

Welsh Government

**M4 Junction 28 Highway  
Improvements**

**Non-Statutory Environmental Report**

M4J28-ARP-EGN-SWG-RP-YE-000002

P07 | 9 January 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 240226

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**ARUP**

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# 1 Introduction

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## 1.1 Introduction

Costain and their designers Ove Arup and Partners Ltd were awarded the Key Stage 3 preliminary design contract for the M4 Junction 28 Improvement works on 5 January 2015. The project includes improvement of the Junction 28 Tredegar Park roundabout and at-grade junctions at Bassaleg and Pont Ebbw located north and east of Junction 28 respectively.

The Scheme will be delivered utilising Section 83(1) of the Government of Wales Act (GOWA) 2006 to deliver highway improvements under the powers of the Highways Act 1980. A range of M4 Corridor Enhancement Measures (M4 CEMs) have been proposed to improve the operation of the existing M4 highway network around Newport. The measures aim to reinforce the over-arching strategy of safeguarding the capacity of the motorway around Newport. The Scheme is a self-contained component of this wider series of proposals associated with the M4 CEMs programme. The Scheme is of strategic and local importance in terms of providing links between the western Valleys, Newport Southern Distributor Road (SDR) and the M4. The Scheme is included in the Wales Transport Strategy (2008), the National Transport Finance Plan (2015) and the M4 Corridor Enhancement Measures Programme (<http://m4cem.com/>)

This Non Statutory Environmental Impact Assessment Report (NSER) provides an environmental assessment of the scheme design and recommends necessary mitigation to be implemented to reduce the impacts to the environment. This report has been prepared using guidance outlined in Design Manual for Roads and Bridges (DMRB) Volume 11 *Environmental Assessment*. (Section 1, Part 1 HD200/08; Section 2, Part 6 HD 48/08 *Reporting of Environmental Impact Assessments and IAN 125(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment'*).

## 1.2 Location of the Scheme

The M4 Junction 28 is a key interchange on both the local and strategic highway networks. It provides access from the Rhymney, Sirhowy and Ebbw Valleys to residential areas and major employment areas of west Newport, the M4 Motorway and Newport SDR.

Junction 28 roundabout is part-time signal controlled, triggered by traffic flow and queuing thresholds such that the junctions are signalised during the AM and PM peak periods but operate as roundabouts during off-peak periods. Tredegar House is located adjacent to J28 with the walls of the estate forming the southern boundary of the roundabout.

To the north, Bassaleg roundabout is linked to J28 via the A467 Forge Road. Bassaleg High school and residential areas lie immediately adjacent. Pont Ebbw roundabout lies to the east of J28 and is linked via the SDR. Tredegar Park playing fields is located immediately north of the roundabout. Residential areas, businesses and St Davids RC primary school are also located in the vicinity.

Newport City Council is responsible for all the roundabouts and highways on the Scheme except for Pont Ebbw roundabout (Morgan Vinci on behalf of NCC) and the J28 sliproads (Highways Authority/Welsh Ministers)

A site location plan showing Junction 28 in the context of its local surroundings is provided in Appendix A1 to this report.

### 1.3 Need for the Scheme

During peak periods, the approaches to Junction 28 are heavily congested. This is exacerbated by queuing and delays at Bassaleg and Pont Ebbw Roundabouts.

The Scheme aims to provide strategic capacity improvements and alleviate congestion throughout key junctions in the strategic highway network serving Newport and South-East Wales. The Scheme aims to provide improvements for traffic resulting from new development and natural growth within the area, while improving the overall resilience of the network. This is to be carried out under an Early Contractor Involvement (ECI) contract.

On an average day in excess of 65,500 vehicles pass through the J28 roundabout, and over 48,000 at Bassaleg and Pont Ebbw. The predominant movements at the Bassaleg roundabout are south in the AM Peak towards J28 and north in the PM Peak towards Rogerstone and Risca along the A467. While the predominant movement at Pont Ebbw is towards J28 along the SDR in the AM Peak and to the A48 East (SDR) in the PM Peak, the presence of the Office for National Statistics and the International Rectifier result in a significant movement to this site in the morning and out in the evening. J28 exhibits heavy vehicle flows between the majority of its arms but, in the AM Peak the predominant movement is from the M4 East towards the A48 South providing access to a number of employment sites and north east Cardiff.

### 1.4 Consultation

Consultation with statutory environmental bodies (SEBs) has occurred throughout the assessment and reporting process. This NSER was issued to statutory consultees in November 2016 for their comment, Appendix A2 contains the responses from the consultees. All comments throughout the assessment process have been taken into account in the preparation of this NSER. Consultation and engagement with statutory consultees is covered in further detail in Section 4, Environmental Impact Assessment Methodology.

### 1.5 Assessment of Implications on European Sites

A Statement to Inform an Appropriate Assessment has been prepared to provide information to the Welsh Ministers ('the Competent Authority') on the implications of the proposed M4 Junction 28 Improvements on European Sites, as required by Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended). A report covering the Stage 1 Screening Stage of the Assessment of the Implications on European Sites (AIES) process is provided alongside this NSER.

The screening stage documented within this report concluded that there are no Likely Significant Effects (LSEs) as a result of the construction or operation of the Scheme. It is therefore not necessary for an Appropriate Assessment to be carried out for the Scheme.

Therefore, for the purposes of Regulation 61 of the Conservation of Habitats and Species Regulations 2010, it is considered that there is no likelihood of significant effects on the European sites considered within this SIAA either alone or in combination with other plans and projects.

