would impose a strain on these businesses.

These results align with the outcomes from the pilot survey (noting again the limitations on the sample size for drawing conclusions regarding the impacts across all businesses using the affected link). Almost all businesses who participated in the survey felt suppliers or customers would be affected by the proposed restrictive measures. Most businesses felt restricting access to vehicles along the A472 would have a negative or very negative impact on their operations. The majority stated that the proposed pricing for vehicles entering the CAZ D was too high. Most businesses would re-route their journeys, and a significant number of businesses stated they would relocate their business. Furthermore, across the 20 firms from the sample, about 300 employees would be affected in their commute. Most popular steps business had already taken to reduce air pollution included alternative transport/work arrangements and the purchase of ULEV vehicles. A summary of the main findings for the IDA on business is shown in Table 4-22 – IDA for businesses and their direct/indirect impacts.

Table 4-22 – IDA for businesses and their direct/indirect impacts

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
1	Change Signal Timings at Crumlin Junction	Potential improvement in access to/from affected business locations, but likely to be small	Cost decreases for deliveries Easier access for customers, employees	0
2	Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector	Potential improvement in access to/from affected business locations, but likely to be small	Cost decreases for deliveries Easier access for customers, employees	0
3	Demolish Dwellings at Woodside Terrace and realignment of the southern footpath	Roadblocks due to site work, but likely to be small		0
4	Peak Period HGV Bans AM & PM	Displacement or delays of deliveries via HGVs to/from affected businesses during peak hours: requires businesses to shift movements outside peak times Reduced response options.	Increased congestion on alternate routes Costs incurred to change transport modes Increased costs of deliveries Negative competitiveness impacts and potential loss of customers Potential relocation of severely affected firms	- -
5	CAZ Class D* with behavioural response	**Costs incurred by some businesses to upgrade fleets to comply.** - CAZ generally tends to affect smaller firms most as they operate older vehicles / cannot redistribute their fleets.	Increased congestion on alternate routes Potential relocation of affected businesses Potential loss of competitiveness for some affected businesses.	- - -

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
		Costs incurred by businesses/ customers/ employees for access to business and deliveries. CAZ impacts vehicle movements other than HGVs: Taxi drivers, public transport providers, commuters and car business trips. In particular: - CAZ will impact LGVs, which are commonly used by smaller businesses / tradesmen hence larger impact on smaller businesses. - CAZ will impact on cars, and hence commuters and other businesses that use cars. - CAZ will impact on buses that could reduce or remove services to marginal areas. Costs incurred by operators will impact public transport fares. - CAZ will impact on taxi drivers, who are amongst lowest income households in society.	Within CAZ zone: reduction in demand as fewer individuals are able or willing to travel through the area. Potential effect on supply chains.	
6	Traffic Management Option (Scenario 1,2)	See 1 and 2	See 1 and 2	**0**
7	Do Maximum (Scenario 1,2,5)	See 1, 2 and 5	See 1, 2 and 5	**- -**

Note: Large beneficial (+++); Moderate beneficial (++); Slight beneficial (+); Neutral (0); Slight adverse (-); Moderate adverse (- -); and Large adverse (- - -)

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.8.5.3 Affordability for households: summary

Traffic management options will have minor impacts on households as there is no direct impact on income or expenditure and the only impact is on traffic flow. This could lead to potentially beneficial indirect impacts on their fuel costs and travel times. A HGV ban may have a small negative indirect impact on households due to the behavioural response of businesses and thus wider employment and supply chains supporting Caerphilly. Demolition would have very high impact on dwelling owners and households living in the dwellings as well as some indirect impact on the households living nearby due to the demolition works. Given the indirect nature of the effect of these options, it is difficult to isolate any distributional effect.

A CAZ D will have a direct, negative impact on households, in particular to those with non-compliant cars. WelTAG analysis suggests middle income households could suffer the most (as they make the most non-compliant trips through the CAZ) and high-income households the least (lowest number of non-compliant trips). Non-compliant vehicles are mostly located in the northern part of the IDA

domain as well as the eastern areas. That said, it is important to note that this analysis does not reflect that a given cost has a greater proportional impact on lower income households. So even though it appears there will be a lower cost burden on the most deprived quintiles, there could still be a greater impact proportionally relative to their disposable income.

Furthermore, there are sensitive receptors located within very close proximity to the CAZ area (nursery and nursing homes) which suggests there will be some impact on their vulnerable users and accessibility both for employees, suppliers and visitors. **Table 4-23** shows the main findings.

Table 4-23 – IDA for households and their direct/indirect impacts

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
1	**Change Signal Timings at Crumlin Junction**	No distributional impact as there is no financial impact on households	Improvement in location of queuing traffic Potential savings in fuel costs due to reduction of commuting times and traffic	+
2	**Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector**	No distributional impact as there is no financial impact on households	Improvement in location of queuing traffic Potential savings in fuel costs due to reduction of commuting times and traffic	+
3	**Demolish Dwellings at Woodside Terrace and realignment of the southern footpath**	Direct impact on households living in affected dwellings: - Households will be given market value for their properties plus a compensation payment and disbursements. However, this could leave families with a financial shortfall when purchasing a new property. Larger impact on households living / owning the affected dwellings	Indirect negative impact on households living nearby during demolition works.	-
4	**Peak Period HGV Bans AM & PM**	Indirect impact on households from rerouting of business supply chain, re-location, etc.	Potential negative impact on employment and household earnings	- -
5	**CAZ Class D* with behavioural response**	Negative direct impact on households using non-compliant cars to travel through the CAZ area Potential larger impacts on the poorest population as they are likely to own non-compliant cars. Also, lower costs could still represent a higher proportional cost to more deprived households	Indirect negative impact through taxis/ coaches/ buses potentially passing on costs Potential negative impact on older population or those with disabilities most likely to use taxis as well as younger and poorer residents using buses/coaches to travel	- - -

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
6	**Traffic Management Option (Scenario 1,2)**	No distributional impact as there is no financial impact on households	Improvement in location of queuing traffic Potential savings in fuel costs due to reduction of commuting times and traffic	+
7	**Do Maximum (Scenario 1,2,5)**	Negative direct impact on households using non-compliant vehicles to travel through the CAZ area. Potential larger impacts on the poorest population as they are likely to own non-compliant cars. Also, lower costs could still represent a higher proportional cost to more deprived households.	Indirect negative impact through taxis/ coaches/ buses potentially passing on costs Potential negative impact on older population or those with disabilities most likely to use taxis as well as younger and poorer residents using buses/coaches to travel	- - -

Note: Large beneficial (+++); Moderate beneficial (++); Slight beneficial (+); Neutral (0); Slight adverse (-); Moderate adverse (- -); and Large adverse (- - -).

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.8.6 HEALTH IMPACT ASSESSMENT SUMMARY

A Health Impact Assessment (HIA) was undertaken to assess the potential impact of proposed policy scenarios on Caerphilly residents. Impacts were tested through five pathways: prevalence of physical conditions such as respiratory and cardiovascular conditions associated with air pollutant exposure, active travel uptake, road accidents, noise pollution and mental wellbeing.

For context, Hafodyrynys is located within the scope of the Caerphilly East GP Cluster, which is home to an increasingly aging population. In addition, a high proportion of individuals in this Cluster live in areas which fall into the most (lowest quintile), or second most (second lowest quintile), deprived areas in Wales. In these areas, the prevalence of depression is some of the highest in the county of Gwent (8.7%)[20]. Therefore, the population is particularly vulnerable to the adverse impacts of worsening air quality.

The policy scenarios considered for Caerphilly vary in nature and scale. However, all measures target excessive pollution at Hafodyrynys. The policy scenarios considered will have diverse impacts

[20] Note: the impacts on air quality presented here are different in nature to those presented in the rest of this document (in particular comparing the performance of options to limit values). To assess compliance, impacts on air quality are judged at individual receptor locations on the specific link against the legal limit. Health impacts are associated with the more general change in air pollution – hence to inform this analysis, we look at a more aggregate change in air pollution (averaging across a number of receptor points and the whole air quality modelling domain) and consider the overall absolute change, rather than the shift relative to a given benchmark.

on Hafodyrynys, due to their varying design features. Whilst some policy scenarios aim to discourage vehicles from utilising the road in question, others aim to encourage free flowing traffic conditions or plan to entirely remove the exposure of individuals to the high levels of vehicle emissions.

Table 4-24 provides a summary of the health impacts associated with each scenario identified in the HIA. Given the core analysis performed is qualitative, it is challenging to draw conclusions as to which impact within each scenario is greatest, and indeed which scenario will have the greatest impacts overall. Although quantitative analysis was performed, this only focused on the impacts of air quality and is itself subject to caveats. That said one can still draw several broad conclusions from the analysis with a sufficient degree of confidence:

a) The traffic management options (Scenarios 1, 2, 6 and 8) are unlikely to have significant impacts on health, with the exception of scenario 8 which may deliver slight improvements in accident and noise exposure risks through reducing speeds
b) Given the traffic options are likely to have insignificant health impacts, the impacts of the 'Do Max' scenario are anticipated to be very similar to those of the CAZ D
c) CAZ D will likely have the largest positive health impacts in the local area around the A472, in terms of air quality, accident risk and noise exposure. But this option will lead to re-routing, which could result in negative health outcomes on affected links. The net effect is uncertain, but the quantitative modelling (and the fact that some vehicles cancel journeys or switch mode) suggest that the net effect would be positive (and for air quality this Scenario would still provide the largest benefit)
    a. HGV ban would also deliver improvements in the local area, but like the CAZ D would create problems elsewhere associated with re-routing. The overall balance (and indeed whether this would be a benefit overall) is more uncertain for this option, although the quantitative modelling suggests the scenario could at least deliver a net benefit through changes in air quality.
    b. Although the demolition option will deliver smaller improvements in air pollutant and noise exposure, and accident risk, these are likely to be positive benefits for local residents. This option does not create issues associated with re-routing traffic
    d) Although unlikely to affect the ranking options in terms of health effects, there is a temporal story not presented in these results:
    a. First, the demolition scenario will result in compliance being achieved in the shortest timeframe as it can be delivered sooner than the other measures. Hence, this measure will start delivering health benefits sooner and over the shortest time period.
    b. The demolition option, and the HGV Ban (to the extent this policy is not reversed in the future), will continue to deliver health benefits into the future. Under the CAZ option, the baseline will 'catch up' eroding any positive health benefits over time.
e) The CAZ D presents the largest negative risk in terms of mental health effects. The CAZ is the most disruptive measure (in terms of eliciting change in behaviour) and hence presents the biggest risk for businesses and household affordability, in addition to potentially adding to journey times. The HGV ban will present a burden for businesses with risks for their viability and employment, but will not affect households. The demolition option will not affect businesses and will impact a smaller group of households and hence is likely to have a smaller impact, but for these households the stress caused by moving home should not be understated.

Table 4-24 – Summary of health impacts from policy scenarios

Option ID	Option Description	Summary Assessment
1	Crumlin Junction Signals	· Although this can be delivered in the short-term, it is unlikely to have any significant health impacts. · Scenario results in minimal reductions in air pollution, and no anticipated effect on active travel or mental health. · Changes in the flow of traffic may result in noise and accident impacts, but reduction along the A472 could be offset by increases elsewhere.
2	Signalise Swffryd Junction	· Although this can be delivered in the short-term, it is unlikely to have any significant health impacts. · Scenario results in minimal reductions in air pollution, and no anticipated effect on active travel or mental health. · Changes in the flow of traffic may result in noise and accident impacts, but reduction along the A472 could be offset by increases elsewhere.
3	Demolish Dwellings	· Through relocating residents and hence removing their exposure to air pollution on Woodside Terrace, and allowing greater dispersion of pollutants on the link, this scenario delivers improvements in air quality and associated health impacts. However, given this will only affect the A472, the impacts benefits are likely to be smaller than under HGV Ban or CAZ D. But this scenario can be delivered by 2022, which means that the scenario will deliver compliance ahead of the CAZ and 'do maximum' scenarios, benefiting residents over a shorter time period. · Relocation could also provide health benefits through lower levels of noise pollution, congestion and accident risk · The short-term impact on mental health may be significant, as residents may be impacted by the stress associated with the financial and organisational burden of moving home. But in the longer-term these residents could benefit from lower air pollution, noise and accident risk.
4	HGV Ban	· This scenario will deliver improvements in air quality, noise pollution, congestion and accident levels within the HGV ban zone during peak hours. And these impacts are likely to be greater than the demolition option. · However, the ban will encourage businesses to reroute their journeys and hence, the roads being used as an alternative will face increasing noise and air pollution, congestion and accident levels. · The net balance of these larger effects is uncertain, but the quantitative modelling suggests the scenario could at least deliver a net benefit through changes in air quality. · In addition, some businesses may cancel journeys and potentially go out of business, which could impact the wellbeing of employees.
5	CAZ Class D*	· This scenario will deliver largest significant improvements in air quality, noise pollution, congestion and accident levels within the CAZ. · The CAZ will encourage individuals to reroute their journeys and hence, the roads being used as an alternative will face increasing noise and air pollution, congestion and accident levels. That said, the assumption that some road users may cancel journeys or mode switch suggests the net balance of effects may be a benefit.

Option ID	Option Description	Summary Assessment
		· Indeed, the quantitative modelling of air quality impacts suggests this scenario will deliver the largest improvement in health effects associated with air pollution exposure. · This scenario will have the largest negative impact on mental health, as there is a cost to businesses (and potentially unemployment), an impact on accessibility and on household affordability. · Furthermore, this scenario can only be delivered by 2026, due to the infrastructural and legislative changes which will need to occur prior to implementation, and other options can be implemented and start delivering benefits sooner. And the baseline will eventually reduce any benefits to zero, which does not occur to the same extent under other options
6	Traffic Management Option	· Although this can be delivered in the short-term, it will not have any significant health impacts. · Scenario results in minimal reductions in air pollution, and no anticipated effect on active travel or mental health. · Changes in the flow of traffic may result in noise and accident impacts, but reduction along the A472 could be offset by increases elsewhere.
7	Do Max	· This scenario will deliver largest significant improvements in air quality, noise pollution, congestion and accident levels within the CAZ. · The CAZ will encourage individuals to reroute their journeys and hence, the roads being used as an alternative will face increasing noise and air pollution, congestion and accident levels. That said, the assumption that some road users may cancel journeys or mode switch suggests the net balance of effects may be a benefit. · Indeed, the quantitative modelling of air quality impacts suggests this scenario will deliver the largest improvement in health effects associated with air pollution exposure. · However, this scenario will have the largest negative impact on mental health, as there is a cost to businesses (and potentially unemployment), an impact on accessibility and on household affordability. · Furthermore, this scenario can only be delivered by 2023, and other options can be implemented and start delivering benefits sooner. And the baseline will eventually reduce any benefits to zero, which does not occur to the same extent under other options
8	30mph speed limit	· Although this can be delivered in the short-term, this scenario results in minimal reductions in air pollution. Therefore, the prevalence of diseases relating to air pollution and mortality rates are unlikely to be impacted to a significant extent. · Reducing speeds may deliver a small benefit through reduced accident and noise exposure risk.

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.9 STAGE THREE APPRAISAL

As part of the WelTAG Stage Three of the study, the appraisal outcomes have been summarised as follows:

- Air Quality Impacts
  - The modelling indicates that the NO_2 limit value can be met in 2025 without local action- though this is contingent on later iterations of Euro standards delivering predicted NOx emission reductions.
  - The baseline in 2021 does not comply with the annual mean NO_2 limit value.
  - The demolition option with the southern footpath realignment in 2021 does comply with the annual mean NO_2 limit value at the modelled locations.
  - It can be clearly seen that demolition reduces concentrations in the canyon, due to the reduction in recirculation of emissions.
  - The HGV peak period ban option in 2021 does not comply with the annual mean NO_2 limit value.
  - The CAZ option has a large effect on NO_2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily because of the Euro 6/VI type vehicle with lower emissions in the fleet. The CAZ option in the modelled 2021 future year is predicted to comply with the annual mean NO_2 standard. However, it is not possible to be fully implemented until the end of 2022.
  - For all other options including changing signal timings at Crumlin junction and signalise the A472/B4471 Swffryd Junction reductions in annual average NO_2 were negligible. Results are presented in the Impact Assessment Report.
  - The greatest health benefits are likely from the demolition option as physical health including respiratory and cardiovascular impacts from high pollution are likely to decline from residents moving to a lower pollution area. The CAZ and HGV ban are likely to have negative economic impacts on local businesses and households which could have a negative impact on mental health. Both CAZ and HGV options are likely to cause re-routing resulting in an overall increase in emissions, and with the potential to result in exceedances with the limit value elsewhere. The HIA and Distributional Analysis have identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local and regional highway.
- Overall Impacts
  - Appraisal against Future Generations Well-being objectives
  - Appraisal Summary Tables (ASTs)

4.9.1 APPRAISAL FUTURE GENERATIONS WELL-BEING OBJECTIVES

The options have been considered against the Well-being of Future Generations Act. These are presented in the ASTs.

4.10 APPRAISAL SUMMARY TABLES

The appraisal outcomes have been summarised within Appraisal Summary Tables (AST). The ASTs provide a breakdown of the impact of each measure on each of the appraisal areas. The scoring has been undertaken using the WelTAG 7-point scale where applicable.

Date Produced - 20/02/2019

Appraisal Summary Table

Option No. / Theme 1

Name of scheme:	Change Signal Timings at Crumlin Junction
Location:	Crumlin Junction
Effectiveness:	Ineffective
Timescale:	2020
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for the air quality.	Neutral (0)
	Noise	Receptor The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact At Woodside Terrace short term impacts are predicted to be negligible at source, long term impacts are seen to be negligible, but with a slight decrease in noise levels of less than a 1dB; this trend is seen across the network.	Neutral (0)
	Landscape	Alterations to signal timings at Crumlin Junction would manipulate the flow of traffic approaching from the A472, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the lack of landtake, and produce no impact on ecology due to the lack of vegetation clearance and works confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
Economy	Journey Time Changes	This option sees an immediate increase in travel time of vehicles in 2021, especially as result of travel delay on the A467 due to the signal timings. Furthermore, the option sees a reduction in the travel time for 2029. Overall there is a negative impact on journey time with an increase of 13.5 hours of travel time (in total during the AM peak) for the vehicles operating on the network. However, due to the small change in travel time per vehicle, and the fact that only the morning peak is impacted, it is expected to have a neutral impact on the overall journey time.	Neutral (0)
	Journey Time Reliability Changes	This option sees a slight benefit to the journey time reliability as it may reduce the EB queuing vehicles on the A472 Hafodyrynys Road in the AM peak especially, through changes to the signal timings.	Slight Beneficial (+)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £41,000 of benefit over the 60 year appraisal period.	Neutral (0)
	Accidents	Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 7,200.00
	Revenue Costs	None	Neutral (0)
	Journey Quality	Changing signal timings is not envisaged to have an impact on the journey quality and, therefore, the journey quality is considered to be neutral.	Neutral (0)
	Physical Activity	Signal timing modifications are unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)

S&C	Security	This scheme is unlikely to have an impact on the security of carriageway users at this location	Neutral (0)
	Access to Employment	Changes to signal timing are not expected to impact on access to employment along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Access to Services	Changes to signal timing are not expected to impact on access to services along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = -£697,000 PVC = £6,000 NPV = -£703,000 60 Years - PVB = £1,050,000 PVC =£6,000 NPV = £1,044,000	BCR 10 years -116.2 60 years 175.0
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	This option will have minimal cost as the option is an existing signalised junction with only timings being changed.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	This option requires minimal amount of resources for implementation. However, the measures directly impact on the ecosystem is not measurable and scores as neutral for this option	0
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is unlikely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This option scores as neutral for as it does not directly impact on areas such as sustainable purchasing, global supply chains or low-carbon technologies.	0

Date Produced - 20/02/2019

Appraisal Summary Table **Option No. / Theme** **2**

Name of scheme:	Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector
Location:	A472 Hafodyrynys Road / B4471 Swyffryd Junction
Effectiveness:	Ineffective
Timescale:	2022
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for air quality.	Neutral (0)
	Noise	Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact At Woodside Terrace short term impacts are predicted to be negligible at source, long term impacts are also seen to be negligible, but with a slight increase in noise levels of less than a 1dB; this trend is seen across the network. The design drawings indicate a new lane at the A472/B4471 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels as vehicles accelerate away from the junction.	Neutral (0)
	Landscape	Introducing traffic signals at the A472/B4471 Junction would manipulate the flow of traffic along the A472, resulting in some standing traffic where not previously experienced. These impacts would have a negligible effect on the wider/existing impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
Economy	Journey Time Changes	This option sees an immediate decrease in travel time in 2021, with a higher reduction for 2029. Overall this option results in 180 hours of time savings in total across all modelled peaks, with a moderate benefit associated to the journey time change.	Moderate Beneficial (++)
	Journey Time Reliability Changes	This option sees a slight benefit to the journey time reliability as it improves traffic flow through the A472 Hafodyrynys Road and Swyffryd Junction, through signalisation of this junction.	Slight Beneficial (+)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £3,404,000 of benefit over the 60 year appraisal period.	Slight Beneficial (+)
	Accidents	For Option 2, an accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. Over the four-and-a-half-year period, one serious accident has occurred in the vicinity of the junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)

	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 487,243.57
	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	Installing a new signalling scheme at the A472/B4471 junction is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	Installing the new signalling at the A472/B4471 junction is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
	Access to Employment	Signalising the A472/B4471 junction is expected to slightly benefit the access to employment along the study route by improving the flow of traffic. Therefore, it is considered that the impact will be slightly beneficial.	Slight Beneficial (+)
	Access to Services	Signalising the A472/B4471 junction is expected to slightly benefit the access to services along the study route by improving the flow of traffic. Therefore, it is considered that the impact will be slightly beneficial.	Slight Beneficial (+)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £7,033,000 PVC = £416,000 NPV = £6,617,000 60 Years - PVB = £44,322,000 PVC = £416,000 NPV = £44,322,000	BCR 10 years 16.9 60 years 107.5
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	This option will need to be properly signed as a new junction layout to avoid traffic accidents.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	This option requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic, in comparison to the existing queues.	+1
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is unlikely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being.	+1

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Appraisal Summary Table **Option No. / Theme** 3

Name of scheme:	Demolish Dwellings at Woodside Terrace
Location:	A472 Hafodyrnys Road
Effectiveness:	High
Timescale:	2022
Feasibility:	Yes. Subject to the CCBC's ability to enforce the Compulsory Purchase Order. A topological survey needs to be undertaken and is required for this option.

Objective		Summary of key impacts	Assessment Qualitative
Environment	Air Quality	The demolition option with footpath realignment in 2021 does comply with the annual mean NO2 standard at relevant locations. It should be noted that the compliance status is extremely marginal and in many cases is smaller than the error in the model. It can be clearly seen that demolition reduces concentrations in the canyon, most likely due to the reduction in recirculation of emissions.	Large Beneficial (+++)
	Noise	Receptors The closest sensitive receptors are now the elevated receptors on Gladstone Road overlooking the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With dwellings at Woodside Terrace demolished, the total dwellings within the NAPPA would decrease, however noise levels would still exceed 68dB LA10,18h at remaining dwellings to the north. The A472 is anticipated to remain in the same alignment. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact If all the dwellings within the NAPPA are removed it would remove the need for this NAPPA; however, demolishing dwellings to the south would result in the NAPPA remaining, but with less dwellings than before.	Neutral (0)
	Landscape	The demolition of dwellings at Woodside Terrace and re-alignment of footpath would expose the study area to a moderate value and locally designated landscapes in the south, and this would result in a slight adverse effect.	Slight adverse (-)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This could generate slight adverse impacts to the local ecology due to the need for vegetation clearance and landscaping near a river and the requirement to demolish buildings with high suitability to support roosting bats. The appropriate surveys will be carried out.	Slight adverse (-)
	Water Environment	No predicted adverse effects to the water environment. No increase to the AADT flows are expected for this option. Demolition works could cause short term impact in ordinary watercourse but of insufficient magnitude to affect its integrity and with no long term effects expected.	Neutral (0)
Economy	Journey Time Changes	The journey time changes for this option are neutral because of the little to no impact which it will have on the layout of the road network. It is expected to have a neutral impact on the overall journey time.	Neutral (0)
	Journey Time Reliability Changes	This option sees a neutral benefit to the journey time reliability as the option does not include any changes to the road infrastructure.	Neutral (0)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. This scenario assumes no change in traffic from the Do Minimum, therefore the benefits are zero.	Neutral (0)
	Accidents	Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that demolishing the dwellings may result in a changes to the existing land & public footpath system.	Slight Adverse (-)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias. No topographical or geotechnical surveys have been undertaken and are not included in this price. Currently the schme is at the design stage.	£ 4,310,939.66
	Revenue Costs	None	Neutral (0)

S&C	Journey Quality	Demolishing the dwellings along the south side of the Woodside Terrace is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	Demolishing the dwellings is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	The footpath on the southen side of the carriageway will be set back by approximately 6m.	Neutral (0)
	Access to Employment	This option does not impact on the access to employment, with a small number of residents being affected. No employment centres are likely to be impacted. Furthermore, it cannot be determined where these residents will relocate. However, it is likely residents will find access to employment after relocation. Therefore, the impact is considered as neutral.	Neutral (0)
	Access to Services	This option does not impact on the access to services, with a small number of residents being affected. No service centres are likely to be impacted. Furthermore, it cannot be determined where these residents will relocate. However, it is likely residents will find access to services after relocation. Therefore, the impact is considered as neutral.	Neutral (0)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	The number of residents being effected is considered as minimal. Furthermore, it cannot be determined where these residents will be re-allocated in regards to housing. Therefore the impact is considered as neutral.	Neutral (0)
VfM	Value for Money	10 Years - PVB = £15,492 PVC = £3,915,000 NPV = -£3,915,000 60 Years - PVB = £28,566 PVC = £3,915,000 NPV = -£3,915,000 The Present Value Benefits (PVB) for this option derives from the monetised impacts of the air quality for the residents.	BCR 10 years 0.004 60 years 0.007
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the Woodside Terrace's residents.	
	Technical, Operational & Financial Feasibility	Financial fesibility to residents.	
	Deliverability & Risk	This option will be high risk, with geotechnical and topographical surveys being required. There are also legal challenges and the residents need to come to a joint decision to relocate.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. However, this measure will not reduce the emissions from the vehicles. It will decrease the concentrations in the local area due to the removal of the canyon. Dispersion is improved and hence concentrations on the road and footpaths decrease. Furthermore, the southern footpath is going to be compliant through re-alignment. Similarly, the northern footpath is likely to be compliant in the option implementation year.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. There are slight adverse consequences to the landscape and biodiversity.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. The residents will no longer be exposed to the high NO2 concentration. However, some social inequalities are envisaged due to the displacing the residents. This is further impacted as the figures show that Caerphilly has a slightly higher economic inactivity of 24.7% compared to the Welsh average of 23.8%. The majority (33.6%) are made up of long-term sick residents.	
Future Generations 7 Well-being goals	Prosperous	This option will lead to a relocation of the current residents at Woodside Terrace to other areas, however it is likely to have a neutral impact on local trade/economy and services due to over 85,500 economically active people in Caerphilly and the small number of people relocating from Woodside Terrace.	0
	Resilient	This option requires a high amount of resources for implementation, both financial costs and physical resources. The measure is likely to result in a small adverse impact on local biodiversity and ecosystems. However, it is likely to score as netural for this well-being goal.	0
	Healthier	This option addresses the problem of poor air quality and removes the residents from the problem. However, residents will be subject to stress and anxiety over significant change. It is likely to have a positive impact on the current residents of the Woodside Terrace overall.	+2
	More Equal	The current resident group will be reimbursed and compensated for the disruption caused and in line with this goal, involvement of local people is of vital importance. There is a clear link between the inequality and health in this option, as less advantaged groups are being offered an economic support to find new housing. However, although a small group of residents are being affected from a population of over 180,800 in Caerphilly (2017), this option has the potential to leave the residents in a financial deficit overall. Especially those who have no mortgage and are now faced with having to take out a new mortgage and those coming to the end of their mortgage having to extend. This option scores as slight adverse for the 'more equal' goal.	-1
	Cohesive Communities	This option is likely to negatively impact on strengthening local community social relationships and damage the links currently made. However, it is unlikely to make Hafodyrynys or the wider area, a less attractive place to live and work, therfore scores as neutral for the cohesive communities goal.	0
	Vibrant Culture	Likely to be diverging the social ties with the current residents and could cause some cultural problems between the council and the public. This scores as negative for the vibrant culture goal.	-1
	Globally Responsible	This option completely removes the health problems caused to the Woodside Terrace residents from NO2. On a localised level, the carbon footprint of demolition needs to ensure to dispose of materials in sustainable manner in order to comply with this goal. This option is seen as sustainable as it puts residents' health first by removing them from the problem.	+1

Date Produced - 20/02/2019

Appraisal Summary Table **Option No. / Theme** **4**

Name of scheme:	Peak Period HGV Bans
Location:	A472 Hafodyrnys Road
Effectiveness:	Low
Timescale:	2022
Feasibility:	Possibly. CCBC can introduce and put forward the traffic order. Road network is managed by CCBC Highways Operations Department and would need to be enforced by the police for this option to be feasible.