## 1.6 Need for an Environmental Assessment

In accordance with DMRB Volume 11, a Screening Assessment was undertaken on 27 June 2016 to determine whether the Scheme would constitute EIA development. EIA Screening procedures which accord with the requirements of the EIA Regulations exist within the DMRB Volume 11 Guidance to determine whether highway developments qualify for statutory EIA, leading to the preparation of an Environmental Statement (ES). Further detail on the determination process is provided in Section 4.2.

The European Union (EU) Directive 2011/92/EU requires that an Environmental Impact Assessment (EIA) be undertaken by the promoters of certain types of development to identify and assess the environmental effects of certain public and private projects before development consent is given. Directive 2011/92/EU which consolidates the original Directive 85/337/EEC (now repealed) and its subsequent amendments specify the qualification requirements and the process by which statutory EIA should be undertaken. This NSER has been produced being informed by reference to EC Directive 2011/92/EU – as amended (the Environmental Impact Assessment (EIA) Directive).

In England and Wales, the requirements of the EIA Directive with regards to road projects has been transposed into United Kingdom (UK) statute by Section 105 of the Highways Act 1980, as amended. This legislation is enacted by the Highways (Assessment of Environmental Effects) Regulations 2007 (as amended). These are often collectively termed the EIA Regulations. The Highways Agency (HA) publishes detailed guidance on the completion of EIAs under the above legislation, namely the Design Manual for Roads and Bridges (DMRB). Volume 11 of the DMRB relates to Environmental Assessment. Arup has used this guidance as a basis for the NSER with specific reference to Part 6 HD 48/08 (5).

The Screening Assessment concluded that the Scheme is not likely to give rise to potential significant effects on the environment by virtue of the Scheme's characteristics, location and characteristics of the potential impacts. Following consultation with Natural Resources Wales (NRW), Cadw and Newport City Council (NCC) it was agreed that the Scheme is therefore not considered to constitute EIA development (refer to Appendix A2).

The proposed M4 J28 Improvement Scheme has been classified as a relevant Annex II Project i.e. statutory EIA is not mandatory, however, relevant projects such as this require an appropriate level of environmental review in accordance with the Regulations. The Scheme has therefore been subject to a Non Statutory Environmental Impact Assessment (NSEIA) and the details are presented in this Non-Statutory Environmental Report (NSER).

## 1.7 Purpose of the Study

This NSER presents the findings of an environmental assessment of the potential environmental impacts and effects of the implementation of the proposed M4 J28 Improvement Scheme. It has been produced as a deliverable in fulfilment of the Welsh Government's Contract requirements and conformity to DMRB Volume 11 and is used to perform the following functions to assist in the iterative design process:

- To obtain and record baseline conditions;
- To identify key environmental constraints and ensure these are taken into account during the design phase;
- To outline opportunities to avoid and/or minimise any adverse effects or to realise any opportunities for mitigation for construction at the detailed design stage;
- To identify any residual effects and mitigation measures to inform subsequent detailed scheme design; and
- To inform decision makers.

Mitigation measures contained in this NSER are summarised in an outline Environmental Management Plan (EMP) to be used for the development of a comprehensive Construction Environmental Management Plan (CEMP). The CEMP will then be utilised to prepare, manage and control construction activities to avoid and / or minimise environmental impacts during the construction phase whilst addressing and adhering to all statutory and legal processes. The contractor will be responsible for any continuing management of mitigation for a period of one year, following this the Highway Authority, or others appointed by the Welsh Government will be responsible for the aftercare.

## 1.8 Sustainable Development

The Welsh Ministers have a well-being duty to practice sustainable development as required by the Well-being of Future Generations (Wales) Act 2015 (the 'Act'). The Act requires public bodies in Wales to ensure that when making their decisions they take into account the impact they could have on people living their lives in Wales in the future.

A Sustainable Development Report (SDR)<sup>1</sup> has been prepared to consider how the Welsh Government's proposed improvements to M4 Junction 28, as part of a package of M4 Corridor Enhancement Measures (CEMs), has taken into account sustainable development and how it would align to the sustainable development principle, in accordance with its well-being duty.

The report concludes that overall the Scheme is considered to align with the Welsh Government's sustainable development principle.

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<sup>1</sup> M4 Junction 28 Improvements, Sustainable Development Report. 2 November 2016. Welsh Government

## 1.9 Report Structure

The report is structured as follows:

**Chapter 2** describes the Scheme;

**Chapter 3** details the alternatives considered;

**Chapter 4** summarises the environmental assessment scope, approach and outline mitigation for each topic area;

**Chapter 5** details the air quality assessment;

**Chapter 6** details the archaeology and heritage assessment;

**Chapter 7**; details the landscape and visual assessment

**Chapter 8** details the ecology and nature conservation assessment;

**Chapter 9** details the material resources assessment;

**Chapter 10** details the noise assessment;

**Chapter 11** details the water environment assessment;

**Chapter 12** summarises the cumulative impacts of the Scheme;

**Chapter 13** summarises the environmental management; and

**Chapter 14** provides a summary of the assessment.

## 2 The Project

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### 2.1 Background to the Scheme

A study was undertaken by the Welsh Government during 2010 and 2011, entitled M4 Corridor Enhancement Measures (CEMs), to examine a range of measures aimed at reducing problems on the M4 motorway around Newport. The aim of this study was to improve the overall resilience of the transport network in South East Wales. One of the measures identified was a junction improvement scheme to enhance the capacity of Junction 28 of the M4 (Tredegar Park), along with two nearby junctions.

Junction 28 is of strategic and local importance in terms of providing links between the western valleys, Newport SDR and the M4. In addition, Junction 28 is a key node on the M4 motorway, providing a key access point during disruption on the motorway, with pre-signed diversion routes leading from Junction 28 along the local road network in both east and west directions. During peak travel times, the approaches to the junction are congested leading to queuing and delays. Bassaleg Roundabout to the north is linked to Junction 28 via the A467 Forge Road, which is heavily trafficked at peak travel times. Similarly, Pont Ebbw Roundabout to the east is linked to Junction 28 via the A48 SDR. This junction provides access to employment and education sites and is currently a source of traffic congestion during peak travel times. The effects of congestion during peak travel times has an impact upon through traffic using the SDR.

This Scheme has been identified as an important element of improvement and is recognised as an individual component in a package of measures aimed at improving the highway network around Newport. The Scheme is included in the Wales Transport Strategy (2008), the National Transport Finance Plan (2015) and the M4 Corridor Enhancement Measures Programme (<http://m4cem.com/>) which is referenced in more detail in Section 2.2.

### 2.2 Project Objectives

A range of potential corridor enhancement measures (CEMs) to improve the operation of the existing M4 around Newport have been proposed. The measures aim to reinforce the over-arching strategy of safeguarding the capacity of the motorway around Newport for use by longer distance/strategic traffic, especially freight vehicles, through:

- Making the best possible use of the existing capacity;
- Improving the resilience of the network; and
- Improving public transport.

The strategy and outline appraisal of the package of measures is contained in a series of technical reports<sup>2</sup>. The objectives of the CEMs are as follows:

- Objective 1 – Making the best possible use of the existing capacity to improve accessibility to key centres and services; and
- Objective 2 – Improving the resilience of the network

This Scheme is a self-contained component of this wider series of proposals associated with the M4 Corridor Enhancement Measures (M4 CEMs) programme. A set of Scheme Specific Objectives (SSOs) has been compiled which are based on those outlined in the report M4 Corridor Enhancement Measures – Strategy, Appraisal and Monitoring<sup>2</sup>. These include:

- To increase throughput at the junctions;
- To increase use of the Southern Distributor Road (SDR);
- Reduce delays to movements between M4, A48, A467 and the SDR;
- To minimise disruption to road users during implementation;
- To enhance road safety at the junctions; and
- To minimise adverse impact on the environment.

## 2.3 Project Description including Land Use Setting and Land Take

The Scheme junction improvements are shown in Appendix A3 – A5. Individual components of the Scheme improvements include:

### **Junction 28** (Tredegar House) (5.51ha)

The existing roundabout will be increased in size through the construction of an elongated signalised roundabout with a dedicated through link for eastbound traffic leaving the M4 to join the A48 and Newport SDR. At the Forge Road exit, the height of the roundabout will be 0.5m higher than the existing arrangement. It will require the felling of the trees and earthworks on the existing inner roundabout. The current proposal includes the widening of the eastbound offslip which will require tree felling/vegetation removal. There will be a rationalisation of the A48 east and westbound links, plus the links to/from Forge Road (A467). The existing drainage system will be provided with additional capacity, new pipework and attenuation ponds. Direction signs shall be provided on the approaches which will require localised vegetation clearance.

### **Pont Ebbw Roundabout** (3.48ha)

The existing roundabout is largely retained at or near existing grade, with an additional through link between the A48 and SDR arms. Some modifications to the existing splitter islands will be necessary. All of the arms on the roundabout will be signalised. It will require the felling of the trees and earthworks on the existing inner roundabout. The existing drainage system will be provided with additional capacity and new pipework for the improved/new sections of road. Direction signs shall be provided on the approaches which will require localised vegetation clearance. An additional exit onto the A48 (westbound) from the adjacent business park will be incorporated as part of the Scheme. The exit junction will be fully signalised and will include a bus stop facility. Localised vegetation clearance will be required.

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<sup>2</sup> M4 Corridor Enhancement Measures – Strategy, Appraisal and Monitoring – May 2010

### **Bassaleg Roundabout (1.9ha)**

The existing roundabout is largely retained and slightly increases in size to the south-west. The works include loss of vegetation and some minor earthworks. It will require the felling of the trees and earthworks on the existing inner roundabout and western side of the roundabout. The existing drainage system will be provided with additional capacity, pipework and an attenuation pond. Direction signs shall be provided on the approaches which will require localised vegetation clearance.

## **2.4 Construction, Operation and Long term Management**

The M4 Junction 28 Improvement scheme will be carried out between February 2017 and April 2018. The improvements are broadly split into three key areas, Tredegar Park roundabout, Bassaleg roundabout and Pont Ebbw roundabout. In order to minimise disruption to the road network, construction will only be undertaken at two of the locations at any one time. Improvement works to Tredegar roundabout will run the full duration of the programme between the dates stated above while Bassaleg and Pont Ebbw roundabouts will be completed between February 2017 – August 2017 and August 2017 – April 2018 respectively.

At each of the sites the improvement works will include:

- Establishment of traffic management,
- site clearance,
- diversion of statutory undertakers apparatus,
- drainage installation,
- earthworks,
- street light and signal ducting,
- kerb installation,
- pavement construction, and
- road marking and street light, signal pole and sign installation.

Capacity will be maintained throughout the construction works by splitting each of the key sites into 5-7 phases with the aim of providing the enhanced capacity at the earliest opportunity.

It is anticipated that working hours would be Monday-Friday 08:00-18:00hrs with off peak lane closures 09:30-15:30hrs. Working hours i.e. weekend working and night working will be subject to agreement by Newport City Council.

There will be a period of five years aftercare for landscape and ecology:

- For the first 12 months after completion, the Contractor will be responsible for aftercare; and
- After the first 12 months, the Highway Authority, or others appointed by the Welsh Government will be responsible for the aftercare.



Construction, operation and long term management has been considered, where relevant, in individual Chapter assessments.