Objective		Summary of key impacts	Assessment Qualitative
Environment	Air Quality	The HGV ban reduces concentrations of NO2 along the corridor by an average of -2 ug/m3. However, the HGV ban option in 2021 does not achieve compliance with the NO2 limit value. This option scores as slight beneficial to the air quality.	Slight Beneficial (+)
	Noise	Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of peak hour HGV bans, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact Short term and long term impacts are predicted to be negligible at source in NAPPA 619, but with a slight decrease in noise level of less than 1dB.	Neutral (0)
	Landscape	The introduction of peak hour HGV bans would manipulate the flow and nature of traffic using the A472, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to produce any impacts on ecology due to the lack of vegetation clearance and works would be confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses	Neutral (0)
Economy	Journey Time Changes	This option sees an immediate decrease in travel time in 2021, with a higher reduction for 2029. Overall this option results in 194 hours of savings for all vehicle types except HGVs who operate the A472 corridor in the morning and evening peak periods. However, as result of HGVs displcement on the wider network, it is expected to have a slight adverse impact on the journey time overall.	Slight Adverse (-)
	Journey Time Reliability Changes	This option sees a neutral benefit to the journey time reliability due to unknown impacts on the corridor and displacement of HGVs elsewhere on the network. This option might result in a journey reliability improvement in 2021 on the A472 Hafodyrynys Road corridor in the AM peak especially. There is an expected adverse impact on the journey time reliability for 2029 due to a higher number of other vehicle types entering the corridor, slowly reducing the slight improvements from 2021.	Slight Adverse (-)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £4,263,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of HGVs from the corridor. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of HGVs. Because of this, the anticpated impacts are Slight Adverse.	Slight Adverse (-)
	Accidents	Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	A questionnaire for businesses local to Hafodyrynys and A472 has been undertaken. The respondents admit that the deliveries that taking place during either a morning or afternoon peak constitute for up to 50% of deliveries within their companies. This is likely to have a moderate adverse impact on the local economy.	Moderate Adverse (--)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 507,821.16
	Revenue Costs	None	Neutral (0)
	Journey Quality	A HGV ban is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)

S&C	Physical Activity	Peak hour HGV bans are unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	This scheme is unlikely to have an impact of the security of carriageway users at this location	Neutral (0)
	Access to Employment	Banning HGVs during morning and evening peak periods is likely to negatively impact on their trips associated with employment. This, in turn, will affect these places operational ability. The impact is considered to be moderately adverse.	Moderate Adverse (--)
	Access to Services	Banning HGVs during peak morning and evening periods is likely to negatively impact on their trips associated with services. The impact is considered to be moderately adverse.	Moderate Adverse (--)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £6,429,045 PVC = £447,000 NPV = £5,982,045 60 Years - PVB = £38,935,698 PVC = £447,000 NPV = £38,488,698	BCR 10 years 14.4 60 years 87.1
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the local businesses and service providers.	
	Technical, Operational & Financial Feasibility	Police enforcement.	
	Deliverability & Risk	The diversion for the HGVs is significant, if not policed properly HGVs will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used. May lead to longer travel routes for HGVs and increases in NO2 on other routes by moving the problem from one area o another.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have a positive impact on overall reduction in NO2. In the local area. However, diversion routes are significant, will take longer to travel and could increase the overall levels of NO2.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes possibly, rerouting of vehicles could increase NO2 elsewhere.	
	Will the intervention impact equally across multiple vehicle classes and journey types	No. HGVs will be targeted	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health in the local area but may increase NO2 overall in other regions.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to see a negative impact on business growth and business opportunities, whilst damaging local supply chains. The measure will however favour low-carbon sectors and push the infrastructure to be more sustainable by understanding the impact of older polluting HGVs on NO2. Its impact on the economic growth may result in Caerphilly receiving less business investment, overall having an adverse impact on a Prosperous Wales.	-1
	Resilient	This measure requires minimal resources for implementation and can be enforced using ANPR. It uses resources efficiently and can positively impact on the ecosystem by removing queueing HGVs from the A472 Hafodyrynys Road local area. The option needs to ensure that by banning peak period HGVs on this route, it does not create a problem somewhere else.	+2
	Healthier	This option is likely to see a reduction in HGVs, which is likely to have a slight benefit to air quality and health. The measure is likely to make for safer active travel conditions.	+1
	More Equal	This option is anticipated to score negatively for impacting local businesses utilising HGVs. The measure could also be damaging to freight operators in the region utilising the strategic route.	-2
	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their freight transport.	-2
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing greenhouse gas emissions, removing a considerable NO2 pollutant source from an Air Quality Management Area (AQMA) and providing a positive example of how infrastructure projects can integrate and promote wider well-being. Future assessments may be necessary to ensure negative impacts because of longer diversions are mitigated.	+1

Date Produced - 20/02/2019

Appraisal Summary Table | **Option No. / Theme** | **5**

Name of scheme:	Clean Air Zone / Low Emission Zone
Location:	A472 Hafodyrynys Road
Effectiveness:	High
Timescale:	2023
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment Qualitative
Environment	Air Quality	The CAZ reduces concentrations of NO2 along the corridor by an average of -14 ug/m3. The CAZ option has a transformative effect on NO2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily due to the effect of Euro 6/VI in the fleet. The CAZ option in 2021 does comply with the annual mean NO2 standard.	Large Beneficial (+++)
	Noise	Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of a clean air zone, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact Short term impacts across the network are predicted to be negligible at source, but with a slight decrease in noise levels of less than 1dB. In the long term, impacts are generally predicted to be negligible overall. The only exception is Crumlin Road which is anticipated to experience a minor beneficial impact at source, although this is thought to be due to its low flow, meaning other roads are likely to be the dominant noise source and receptors on Crumlin Road are unlikely to face a significant benefit.	Neutral (0)
	Landscape	The introduction of a Clean Air Zone/Low Emission Zone would see a displacement of HGV and other traffic to alternative routes, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to produce any impacts on ecology due to the lack of vegetation clearance and works confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Increase in AADT traffic flows predicted at Junction B4471/A472 but not considered sufficient to cause notable increase of pollution risk to receiving watercourses that receive discharge from wider catchment.	Neutral (0)
Economy	Journey Time Changes	This option sees a larger change to the journey time in 2021 compared to 2029, with an overall benefit change of 214 hours for A472 Hafodyrynys Road users. However, this option is likely to include large vehicle displacement on the wider network such as the M4, A4042, A467 and the A465. The increase in journey time for the users on the previously mentioned strategic routes is anticipated to outweigh the benefit for the A472 Hafodyrynys Road. This option therefore is likely to have a large adverse impact on the journey time.	Large Adverse (---)
	Journey Time Reliability Changes	This option sees a moderate adverse impact on the journey time reliability as result of the different diversion routes, increased distance and problems on the network elsewhere will result in more travel delay, especially for vehicles travelling eastbound on the A472 Hafodyrynys Road in the morning peak.	Moderate Adverse (--)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £972,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of traffic from the corridor as a result of the Clean Air Zone. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of traffic away from the Clean Air Zone. Similary, the TUBA costs do not include the charge paid by non compliant vehicles within the Clean Air Zone. Due to this, the impacts are expected to be Large Adverse.	Large Adverse (---)
	Accidents	This option is likely to displace traffic from the strategic corridor onto potentially unsuitable routes. This could result in increased traffic volumes in residential areas etc. making accidents more likely to happen.	Slight Adverse (-)
	Changes in Productivity	This option is likely to affect the availability of labour markets within the area. The charging Clean Air Zone will act as a barrier to commuters between Caerphilly and Torfaen.	Moderate Adverse (--)
	Local Economy	A questionnaire for businesses, local to Hafodyrynys and A472 has been undertaken. Only three respondents considered proposed charges for the CAZ as 'about right'. Some respondents suggest also that such changes might result in the area to be unattractive from a business point of view. This is likely to have a large adverse impact on the local economy.	Large Adverse (---)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land. This option will include the construction of signs on the nearby infrastructure.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 20,000,000.00
	Revenue Costs	None	Neutral (0)

S&C	Journey Quality	A clean air/low emission zone is envisaged to have an impact on the journey quality through less exposure to NO2 levels for drivers, passengers, pedestrians and cyclists. This is likely to have a slight beneficial impact.	Slight Beneficial (+)
	Physical Activity	Introducing the Clean Air Zone/Low Emission Zone is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	This scheme is unlikely to have an impact of the security of carriageway users at this location	Neutral (0)
	Access to Employment	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to local employment as well as companies main transport routes being effected. The impact is considered to be large adverse.	Large Adverse (---)
	Access to Services	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to the local services. Reduced number of trips associated with business & delivery will also see a reduction in the access to services. The impact is considered to be large adverse.	Large Adverse (---)
	Affordability	The clean air zone may result in an increase in the time necessary to save money to upgrade vehicles as a result of paying for the CAZ charge or having to extend their general daily trips.	Slight Adverse (-)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £3,066,149 PVC = £15,303,851 NPV = -£12,237,702 60 Years - PVB = £11,536,149 PVC = £15,303,851 NPV = -£3,767,702	BCR 10 years 0.2 60 years 0.8
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the local businesses and general public. The road users are likely to be financially penalised either by the introduced charges or the requirement to buy a newer vehicle.	
	Technical, Operational & Financial Feasibility	No legislation currently in place to allow a clean air zone to be implemented in Wales. This is likely to take up to 2021 for legislation to be in place, with the JAQU guidance suggesting a further 5 years implementation period following legislation being in place.	
	Deliverability & Risk	The diversion for vehicles is significant, if not policed properly vehicles will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. There may potentially be an overall reduction to NO2, although it is likely that there may be localised increases in NO2 elsewhere, due to the Clean Air Zone/Low Emission Zone avoidance.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes, potentially to the areas where the traffic re-routes.	
	Will the intervention impact equally across multiple vehicle classes and journey types	No. Older vehicles will be targeted.	
	Will the intervention have a positive impact on wider public health and inequalities	There may be a positive impact on the residents' health, however significant social inequalities are envisaged due to the vehicles' emissions restriction. CAZ displacement of older vehicles on the corridor and can impact on the air quality in other areas.	
Future Generations 7 Well-being goals	Prosperous	This option may lead to a local economy which is adapted to future change and thinks more about the air quality problem. The same can be said about working together with other public bodies' goals. This measure could however negatively impact local economy and provision of local services by discouraging trips through the zone.	-2
	Resilient	This measure requires notable resource for implementation. However, the measure can positively impact on the ecosystem by removing poor quality vehicles that negatively impact on local air quality readings. The option needs to ensure that by charging certain vehicles, it does not create a problem somewhere else. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	+1
	Healthier	This option is likely to see a reduction in poor quality vehicles, which is likely to have a slight benefit to air quality and subsequently to the health of the local residents.	+2
	More Equal	The CAZ charge can be classified as a proportional charge system which does not take into consideration someone's income. The more deprived groups are likely to be impacted more than those that are more financially secure. A measure to tackle this problem can be the introduction of interest-free loans for a limited time to purchase compliant vehicles. This idea was put forward by the secretary of the Yorkshire Professional Driver's Association in response to the Leeds CAZ. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	-2
	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their commuting and freight transport.	-2
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, emphasising a need for developing sustainable low-carbon technologies, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+2

Date Produced -20/02/2019

Appraisal Summary Table | **Option No. / Theme** | **6**

Name of scheme:	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB (Option 2)
Location:	Crumlin Junction, A472 Hafodyrynys Road / B4471 Swyffryd Junction
Effectiveness:	Ineffective
Timescale:	2022
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for the air quality.	Neutral (0)
	Noise	Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact Overall receptors are subject to negligible changes in the short and long term. The negligible beneficial and adverse impacts from option 2 and option 3 respectively effectively counteract each other. The design drawings indicate a new lane at the A472/B44721 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels as vehicles accelerate away from the junction.	Neutral (0)
	Landscape	Alterations to signal timings at Crumlin Junction and introduction of traffic signals at the A472/B4471 junction would manipulate the flow of traffic approaching from the A472 and result in some standing traffic where not previously experienced. These alterations would have a negligible effect on the wider/existing impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
Economy	Journey Time Changes	This option sees a minor increase in travel time of vehicles in 2021, however this is outweighed by a positive change to the journey time in 2029 for an overall positive journey time change of 60 hours. The majority of the increase to journey time is associated with the signal timings in 2021. It is anticipated that the traffic management option will have a slight benefit on the journey time change.	Slight Beneficial (+)
	Journey Time Reliability Changes	This option sees a moderate benefit to the journey time reliability, especially to traffic travelling eastbound in the AM peak.	Moderate Beneficial (++)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £1,486,000 of benefit over the 60 year appraisal period.	Slight Beneficial (+)
	Accidents	An accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 494,443.57

	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	A traffic management option is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	A traffic management option is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
	Access to Employment	Traffic management could improve the vehicle flow through the corridor and therefore create a more attractive route for drivers. This could potentially attract additional users and therefore slightly improve access to employment.	Slight Beneficial (+)
	Access to Services	Traffic management could improve the vehicle flow through the corridor and therefore create a more attractive route for drivers. This could potentially attract additional users and therefore slightly improve access to services.	Slight Beneficial (+)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £2,371,000 PVC = £422,000 NPV = £1,949,000 60 Years - PVB = 19,282,000 PVC =£422,000 NPV =18,860,000	BCR 10 years 5.6 60 years 45.7
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	Signal timing will have minimal cost as the option is an existing signalised junction with only timings being changed. An eastbound queue detector will need to be properly signed as a new junction layout to avoid traffic accidents.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	Signalising Swyffryd Junction & eastbound queue detector requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic, in comparison to the existing queues.	+1
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is not likely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+1

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Appraisal Summary Table | **Option No. / Theme** | **7**

Name of scheme:	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone
Location:	Crumlin Junction, A472 Hafodyrynys Road / B4471 Swyffryd Junction
Effectiveness:	High
Timescale:	2023
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	The CAZ reduces concentrations of NO2 along the corridor by an average of -14 ug/m3. The CAZ option has a transformative effect on NO2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily due to the effect of Euro 6/VI in the fleet. The CAZ option in 2021 does comply with the annual mean NO2 standard.	Large Beneficial (+++)
	Noise	Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472. Absolute Noise Levels With the implementation of a clean air zone, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road. Noise Impact Similarly to option 6, short term impacts are predicted to be negligible at source, but with a slight decrease in noise levels of less than 1dB across the network. In the long term, impacts are generally predicted to be negligible overall. The minor beneficial impact on Crumlin road is marginally less than option 6 and receptors are unlikely to face a significant benefit. The design drawings indicate a new lane at the A472/B44721 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels .	Neutral (0)
	Landscape	The introduction of a Clean Air Zone/Low Emission Zone, alterations to signal timings at Crumlin Junction and introducing traffic signals at the A472/B4471 Junction would see a displacement of HGV and other traffic to alternative routes and manipulation of vehicle flows using the transit corridor. The alterations would have neutral effect on the immediate landscape setting and wider area.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Increase in AADT traffic flows are predicted at Swyffrydd Junction B4471/A472 but not considered sufficient to cause notable increase of pollution risk to receiving watercourses that receive discharge from wider catchment.	Neutral (0)
Economy	Journey Time Changes	This option similarly to the Clean Air Zone (CAZ) option, sees an immediate decrease in travel time in 2021, with a higher reduction for 2029, with an overall positive journey time change of 269 hours. However overall, this option is likely to include large vehicle displacement on the wider network such as the M4, A4042, A467 and the A465. The traffic management options (timings and junction improvement to Swyffryd Road) are likely to see more benefit to the journey time overall compared to the CAZ. Therefore the do maximum option is anticipated to have a moderate adverse impact on journey time changes.	Moderate Adverse (--)
	Journey Time Reliability Changes	This option sees a neutral benefit to the journey time reliability as the slight benefit from Option 1 (Change of signal timings) and Option 2 (Signalisation of Swyffryd Junction) are counterbalanced by the moderate adverse impacts of the CAZ.	Slight Adverse (-)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £2,286,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of traffic from the corridor as a result of the Clean Air Zone. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of traffic away from the Clean Air Zone. Similary, the TUBA costs do not include the charge paid by non compliant vehicles within the Clean Air Zone. Due to this, the impacts are expected to be Large Adverse.	Large Adverse (---)
	Accidents	An accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
	Changes in Productivity	This option is likely to affect the availability of labour markets within the area. The charging Clean Air Zone will act as a barrier to commuters between Caerphilly and Torfaen.	Moderate Adverse (--)

	Local Economy	A questionnaire for businesses, local to Hafodyrynys and A472 has been undertaken. Only three respondents considered proposed charges for the CAZ as 'about right'. Some respondents suggest also that such changes might result in the area to be unattractive from a business point of view. This is likely to have a large adverse impact on the local economy.	Large Adverse (---)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 20,494,443.57
	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	A do maximum option which includes a clean air zone is envisaged to have an impact on the journey quality through less exposure to NO2 levels for drivers, passengers, pedestrians and cyclists. This is likely to have a slight beneficial impact.	Slight Beneficial (+)
S&C	Physical Activity	A do maximum option is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
S&C	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
S&C	Access to Employment	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to local employment as well as companies main transport routes being effected. The impact is considered to be large adverse.	Large Adverse (---)
S&C	Access to Services	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to the local services. Reduced number of trips associated with business & delivery will also see a reduction in the access	Large Adverse (---)
S&C	Affordability	The clean air zone may result in an increase in the time necessary to save money to upgrade vehicles as a result of paying for the CAZ charge or having to extend their general daily trips.	Slight Adverse (-)
S&C	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £4,795,943 PVC = £15,549,851 NPV = -£10,753,908 60 Years - PVB = £25,911,943 PVC = £15,549,851 NPV = £10,362,092	BCR 10 years 0.3 60 years 1.7
Other Issues	Acceptability	Given the nature of the proposals, this measure is likely to be opposed by current residents/businesses.	
Other Issues	Technical, Operational & Financial Feasibility	No legislation currently in place to allow a clean air zone to be implemented in Wales. This is likely to take up to 2021 for legislation to be in place, with the JAQU guidance suggests a further 5 years implementation period considering legislation is in place.	
Other Issues	Deliverability & Risk	Changes to the signal timings will have a minimal cost as the option is already a signalised junction. The diversion for vehicles away from the clean air zone is significant, if not policed properly vehicles will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that signal timings should have minimal impact on overall reduction in NO2. However, with the introduction of a CAZ there may potentially be an overall reduction to NO2, although it is likely that there may be localised increases in NO2 elsewhere, due to the Clean Air Zone/Low Emission Zone avoidance.	
Secondary Criteria of the Objective	Will the intervention result in unintended consequences or other environmental impacts	Yes, potentially to the areas where the traffic re-routes.	
Secondary Criteria of the Objective	Will the intervention impact equally across multiple vehicle classes and journey types	Signal timing changes should have an equal impact on all vehicle classes and journey types. However, older vehicles will be targeted as part of the CAZ measure, so the intervention will not impact equally across vehicle classes.	
Secondary Criteria of the Objective	Will the intervention have a positive impact on wider public health and inequalities	It is considered that signal timings should marginally improve the wider public health. Although there may be a positive impact on the residents' health from a CAZ, significant social inequalities are envisaged due to a charge on older vehicles generally owned by people with less disposable income.	
Future Generations 7 Well-being goals	Prosperous	This option may impact on the local economy of Caerphilly and local residents.	-2
Future Generations 7 Well-being goals	Resilient	A clean air zone requires notable resource for implementation. However, the measure can positively impact on the ecosystem by removing poor quality vehicles that negatively impact on local air quality readings. The option needs to ensure that by changing certain vehicles, it does not create a problem somewhere else. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles. For the traffic management options, an eastbound queue detector requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic for the Swyfrydd Road junction, in comparison to the existing queues.	+1
Future Generations 7 Well-being goals	Healthier	Signal timings and an eastbound queue detector is likely to have a neutral impact to the health of the local communities. A clean air zone is likely to see a reduction in poor quality vehicles, which is likely to have a moderate benefit to air quality and subsequently to the health of the local residents.	+2
Future Generations 7 Well-being goals	More Equal	The CAZ charge can be classified as a proportional charge system which does not take in consideration someone's income. The more deprived groups are likely to be impacted more than those that are more financially secure. A measure to tackle this problem can be the introduction of interest-free loans for a limited time to purchase compliant vehicles. This idea was put forward by the secretary of the Yorkshire Professional Driver's Association in response to the Leeds CAZ. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	-2
Future Generations 7 Well-being goals	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their commuting and freight transport.	-2
Future Generations 7 Well-being goals	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
Future Generations 7 Well-being goals	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being. A clean air zone complies with the 'globally responsible' objective by reducing green house gas emissions, developing sustainable low-carbon technologies, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+2

4.11 CONCLUSION TO THE TRANSPORT CASE

This section provides a conclusion to the transport case through a summary of the air quality modelling results and the environmental, economic and social appraisals.

4.11.1 AIR QUALITY MODELLING SUMMARY

Air quality modelling has demonstrated that Option S1 (Retiming of signals) does not bring forward compliance or reduce the NO_2 levels.

Air quality modelling results have shown that the compliance status is met for Option S3 (Demolition of Dwellings at Woodside Terrace), although it does bring forward compliance. The study has stated compliance will be achieved by 2022. This allows sufficient time for a public inquiry should there be opposition from local residents. Demolition could achieve compliance sooner if CCBC are able to dispel concerns and get residents to agree to the option. Furthermore, Option S4 (Peak Period HGV bans), reduces concentrations of NO_2 along the corridor by a few $\mu g/m^3$. However, Option 4 in 2021 does not comply with the annual mean NO_2 standard and is therefore an ineffective option as it does not meet the study's objectives. The Option S5 (CAZ) has a transformative effect on NO_2 concentrations which reduce by 40-50% in the modelled corridor. However, the implementation for the CAZ is likely to be 2023 due to the need for a further feasibility study to understand the displacement effects of the traffic and upgrading works required. Option S3 (Demolition), is preferred as it moves compliance forward, all the other options have little to no effect or cannot be achieved before the compliance year of 2025 without any local intervention.

4.11.2 APPRAISAL SUMMARY

The environment section of the Appraisal Summary Tables (AST) has found that from all other sub-sections (noise, landscape, historic environment, biodiversity and water environment), the biggest influence is on air quality. The demolition option, CAZ and the do maximum options have scored the highest for air quality. The HGV ban (S4) option has a slight benefit as it does reduce NO_2 concentrations, but not enough to meet legal compliance. Furthermore, this option has significant adverse impacts on the local economy. It is also anticipated that a HGV ban would displace traffic onto unsuitable alternative routes. Further analysis would be required to determine these impacts prior to the implementation of a HGV ban. The remaining options have scored neutral for all environment AST sections. The only adverse impacts being associated with the demolition option, for its impact on landscape and biodiversity. However, the impact on landscape would be temporary and any risks would need to be mitigated throughout the project.

The economy section of the AST has found Option S2 (signalisation of Swffryd Road Junction) to have the highest BCR over the 10 years appraisal at 15.2 and the second highest for the 60 years appraisal at 94.6. Option S2 also scored positively for the journey time changes, journey time reliability, transport costs and accident reduction benefits. Option S3 (Demolish Dwellings at Woodside Terrace and realignment of the southern footpath) has been appraised as neutral across all economic aspects except land, due to the anticipated transgression to the existing land, road or pathway systems. The air quality modelling has quantified some monetised impacts as part of a Cost Benefit Analysis (CBA) output which have been calculated in the BCR. The impact on the local economy has been appraised using the pilot study questionnaire in **Appendix C**. This has found a large adverse impact of Option S5 (CAZ) and Option S7 (Do maximum) which also incorporates the

CAZ. Option S4 (Peak Period HGV bans) is also found to have a moderate adverse impact as of the surveyed businesses', have or distribute deliveries during the affected morning and evening peak.

The social & cultural section of the AST has found the options impact on the access to employment, access to services and affordability sub-sections. For the other sub-sections (journey quality, physical activity, security and severance), the score has been neutral. Option S2 (signalisation of Swffryd Road Junction) and subsequently Option S6 (traffic management), have scored positively for access to employment and access to services. Option S4 (Peak Period HGV bans) and Option S5 (CAZ) have scored negatively on their impact to access to employment and services, whilst the CAZ also influences affordability. This is due to the usual users who have high emission vehicles, likely having to pay the charge or extend their daily trips through rerouting.

5

FINANCIAL CASE

5 FINANCIAL CASE

5.1 OVERVIEW

The financial case informs you whether an option is affordable in the first place and the long term financial viability of a scheme. It covers both capital and revenue requirements over the lifetime of the project and the implications of these for the balance sheet, income and expenditure accounts for public sector organisations'.

At Stage Two, it was considered that any of the measures identified in the Low (up to £500k) and Medium (£500k – £2m) are affordable within the information available to inform the study, though the measures identified with High costs will need the affordability re-evaluated when detailed designs have been finalised.

5.2 FINANCIAL MODEL

The WelTAG appraisal guidance states that the lifetime costs of the project to include occurrence, price, source of funding, maintenance liabilities, risk allowances, environmental, social and cultural impacts and externalities.

5.2.1 METHODOLOGY RELATING TO THE COMPILATION OF THE ESTIMATES.

The quantities have been taken off the drawings provided by the design team. These are General Arrangement drawings with no details relating to the specific Highways Method of Measurement Series.

Therefore, due to absence of data relating to the existing ground conditions, an estimated assessment of the various series has been included, with regards to the items and quantities.

The estimate has been compiled using the items and rates taken from the South East and Mid Wales Highways Framework 1st January 2019 – 31st December 2022, Schedule of Rates, Lot 8. In general, the higher band rates have been used. Rogue items have been inserted for items that are not included within the Schedule of Rates, using rates taken from Spon's Civil Engineering and Highway Price Book 2018 or historic rates deemed to be appropriate for the size and nature of the scheme.

The following comments and exclusions should be noted:

- No allowance has been made for the treatment and removal of contaminated material
- Land take and associated costs have not been assessed, unless stated within the individual option.
- Any costs associated with Statutory Undertakers diversions and fees are excluded
- VAT is excluded
- Preparation and Supervision Costs are excluded

With respect to the cost estimate for S5 Clean Air Zone, this is a high-level estimate based on uncertainty surrounding the option. The cost includes policy costs, infrastructure costs (enforcement cameras etc.), cost of improving alternative routes, and risk allowance. Due to limitations of the study it has not been possible to model the rerouting impacts of the CAZ. Further assessment work would need to be undertaken to identify mitigation requirements on alternative routes with due consideration for air quality exceedance, road safety, and other direct adverse impacts. Whilst it has

not been possible to model the rerouting of traffic, it is likely that the following routes would be impacted: the A467, A4043, A465 Heads of the Valleys Road, A4042 and the M4. These improvements are to ensure that the measure seeks to resolve the issues identified rather than simply displacing the impacts elsewhere.