## 3 Alternatives Considered

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In accordance with the 2011 EIA Directive, the following has been included in this NSER.

*‘An outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account environmental effects’.*  
(Article 5, 3(d) Directive 2011/92/EU)

This chapter includes an outline account of the main and reasonable alternatives to the Scheme that have been considered by the Welsh Government and its advisors, taking into account their potential environmental impacts. Secondly, this chapter includes a description of the iterative design development of the Scheme and the justification behind any design changes.

### 3.1 Historical Alternatives (prior to KS3)

As part of the M4 CEMs, it was identified that J28 needed a greater capacity and through flow. The following reports contain a history of the potential options considered for providing strategic capacity improvements at M4 Junction 28:

- M4 Junction 28 Pont Ebbw Roundabout Bassaleg Roundabout M4 Junction 26 Workshop February 2010 Outcomes Report, Draft 2 dated 19 April 2010
- M4 Corridor Enhancement Measures – Strategy, Appraisal and Monitoring, May 2010
- M4 Corridor Enhancement Measures Junction 28 Technical Report, Draft 5 dated January 2011
- M4 Corridor Enhancement Measures Junction 28 Technical Report - Summary and Recommendations, Draft 1 dated February 2011
- M4 Corridor Enhancement Measures Junction 28 Technical Report Addendum - Option 3a Addendum, Draft 1 dated 22 November 2011

A number of options were considered in accordance with guidance set out in WelTAG and detailed in M4 Corridor Enhancement Measures: Junction 28 Technical Report. The preferred M4 J28 Improvement scheme option emerged as the best viable solution and consequently this scheme is being brought forward for Key Stage 3 Design<sup>3</sup>.

### 3.2 Scheme Alternatives and Alterations

Key Stage 2 (KS2) concept design was provided by Welsh Government at the start of Key Stage 3 (KS3). In the design development phase during the early stages of the KS3 period, potential measures for improving the operation and throughput of the proposed KS2 design proposals and for providing increased value for money were considered and reported within the Design Options Report<sup>4</sup>.

Design options for the Pont Ebbw roundabout were broadly similar to the concept design, particularly with regards to land take and environmental impact.

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<sup>3</sup> Arup M4 Corridor Enhancement Measures. Junction 28 Technical Report, January 2011

<sup>4</sup> Arup M4 Junction 28 Improvements. Design Options Report 8 June 2015

Alternatives and recommendations were based on capacity resilience and traffic flows. A dedicated exit has been provided for the Government Offices site, which would ease congestion within their site.

The concept design for the Bassaleg roundabout included a ‘throughabout’ connecting Forge Road with the A467. During the KS3 preliminary design, traffic modelling showed that a signalised roundabout would achieve the Scheme objectives and this was then taken forward into detailed design.

The concept design for J28 evolved during KS3 preliminary design and sought to make as much use of the existing infrastructure whilst maximising the robustness of the scheme’s ability to minimise congestion. An alternative scheme design was recommended for construction. The alternative design provided benefits in terms of traffic capacity, and reducing the construction cost and also reduced the impact on the environment. The Design Options Report reported that:

*“Option TP-2 will result in less land take therefore reduced tree felling will be required. The retention of trees and scrub vegetation will maintain potentially valuable habitats for dormice, which are a European Protected Species and known to be present along the M4 corridor. Furthermore, the retained habitats will have a beneficial impact for nesting birds and other wildlife present within the area.”*

CCTV surveys during the project revealed the current drainage arrangements were in need of repair. As a result, maintenance to the drainage network has been included within the Scheme proposals.

Cross discipline design meetings ensured that changes to the design were captured within the environmental assessment process and the detailed design is assessed within this NSER.

## 4 Environmental Impact Assessment Methodology

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This chapter presents an overview of the environmental assessment methodology

### 4.1 The Environmental Assessment Process

The Environmental Assessment has been carried out in accordance with the relevant legislation and best practice guidance.

The stages that have been applied to this environmental assessment follow the stages defined by HA 201/08<sup>5</sup> which aim to provide an iterative process throughout the assessment and design stage of the Scheme.

### 4.2 Screening

In accordance with DMRB Volume 11, Section 2 Part 3 HD47/08, a Screening Assessment was undertaken in May 2015 to determine whether the Scheme would constitute EIA development. The Screening Assessment concluded that the proposed works scheme is not likely to give rise to potential significant effects on the environment by virtue of the Scheme's characteristics, location and characteristics of the potential impacts. Following consultation with Natural Resources Wales (NRW), Cadw and Newport City Council (NCC) it was agreed that the proposed works is therefore not considered to constitute EIA development (refer to Appendix A2).

In accordance with Design Manual for Roads and Bridges (DMRB) HD 47/08, the Welsh Government's Record of Determination (RoD) has been completed and approved. This documents the main potential environmental impacts arising from the proposed Scheme. The RoD was subject to approval by Welsh Government's specialists and the Project Manager under delegated responsibilities on behalf of Welsh Government's Secretary of State, and this decision is recorded in a Notice of Determination (NoD). The NoD was published accordingly by the Welsh Government on 22<sup>nd</sup> November and will be subject to a challenge window for a minimum period of six weeks, to allow objections to be made to the determination.

This Non Statutory Environmental Impact Assessment (NSEIA) has been undertaken to assess the impact of the Scheme and recommend mitigation measures to reduce any impacts identified.