5.3 SCHEME COSTS

At Stage Three more detailed construction costing activities have been undertaken by WSP. More detailed scheme costs can be found in the IAR.

The costs have been based on the design drawings which are presented in **Appendix D** and **Appendix E**.

Table 5-1 – Scheme Costs

Option Number	Scheme Option Description	Total Capital Costs	Total Costs with an applied 44% Optimism Bias
		No Risk Allowance	Optimism Bias Stage 1
1	Change Signal Timings at Crumlin Junction	£ 5,000	£ 7,200
2	Signalise the A472/B4471 Swffryd Junction and introduce an eastbound queue detector	£ 338,364	£ 487,244
3	Demolish Dwellings at Woodside Terrace and realignment of the southern footpath	£ 2,993,708	£ 4,310,940
4	Peak Period HGV Bans	£ 352,654	£ 507,821
5	Clean Air Zone / Low Emission Zone	£ 20,000,000	£ 20,000,000 (Initial Estimate Cost Includes Risk)
6	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swffryd Junction with 2 lanes on A472 EB (Option 2)	£ 343,364	£ 494,444
7	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone	£ 20,343,364	£ 20,494,444

5.4 RISKS

Using the TAG Unit 1.2 Scheme Costs[21], an optimism bias of 44% has been applied to the capital costs of the scheme. The optimism bias applies to the roads category. Risks for all options in **Table 5-1** have been higlighted below:

S1 – No risks on deliverability, timescale and implementation costs are expected.

S2 – There are medium risks associated with the signalisation of the A472/B4471 Swffryd Junction option. Predominantly due to the option designs created using 2D Ordnance Survey data. This option includes a topographical survey. The design for the junction will need to be developed from an outline design to a preliminary design. A geotechnical survey is not likely to be necessary for this option at the current stage.

S3 – There are high risks associated with the demolition option. This option has been designed using the topographical survey and additionally, a geotechnical survey will be necessary before the works can begin. Prior to the geotechnical survey, a detailed environmental survey will also need to be undertaken. In addition, the proposed compliance year of January 2022 allows for a period where residents may oppose this measure and a public inquiry may be necessary. If resident's concerns can be dispelled the compliance can be achieved sooner. This option is likely to require asbestos surveys, asbestos removal. Most of the buildings have basements which will have to be filled in with material.

S4 – Limited risks are associated with this option. The biggest risks are associated with the displacement of the HGVs on the local and regional highway network. No detailed surveys are expected to be required for this option. However, further assessment work is required.

S5 – Significant high risk. Further feasibility study required. Potential upgrading works may result from this on alternative routes and assessment required for behavioural change.

S6 - There are medium risks associated with this option.

S7 - This do maximum option requires a geotechnical survey before the designs can be finalised. The CAZ it is expected to have a significant high risk.

All identified risks have been documented in the risk registers which are presented within the IAR.

[21]TAG Unit A1.2 Scheme Costs Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625380/TAG_unit_a1.2_cost_estimation_jul17.pdf

6

COMMERCIAL CASE

6 COMMERCIAL CASE

6.1 OVERVIEW

The commercial case 'tells you if a scheme will be commercially viable, whether it is going to be possible to procure the scheme and then to continue it in to the future'. It includes the commercial and contractual means by which the proposals could be delivered.

The areas that have been are included:

- Output based Specification
- Procurement strategy
- Payment mechanisms (related to funding and associated issues to developing and implementing the measures)
- Risk Allocation & Transfer (related to the measures)

6.1.1 OUTPUT BASED SPECIFICATION

The Transport Case outlines potential measures which could be implemented at Hafodyrynys to accelerate compliance with the Ambient Air Quality Directive and achieve the study objectives. These will be assessed through the study to identify any interdependencies and efficiencies which can be achieved by grouping options together in packages. A preferred measure / basket of measures for delivery will be identified at the Full Business Case stage.

6.1.2 PROCUREMENT STRATEGY

Any procurement strategy developed will follow and comply with Caerphilly County Borough Council's (CCBC) agreed procurement processes, the Council's Standing Orders for Contracts Guidance and any national or European legislation relevant at the time of tendering.

CCBC has a team within the Engineering Projects Group who are frequent engineering and construction clients, with experience in delivering major projects, primarily via partnering arrangements and within existing framework agreements.

Adopting a collaborative approach to procurement and building on existing relationships, the strategy will be used to engage early with Framework Contractors where appropriate to use their expertise in relation to engineering solutions and their intelligence in relation to the local supply chain. Consideration will also be given as to how we can embed the requirements of the Well Being of Future Generations Act, with a focus on the development of the local supply chain, creating and sustaining employment and training opportunities throughout the delivery of the proposal.

The options appraisal looked at seven measures within the Stage Three report (already discussed within the document), some as individual and some as a package of measures. The options appraisal has concluded that demolition of the properties on the south side of Hafodyrynys Road (namely 1-20 Woodside Terrace, 1 & 2 Woodside Shops and Yr Adfa and realignment of the footpath) is the measure that can achieve compliance in the 'shortest possible time'.

The delivery of the proposed demolition works along Hafodyrynys Road will require evaluation and management of risk, finance and performance. By utilising Framework Contractors, there is an

opportunity to build on lessons learned from previous projects and benefit from a process of continuous improvement.

There are essentially two procurement routes available for consideration and Caerphilly Council will consider, where appropriate the use of technical advisors to assist in the scheme specification, tendering and management.

These two main procurement routes are;

- Full tender process under Band C of the Council's Standing Orders for Contracts
- Utilising the South East & Mid Wales Highways Framework

The South East & Mid Wales Highways Framework has already been through a tender process and the framework is split in to lots, which has allocated contractors assigned to each of those lots.

The Authority chooses the lot which best fits the description and price of the proposed scheme, the Authority then has to run a mini competition with the contractors assigned to that lot. There is guidance given on how this should be done and timescales to allow for responses etc. Tendering through the framework document would be a far quicker process than the Council's Standing Orders for Contracts.

The Authority would utilise its Engineering Projects Group to help write the specification for the required works prior to the mini competition process and project manage the implementation phase.

6.1.3 PAYMENT MECHANISMS

Funding for the proposals at Hafodyrynys is being supplied by Welsh Government via a Clean Air Fund. Details as to how Caerphilly and Welsh Government intend to make payments with respect to proposed products and services will be developed on completion of the final design.

6.1.4 RISK ALLOCATION & TRANSFER

It is not considered possible at this stage to determine how the risks of the proposal might be apportioned between Caerphilly and any Contractor. However, it is expected the general principle will be to ensure that risks should be passed to the party best able to manage them, subject to Value for money (VfM).

Under the terms of the South East & Mid Wales Highways Framework it is recommended that a scheme specific register is prepared and priced for each contract at pre-tender preparation stage. The pre-tender estimate and the risk allowance should be used to determine both the Contracting Authority's budget for the scheme and to determine the appropriate lot. In the case of Hafodyrynys, the approximate costs (with contingency) equates to £4.3m to demolish the properties make safe the road and landscape the area.

7

MANAGEMENT CASE

7 MANAGEMENT CASE

7.1 SUMMARY OF MANAGEMENT CASE FROM STAGE ONE AND TWO

The management case tells you if an option is achievable. This case 'covers the delivery arrangements for the project and then its management during its life time. It covers the arrangements for the procurement, construction and on-going operation of the intervention, details of the monitoring arrangements and the undertaking of the evaluation plan. The management case should embed the five ways of working.

The WelTAG Stage One and Two reports outlined:

- Project Planning – Governance, organisational Structure
- Key Project Parties & Roles
- Identified the Review Group
- Communications & Stakeholder Management Plan

Stage Two highlighted that the following assessments had to be included in the WelTAG Stage Three:

- Preliminary scheme drawings
- Preliminary cost estimates
- Assessment of Technical, Operational and Financial Feasibility, and Deliverability and Risk
- Qualitative Value for Money assessment
- Detailed modelling of impacts – both traffic modelling and emissions/dispersion modelling.

7.2 DELIVERABILITY

Key milestones and delivery dates. Some consideration has been given to medium and short-term measures but with no exact timelines at Stage One and Two of the WelTAG.

7.3 KEY PROJECT PARTIES & ROLES

- Caerphilly County Borough Council (CCBC)
  Ultimate client commissioning the study and overseeing delivery.
- Welsh Government (WG)
  Directing CCBC in the delivery of this study.
- RICARDO / WSP
  Project Consultants, delivering the study.
- Air Quality Independent Review Panel
  Appointed by Welsh Government

7.4 REVIEW GROUP

A Review Group has been set up to guide the WelTAG 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
- Welsh Government

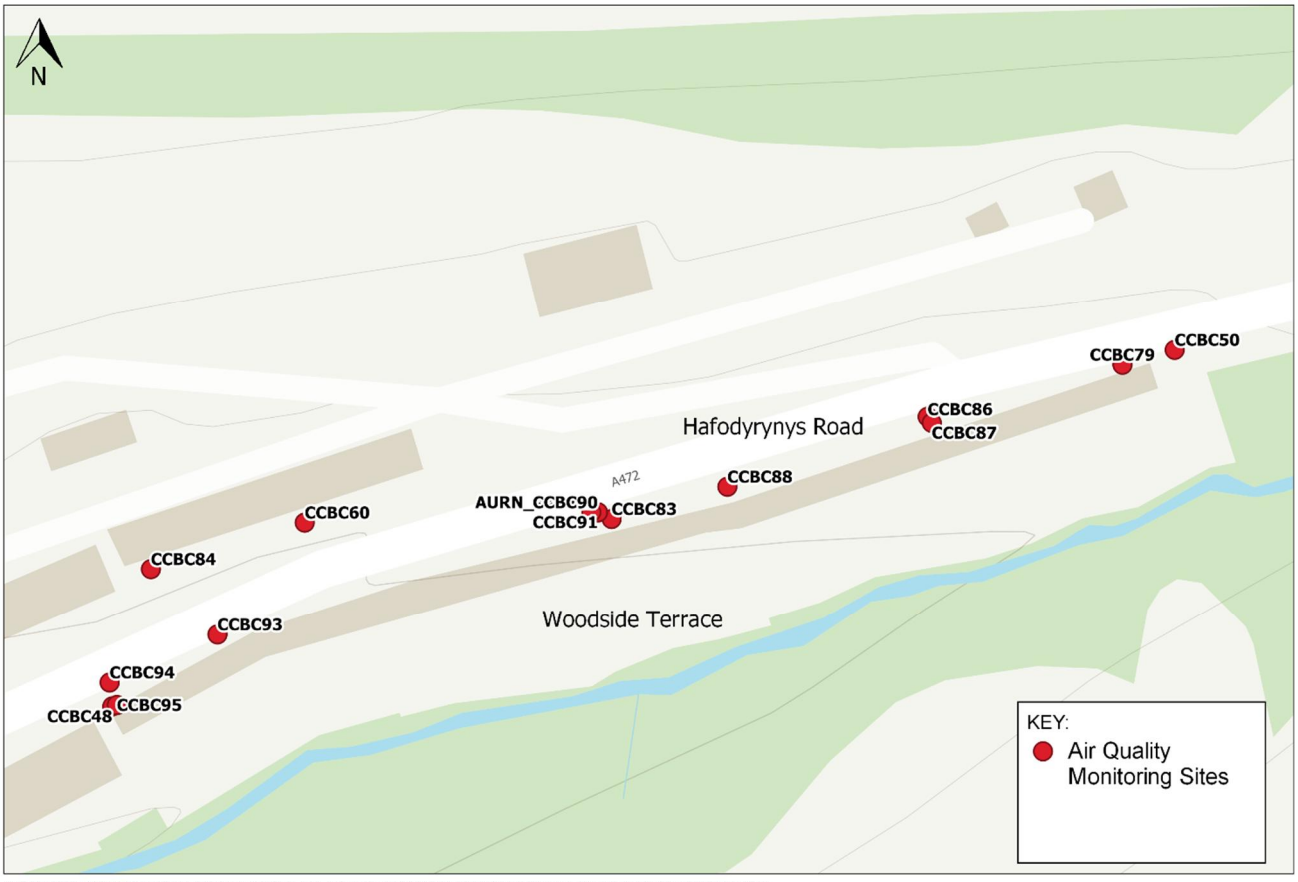
- Third party consultants (Ricardo / WSP at Stage One, Two and Three)

7.5 MONITORING AND EVALUATION PLAN

As per the five stages of WelTAG, it will be critical to monitor the impacts of the measures during and post implementation. The monitoring of outcomes during implementation in Stage Four will allow for adjustments to be made, if required, to realise the benefits of the intervention and mitigate any unforeseen adverse impacts. The longer-term evaluation provided in Stage Five covers both the process of delivering the scheme and the outcomes achieved. This makes WelTAG a learning process and future WelTAG appraisals will benefit from the sharing of experience gained elsewhere.

It is recognised that there is uncertainty in the modelling which has been undertaken. As such, should compliance on the A472 be delayed beyond current projections. It may be necessary to implement other measures mentioned in this report to ensure compliance with the limit values in the shortest time possible.

Figure 7-1 – Existing NO_2 monitor locations on the A472 Woodside Terrace



7.5.1 AIR QUALITY MONITORING

Air quality monitoring along the A472 Woodside Terrace comprise a combination of reference and indicative methods.

The reference method for the measurement of nitrogen dioxide and oxides of nitrogen is that described in EN 14211:2005 'Ambient air quality — Standard method for the measurement of the concentration of nitrogen dioxide and nitrogen monoxide by chemiluminescence.'

Reference method monitoring will be undertaken at a minimum of one location within the study corridor, with the recommended location being shown in **Figure 7-1**. This location has been selected because it meets the criteria in Annex III of the Directive, which specifically notes that:

Sampling should be directed at locations where the highest concentrations occur to which the population is likely to be directly or indirectly exposed for a period which is significant in relation to the averaging period of the limit value (Para B.1a)

For all pollutants, traffic-orientated sampling probes shall be at least 25 m from the edge of major junctions and no more than 10 m from the kerbside (Para C)

The final choice for the reference monitoring location will need to take account of Health and Safety and provision of infrastructure.

In addition to the reference monitoring, it is recommended that indicative diffusion tube monitoring is continued. The existing monitoring locations are provided in Figure 7-1.

7.5.2 TRAFFIC MONITORING

This study has highlighted the intrinsic link between air quality and traffic volumes, speeds and fleet mix. As such, it is recommended that the air quality monitoring is supplemented with either long term or regular short-term traffic monitoring to better understand any observed change in air quality. The following surveys should be considered:

Classified Link (Volume) Counts

This would require at least 1 full week (24 hours a day) of data for a DMRB neutral period. This data would be used to infer changes in Annual Average Daily Traffic (AADT) over time. Long term permanent count site data would be preferable so that the data would not need to be corrected for seasonality and the impacts of any incidents on the network could be fully understood.

Speed Data

Traffic speeds should be monitored post implementation to identify the real impacts of a change in speed limit and the speed data should be used to inform any decision on the requirement for and nature of enforcement. INRIX traffic data could be used to monitor speeds post implementation of measures though where possible should be backed up with survey data. Whilst undertaking surveys would potentially provide more robust data (larger sample size), it will be important to consider whether the survey is likely to impact upon typical driver behaviour and could underestimate real speeds on the corridors.

Automatic Number Plate Recognition

In addition to the classified link count data, there would be significant benefit in undertaking ANPR surveys. This data can be linked back to the DVLA database to determine not only vehicle classification, but also emission standards of vehicles. The data could be used to identify the rate of change of the fleet towards cleaner, newer, low emissions vehicles and could be used to evidence the need for additional measures to accelerate the rate of change, e.g. a scrappage scheme.

The monitoring locations on the northern side of the A472 will remain post implementation of the preferred measure (S3-Demolition). However, the location of the continuous monitor will need reviewing because the area of exposure will change on completion of the scheme. Any newly proposed location(s) for the monitor will be agreed with Welsh Government (WG).

8

SUMMARY AND NEXT STEPS

8 SUMMARY AND NEXT STEPS

8.1 OVERVIEW

This WelTAG Stage Three report has considered the 'preferred options' brought forward from Stage Two in greater detail. Detailed traffic modelling has been undertaken for the options under consideration. The outputs of the traffic model have been used to inform robust air quality modelling to identify the potential reductions in NO_2 resulting from each option. In addition to this, the wider impacts of each option have been appraised against the WelTAG aspects of well-being. Value for Money assessments have also been undertaken, though this has not influenced the identification of measures taken forward for implementation.

8.2 AIR QUALITY BENEFITS

Each of the options have been modelled to identify their potential impacts on NO_2 concentrations. The results of this modelling can be summarised as follows:

Reference	Measure Description	Summary of Impacts
1	Change Signal Timings at Crumlin Junction	This option has imperceptible impacts on NO_2 concentrations.
2	Signalise the A472/B4471 Swffryd Junction	This option has imperceptible impacts on NO_2 concentrations. This option has significant Transport Economic Efficiency (TEE) benefits associated with improving eastbound traffic flow during the morning peak period.
3	Demolish Dwellings at Woodside Terrace and realignment of the southern footpath	This option does not reduce emissions overall though does remove the receptor and reduce NO_2 concentrations along the study corridor therefore bringing forward compliance (to 2022) as per the objective.
4	Peak Period HGV Bans	This option results in minor reductions in NO_2 concentrations though would have significant adverse impacts on the local economy and may potentially displace HGV traffic through other areas and create additional Air Quality Management Areas and/or unsafe routes.
5	Clean Air Zone / Low Emission Zone	This option would result in significant reductions in NO_2 concentrations in the implementation year of 2023 This option has significant adverse impacts on the local economy, road users and could potentially displace traffic through other areas and create additional Air Quality Management Areas and/or unsafe routes. The HIA and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway network.

Reference	Measure Description	Summary of Impacts
6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction	This option has imperceptible impacts on NO_2 concentrations.
7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swffryd Junction & Clean Air Zone / Low Emission Zone)	This option would result in significant reductions in NO_2 concentrations in the implementation year of 2023. These benefits are primarily due to the CAZ within this option package. This option has significant adverse impacts on the local economy, road users and could potentially displace traffic through other Air Quality Management Areas and/or unsafe routes. The HIA and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway network.

8.3 MEASURES FOR IMPLEMENTATION

The WelTAG Stage Three assessment has demonstrated that Option S3 (Demolish Dwellings at Woodside Terrace and realignment of the southern footpath) would bring forward compliance in the shortest possible time. On this basis, this Stage Report concludes that this measure should be taken forward for implementation. Some risks have been identified which may impact on the implementation timeframe of this option, though despite these risks, this option would still bring forward compliance in the shortest possible time in line with the Air Quality Directive.

Whilst the modelling has demonstrated that Option S3 (Demolish Dwellings at Woodside Terrace and realignment of the southern footpath) would bring forward compliance in the shortest possible time, consideration needs to be given to the needs to reduce exposure in the short term. As such the air quality campaign is also proposed for implementation to compliment the demolition option as this can be delivered quickly. Option S1 (Change Signal Timings at Crumlin Junction) does not achieve any tangible benefits in air quality despite being able to be delivered quickly, therefore this measure is not proposed to be taken forward for implementation.

8.4 NEXT STEPS

To progress with Option S3 (Demolish Dwellings at Woodside Terrace and realignment of the southern footpath), it will be necessary to further develop the design. To inform this a topographical survey of the A472 corridor (Crumlin Junction to Swffryd Junction) has been undertaken. This survey has been used to update the outline design drawing of the preferred option (**Appendix D**) to preliminary design, which is presented within **Appendix E**. Additional surveys are currently being specified, this will include a geotechnical survey and environmental surveys. Upon receipt of all required survey information, detailed design drawings will be prepared for the preferred option. This will also include considerations for the requirements for traffic management during the construction phase. The cost estimates will be updated once the detailed design has been completed. It is anticipated that the completion of detailed design will reduce the risks which have been identified for this option and allow for robust costs and implementation timeframes to be identified.

Appendix A

SUMMARY OF CHANGES TO 2017 WELTAG GUIDANCE

WELTAG 2017 GUIDANCE UPDATE

The main changes in the final WelTAG 2017 relative to the Consultation Draft used for Stage One and Two are as follows:

- The application of the five ways of working to the consideration of possible solutions;
- A consideration of how solutions enable public bodies to maximise their contribution to each of the seven national well-being goals: A prosperous Wales, a resilient Wales, a healthier Wales, a more equal Wales, a Wales of cohesive communities, a Wales of vibrant culture and Welsh language, and a globally responsible Wales.
- A commitment towards the four aspects of well-being in Wales: economic, social, environmental and cultural; and
- A move from Delivery Case to Management Case.

WelTAG 2017 combines the principles of the HM Treasury Green Book and WG's Five Case Model for Better Business Cases, represented by the five WelTAG Stage Reports. The 2017 guidance also differs from the previous consultation version wherein the five-case business model now more closely reflects the model adopted by the DfT WebTAG guidance.
The contents of each Stage Report must be presented using the structure of the Five Cases Model as follows:

- Strategic case: the case for change, fit with other policies and 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?

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 and using the five ways of working set out in the Well-being of Future Generations Act. 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.
The WelTAG Guidance has also been revised to reflect the Well-being of Future Generations (Wales) Act, which strives to improve the social, economic, environmental and cultural well-being of Wales and identifies seven well-being goals:
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.

Appendix B

PUBLIC CONSULTATION REPORT

Caerphilly County Borough Council
WelTAG Stage 3 Feasibility Study

Consultation Summary Report

Introduction

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 A472, Hafod-yr-Ynys Road exceeds the limit value for nitrogen dioxide (NO_2) and Caerphilly County Borough Council is investigating measures to bring forward reductions in NO_2 to ensure compliance with the Ambient Air Quality Directive in the shortest possible time.

A feasibility study has predicted that a 'Do Minimum' scenario, which involves public awareness raising and educational campaigns would achieve compliance by 2025. The study also assessed a number of options and concluded that demolition of the houses at 1-20 Woodside Terrace to include 1&2 Woodside Shops and Yr Adfa will achieve compliance with the air quality limit values in the shortest possible time; by 2022.

Caerphilly Council's Cabinet have considered the findings from the study. Following deliberations regarding the potential impact on the mental health and well-being of the residents, together with the potential to create financial hardship; the Cabinet agreed to consult on the 'Do Minimum' option as the preferred option for securing compliance with the Air Quality Directive. In addition, the Council have lobbied Welsh Government for additional financial support, in order to prevent those affected residents being forced into financial hardship in the event that the demolition option is subsequently required.

Following the Cabinet Decision and the outcome of the Feasibility Study, a 10 week Public Consultation commenced on Tuesday 02 April to allow people to submit their views on the draft version of the Stage 3 Feasibility Study Report prior to the submission of the final report to Welsh Government on 30 June 2019.

Method

All stakeholders have been sign posted to the consultation by social media, with additional e-mails and written correspondence being sent to key stakeholders / groups to maximise the number of responses received during the consultation period.

Engagement

Key engagement mechanisms included:

- Online - via the CCBC Website, social media (including Facebook and Twitter)
- E-mails and written correspondence (letters to local residents)
- Paper Questionnaires – hand delivered to residents directly affected by the outcome of the feasibility study.
-

Social Media

The consultation was promoted via social media at the outset of the consultation period with occasional social media reminders thereafter.

Survey

The questionnaire was designed to seek residents, stakeholder and visitors views on

- The Cabinet decision to support 'Do minimum' as a preferred option whilst lobbying Welsh Government for additional funding should the demolition option be pursued, and;
- The outcome of the WelTAG Stage 3 Feasibility Study to demolish 23 properties to the Southern side of the A472.

Respondents were asked whether they agreed or disagreed in relation to each of the options set out for delivering compliance with the European Union Ambient Air Quality Directive (2008/50/EC) in the 'shortest possible time'. There was also provision within the questionnaire to explain why they agreed/disagreed with any of the options put forward and to note any equality implications.

Survey Findings

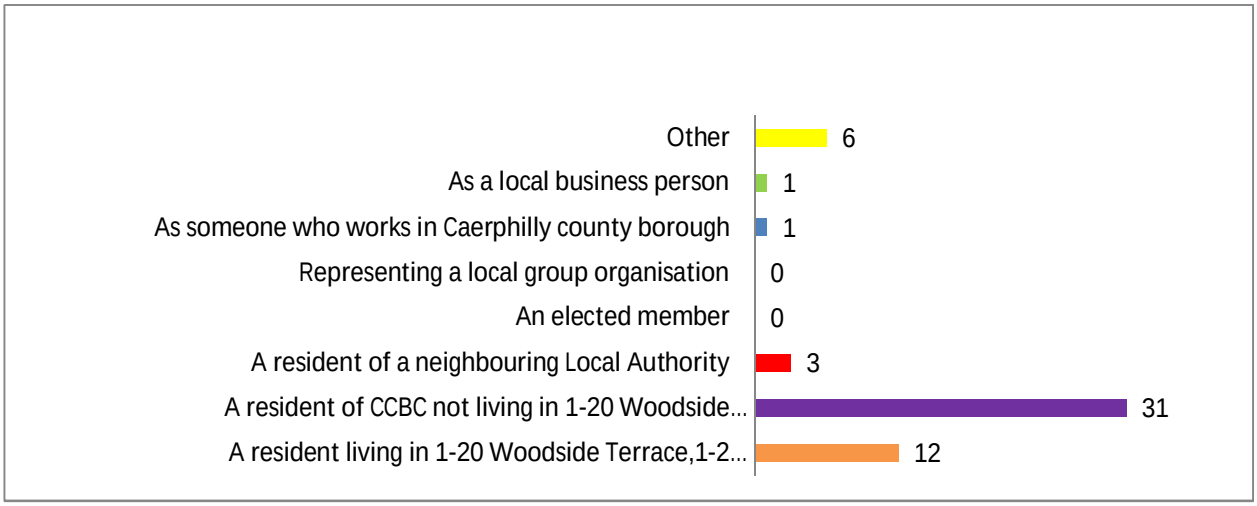
A total of 54 responses were received and have been included in this analysis. Not all respondents answered every question and where the number of responses to a question is lower, this figure is noted in brackets next to the heading of the relevant question.

Respondent Profile (n=54)

A profile of respondents provides context for an analysis of the responses received.

As shown in Graph 1, the largest proportion (31) of those who responded indicated that they were residents living in the borough. In addition 12 respondents indicated that they are residents of 1-20 Woodside Terrace, 1&2 Woodside Shops and Yr Adfa. Under the 'other' category 4 people indicated that they were either friends or relatives of those living in Woodside Terrace.

Graph 1: Interest in Consultation (n=54)

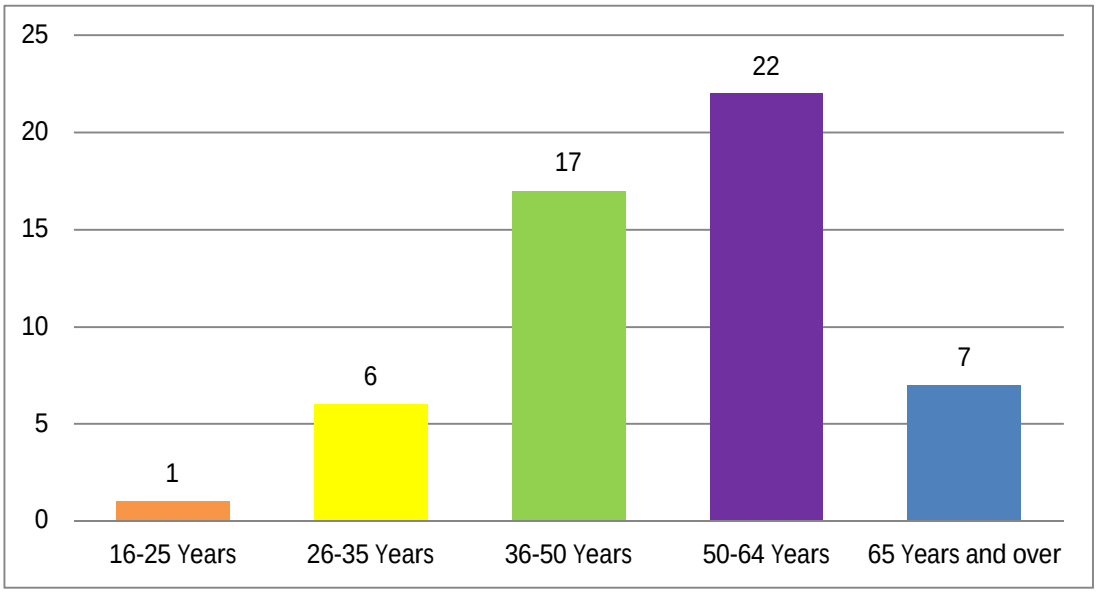


Gender (n= 54)

Of those who gave a response to this question, 25 were female and 29 were male.

Age Groups (n=53)

As shown in Graph 2, the largest proportion of respondents were aged 50 and over.



Equalities (n=53)

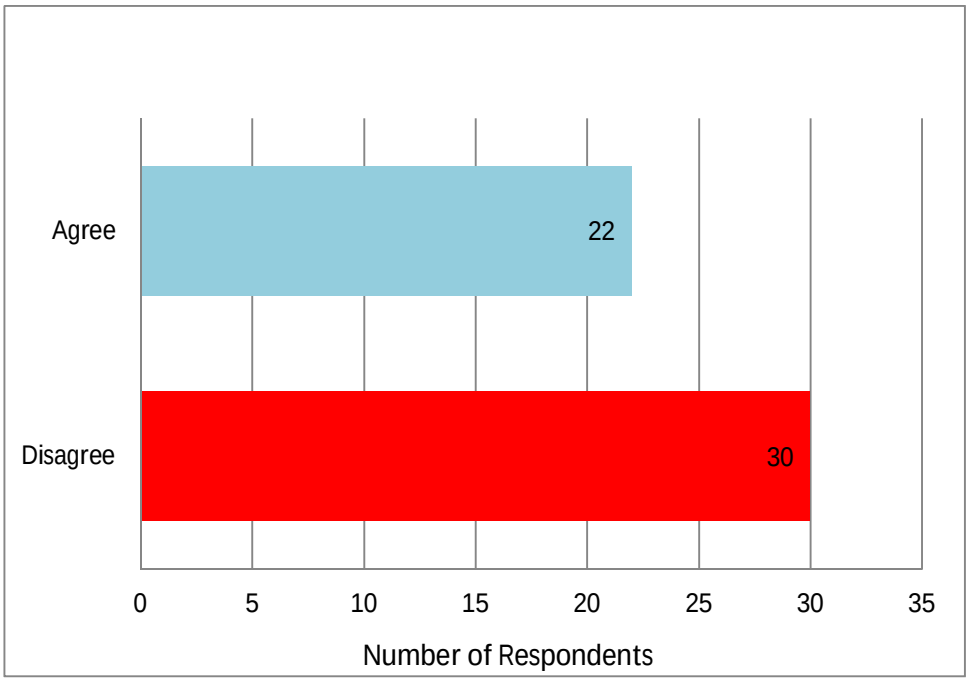
53 of the respondents felt that their responses to the public consultation was not influenced positively or negatively by any of the characteristics listed within Q9 of the questionnaire. However, 1 respondent commented that their answer was influenced by the fact that he/she has 3 small children who all depend on her.

Options Appraisal

Feasibility Study (n=52)

It can be seen from Graph 3 below that there is a divide of opinion in relation to the feasibility outcome. Of the 52 respondents who answered the question, 22 people agreed with the outcome of the feasibility study i.e. to demolish the properties. However, 30 people disagreed with this option.

Graph 3: Do you agree or disagree with the outcome of the Hafod-Yr-Ynys Air Quality Feasibility Study WelTAG Stage 3 Report? (n =52)



Respondents were additionally asked to give reasons why they agreed/disagreed with the feasibility study. Whilst the figures above suggest that 30 respondents disagreed with demolition, the comments that accompanied this answer did not always appear consistent with this view.

Key themes in support of the feasibility outcome include:

- Demolition is the only option that will bring about compliance with the EU Directive
- Concerns for the impact on residents, in particular health concerns
- Concern that the air quality situation will worsen over years at a quicker rate than green technology
- Increased housing development within the area will further add to air quality issues
- That improvements to air quality need to be made elsewhere not just at Woodside Terrace
- Severe uncertainty around predictions in the reduction of NO_2 to reach compliance by 2025.
- In the absence of restricting traffic type and volume, demolition is the only other option.
- Road Safety concerns – volume of traffic
- The area is extremely dilapidated

Key themes to emerge in disagreement with the feasibility outcome include:

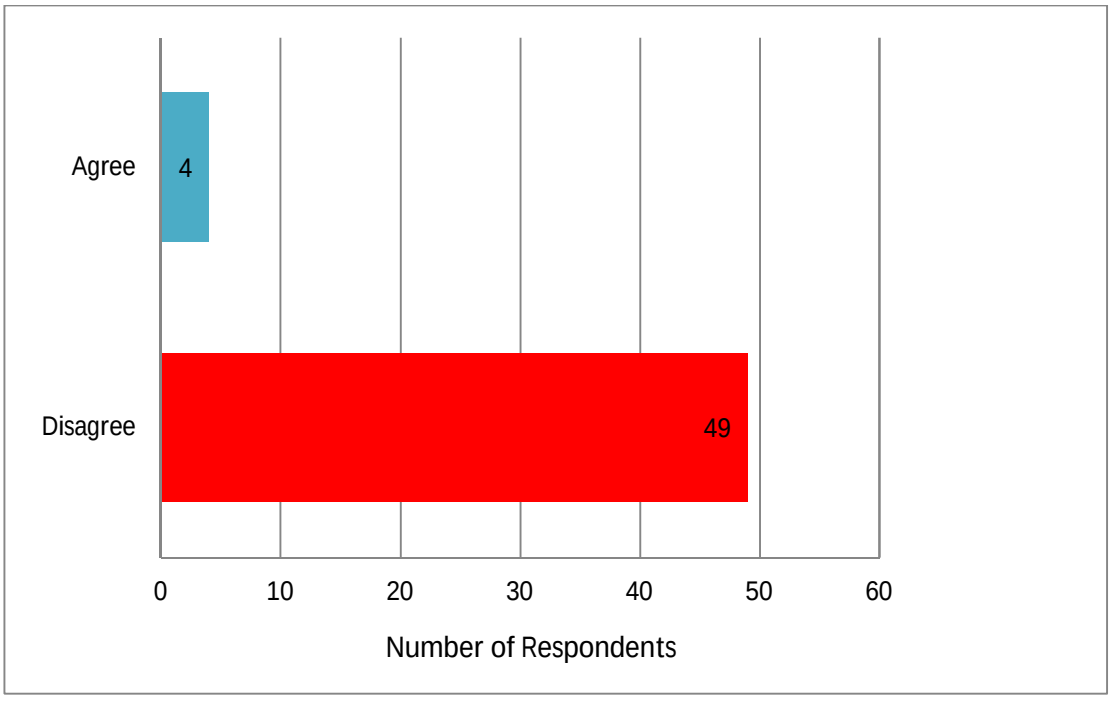
- Improvements to air quality can be made in other ways e.g. restricting traffic type and volume and improving the road network to reduce congestion
- Unreasonable to offer 10% of market value to residents.
- Re-utilise alternate traffic route through Swffryd (B4471) seen as a better option to relieve issue.

- Impact on residents has not been fully considered.
- Ambiguity surrounding reliance on vehicular emission modelling outcomes.
- No faith in assumption that residents on other side of the road aren't affected.
- The health impact assessment (in relation to demolition) does not take into consideration the psychological impacts on residents.
- Residents need safer environment to live in. Volume of traffic makes it an unhealthy place to live.
- Traffic flows are underestimated considerably.
- Demolition is the only option!

Do minimum (n=53)

In relation to the 'Do minimum' option, 49 people disagreed with the CCBC cabinet proposal and 4 of the respondents agreed. One respondent did not answer.

Graph 4: Do you agree or disagree with the proposal that 'Do minimum' is the preferred option? (n=53)



Key themes in support of the 'Do minimum' option included:

- Residents in properties included in the demolition proposal not wishing to leave their home
- Tackling the traffic emissions by taking the higher pollution vehicles off the roads and replacing with greener equivalents should be the priority of Government

Key themes in disagreement with the 'Do minimum' option included:

- Do minimum is not an option as it is not compliant with EU directive
- 'Do minimum' does not feature in the content of the feasibility study and is not an option
- 'Do minimum' will have a detrimental effect on the lives of the residents
    - This is a public health issue - everything possible should be done to reduce the impact on people's health
- Air quality will worsen if nothing is done to address the issues
- Traffic and congestion is an ongoing issue in the area and needs to be resolved

Discussion

Upon review of the data, it is apparent that the majority of people who responded to the question in relation to the feasibility study disagreed with the outcome of the report (30/54). Out of the respondents who disagreed, respondents further commented on the reasoning for their choice. For those who disagreed with the conclusions in the feasibility study (demolition), comments provided suggest that respondents felt that demolition will not encourage reductions in traffic emissions borough wide and feel that this is something that should be further considered.

Others felt that the air quality issues at Hafodyrynys could be effectively managed/reduced by other means such as further road infrastructure improvements, i.e. alternative traffic routes/diversions, construction of a by-pass to name a few. However, it should be noted that options such as a bypass which would offer an alternative route have been considered in earlier stages of the study and have been ruled out based on the timescales it would take to deliver the option.

Some residents living in the nearby vicinity felt that their properties should be included within the demolition proposal, however, real time data and modelling outcomes conclude that properties on the north side of the A472 are currently in compliance with the air quality limit value for NO_2 and demolition of the properties on the south side of the A472, will reduce the concentrations of nitrogen dioxide within the area even further. For this reason, the properties on the north side of the A472 or properties in the wider vicinity have not been included within the demolition proposal.

Some of the comments provided in support of the disagreement with the feasibility outcomes (little faith in modelling methodology and the under representation of traffic flows) still acknowledged that demolition of the properties is an option to resolve the issue going forward, not only to reduce the air quality issues within the area but also for road safety purposes.

Of those people who agreed with the feasibility outcome (22), respondents chose to provide further justification for their answers. Respondents raised concerns for the resident's health and prolonged suffering of those living at the properties. Respondents also chose to mention that it was the option that would achieve compliance with the EU directive and acknowledge that demolition should not leave residents in financial hardship should the option be implemented.

Of those who wished to elaborate on their reasoning for disagreeing with 'Do minimum' it was felt that CCBC were not taking the air quality, or health of the residents seriously.

One respondent felt that 'Do minimum would be acceptable as an 'interim' option prior to working on a long-term resolution, whilst other respondents felt the Local Authority were absolving their responsibility to address the issue at hand.

Although 22 of 52 respondents agreed with demolition, a majority (49/53 respondents) disagreed with the do minimum option. In addition, whilst there are mixed views relating to demolition, it would appear that a number of respondents did feel that demolition would be a better option going forward than do minimum.

Annex 1

- Caerphilly 50+ Forum
- Coleg Gwent
- Department for Work and Pensions
- Aneurin Bevan University Health Board
- Gwent Police
- Gwent Association of Voluntary Organisations
- Keep Wales Tidy
- Groundwork Wales
- Charter Housing
- Smart Money Credit Union
- Age Cymru Gwent
- Bargoed YMCA
- Caerphilly Local Access Forum
- South Wales Fire & Rescue Service
- Action for Children
- Disability CanDo Organisations
- Coleg y Cymoedd
- Natural Resources Wales
- Alzheimer's Society
- Caerphilly People First
- Gwalia Housing Association
- Working Links
- Workers Education Association
- Islwyn Credit Union
- Caerphilly & Blaenau Gwent Citizen's Advice Bureau
- Office of the Police and Crime Commissioner for Gwent
- Public Health Wales
- Tabernacle Baptist Church, Newbridge
- Gwent Wildlife Trust
- United Welsh Housing Association
- Gofal
- Llamau
- Menter Iaith Caerffili
- Barnardos
- Wales Cooperative Centre
- Home Start Caerphilly Borough
- Coalfields Regeneration Trust
- St Gwladys' Church, Bargoed
- Pobl Group
- BAG Credit Union
- Business in the Community
- Stroke Association
- Sight Cymru
- Hafodyrynys Village Hall Association
- Pontymister Athletic Bowls Club

- Argoed Community Council
- Rhymney Valley Athletics Club
- Risca Town Council
- Blackwood Golf Club
- The Royal British Legion – Blackwood & District
- Blackwood Mini & Junior Rugby Club
- Cwmcarn OAP Hall & Welfare Association
- Trinant Association Football Club
- Little Peeps Playgroup
- Risca Chamber of Trade
- Pontllanfraith Karate Club
- Risca Town Council
- 1st Cefn Fforest Beavers and Clubs
- Cwmcarn Residents & Community Association
- Oakdale Rugby Club
- Pengam Boys & Girls Club
- Newbridge Methodist Church
- Pontllanfraith WI
- Trinant Café
- Blackwood & District Heritage Association
- Blackwood Town Council
- Rotary Club of Pontllanfraith
- Newbridge & District Chamber of Trade
- Cwmfelinfach Community Centre
- Britannia Community House
- Hollybush Community Centre
- Pontllanfraith Children's Contact Centre
- Mount Pleasant Baptist Church, Blackwood
- Cwmcarn Gymnastics/Sports Acrobatics Club
- Agape Community Church Ty Sign
- Argoed Baptist Church
- Newbridge Memo
- Blackwood Little Theatre
- Oakdale Photographic Society
- Cwmcarn Angling Association
- The Royal British Legion – Newbridge Branch
- New Life Christian Church, Abercarn
- 277 (Blackwood) Squadron Air Training Corps
- Moriah Baptist Church and The Big Conversation Risca
- Risca East Community Council
- Oakdale Community Partnership
- Mynyddislwyn Male Choir
- Blackwood Musical Theatre Socetiy
- Risca Town Council
- SHADE
- Cwmfelinfach Residents' Association
- Oxford House Industrial History Society

- Phoenix Community Transport
- Cylch Meithrin Cwm Gwyddon
- Crumlin Navigation Colliery Project
- Blackwood & District Amateur Radio Society
- Aber Valley Community Council
- Risca Town Community Council
- Llanbradach and Pwllypant Community Council
- Draethen, Waterloo and Rudry Community Council
- New Tredegar Community Council
- Darran Valley Community Council
- Rhymney Community Council
- Argoed Community Council
- Risca East Community Council
- Penyrheol, Trecenydd and Energlyn Community Council
- Bargoed Town Council
- CCBC Inclusion Services
- Blackwood Town Council
- Bedwas, Trethomas and Machen Community Council
- Caerphilly Town Council
- Maesycwmmer Community Council
- Nelson Community Council
- Gelligaer Community Council
- Road Haulage Association
- Freight Transport Association

Annex 2

Hafod-Yr-Ynys Air Quality Feasibility Study (WelTAG Stage 3)

It should take you approximately 10 minutes to answer all the questions. If you need to speak to someone about this survey then please email:ehadmin@caerphilly.gov.uk or telephone 01443 811346/811347.

Privacy notice (data protection)

Your response to this questionnaire is being collected by Caerphilly County Borough Council (as data controller) and will be used to inform the feasibility study and provide evidence to help us make decisions about how to improve air quality in Caerphilly CBC. By submitting your response, you are giving your consent for us to use the information you have provided. When results are shared publicly or with other organisations, your information will be anonymised so you cannot be identified. If you provide contact details then we may send you messages in line with the preferences you give, but you can opt-out at any time.

We will keep your information safe and secure in line with UK data protection law. Your data will be processed by the relevant services (departments) within Caerphilly County Borough Council.

Q1 Please indicate your interest in this consultation (please select all that apply):

- ☐ A resident living in 1-20 Woodside Terrace,1-2 Woodside shops or Yr Adfa
- ☐ A resident of CCBC not living in 1-20 Woodside Terrace,1-2 Woodside shops or Yr Adfa
- ☐ A resident of a neighbouring Local Authority
- ☐ An elected member
- ☐ Representing a local group or organisation
- ☐ As someone who works in Caerphilly county borough
- ☐ As a local business person
- ☐ Other

If you have indicated other, please give details:

Q2 Please could you provide your postcode in the space below e.g. CF82 7PG

Q3 Do you agree or disagree with the outcome of the Hafod-Yr-Ynys Air Quality Feasibility Study WelTAG Stage 3 Report?

- ○ Agree
- ○ Disagree

Q4 Please could you provide a brief explanation to your answer contained in Q3 in the box below:

Q5 Do you agree or disagree with the proposal that 'Do minimum' is the preferred option?

- ◯ Agree
- ◯ Disagree

Q6 Please could you provide a brief explanation to your answer contained in Q5 in the box below:

Q7 Please indicate your gender below:

- ◯ Male
- ◯ Female
- ◯ Prefer not to say
- ◯ Other

If you selected other, please specify in the box below your gender

Q8 I am aged:

- ◯ 11-15 years
- ◯ 16-25 years
- ◯ 26-35 years
- ◯ 36-50 years
- ◯ 50-64 years
- ◯ 65 years and over
- ◯ Prefer not to say

Q9 If you feel that your response to this survey has been influenced (positively or negatively) because of any of the following: your ethnic origin, gender, age, marital status, sexual orientation, disability, gender reassignment, religious beliefs or non-belief, use of Welsh language, BSL or other languages, nationality or responsibility for any dependents, please give details in the box provided:

Q10 I confirm that I wish to submit the information entered into this form to Caerphilly County Borough Council. I understand that this information will be collated via Snap Surveys, a third party organisation https://www.snapsurveys.com/survey-software/privacy-policy-uk/ and for it to be used as described in Caerphilly County Borough Council's privacy notice https://www.caerphilly.gov.uk/CaerphillyDocs/FOI/PrivacyNotices/Privacy-Notice-Consultations-Surveys.aspx

- ◯ I confirm the above

Thank you for taking the time to respond to this survey. Please return this form to any of the main Council offices or your nearest library,leisure centre, cash office, housing office or customer first centre. If you prefer, you can also return the survey in the post to Consultation and Public Engagement Officer, Policy Unit, Caerphilly County Borough Council, Penallta House, Tredomen Park, Ystrad Mynach, Hengoed,CF82 7PG.

Annex 3

It should be noted that some abusive comments have been taken out of the responses. The comments presented have been tabulated in the sections that the respondents chose to do so upon submission of the individual survey responses. Therefore, some comments may seem inconsistent with the initial selection of the agree/disagree columns for both the Feasibility Study Outcome and 'Do Minimum' options.

Feasibility Study

Agree
Air quality is a serious issue for residents of this street and those close by. No doubt the issue will worsen over the coming years before technology such as electric cars catch up. With new houses being built in Caerphilly Borough this issue will no doubt get worse.
The residents cannot be allowed to continue to suffer in the way that they are.
Definite improvements need to be made not just for the residents of Woodside houses but also the commuters who are continually caught in the jams in this area. HGV vehicles cause a big issue due to their inability to climb Hafodyrynys hill at pace, causing added congestion and air quality issues. A restriction on such vehicles as well as a better traffic management plan at the Swffryd and Crumlin junction I would anticipate to allow sufficient improvements to the residents allowing them to remain in their residence and improving congestion at peak times. Similar restrictions as implemented on Kendon Hill should be considered as this route has seen mass improvements since HGV restrictions have been put in place.
Definite improvements need to be made not just for the residents of Woodside houses but also the commuters who are continually caught in the jams in this area. HGV vehicles cause a big issue due to their inability to climb Hafodyrynys hill at pace, causing added congestion and air quality issues. A restriction on such vehicles as well as a better traffic management plan at the Swffryd and Crumlin junction I would anticipate to allow sufficient improvements to the residents allowing them to remain in their residence and improving congestion at peak times. Similar restrictions as implemented on Kendon Hill should be considered as this route has seen mass improvements since HGV restrictions have been put in place.
I agree that demolition is the only option that will bring compliance in the shortest possible time but the currently offered remuneration package of market value plus 10% is unreasonable leaving residents in financial hardship. A similar property in a cleaner area within the surrounding area could not be acquired for this figure - it is unreasonable to expect the residents to relocate to a smaller property or have to increase their borrowing The current value is adversely affected by the pollution issue & is therefore not a true reflection of the property value. I do not agree that there is sufficient evidence that levels will be bet by 2025.
It works
I agree because I am concerned about my health.
If the council are not going to consider restricting traffic type and volume then the only option is purchase/demolition of the properties.
I agree that we need the air quality to improve quickly. So the do minimum is not the best option.

We agree with the proposed next steps of proceeding with the demolition, because as outlined in the report all other options either fail to improve air quality to an acceptable level or leave us exposed to an unacceptable level of pollution for a prolonged period of time. Neither of which we find acceptable as three members of the household have developed respiratory problems since living at the address.
This street is a highly polluted area with people still living in it and the view of the council to do nothing is in affect helping to shorten the lives of these residents.
Overall pollution levels will decrease with the removal of the properties, which has been highlighted in the study and modelling. This will have the desired effect quickly, although the financial implications for residents should be seriously considered. This situation has greatly reduced the value of the properties and homeowners will need extra funding to help purchase a new home.

Disagree
The area is extremely dilapidated and should be made the subject of a compulsory purchase order then demolished. The entire design of having such a high volume road next to it is ridiculous
Air quality is a serious issue for residents of this street and those close by. No doubt the issue will worsen over the coming years before technology such as electric cars catch up. With new houses being built in Caerphilly Borough this issue will no doubt get worse. Traffic and congestion is an ongoing issue in the area and needs to be resolved.
No one should have to suffer those poor air conditions. I feel for the people living there. Surely the council could offer them alternate accommodation.
The houses are no longer habitable given the findings of the report. Doing the minimum should never be the default option when talking about someone's health. The Council should be leading and demonstrating that they care about the health of its residents. The Council should be issuing CPOs on all the owners and giving them appropriate compensation to find suitable comparable accommodation. All moving and legal feedback should also be covered. Alternatively, compensate the residents but allow them to keep their owns but p
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Do Minimum

Agree
I do not see the description "Do Minimum" but the "Do Maximum" does not meet the time required and has other limitations.
We agree with do nothing approach. See same reasons above. especially as the road will not be widened.
The residents are not the cause of the air quality problems but seem to be seen as a quick solution. Surely tackling the traffic emissions by taking the higher pollution vehicles off the roads & replacing with greener equivalents should be the priority of Government. This would see widespread benefits not just those living on this stretch of road but future generations.

Disagree
The area is extremely dilapidated and should be made the subject of a compulsory purchase order then demolished. The entire design of having such a high volume road next to it is ridiculous
Air quality is a serious issue for residents of this street and those close by. No doubt the issue will worsen over the coming years before technology such as electric cars catch up. With new houses being built in Caerphilly Borough this issue will no doubt get worse. Traffic and congestion is an ongoing issue in the area and needs to be resolved.
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Appendix C

PILOT STUDY QUESTIONNAIRE

Hafodyrynys Business Questionnaire

This report was generated on 11/02/19. Overall 21 respondents completed this questionnaire. The report has been filtered to show the responses for 'All Respondents'.

The following charts are restricted to the top 12 codes. Lists are restricted to the most recent 100 rows.

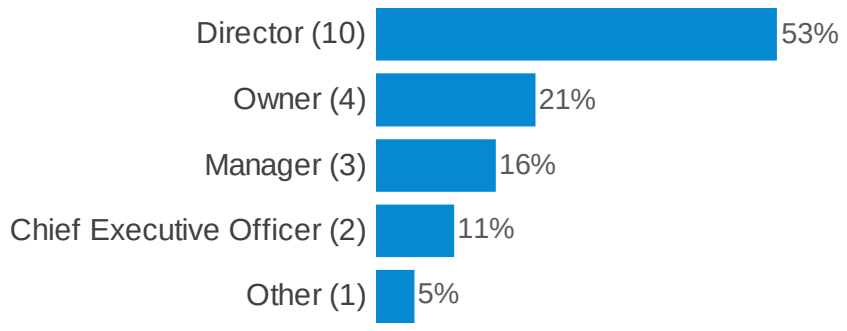
Business Name:

Businesses names have been removed from these questionnaire results.

What is the first half of your business postcode (e.g. CF1) ? We use this to better understand the responses to the consultation by looking at where people work.

NP11 3EH	NP12	NP11 3PL	NP11	NP12	NP11
NP12	NP11	CF82	NP11	NP13	NP11
NP12	NP11	NP12	NP11	np12	NP13
NP11	NP11				

Position within the business:



If other, please specify:

Assistant plant manager & Transport Manager
Env, H & S Co-Ordintaor

Hafodyrynys Business Questionnaire

Please can you confirm the following:

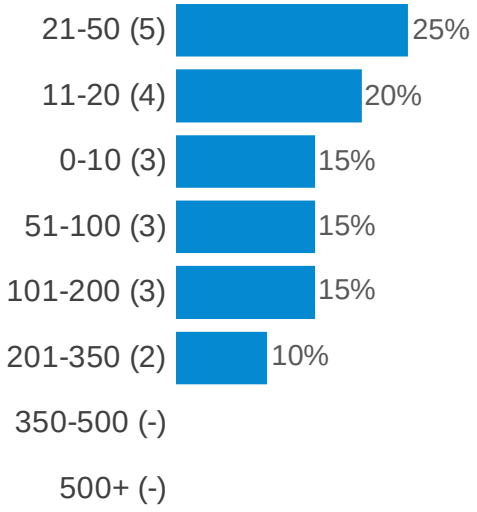
What type of organisation are you representing?

If other, please specify

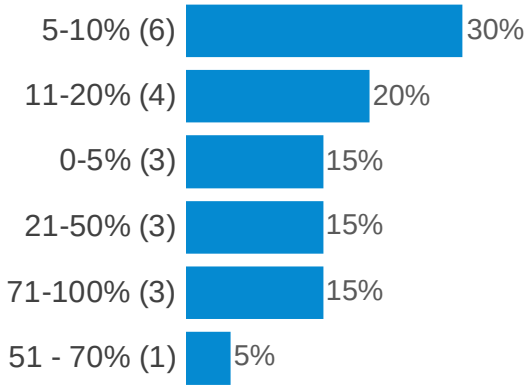
Laundry Facilty (Nuclear)
groundworks, demolition, aggregate recycling

Hafodyrynys Business Questionnaire

What is the total number of employees within your local branch?



Approximately what percentage of your workforce currently commutes to work via the A472 where the proposed Clean Air Zone (CAZ) would be located?



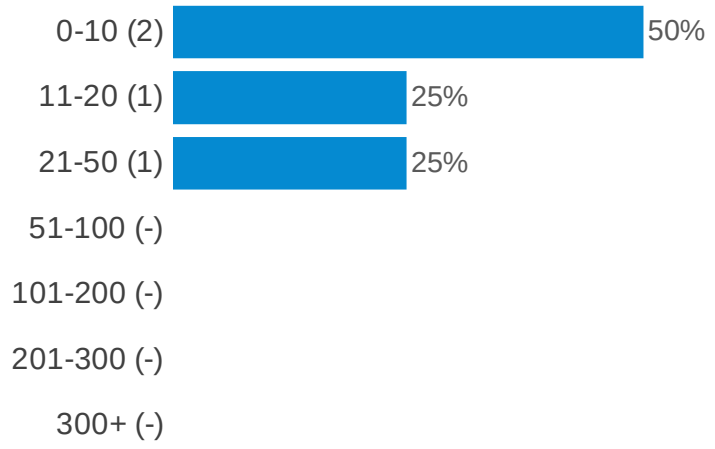
Does your business provide vehicles for staff i.e. pool cars/business vehicles?