### 4.3 Scoping

Scoping of potential environmental issues against the physical and operational aspects of the Scheme has been undertaken to provide a basis for ensuring that the environmental assessment is appropriately focused on issues of genuine potential significance. The scoping exercise and the environmental assessment have been

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<sup>5</sup> Design Manual for Roads and Bridges. HA 201/08, Volume 11, Section 2, Part 1, General Principles and Guidance of Environmental Impact Assessment – Highways Agency

undertaken principally in accordance with guidance contained within the following documents:

- DMRB, Volume 11 Part 4 HA 204/08: Scoping of Environmental Impact Assessments.
- IAN 125/09(W): (Environmental Assessment), IAN 126/09(W) (Reporting of Determination and Publication Notices), and Supplementary guidance for users of DMRB Volume 11.

In view of the above, scoping resulted in a number of environmental topic areas being identified for inclusion in the NSEIA (scoped-in). For these scoped-in topics, the scoping exercise served to establish the:

- the extent and availability of existing environmental information
- key sensitivities and interests within the receiving environment
- data collection and survey requirements
- the scope and level of detail to be progressed within individual assessments, and
- the methodologies, guidance and criteria to be adopted.

Scoping also resulted in some environmental topic areas being discounted (scoped-out) from the environmental assessment on the basis of there being limited potential for significant environmental effects to be generated through Scheme implementation.

Table 4 1 Environmental Impact Area Scoping

<b>Environmental Impact Area</b>	<b>Scoped In/Out</b>
Air Quality	Scoped In
Cultural Heritage	Scoped In
Landscape Effects	Scoped In
Ecology and Nature Conservation	Scoped In
Materials	Scoped In
Traffic Noise and Vibration	Scoped In
Road Drainage and the Water Environment	Scoped In
Geology and Soils	Scoped Out
Effects on All Travellers	Scoped Out
Community and Private Assets	Scoped Out

### 4.3.1 Topics Scoped out

The topics to be scoped out of the NSER were considered in detail in the M4 J28 Scoping Report<sup>6</sup> and summarised in the following sections.

<sup>6</sup> M4 Junction 28 Improvements: Environmental Scoping Report. 27 October 2016

## Geology and Soils

The majority of the proposed works are to be undertaken within the existing highway boundary and the increase in footprint of the junctions is minimal. On this basis, the impact on geology and soils is considered to be negligible.

Due to the lack of potential for significant impacts on geology and soils and the nature of the Scheme, it is considered that no further assessment will be undertaken and a specific chapter on this topic should not be included in NSER.

## Effects on All Travellers

The design features of this Scheme would ensure safe and convenient access is available to Bassaleg School from the surrounding network. The Stage 1 Non-Motorised Users (NMTU) Audit Report for the Scheme has outlined how the design features integrated within the preliminary design meet the key scheme objectives. Any further design changes will be assessed in accordance with DMRB guidance within the NMTU audit reports completed against future design stages.

The design allows the existing NMTU routes to be maintained during the majority of the construction phase, by maintaining them along their existing alignments. A number of short term diversions will be required during particular stages of the works. These diversions would be kept to a minimum in terms of length, and would be well signed and advertised. Where NMTU routes run alongside construction areas, protection measures would be installed to ensure safety and comfort of NMTUs.

Existing Pelican, Puffin and Toucan crossings are generally maintained by the design. A new Toucan crossing would be provided crossing the A467 Forge Road to provide connectivity to/from the Scheme on the former Tredegar Park golf course. This would ensure safe and convenient access is available to Bassaleg School from the surrounding network, and provides a new route that would be compliant with the relevant accessibility legislation. The existing National Cycle Network route crossing is maintained across Court Crescent. Connections to bus stops around this junction are generally maintained, with local enhancements resulting from the introduction of the Toucan crossing of the A467.

New Puffin crossings are provided at Junction 28, crossing the A48 Cardiff Road, and providing additional route options for NMTUs around the junction. The existing footways and cycleways around the junction would be maintained along their current alignments, with the exception of a minor diversion of National Cycle Network Route 4 to accommodate earthworks, over a length of 20-50m. This would be constructed offline, and then diverted onto the new alignment before the old cycleway is removed.

The existing pedestrian and cycle facilities crossing the A48 Cardiff Road, B4239 Lighthouse Road, B4237 Cardiff Road and the entry/exit from the IPO/ONS site would be retained. These footways provide connections between bus stops and the local community and employment facilities, including Tredegar Park recreation ground.

The project aims to reduce congestion and delays once completed. The consequence of improving traffic flows will serve to reduce driver stress.

During construction, the scheme objectives require the scheme to be implemented with a minimum of disruption to the travelling public. Traffic modelling has been undertaken for the construction phases, and a number of measures to manage potential disruption on the network have been identified, including active monitoring and control of signal timings and maintaining the number of live traffic lanes during peak periods. The construction phasing, particularly at Junction 28 has been designed to minimise delays caused by the works, and to deliver capacity enhancements early to improve operation, consequently driver stress and frustration would be reduced.

Consequently, it is considered that no further environmental assessment will be undertaken and a specific chapter on this topic should not be included in the NSER.

## Community and Private Assets

The majority of the proposed works are to be undertaken within the existing highway boundary and the increase in footprint of the junctions is minimal. The IPO/ONS exit junction will be constructed on private property and the transfer of the required land (approximately 0.5ha) will be carried out by agreement. The impact on the community and private assets during operation is considered to be negligible.

During the construction of the Scheme, the equipment and materials will be stored within the existing highway boundary, or by agreement with a local landowner on their property. The majority of the works will be completed within the existing highway boundary. Access from private estates onto the public highway will be maintained throughout the construction period, with temporary closures of traffic lanes carried out to required standards. Occasional closures of accesses may be necessary, during which times the contractor will liaise with those affected and suitable alternate arrangements agreed as required. Access to community facilities including schools and recreation areas will be maintained throughout the construction period. The contractor's community engagement proposals are currently being reviewed by Welsh Government.

Traffic modelling of the scenarios during the construction phase has been undertaken, and measures to minimise disruption have been identified and agreed to be implemented.

Due to the lack of potential for significant impacts and the nature of the Scheme, it is considered that no further assessment will be undertaken and a specific chapter on this topic has not been included in the NSER.

## 4.4 Scoping Consultation and Engagement

Relevant statutory and non-statutory consultees have been contacted by members of the project team during preparation of the NSER. Consultees that have been engaged in the design, baseline data gathering and assessment phases include:

- Cadw;
- Glamorgan Gwent Archaeological Trust;
- Natural Resources Wales (NRW); and

- Newport City Council (NCC) – highways, environmental health, housing, parks, regeneration, planning;

Feedback from the above stakeholders has informed the design process by helping identify risk and suggest measures of mitigation to help shape the Scheme design. Engagement with the above bodies has spanned a diversity of issues such as protected species, flood risk and cultural heritage.

The scope of this NSER was agreed with NRW, Cadw and NCC following submission of a draft Environmental Scoping report, May 2015. The scope was further agreed following a re-consultation in August 2016.

## 4.5 Surveys and Predictive Techniques, Methods and Constraints

This section sets out the approach to the NSER including baseline data gathering, prediction of scheme effects and development of mitigation measures.

### 4.5.1 Baseline Conditions

The baseline conditions were derived from a desktop assessment of relevant published data, supplemented by environmental surveys for the following topics the extent of the study area differed within each specialist assessment based on their assessment needs (please refer to Chapter 5 for baseline conditions);

- Ecology and Nature Conservation;
- Noise and Vibration;
- Cultural Heritage;
- Air Quality;
- Landscape;
- Material Resources; and
- Road Drainage and the Water Environment.

Assessment was undertaken to identify the impact of the proposed works upon the three roundabout areas, namely; Junction 28 (Tredegar House), Bassaleg and Pont Ebbw roundabouts. Baseline conditions are described for these sites along with an assessment of predicted impacts based upon the details of the proposed works. Where adverse impacts are predicted mitigation is proposed, where this is possible.

The desktop assessment involved the collation of relevant and available published information from environmental stakeholders, local councils, and other key stakeholders.

This exercise enabled key environmental constraints to be identified and mapped. This information has been collated using Geographic Information Systems (GIS) software, which enabled detailed environmental constraints mapping to be produced (refer to Appendix A6).



### 4.5.2 Assessment Methodology

The NSER has considered the environmental effects during construction and operation of the Scheme, taking account of direct and indirect, beneficial and adverse effects in accordance with the general Highway Agency’s Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2 Environmental Impact Assessment approach to determining significance although the methodology for the assessment varies from topic to topic and is set out in detail in the topic sections of this NSER. The specific assessment methodology and significance criteria against which the likely significant effects on the environment have been assessed are described in the topic sections.

The assessment process has involved an iterative dialogue between the environmental assessment team and the Welsh Government design team, with topic specialists commenting on the design and suggesting amendments to reduce adverse environmental effects or increase environmental benefits. The design that is being submitted reflect this process, and the assessments are based on the detailed design. The mitigation measures incorporated into the design during the environmental assessment process are recorded within each of the topic assessment chapters.

### 4.5.3 Identification of Potential Impacts and Significance Criteria

Impacts are defined as physical changes to the environment attributable to the construction and operation of the Scheme, compared with the baseline conditions. Baseline conditions are defined as the environmental conditions that would develop without the Scheme. The effects of impacts on existing resources and receptors may be adverse or beneficial, direct or indirect, temporary or permanent.

The approach to environmental assessment is based on standard methodologies, best practice guidelines and consistent with DMRB HA205/08.

### Sensitivity or Value of Receptors

Receptors are defined as individual environmental features that have the potential to be affected by a scheme (Highways Agency et al., 2008g). For each topic, baseline studies have identified potential environmental receptors and the sensitivity or value has been assessed based on criteria defined in HA205/08).

Table 4.2 Criteria and DMRB Definitions of Sensitivity (or value)

Sensitivity (or Value)	Magnitude of Impact				
	No Change	Negligible	Minor	Moderate	Major
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large

Sensitivity (or Value)	Magnitude of Impact				
	No Change	Negligible	Minor	Moderate	Major
High	Neutral	Slight	Slight or moderate	Moderate or Large	Large or Very large
Very High	Neutral	Slight	Moderate or large	Large or Very large	Very large

Based on Table 2.4 of HA205/08 (Highways Agency et al., 2008e)

### Magnitude of Impact

DMRB defines an impact as:

*‘Change that is caused by an action; for example land clearing (action) during construction which results in habitat loss (impact)’* (Highways Agency et al., 2008g)

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

The categorisation of the magnitude of impact is topic specific but follows the guidance in HA205/08 as set out in Table 4.3

Table 4.3 Criteria and DMRB Definitions of Impact Magnitude

Magnitude of Impact	Typical Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (beneficial).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute/a reduced risk of negative impact occurring (beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (adverse).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (beneficial).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

## Significance of Effects

DMRB defines an ‘effect’ as:

*‘Term used to express the consequence of an impact (expressed as ‘significance of effect’), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource’ (Highways Agency et al., 2008g).*

Significance criteria, where feasible, are used to transparently evaluate impact predictions according to a clearly defined scale and within a generic framework, for consistency between topics. In this way the costs and benefits of the scheme are clearly presented.

Each chapter defines the approach taken to the assessment of significance. Where appropriate, topic chapters have adopted the general approach set out in DMRB HA 205/08 (see Table 4.4). The evaluation of significance takes into account industry and professional guidance; codes of practice; policy objectives regulations or standards; advice from statutory consultees and other stakeholders, as well as expert judgement of the EIA practitioners, based on specialist experience. For some topics, a simplified or quantitative approach is considered appropriate.