If you have answered yes to Q8, please state how many business vehicles you have:

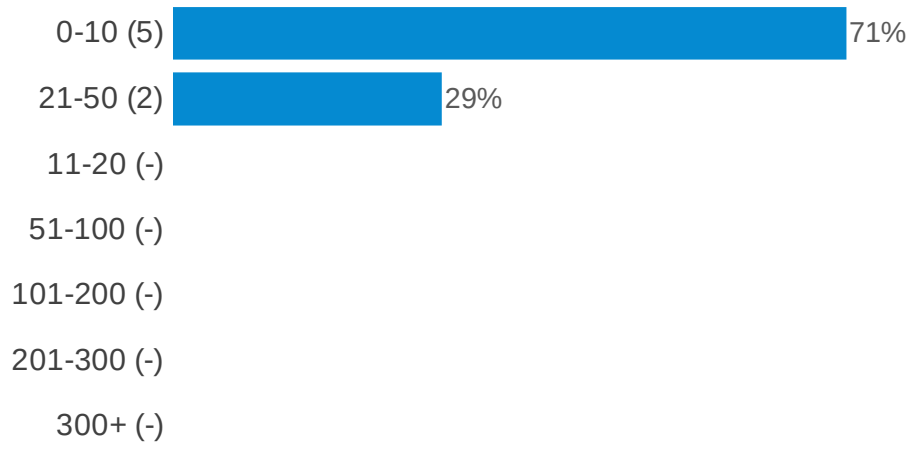
4	65
Three cars	1
8	1
35	

Hafodyrynys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (HGV)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Van)

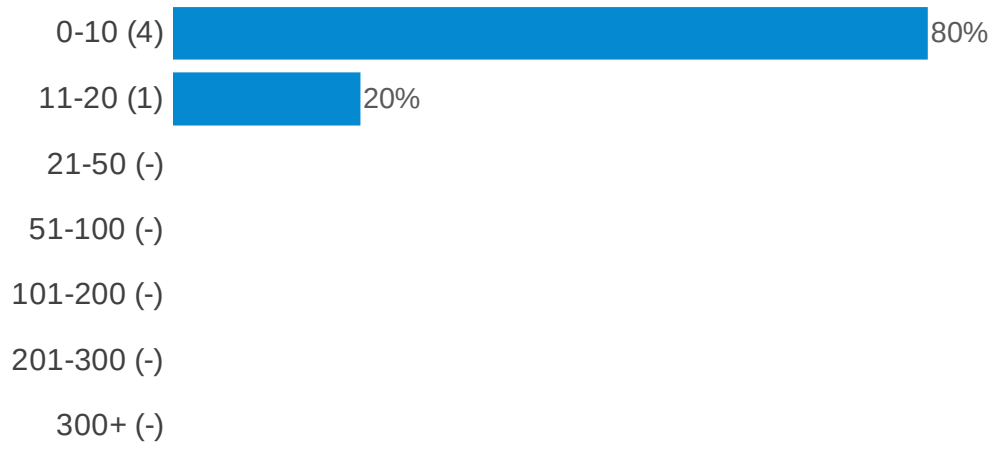


To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Coach)

Hafodyrynys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Bus)

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Car)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Motorcycle/Moped)

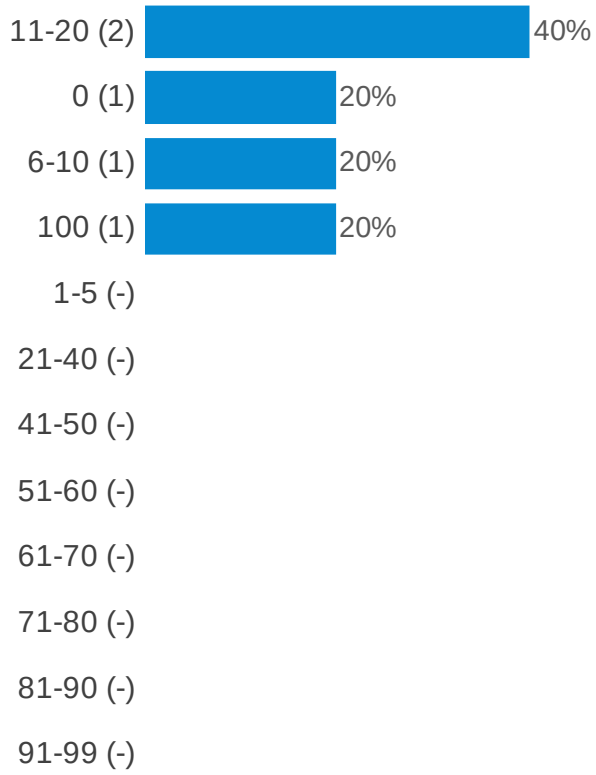
Hafodyrynys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Minibus)

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (LGV)

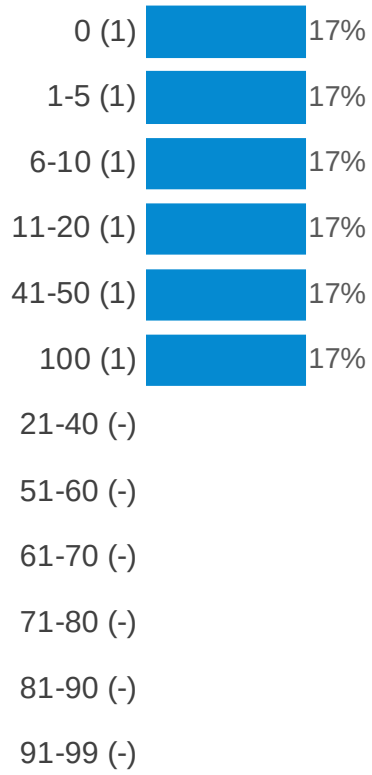
Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (HGV Euro 6 diesel)



Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Van Euro 4 Petrol/Euro 6 diesel)



Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Coach Euro 6 diesel)

Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Bus Euro 6 diesel)

Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Car Euro 4 petrol/Euro 6 diesel)

Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Motorcycle/Moped Euro 4 petrol/Euro 6 diesel)

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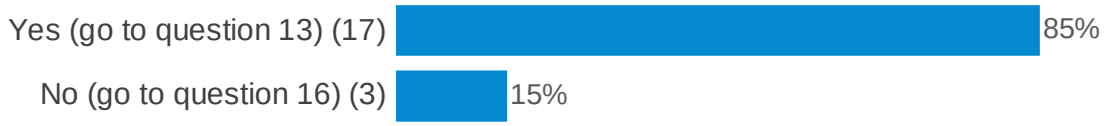
Hafodyrynys Business Questionnaire

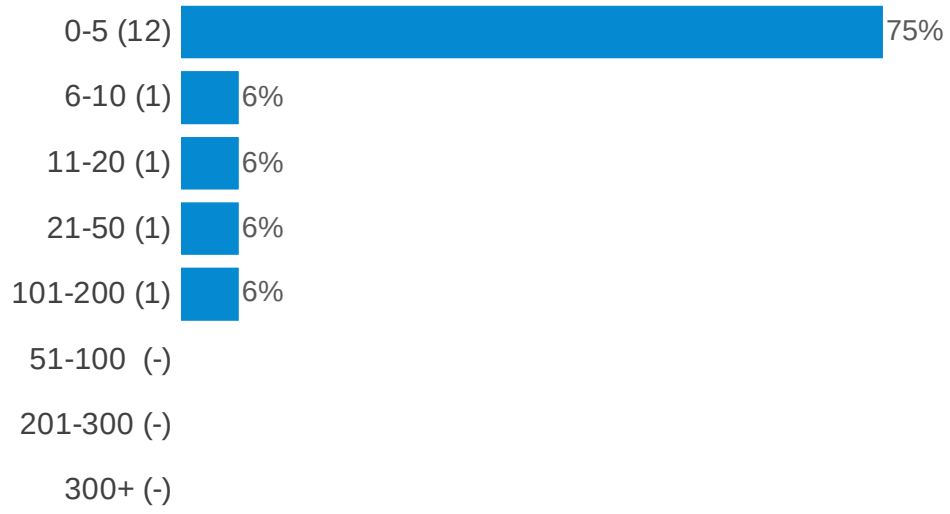
Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (LGV Euro 6 diesel)

Does your business deliver to customers (business and private) via the A472?

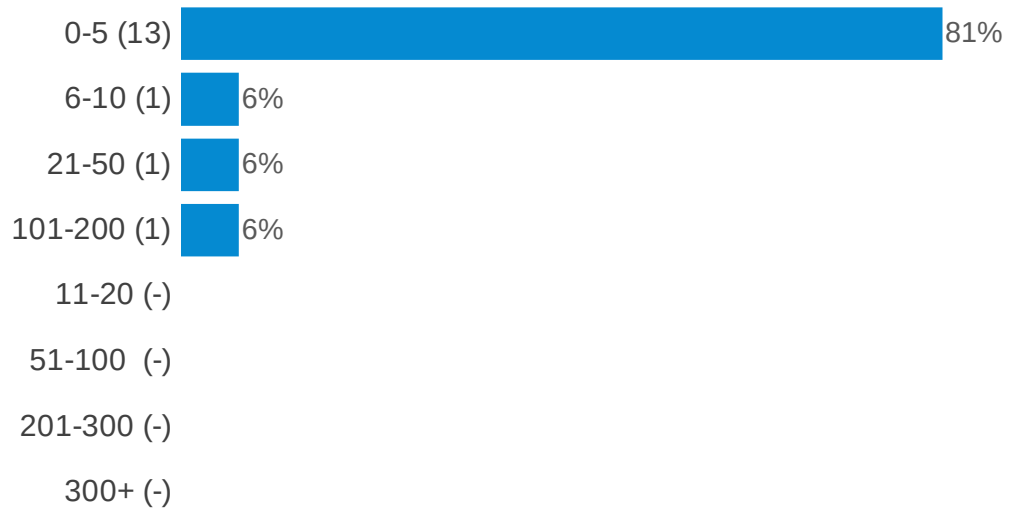


Hafodyrynys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Monday)

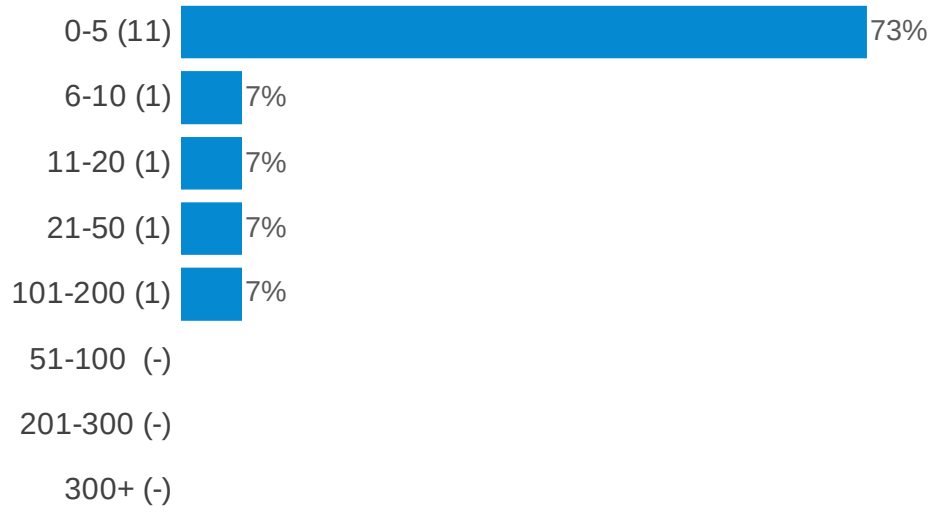


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Tuesday)

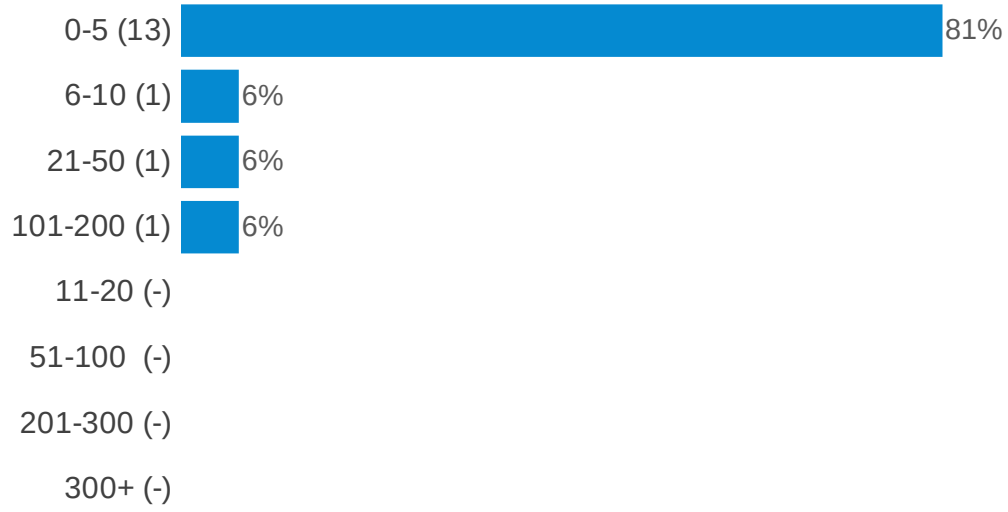


Hafodyrynys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Wednesday)

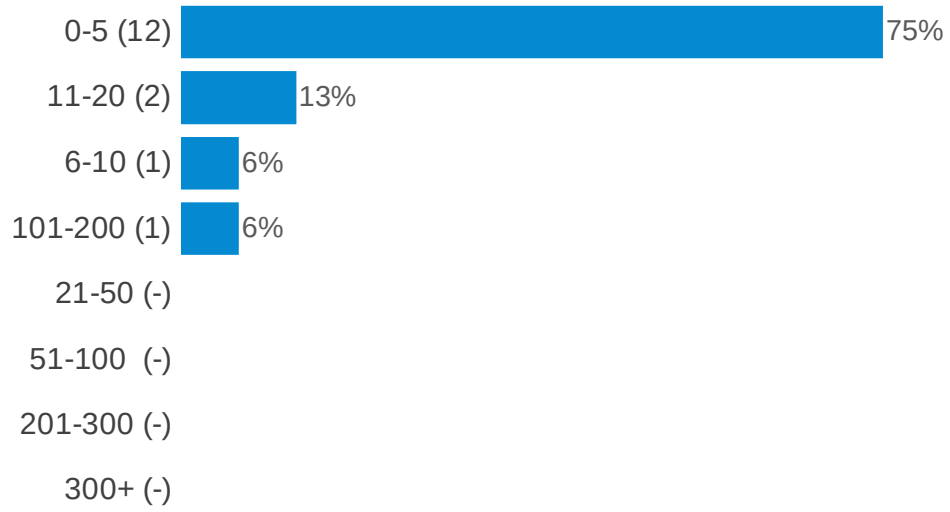


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Thursday)

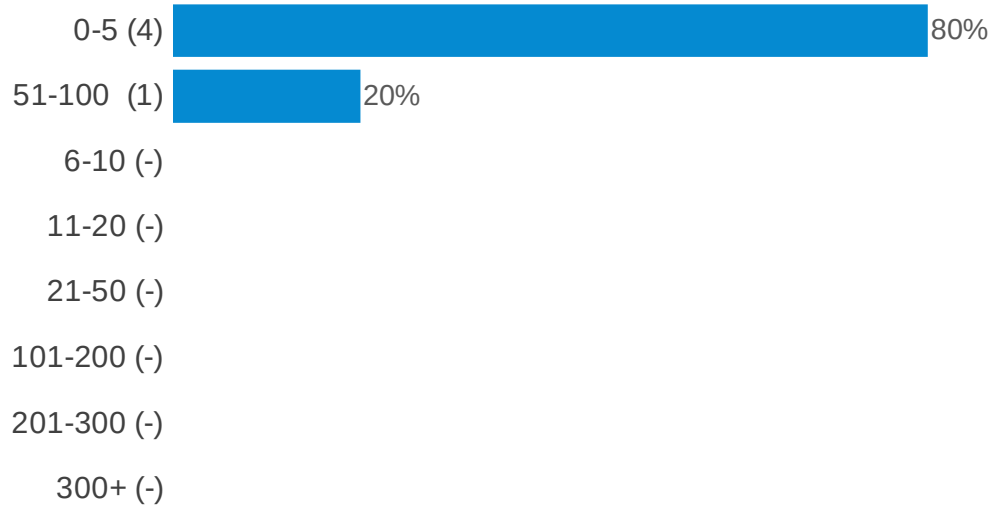


Hafodyrynys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Friday)

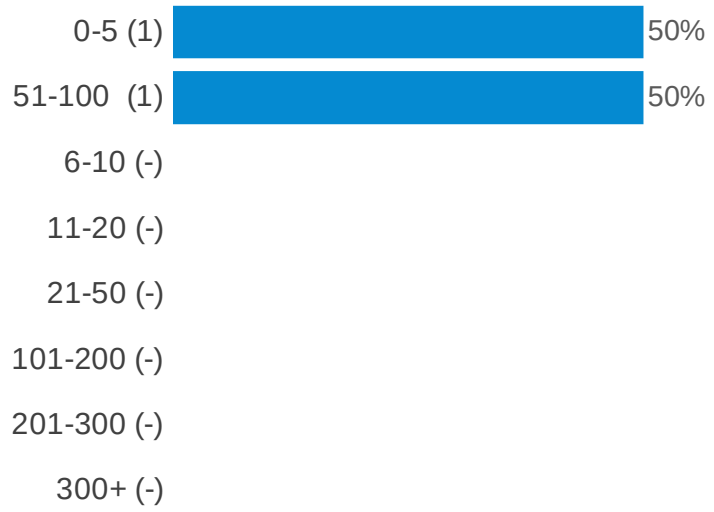


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Saturday)



Hafodyrynys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Sunday)



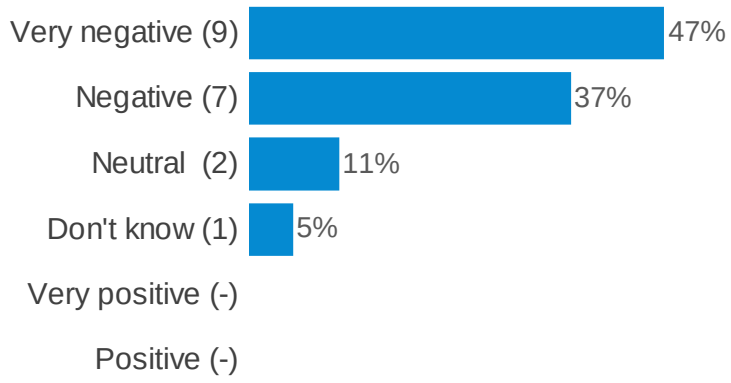
How many of the above deliveries would take place during the morning peak traffic times (between 07:00 and 10:00) ?

3 - 5
2
0
2
Variable Not quantifiable
Somewhere in the region of 150 deliveries across 5 vehicles
2
10%
1-2
20%
NONE
22
3
2
Typically this would be "0" as most of our bookings are in the afternoon.
zero

How many of the above deliveries would take place during the evening peak traffic times (between 16:00 and 19:00)?

10 - 15
1
0
2
Variable , not quantifiable
5 Vehicles carrying an estimate of 30 deliveries
0
10%
0
20%
50 %
2
0
0
Collections are usually booked for the afternoon around midday - 1pm. Guess it may be 0-1 per day.
50%

What impact do you feel restricting access to vehicles along the A472 would have on your business?



A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (HGVs £100)

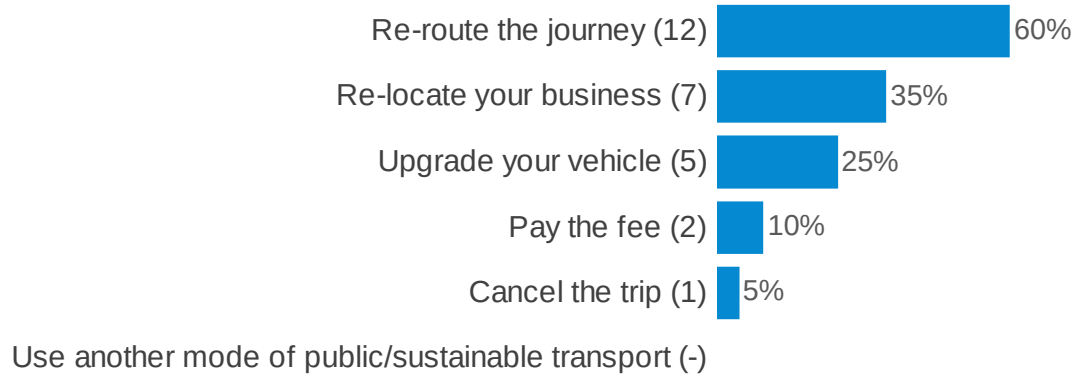
A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Buses £100)

A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Coaches £100)

A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Taxis £12.50)

A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Private vehicles £12.50)

If there was a daily charge at the above rates, how would you be most likely to respond?

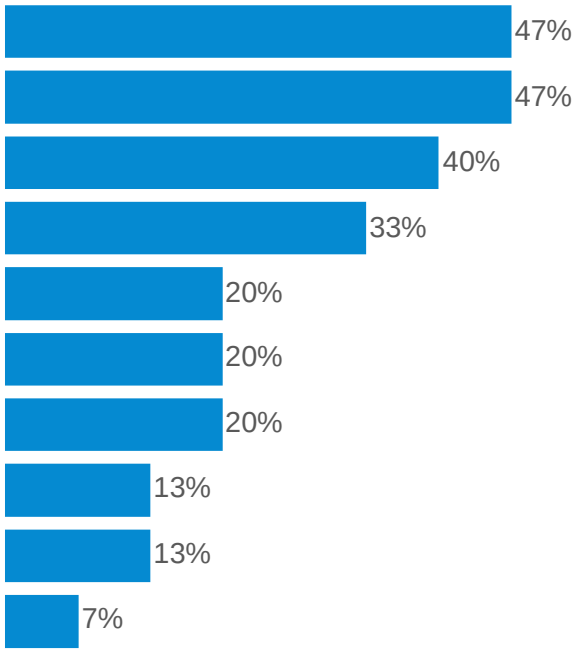


Do you feel your suppliers and/or customers will be affected by potential vehicle access restrictions on the A472?

If you answered yes to question 19, please indicate why you think that this is the case in the space provided below:

Delays to delivery schedules and cancellation of work (due to the increased impact on drivers hours)
Any additional costs incurred would need to be passed on.
Increased journey length / time
Critical shipments and turnaround times to nuclear power station sites across UK.
Deliveries and couriers will travel their own routes and any charges will impact on pricing all ways
This road is used as our main access to the M4 and M50, Raw materials are delivered daily
Any costs put onto our suppliers will eventually make its way to us.
Our customers have many options of who to buy from Cost is critical in our business.
IT WOULD MAKE MY BUSINESS LESS ACCESSIBLE TO BOTH CUSTOMERS AND SUPPLIERS
Potential delays in receiving their deliveries/collections
Additional costs and delivery schedules
Delay of goods and or epensive to travel here
costs would passed on to the customer; they might go elsewhere - detrimental to the business
their company would be less productive
Would affect companies delivering products which are seeking approval from us
Increased charges to business from suppliers/couriers.
We would have to relocate outside as this would push our prices up which would cripple our business

What steps (if any) has your business already taken to reduce air pollution? (tick all that apply)



If other, please specify

All of our HGVs are post 2014 build, so are fitted with Adblue NOx reduction equipment.
None apply
Vehicle renewal plans in place which replaces older vehicles with new.
We are a welsh government gold Corporate Health Standard Company and have ISO 14001 also cycle to wo

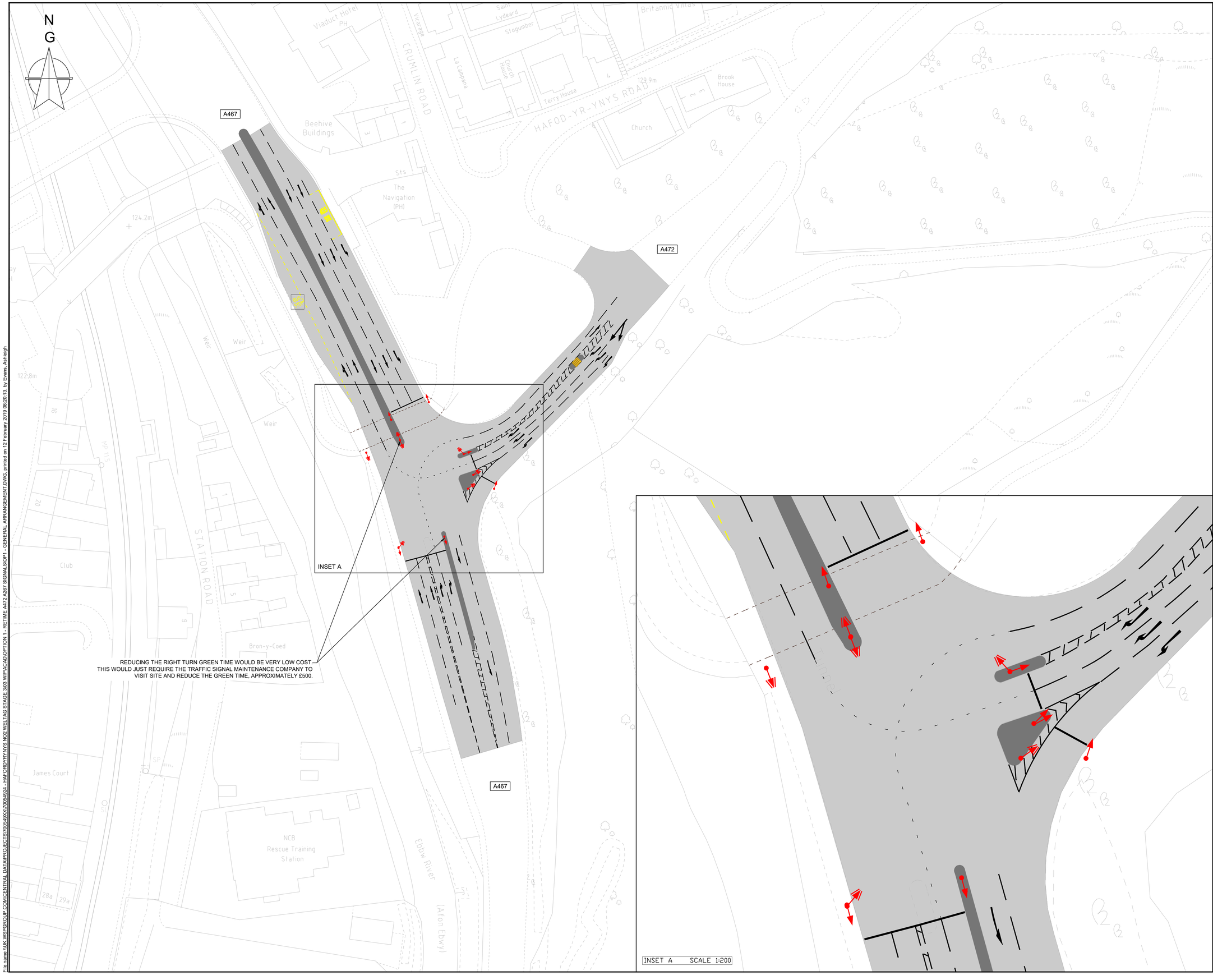
Do you have any further comments or suggestions relating to the improvement of air quality along the A472 and what it means for your business?

Restricting traffic or imposing a chargeable clean air zone will only move this problem South.
No, not my area of expertise
Demolition of the properties on south side of the A472 as only long term feasible solution .
we supply the whole bereavement services U.K. wide.Only other, road infrastructure improved to m4
We're committed to replacing the fleet in line to a minimum of euro 6 compliance.
Access should be improved not restricted, S.wales is already disadvantaged by infrastructure.
DUEL CARRAGE WAY FOR THE WHOLE A472 FROM CRUMLIN TO PONTYPOOL.
NONE
The Residents should be relocated, then action plan to demolish in due course.
For the residents it would be better if the houses were demolished, it is clearly affecting them.
I've tried to put comment in this field but not enough room!
I am very sympathetic to the residents, something must be done to improve air quality
The effect on local business could be dramatic with extra charges on services. Employees re-routing
All options currently proposed will make Caerphilly and Blaenau Gwent unattractive to business

I confirm that I wish to submit the information entered into this form to Caerphilly County Borough Council. I understand that this information to be collated via Snap Surveys, a third party organisation (https://www.snapsurveys.com/survey-software/privacy-policy-uk/) and for it to be used as described in Caerphilly County Borough Council's privacy notice (https://www.caerphilly.gov.uk/CaerphillyDocs/FOI/PrivacyNotices/Privacy-Notice-Consultations-Surveys.aspx).

Appendix D

OPTION DRAWINGS



NOTES

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6. CONTRACTOR TO ESTABLISH ALL UTILITY AND DRAINAGE LOCATIONS AND COORDINATE SAFE WORKING PROCEDURES BEFORE ANY EXCAVATION WORKS TAKE PLACE.
7. THE WORKS SHALL BE PROGRAMMED TO ENSURE A CLEAR FOOTWAY IS AVAILABLE FOR PEDESTRIANS THROUGHOUT THE WORKS.
8. DIAGRAM NUMBERS TO TSRGD REFER TO THOSE SET OUT IN THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016.
9. ALL ROAD MARKINGS ARE TO BE WHITE THERMOPLASTIC SCREED UNLESS STATED OTHERWISE.
10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

KEY

PRIMARY SIGNAL HEAD

SECONDARY SIGNAL HEAD

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

wsp
1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
T+ 44 (0) 292 076 9200
wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

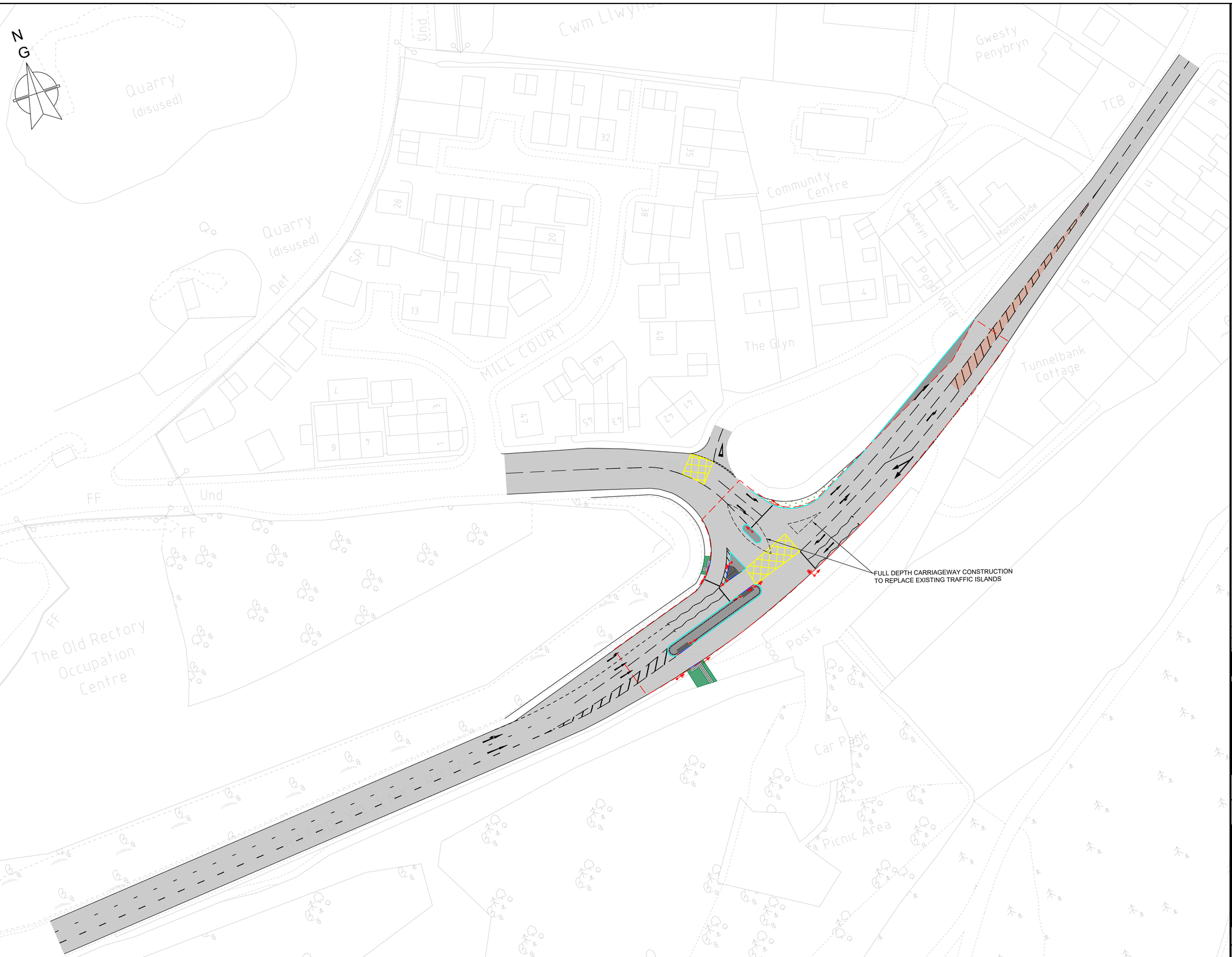
ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: OPTION 1 - RETIMING OF A472/A467 SIGNALISED JUNCTION GENERAL ARRANGEMENT

SCALE @ A1:	CHECKED:		APPROVED:
1:500	RM		DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AE	AE	February 19

DRAWING No: 70054924-OP1-100 REV: P01



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KEY

- PRIMARY SIGNAL HEAD (8 no.)
- SECONDARY SIGNAL HEAD (5 no.)
- PEDESTRIAN GUARDRAIL (57 Lin.m)
- 400mm x 400mm RED BLISTER TACTILE PAVING FOR CONTROLLED CROSSING POINTS
- DROPPED KERBS (21.6m 24 units)
- RIGHT TRANSITION KERB (5.4 Lin.m 6 units)
- LEFT TRANSITION KERB (5.4 Lin.m 6 units)
- HB2 KERB (172.5 Lin.m)
- EXISTING CARRIAGEWAY RESURFACING EXTENTS (2350m²)
- RE-SURFACING 'FLEXIBLE FOOTWAY CONSTRUCTION: (41m2)
  SURFACE COURSE: 20mm THICK, 6mm NOMINAL SIZE TO BSEN13108:PART 1: CLAUSE 7.6 WITH 160/220 PEN ASPHALT CONCRETE BINDER AND IN ACCORDANCE WITH CLAUSE 912 OF THE SPECIFICATION FOR HIGHWAY WORKS 1998, AS AMENDED.
- 500mm OF TOPSOIL AND GRASS SEEDING (78.7m²)
- EXISTING CARRIAGEWAY
- PROPOSED FULL CARRIAGEWAY CONSTRUCTION (56.5m²)

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: OPTION 2 - SIGNALISATION OF A472/B4471
PRIORITY T- JUNCTION
GENERAL ARRANGEMENT

SCALE @ A1:	CHECKED:		APPROVED:
1:500	RM		DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AE	AE	February 19

DRAWING No: 70054924-OP2-100 REV: P01

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70054924XX\70054924 - HAFODYRYNYS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 2 - SIGNALISATION OF A472 B4471\OP2 - GENERAL ARRANGEMENT A.DWG, printed on 12 February 2019 08:20:57, by Evans, Ashleigh

NOTES

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10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

KEY

FULL 'FLEXIBLE' FOOTWAY CONSTRUCTION; (634m²)
SURFACE COURSE: 20mm THICK, 6mm NOMINAL SIZE TO BSEN13108:PART 1: CLAUSE 7.6 WITH 160/220 PEN ASPHALT CONCRETE BINDER AND IN ACCORDANCE WITH CLAUSE 912 OF THE SPECIFICATION FOR HIGHWAY WORKS 1998, AS AMENDED.

BINDER COURSE: 50mm THICK, 20mm NOMINAL SIZE ASPHALT CONCRETE

SUB-BASE: 150mm GRANULAR SUB-BASE

EXISTING RETAINING WALL STRUCTURE

EXISTING PROPERTIES TO BE DEMOLISHED

EXISTING PROPERTIES TO REMAIN

500mm OF TOPSOIL , GRASS SEEDING & PLANTING

EDGING KERB

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	xxx	xxx

DRAWING STATUS: S2 - FOR INFORMATION

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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

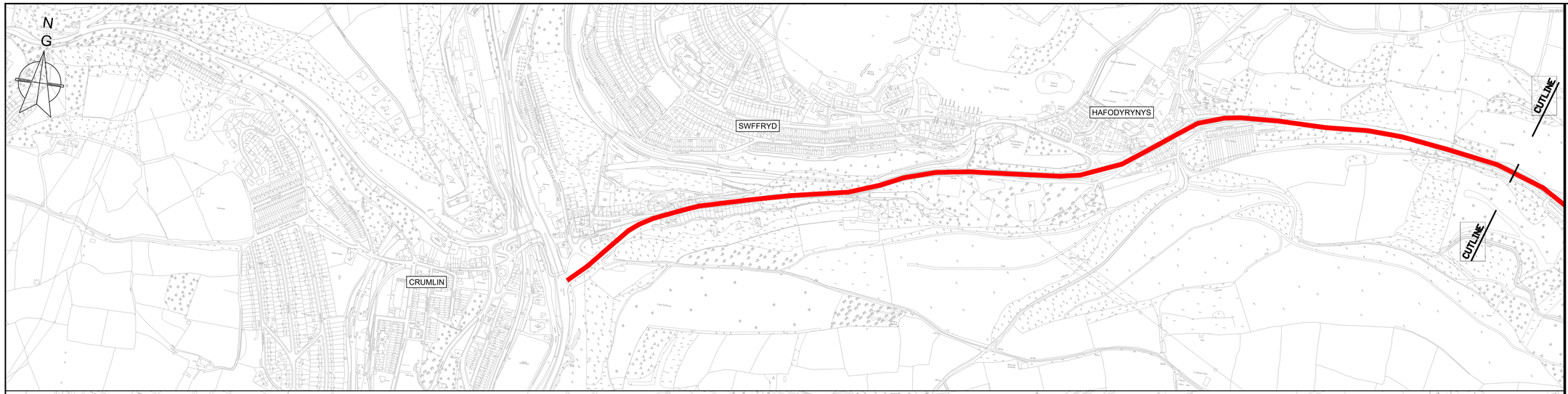
TITLE: Option 3 - Demolition of Dwellings at Woodside Terrace

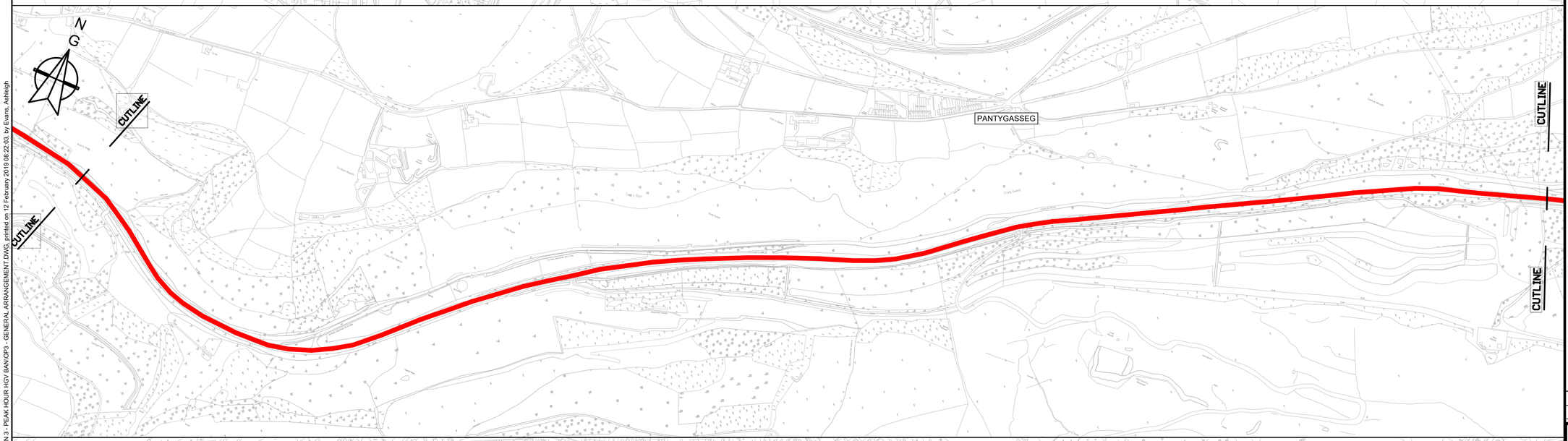
SCALE @ A1:	CHECKED:	APPROVED:
1:500	RM	DM

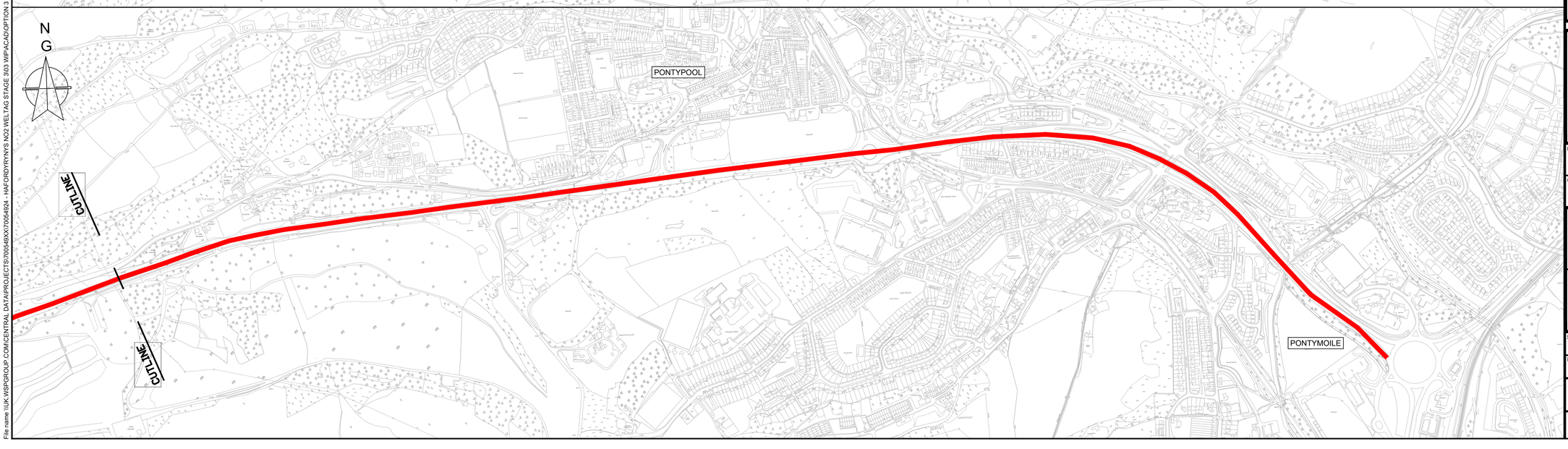
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	GS	GS	February 19

DRAWING No: 70054924- REV: P01

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70054924\70054924 - HAFODRYRYNYS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 5 - DEMOLITION OF A472 PROPERTIES\OP5 - GENERAL ARRANGEMENT E (6.5M SETBACK FOOTPATH).DWG, printed on 19 February 2019 11:36:24, by Smith, Geraint







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KEY

PEAK HOUR HGV BAN ZONE

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS:
S2 - FOR INFORMATION

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wsp.com

CLIENT:
CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

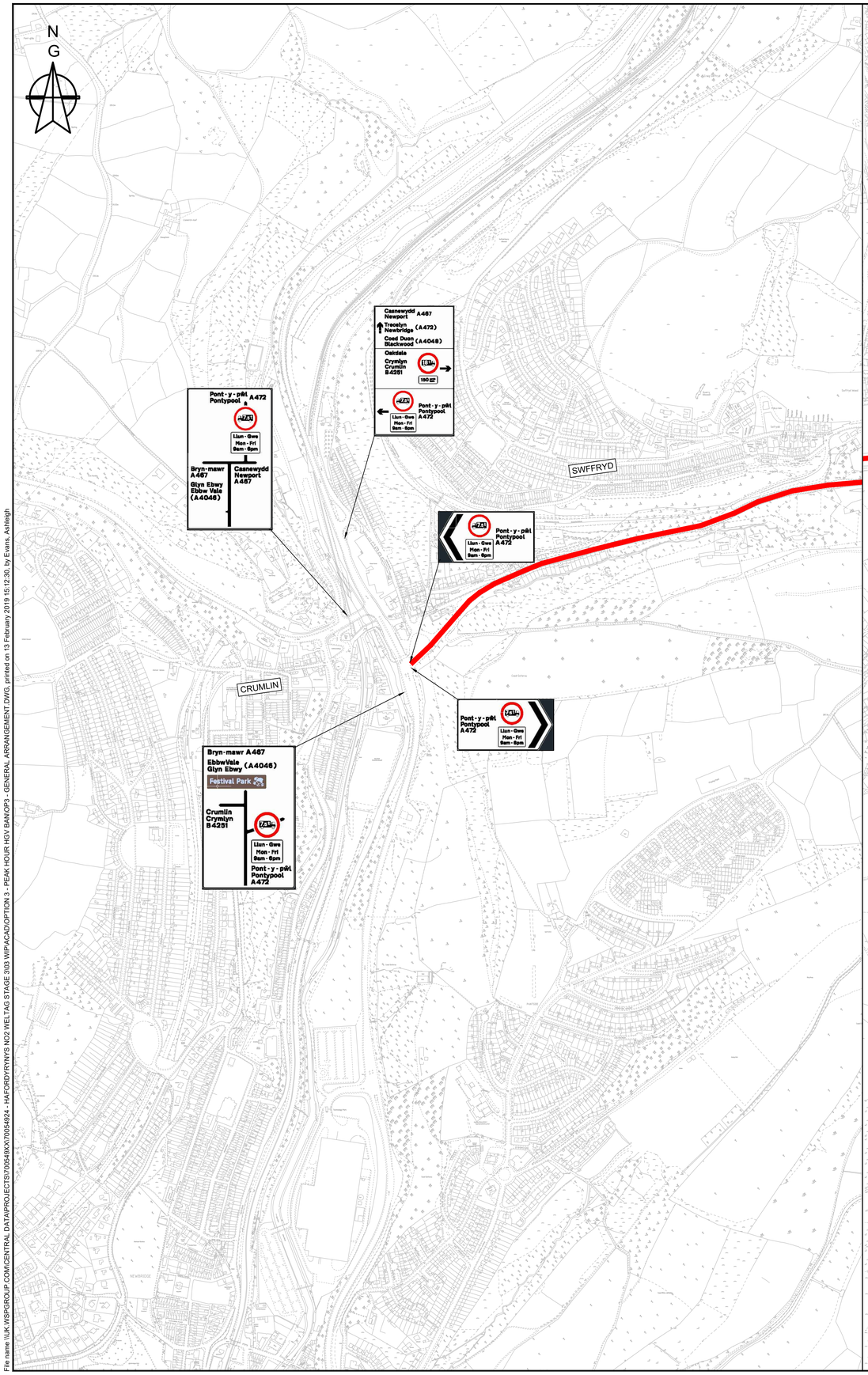
SITE/PROJECT:
HAFODYRYNYS , CAERPHILLY

TITLE:
Option 4 PEAK HOUR HGV BAN
GENERAL ARRANGEMENT
SHEET 1

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	RM		DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AE	AE	February 19

DRAWING No: 70054924-OP3-100-1
REV: P01

File name \\UK-WSPGROUP.COM\CENTRAL DATA\PROJECTS\70054924XX\70054924 - HAFODYRYNYS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 3 - PEAK HOUR HGV BAN\OP3 - GENERAL ARRANGEMENT.DWG, printed on 12 February 2019 08:22:03, by Evans, Ashleigh



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KEY

PEAK HOUR HGV BAN ZONE

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: Option 4 - PEAK PERIOD HGV BAN
GENERAL ARRANGEMENT
SHEET 2

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	RM		DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AE	AE	February 19

DRAWING No: 70054924-OP3-100-2 REV: P01

File name:\\UK WSPGROUP.COM\CENTRAL DATA\PROJECTS\70054924XX\70054924 - HAFODYRYNYS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 3 - PEAK HOUR HGV BAN\OP3 - GENERAL ARRANGEMENT.DWG, printed on 13 February 2019 15:12:30, by Evans, Ashleigh

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5. ALL WORKS ARE TO BE IN ACCORDANCE WITH CAERPHILLY COUNTY BOROUGH COUNCIL SPECIFICATIONS AND STANDARDS.
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7. THE WORKS SHALL BE PROGRAMMED TO ENSURE A CLEAR FOOTWAY IS AVAILABLE FOR PEDESTRIANS THROUGHOUT THE WORKS.
8. DIAGRAM NUMBERS TO TSRGD REFER TO THOSE SET OUT IN THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016.
9. ALL ROAD MARKINGS ARE TO BE WHITE THERMOPLASTIC SCREED UNLESS STATED OTHERWISE.
10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

KEY

AREA OF CLEAN AIR ZONE IMPLEMENTATION

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS:
S2 - FOR INFORMATION

wsp
1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
T+ 44 (0) 292 076 9200
wsp.com

CLIENT:
CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT:
HAFODYRYNYS , CAERPHILLY

TITLE:
Option 5 - CLEAN AIR ZONE IMPLEMENTATION GENERAL ARRANGEMENT

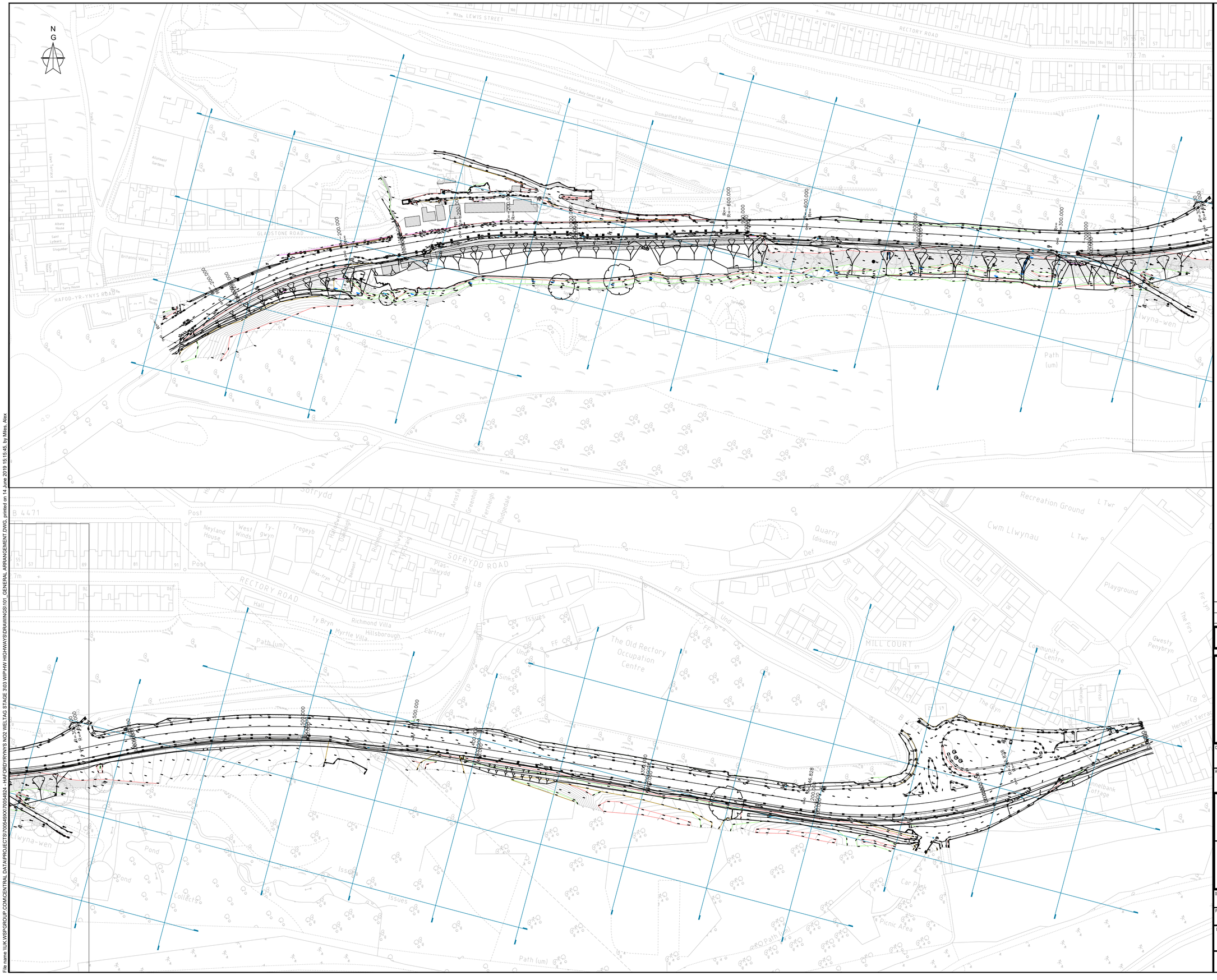
SCALE @ A1:	CHECKED:		APPROVED:
1:5000	RM		DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AE	AE	February 19

DRAWING No: 70054924-OP4-100
REV: P01

File name:\\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70054924XX\70054924 - HAFODYRYNYS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 4 - CLEAN AIR ZONE\OP4 - GENERAL ARRANGEMENT.DWG, printed on 13 February 2019 08:17:03, by Evans, Ashleigh

Appendix E

PRELIMINARY DESIGN DRAWINGS - PREFERRED OPTION



NOTES

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KEY

PRIMARY SIGNAL HEAD

SECONDARY SIGNAL HEAD

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

wsp
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T+ 44 (0) 292 076 9200
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CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

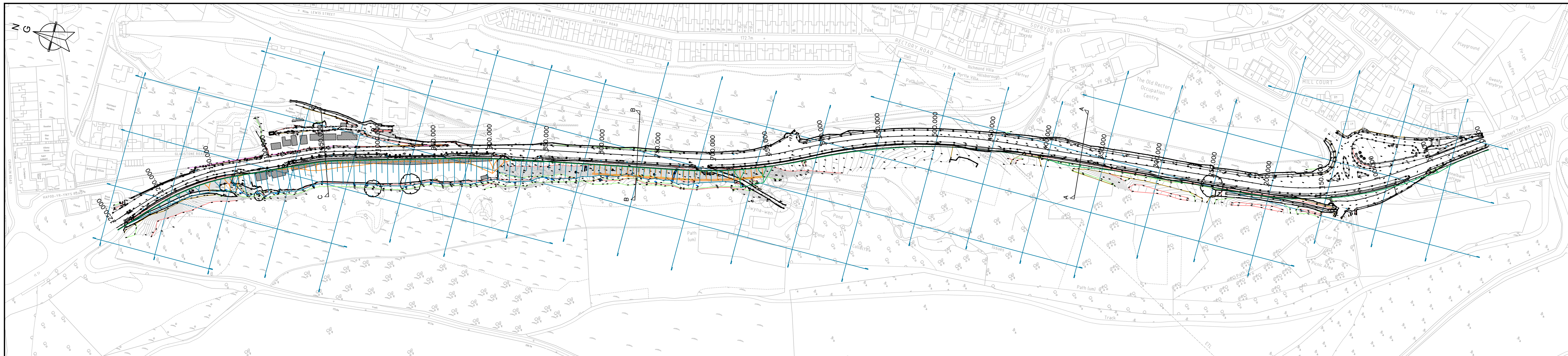
ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: ###