Table 4 4 Significance of Effect

Sensitivity (or Value)	Magnitude of Impact				
	No Change	Negligible	Minor	Moderate	Major
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
High	Neutral	Slight	Slight or moderate	Moderate or Large	Large or Very large
Very High	Neutral	Slight	Moderate or large	Large or Very large	Very large

Based on Table 2.4 of HA205/08 (Highways Agency et al., 2008e)

### 4.5.4 Study Area

The area over which impacts could occur is wider than the site and dependant on a consideration of how widespread specific impacts might be distributed. The study area therefore varies depending on the subject under consideration. Specific study areas are defined in each topic section, and allow for assessment of indirect as well as direct effects, together with off-site factors, such as traffic routes.

### 4.5.5 Mitigation and Enhancement

Where likely significant adverse effects have been identified in the assessment, measures have been proposed to avoid or reduce effects where possible. Where adverse effects cannot be avoided, measures to compensate for the adverse effects are proposed. Collectively these are known as mitigation measures.

Enhancement measures to improve the environmental performance of the Scheme are also proposed where opportunities to implement such measures within the scope of the Scheme are identified.

Mitigation and enhancement measures are described in the topic sections of the environmental assessment where relevant and identified on the Environmental Master Plans in Appendix C10.

### 4.5.6 Cumulative Effects

The cumulative effects assessment (CEA) follows the guidance that is provided in DMRB Vol. 11, Section 2, Part 5 (HA 205/08) which recognises two principle types of cumulative impacts to be addressed as follows:

- Cumulative Impacts from a single project; and
- Cumulative impacts from different projects (in combination with the project being assessed).

Cumulative effects both from the project and from different projects are assessed together within Chapter 12.

### 4.5.7 Limitations

The environmental assessment of the Scheme has been undertaken based on the detailed design details shown in Appendix A3-A5. Minor design detail and development of construction methods may develop further. Any further environmental considerations will be incorporated in a Construction Environmental Management Plan (CEMP).

### 4.5.8 Assumptions

It is assumed that the design, construction and operation of the project will be carried out in accordance with prescribed guidance and good working practice implemented on such projects.

A detailed construction methodology will be designed by the contractor for the project. However, for the purposes of this assessment, a number of basic assumptions on construction activities have been formulated.

It is assumed that normal good working practice will be undertaken during the construction phase, following guidance available from CIRIA, NRW and the HSE.

Professional judgement was used in the carrying out of this work where professional guidance was not available, and in the interpretation of results. Where there was not enough information about the risk of qualifying interest being present, or of the risk of impacts, the assessment used the precautionary

principle to inform the judgement. The precautionary principle has been applied to ensure that any assessment errs on the side of caution, without being overly cautious.

## 5 Air Quality

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### 5.1 Introduction

This chapter of the report provides an assessment of air quality effects during both the construction and operational phases of the Scheme. This chapter outlines the current regulatory system relevant to air quality assessment and management, the baseline air quality conditions in the study area, and the methodology used to assess air quality effects. It then assesses the effect of the Scheme on local air quality and regional emissions.

Potential effects arising from both the construction and operational phase of the Scheme have been assessed before and after the implementation of mitigation measures. Potential changes to air quality in the area as a result of the operation of the Scheme have been considered in relation to national and EU air quality standards to determine their significance.

The method for assessing the likely air quality effects of the Scheme has followed the detailed assessment methodology guidance described in DMRB Volume 11, Section 3, Part 1: HA 207/07<sup>7</sup>, hereafter referred to as the DMRB HA207/07.

In addition to the DMRB, the construction dust assessment has followed guidance on the assessment of dust from demolition and construction published by the Institute of Air Quality Management<sup>8</sup> (IAQM), as this provides a more detailed assessment methodology and significance criteria and in doing so represents environmental best practice.

The operational assessment has considered the associated Interim Advice Notes (IANs), including the following:

- IAN 174/13<sup>9</sup> Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 ‘Air Quality’ (HA 207/07).
- IAN 170/12v3<sup>10</sup> Updated Air Quality Advice on the Assessment of Future NO<sub>x</sub> and NO<sub>2</sub> Projections for Users of DMRB Volume 11, Section 3, Part 1 ‘Air Quality’.
- IAN 185/15<sup>11</sup> (Highways Agency, 2015) Updated Traffic, Air Quality and Noise Advice on the Assessment of Link Speeds and Generation of Vehicle

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<sup>7</sup> Welsh Government, Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 Air Quality (HA207/07), 2007

<sup>8</sup> Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, 2016

<sup>9</sup> Highways Agency, Interim Advice Note 174/13 Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 ‘Air Quality’ (HA 207/07), 2013

<sup>10</sup> Highways Agency, Interim Advice Note 170/12v3 Updated Air Quality Advice on the Assessment of Future NO<sub>x</sub> and NO<sub>2</sub> Projections for Users of DMRB Volume 11, Section 3, Part 1 ‘Air Quality’

<sup>11</sup> Highways Agency, Interim Advice Note 185/15 Updated Traffic, Air Quality and Noise Advice on the Assessment of Link Speeds and Generation of Vehicle Data into ‘Speed-bands’ for Users of DMRB Volume 11, Section 3, Part 1 ‘Air Quality’ and Volume 11, Section 3, Part 7 Noise.

Data into 'Speed-bands' for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3, Part 7 Noise.

The IANs listed above have not yet been adopted in Wales. However, it is considered that these IANs reflect current best practice guidance and, as there is no suitable Welsh equivalent guidance, these have been used to inform the proposed method of assessment. It is acknowledged that references to the National Planning Policy Framework (NPPF) set out in the above IANs are not relevant in the Welsh context.