SCALE @ A1:	CHECKED:		APPROVED:
1:1000			DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AM	AM	May 19

DRAWING No: 70054924-OP1-100 REV: P01



PLAN
SCALE - 1:2000

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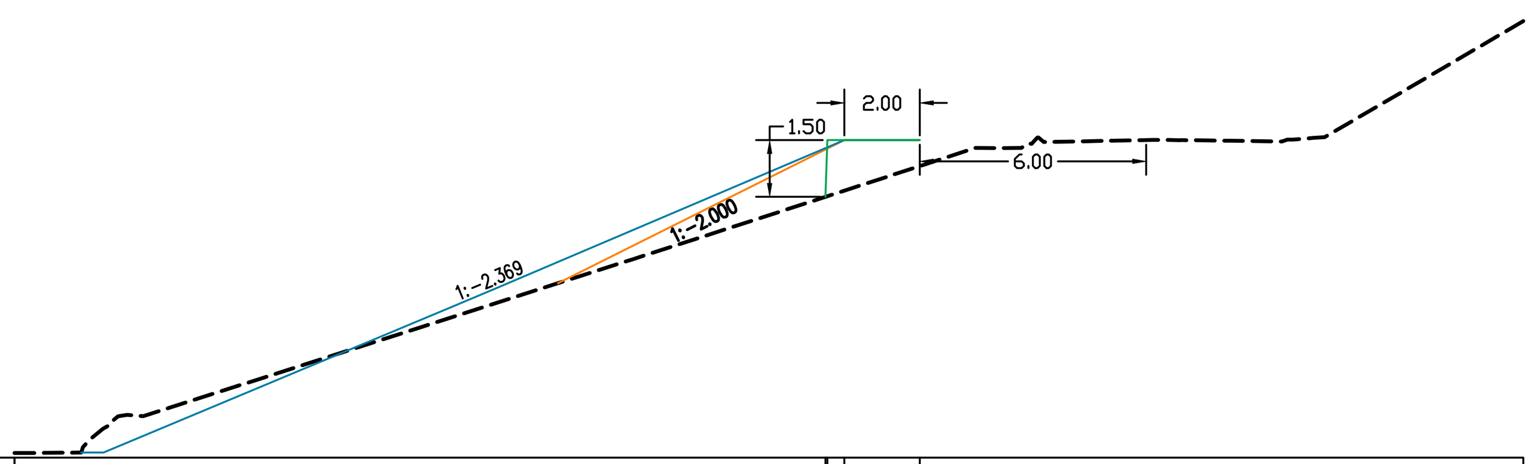
KEY

PRIMARY SIGNAL HEAD

SECONDARY SIGNAL HEAD



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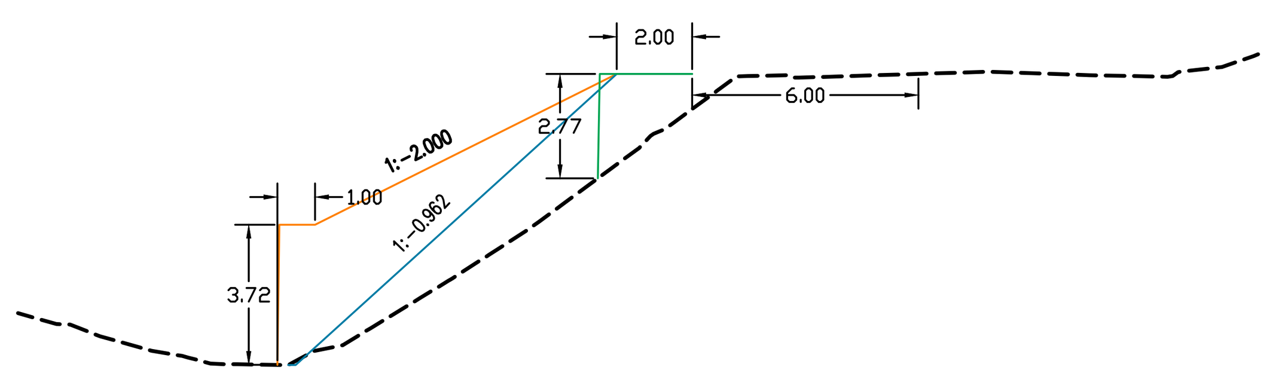
Wall Option	146.917, 148.422, 148.422
Variable Slope Option	140.135, 140.134, 140.134, 144.003, 144.527, 148.422, 148.422
Wall and Slope Option	144.625, 148.422, 148.422
Existing Ground LEVELS	140.121, 140.121, 140.135, 140.765, 141.134, 141.099, 145.255, 146.408, 148.213, 148.209, 148.309, 148.370, 148.425, 148.416, 148.420, 148.405, 148.384, 148.433, 148.499, 151.577

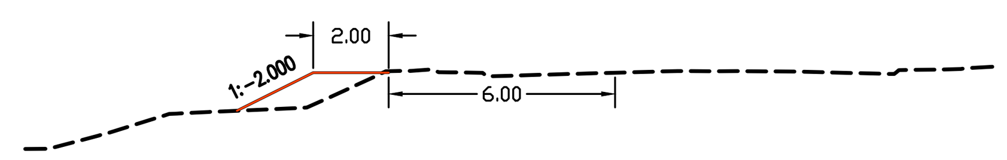
SECTION C–C



Level Datum =160.000

Wall Option	165.691, 168.461, 168.461
Variable Slope Option	160.737, 160.737, 163.929, 165.268, 168.461, 168.461
Wall and Slope Option	160.742, 164.461, 164.461, 168.461, 168.461
Existing Ground LEVELS	162.114, 162.000, 161.811, 161.500, 161.117, 161.000, 160.876, 160.757, 160.760, 160.737, 161.000, 161.111, 161.415, 161.717, 162.000, 162.500, 162.984, 163.038, 163.663, 164.000, 164.500, 165.000, 165.500, 166.000, 166.500, 167.000, 167.500, 168.000, 168.404, 168.427, 168.363, 168.377, 168.518, 168.426, 168.386, 168.565, 168.642, 168.641, 168.983

SECTION B–B



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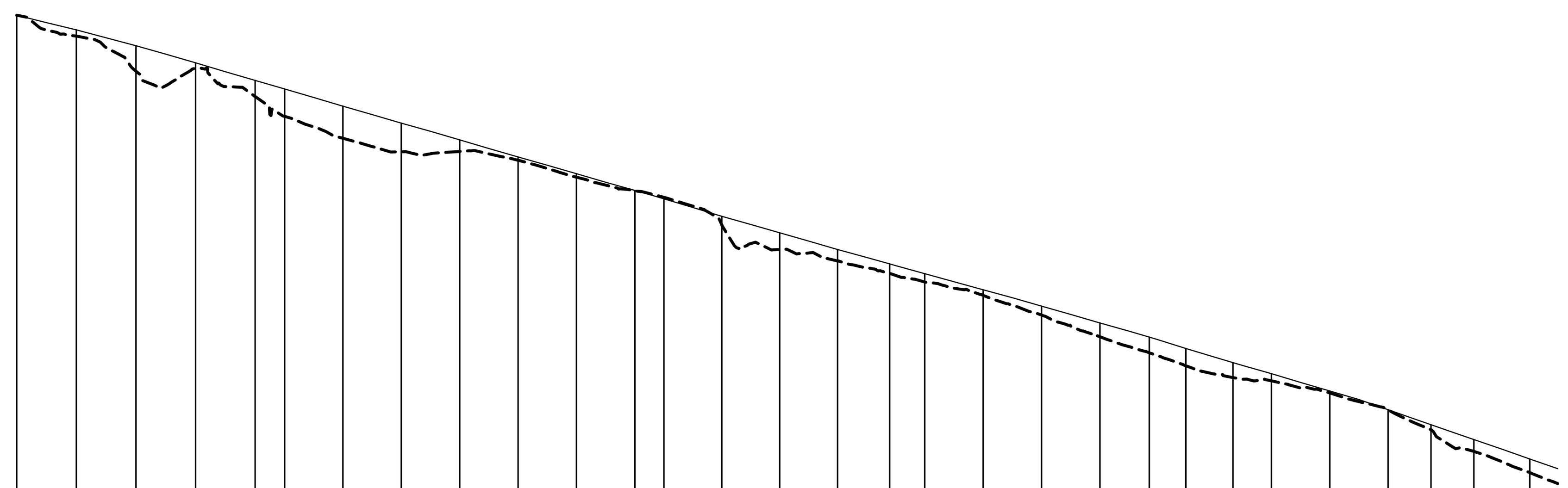
Wall Option	196.635, 197.645, 197.645
Variable Slope Option	196.635, 197.645, 197.645
Wall and Slope Option	196.635, 197.645, 197.645
Existing Ground LEVELS	195.620, 195.637, 195.978, 196.046, 196.207, 196.500, 196.560, 196.601, 196.718, 197.000, 197.277, 197.684, 197.693, 197.658, 197.655, 197.642, 197.547, 197.615, 197.690, 197.685, 197.688, 197.673, 197.610, 197.715, 197.727, 197.765, 197.803

SECTION A –A

CROSS SECTIONS
SCALE - 1:200



Level Datum =136.000

DESIGN LEVELS	176.984, 175.722, 174.369, 172.906, 171.397, 170.667, 169.185, 167.736, 166.302, 164.829, 163.396, 161.963, 161.244, 159.747, 158.331, 156.905, 155.665, 154.833, 153.453, 152.044, 150.609, 149.395, 148.422, 147.207, 146.259, 144.771, 143.172, 141.890, 140.618, 138.948
EXISTING LEVELS	176.000, 175.500, 175.197, 174.945, 174.209, 173.500, 172.000, 171.000, 171.114, 172.233, 172.362, 171.000, 170.833, 170.151, 169.149, 168.352, 167.846, 167.411, 166.645, 166.433, 165.728, 165.280, 164.969, 165.151, 165.305, 165.380, 165.100, 164.751, 164.355, 164.000, 163.555, 163.176, 162.820, 162.500, 162.163, 162.000, 161.692, 161.293, 161.000, 160.467, 159.803, 158.000, 157.120, 157.531, 156.914, 156.547, 156.649, 155.964, 155.643, 155.379, 155.069, 154.681, 154.371, 154.070, 153.905, 153.587, 153.352, 152.754, 152.024, 151.244, 150.698, 150.414, 149.859, 149.186, 148.747, 148.366, 147.750, 147.365, 146.933, 146.543, 146.176, 145.874, 145.669, 145.766, 145.344, 145.091, 144.678, 144.303, 143.862, 143.584, 143.152, 141.941, 140.500, 139.915, 139.464, 138.668, 138.000, 137.500, 136.845
LEVEL DIFFERENCE	0.001, 0.638, 0.531, 0.837, 2.186, 2.710, 0.474, 1.273, 1.390, 1.716, 2.354, 2.514, 2.751, 2.732, 2.456, 1.918, 0.997, 0.454, 0.280, 0.274, 0.297, 0.249, 0.034, -0.091, -0.130, -0.125, 0.743, 1.632, 1.424, 1.019, 0.981, 0.869, 0.815, 0.843, 0.715, 0.557, 0.483, 0.646, 0.761, 1.005, 1.185, 1.317, 1.346, 1.386, 1.488, 1.453, 1.186, 0.614, 0.418, 0.161, 0.176, 0.021, 0.350, 0.450, 1.078, 1.012, 1.077, 1.163, 1.274
DISTANCE	20.422, 40.844, 61.266, 81.688, 91.755, 111.755, 131.755, 151.755, 171.755, 191.755, 211.755, 221.713, 241.544, 261.375, 281.206, 299.027, 311.054, 331.054, 351.054, 371.054, 387.988, 400.502, 416.628, 429.790, 449.790, 469.790, 484.458, 499.141, 518.294

Horizontal Scale = 1:2000, Vertical Scale = 1:500

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

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T+ 44 (0) 292 076 9200
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CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

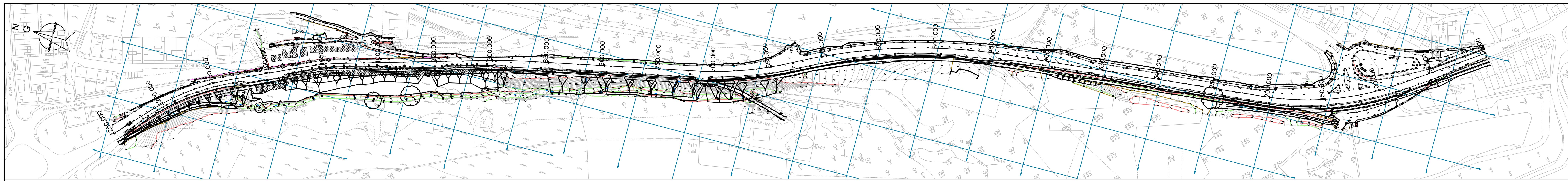
SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

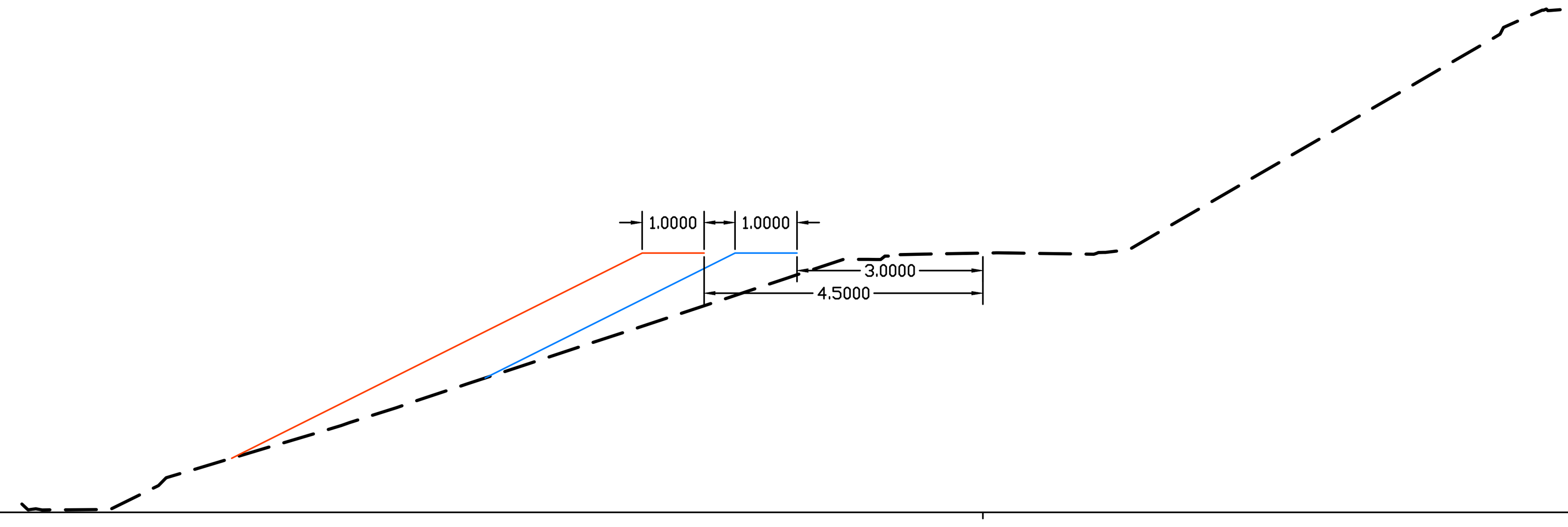
TITLE: ###

SCALE @ A1:	CHECKED:		APPROVED:
1:1000			DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AM	AM	June 19

DRAWING No: 70054924-OP1-100 | REV: P01

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\700549XX\70054924 - HAFORDYRYNYS NO2 WELTAG STAGE 3\03 WIP\HW HIGHWAYS\DRAWINGS\102_CROSS SECTIONS_RECOVER.DWG, printed on 14 June 2019 15:17:29, by Miles, Alex

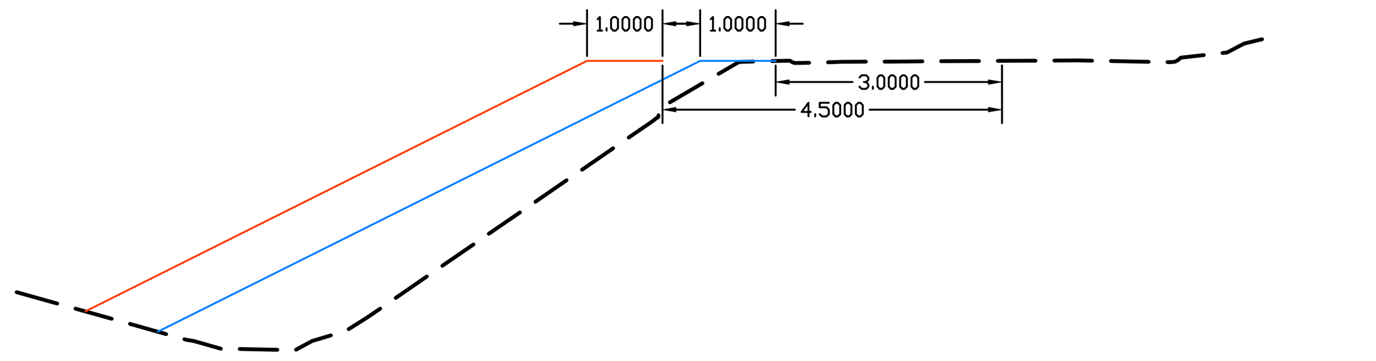




Level Datum =140.000

Temporary LEVELS	148.371
General LEVELS	144.337, 148.371, 148.371
General OFFSET	−16.069, −8.000, −6.000
Design LEVELS	141.747, 148.371, 148.371
Design OFFSET	−24.248, −11.000, −9.000
Existing Ground LEVELS	140.266, 140.113, 140.077, 140.093, 140.861, 141.115, 142.585, 142.805, 142.897, 143.380, 143.527, 144.151, 144.373, 146.670, 147.561, 148.169, 148.166, 148.269, 148.320, 148.368, 148.379, 148.333, 148.390, 148.498, 155.436, 155.653, 156.215, 156.243

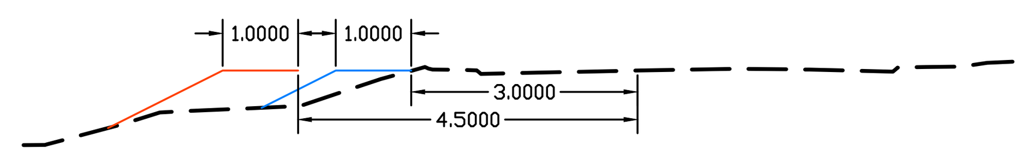
Chainage = 1050.000



Level Datum =160.000

Temporary LEVELS	168.369
General LEVELS	161.181, 168.369, 168.369
General OFFSET	−22.376, −8.000, −6.000
Design LEVELS	161.721, 168.369, 168.369
Design OFFSET	−24.296, −11.000, −9.000
Existing Ground LEVELS	162.233, 160.965, 160.934, 160.723, 160.725, 160.695, 160.936, 161.211, 161.552, 166.729, 167.113, 168.340, 168.361, 168.313, 168.312, 168.341, 168.382, 168.333, 168.452, 168.523, 168.591, 168.828, 168.941

Chainage = 770.000



Level Datum =195.000

Temporary LEVELS	197.574
General LEVELS	196.591, 197.574, 197.574
General OFFSET	−9.967, −8.000, −6.000
Design LEVELS	196.055, 197.574, 197.574
Design OFFSET	−14.038, −11.000, −9.000
Existing Ground LEVELS	195.603, 195.623, 196.154, 196.468, 196.490, 196.636, 197.351, 197.666, 197.593, 197.525, 197.486, 197.566, 197.621, 197.601, 197.545, 197.652, 197.670, 197.676, 197.777, 197.807

Chainage = 370.000

NOTES

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KEY

PRIMARY SIGNAL HEAD

SECONDARY SIGNAL HEAD

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: ###

SCALE @ A1: 1:1000	CHECKED:		APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AM	DRAWN: AM	DATE: May 19
DRAWING No: 70054924-OP1-100			REV: P01

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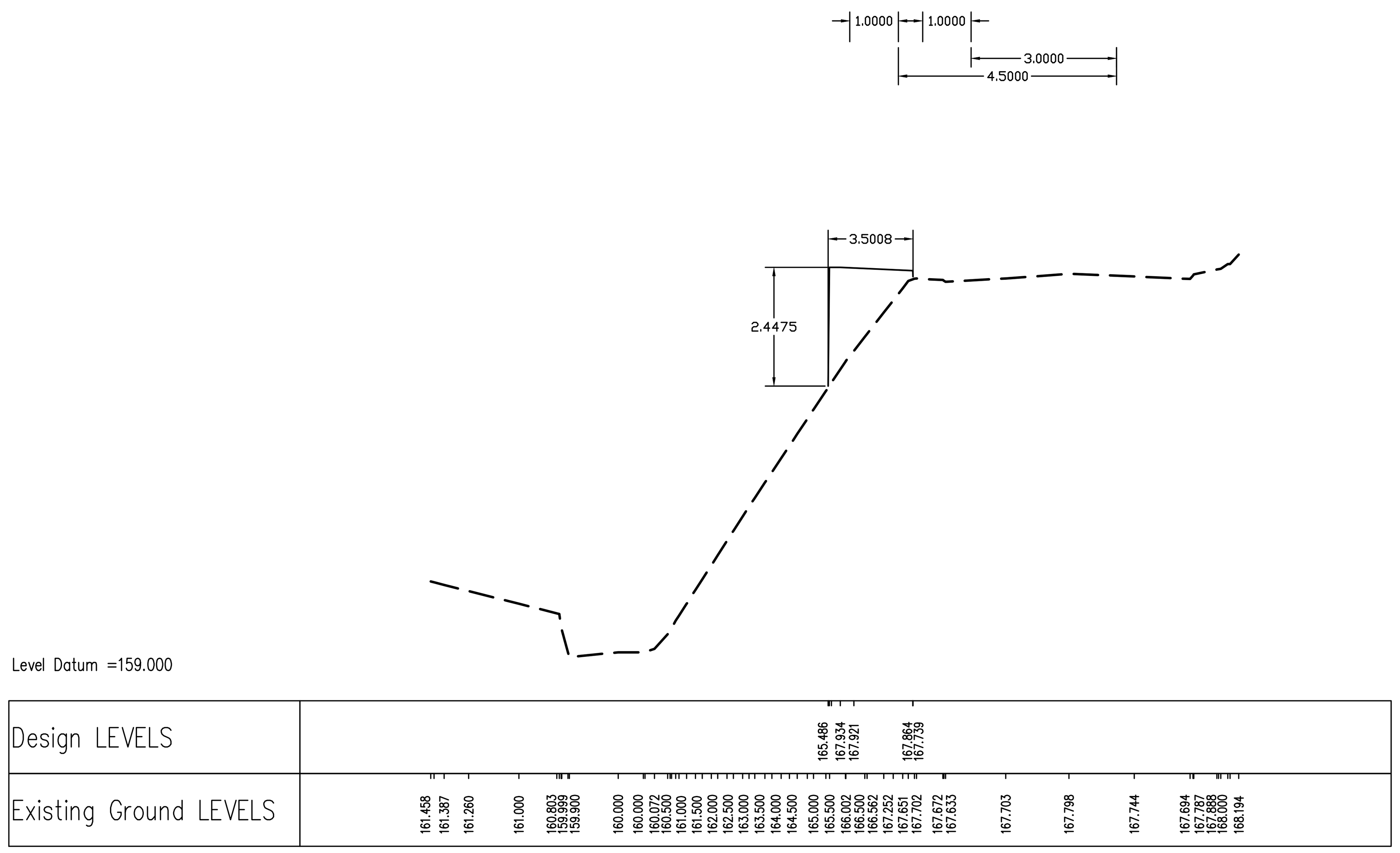
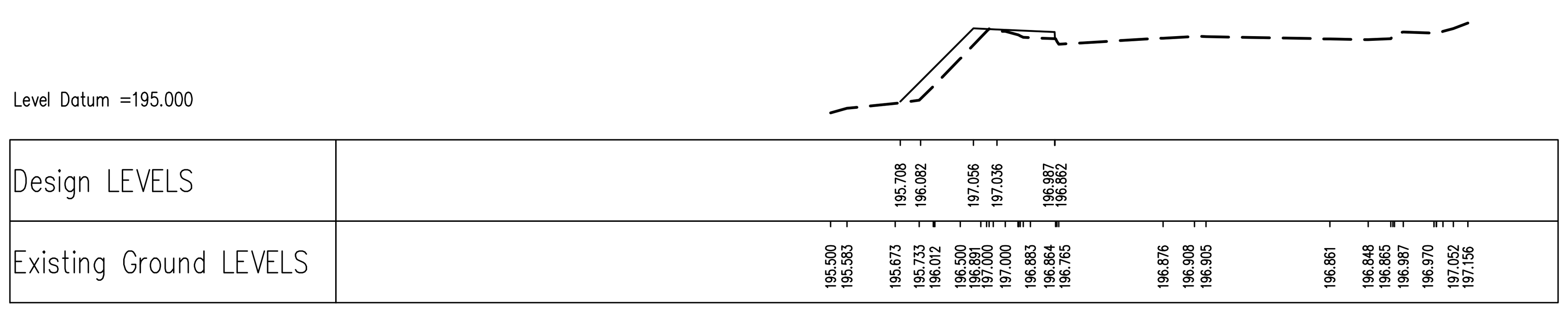
SCALE - 1:2000



SECTION B-B
RETAINING WALL OPTION



SECTION A-A
1:2 EARTHWORKS TIE IN

CROSS SECTIONS
SCALE - 1:200

NOTES

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PRIMARY SIGNAL HEAD

SECONDARY SIGNAL HEAD

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

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1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
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CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

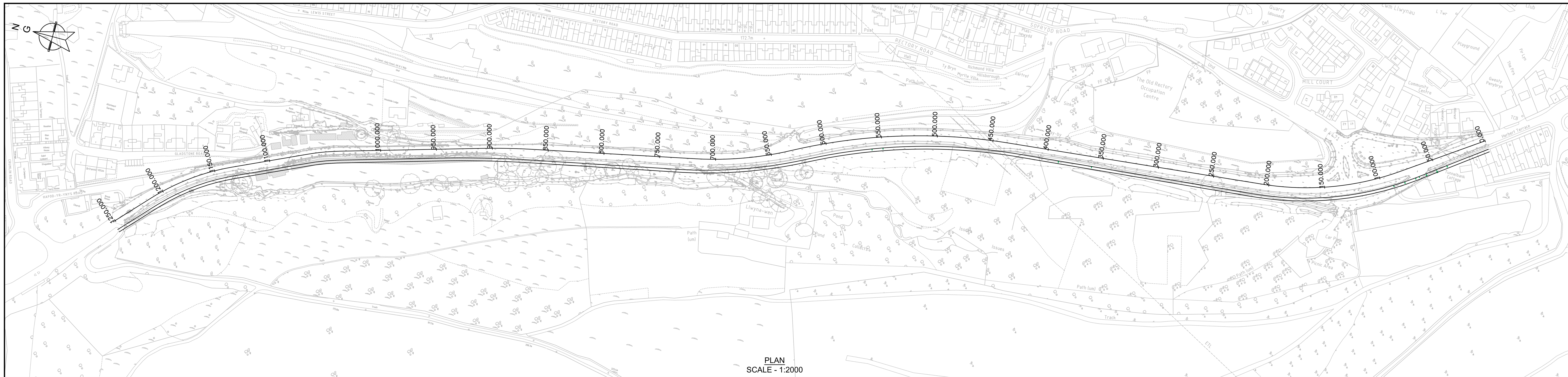
ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

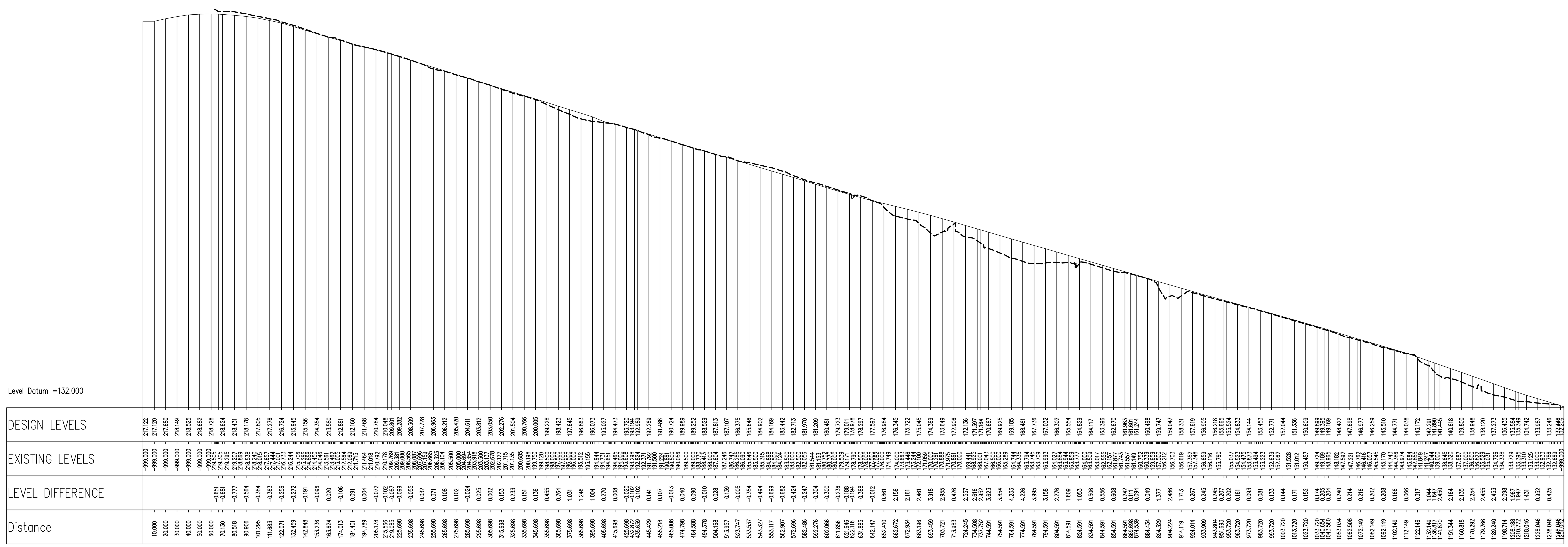
TITLE: ###

SCALE @ A1: 1:1000	CHECKED:		APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AM	DRAWN: AM	DATE: June 19

DRAWING No: 70054924-OP1-100 REV: P01



PLAN
SCALE - 1:2000



Horizontal Scale = 1:2000, Vertical Scale = 1:500

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CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

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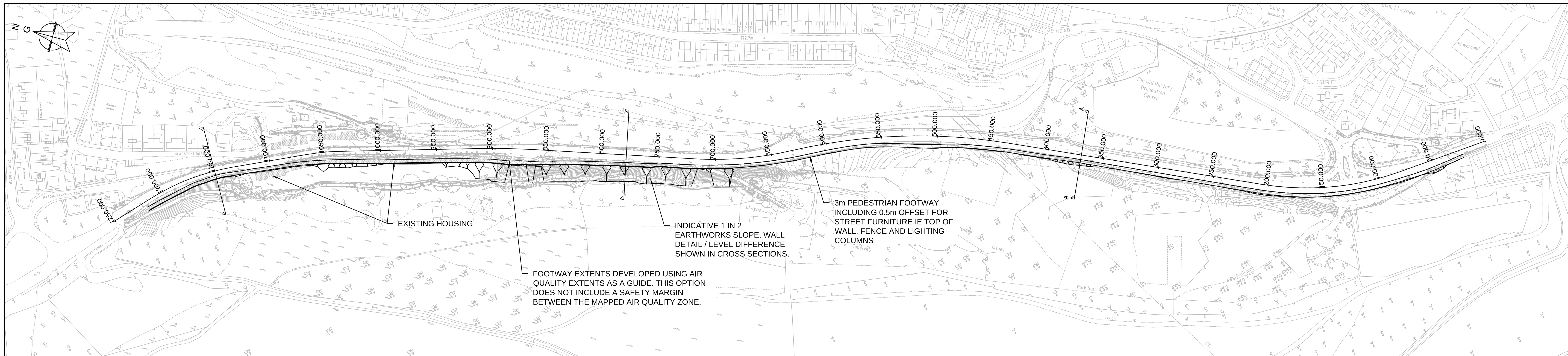
SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: ###

SCALE @ A1: 1:1000	CHECKED:		APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AM	DRAWN: AM	DATE: June 19
DRAWING No: 70054924-OP1-100			REV: P01



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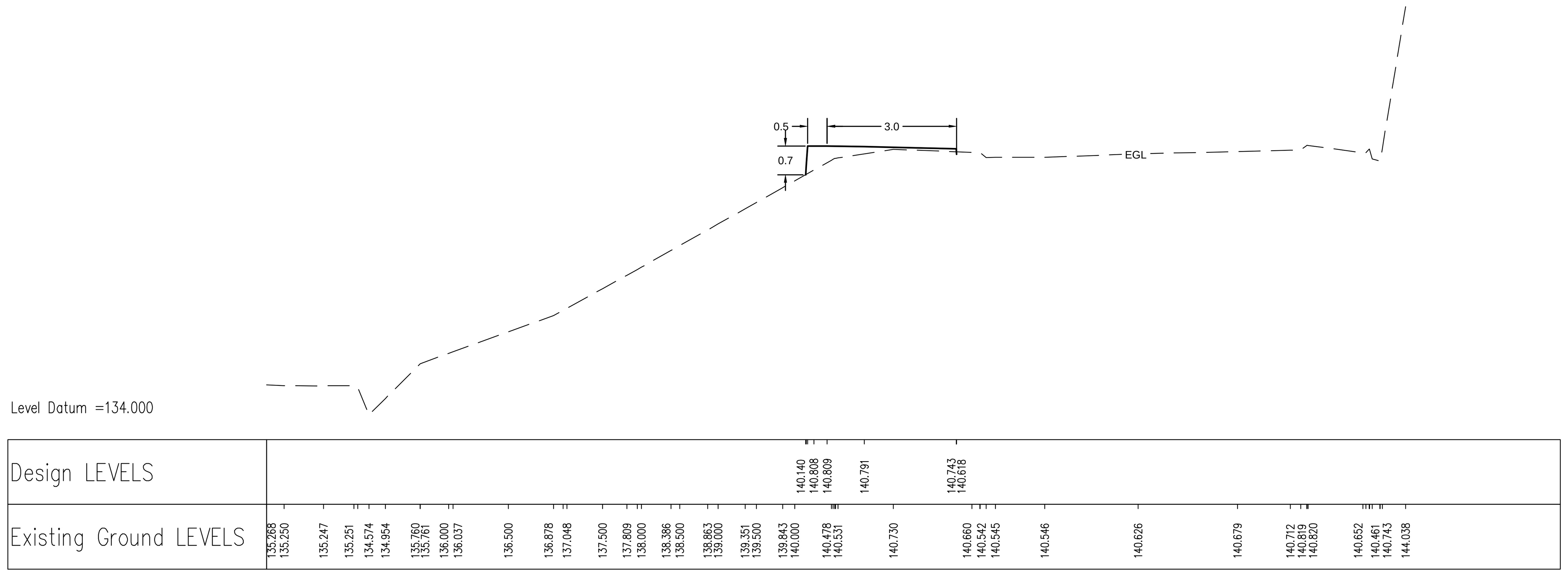

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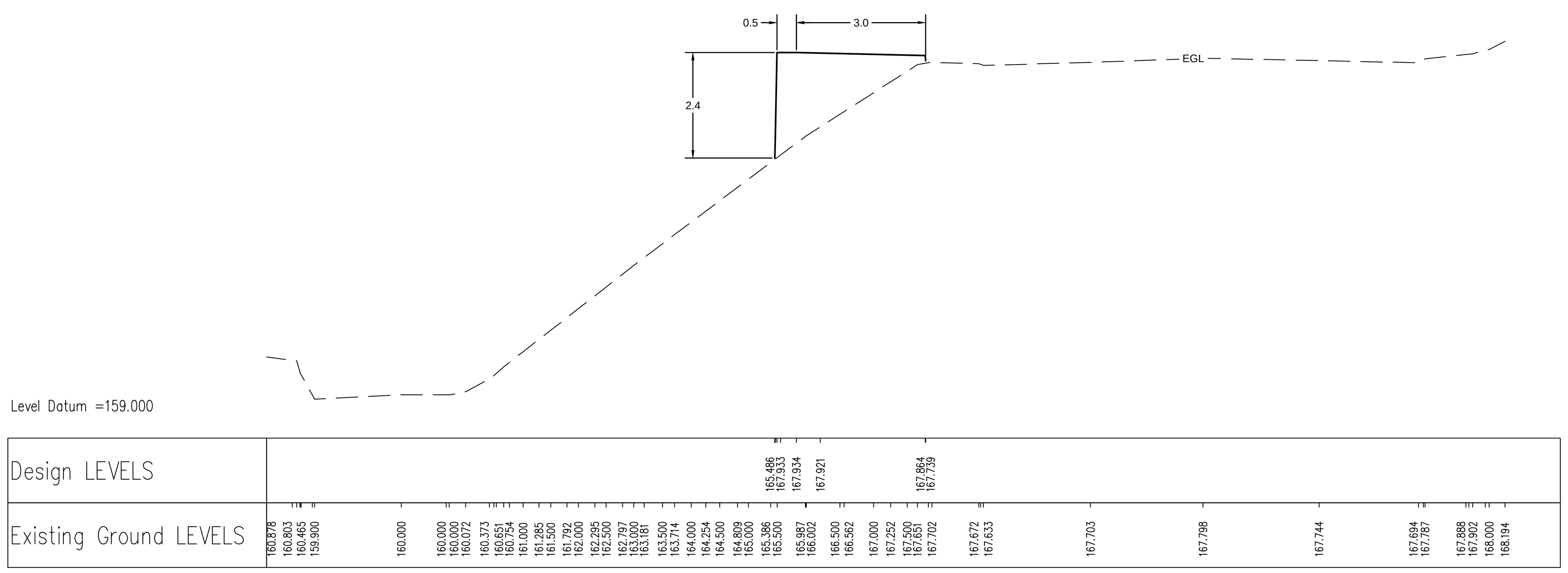

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REV	DATE	BY	DESCRIPTION	CHK	APP
P01		XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

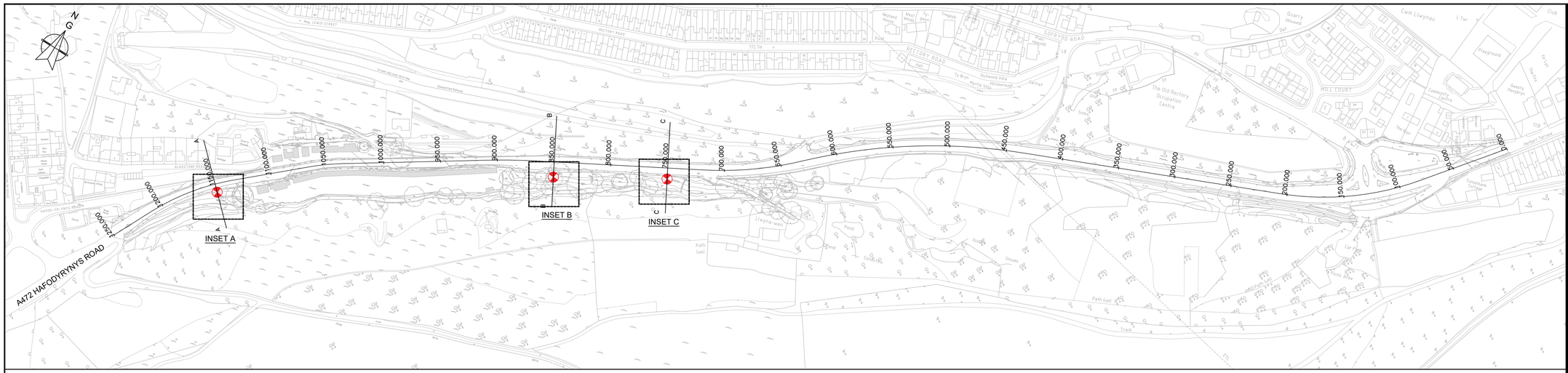
ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: INDICATIVE CROSS SECTIONS

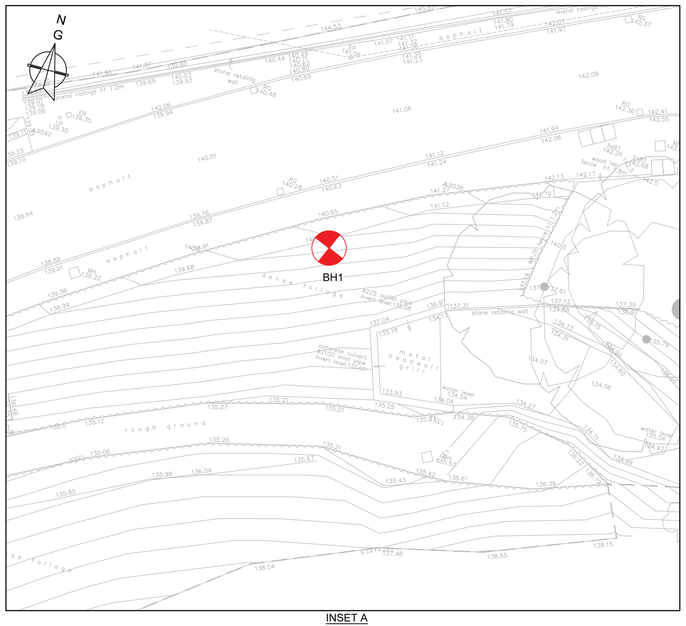
SCALE @ A1: 1:1000	CHECKED:		APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AM	DRAWN: AM	DATE: June 19

DRAWING No: 70054924- REV: P01

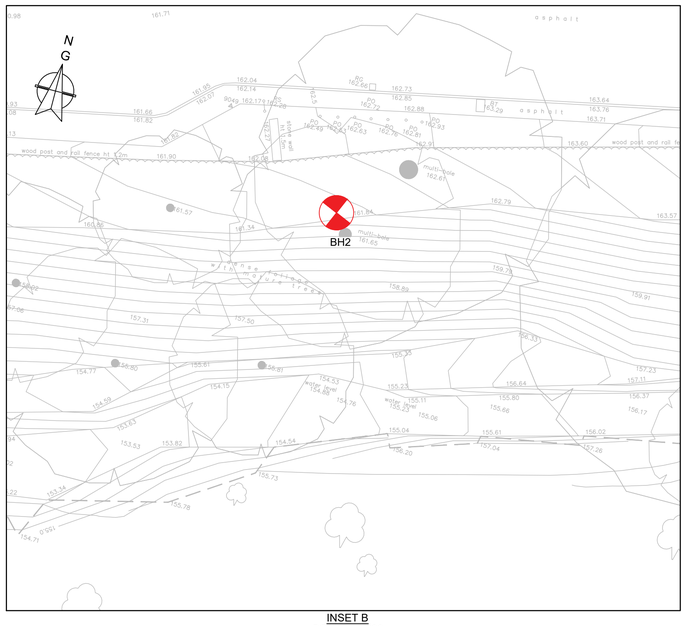


KEY

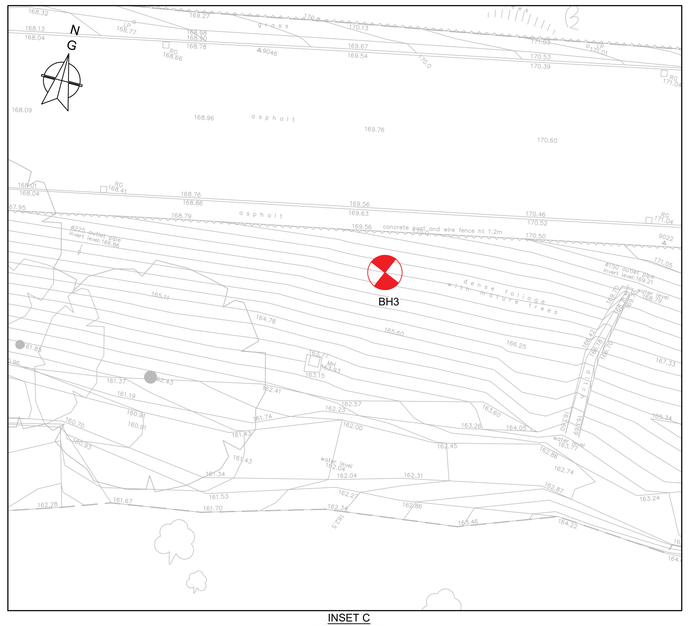
LOCATION OF REQUIRED BOREHOLE



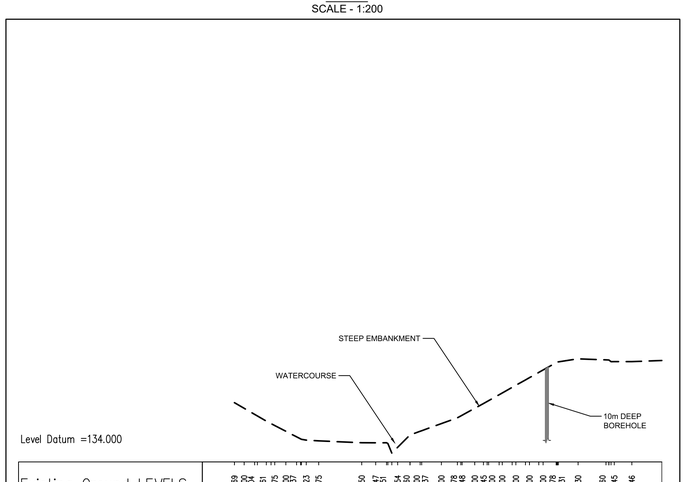
INSET A
SCALE - 1:200



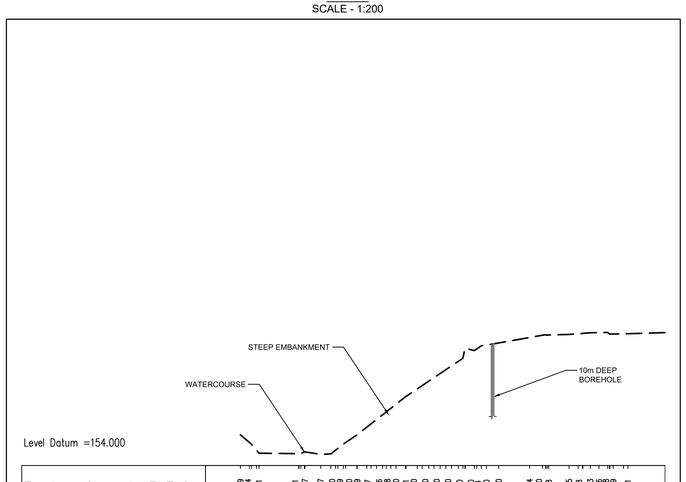
INSET B
SCALE - 1:200



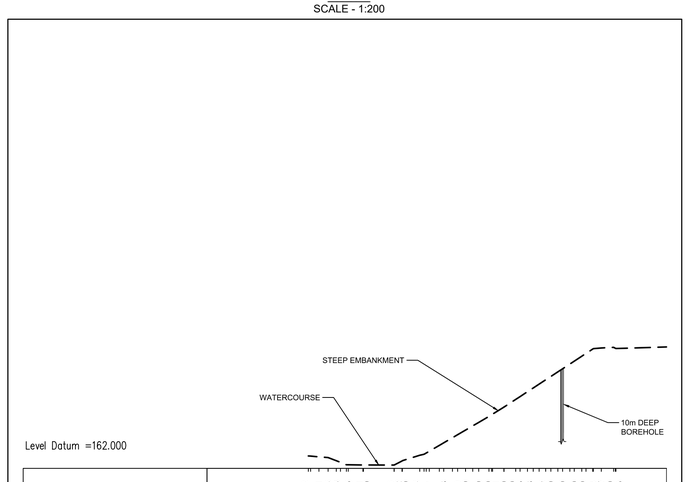
INSET C
SCALE - 1:200



CROSS SECTION A-A
SCALE - 1:200



CROSS SECTION B-B
SCALE - 1:200



CROSS SECTION C-C
SCALE - 1:200

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

wsp
1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
T+ 44 (0) 292 076 9200
wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

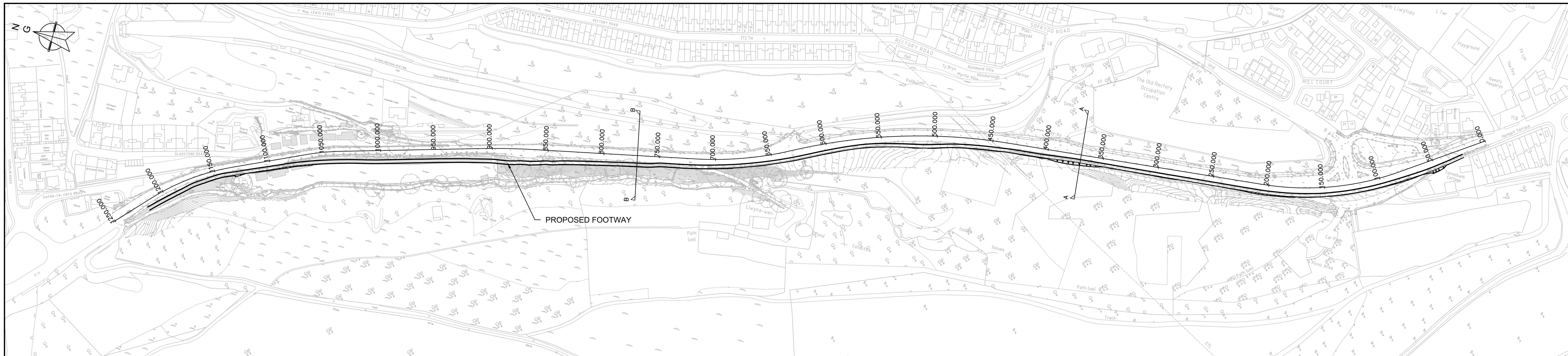
ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

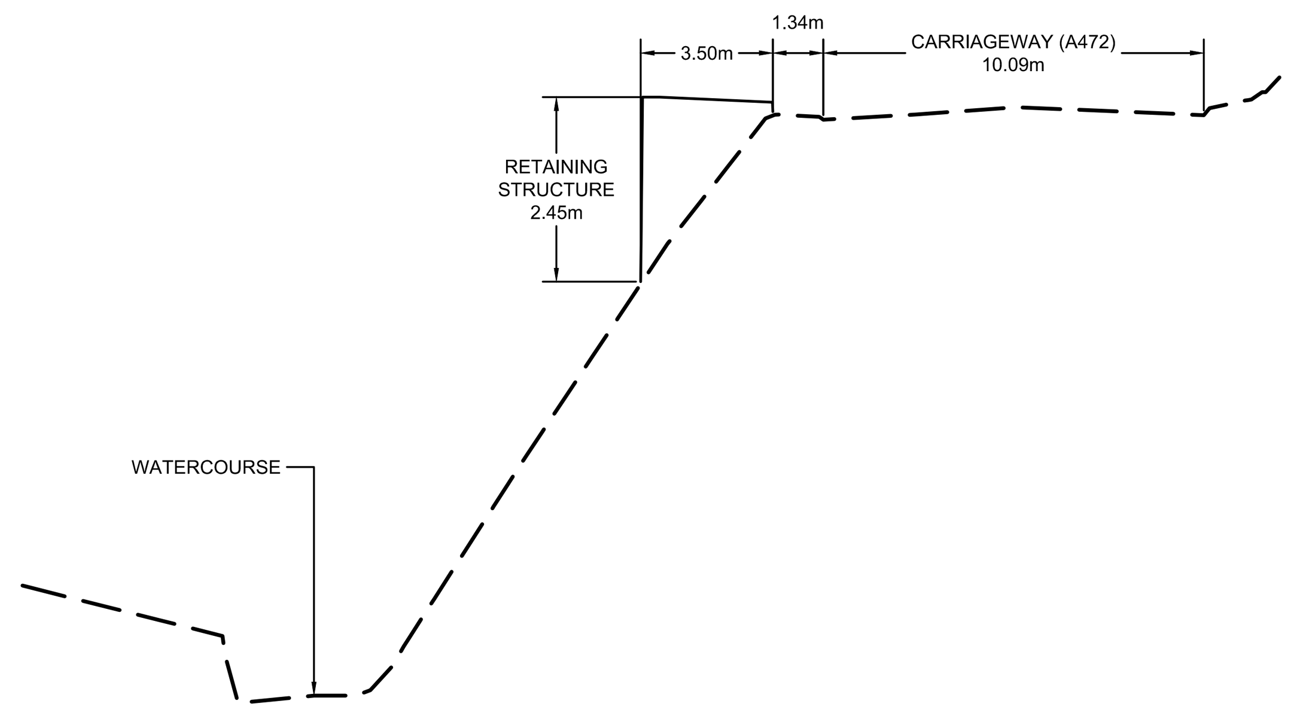
TITLE: ###

SCALE @ A1:	CHECKED:		APPROVED:
AS SHOWN			DM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70054924	AM	AM	June 19

DRAWING No: 70054924-WT3-SK03 REV: P01



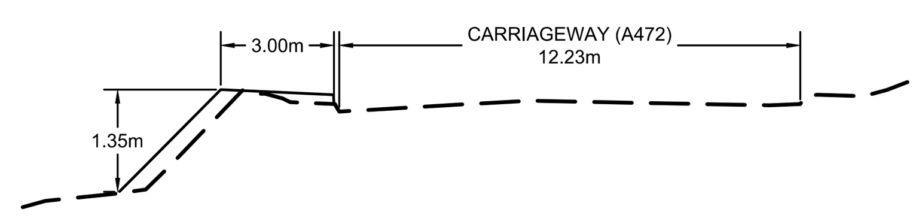
PLAN
SCALE - 1:2000



Level Datum =159.000

Design LEVELS	165.486, 167.934, 167.921, 167.864, 167.739
Existing Ground LEVELS	161.458, 161.387, 161.260, 161.000, 160.803, 159.999, 159.900, 160.000, 160.000, 160.072, 160.500, 161.000, 161.500, 162.000, 162.500, 163.000, 163.500, 164.000, 164.500, 165.000, 165.500, 166.002, 166.500, 166.562, 167.252, 167.651, 167.702, 167.672, 167.633, 167.703, 167.798, 167.744, 167.694, 167.787, 167.888, 168.000, 168.194

SECTION B-B
RETAINING STRUCTURE OPTION



Level Datum =195.000

Design LEVELS	195.708, 196.082, 197.056, 197.036, 196.987, 196.862
Existing Ground LEVELS	195.500, 195.583, 195.673, 195.733, 196.012, 196.500, 196.891, 197.000, 197.000, 196.883, 196.864, 196.765, 196.876, 196.908, 196.905, 196.861, 196.848, 196.865, 196.987, 196.970, 197.052, 197.156

SECTION A-A
1:2 EARTHWORKS TIE IN

CROSS SECTIONS
H SCALE - 1:200
V SCALE - 1:100

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	01/01/1901	XXX	FIRST ISSUE	XXX	XXX

DRAWING STATUS: S2 - FOR INFORMATION

1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
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wsp.com

CLIENT: CAERPHILLY COUNTY BOROUGH COUNCIL

ARCHITECT:

SITE/PROJECT: HAFODYRYNYS , CAERPHILLY

TITLE: CROSS SECTIONS FOR COMMENT

SCALE @ A1:	CHECKED:		APPROVED:
AS SHOWN			DM
PROJECT NO: 70054924	DESIGNED: AM	DRAWN: AM	DATE: June 19

DRAWING No: 70054924-WT3-SK04 REV: P01

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