It has been noted that Highways England have produced IAN 175/13<sup>12</sup> to assess compliance with the EU Directive. IAN175/13 has been withdrawn and is currently pending update. Therefore, no assessment has been undertaken following the IAN175/13 assessment methodology, however consideration has been given to the need for the scheme to not delay compliance with the EU Directive.

## 5.2 Study Area

The study area of the air quality assessment is defined by the guidance used to assess potential air quality effects. Air quality effects during the construction phase have been assessed within 350m of construction works where receptors are present. Air quality effects during the operational phase have been assessed at receptors within 200m of roads that meet the following criteria set out in DMRB HA207/07 Volume 11, Section 3, Part 1:

- Road alignment will change by 5m or more; or
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10kph or more; or
- Peak hour speed will change by 20kph or more.

Following the review of traffic data provided by the Arup transport planning team, the study area, defined using the above criteria, included Highcross Road (B4591), Forge Road (A467), the M4 carriageway between Junction 30 and the Second Severn Crossing and the A48 Southern Distributor Road and A4810 Steelworks Access Road. The traffic data for those roads located within the study area is shown in Appendix B1. Appendix B2 shows the roads included in the study area as well as human health receptors and designated sites such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar designations and Sites of Special Scientific Interest (SSSI) have the potential to be affected by the Scheme. In addition to the assessment of local air quality effects at specified receptors, an assessment of regional emissions has been undertaken where the criteria set out in DMRB HA207/07 Volume 11, Section 3, Part 1 are met:

- Daily traffic flows (two way) will change by 10% AADT or more.

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<sup>12</sup> Highways Agency, Interim Advice Note 175/13 Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 'Air Quality'

- HDV flows (two way) will change by 10% AADT or more.
- Daily average speed (two way) will change by 20kph or more.

Appendix B3 shows those roads which meet the above criteria and therefore have been included in the assessment of regional emissions.

## 5.3 Baseline Air Quality Conditions

This section describes the baseline air quality conditions in the surrounding area of the Scheme. Baseline ambient air quality refers to the concentrations of relevant substances that are already present in the atmosphere – these are present from various sources, such as industrial processes, commercial and domestic activities, agriculture, traffic and natural sources.

### 5.3.1 Industrial Processes

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes. Part A processes are regulated through the Pollution Prevention and Control (PPC) system (EC Directive 96/91/EC on Pollution Prevention and Control originally implemented into law via the Pollution Prevention and Control Act (1999)) which was superseded in 2007 by the Environmental Permitting Regulations which were subsequently amended in 2014<sup>13</sup>. Generally, the larger, more polluting processes are regulated by Natural Resources Wales (NRW) and smaller, less polluting ones by the local authorities.

There is one regulated Part A process within 120m of the Pont Ebbw Roundabout, a semiconductor plant operated by International Rectifier Newport Limited. This process is regulated by the NRW for releases to air and water. The impact on ambient air quality due to this process is likely to be small compared with the impact of emissions from vehicular traffic associated with the M4 and A48. In addition, concentrations due to emissions from this regulated process are included in background concentration data used in this assessment.

In addition, Newport City Council (NCC) regulates a number of Part B processes in the surrounding area of the Scheme, however, due to the size and nature of these processes these do not significantly affect ambient air quality concentrations in the area and the impact on ambient air quality due to emissions from these processes are included in background concentrations data used in this assessment.

### 5.3.2 Local Authority Review and Assessment

As required under the Environment Act 1995, local authorities are required to review and assess air quality with respect to the objectives for seven pollutants specified in the Government's National Air Quality Strategy. Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential areas likely to exceed air quality objectives, then a detailed assessment of those areas is required. Where objectives

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<sup>13</sup> The Environmental Permitting (England and Wales) Regulations 2014.



are not predicted to be met, local authorities must declare the area as an air quality management area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP) which includes measures to improve air quality within the AQMA.

The Scheme lies within the NCC administrative area. NCC produced an USA<sup>14</sup> in 2015 presenting the latest information gathered from air quality monitoring and modelling undertaken by NCC.

Through the review and assessment regime, NCC has declared nine air quality management areas (AQMAs) for nitrogen dioxide (NO<sub>2</sub>), four of which are adjacent to the existing M4. The Scheme does not lie within an AQMA, the nearest of which (Glasllwch AQMA) is located 1.2 km north of Junction 28 (Tredegar House) and approximately 720 m east of Bassaleg roundabout encompassing properties at Bassaleg Road where the road crosses the M4. Three other AQMAs, Shaftesbury/Crindau AQMA, St Julians AQMA and Royal Oak Hill AQMA, are affected by changes in traffic on the wider road network as a result of the proposed Scheme and are located 4.4km, 5.5km and 7.4km north-east of the Scheme respectively. All four AQMAs adjacent to the M4 have the potential to be affected by the Scheme and as such have been included in the assessment the locations of these AQMAs are shown in Appendix B4. The 2015 USA indicates that exceedences of the annual mean NO<sub>2</sub> objective are widespread across the area, as such NCC are revising the existing AQAP<sup>15</sup> to provide robust recommendations to deliver air quality improvements.

### 5.3.3 Air Quality Monitoring

NCC undertakes both continuous and passive diffusion tube monitoring of NO<sub>2</sub> throughout the area. Continuous air quality monitoring is undertaken 4.6 km to the north east of the Scheme at St. Julian's School and Junction 25 of the M4. Air quality monitoring has also been undertaken in the area as part of the M4 Corridor around Newport scheme. Those continuous monitoring location and passive diffusion tube sites within the study area of the Scheme have been reviewed to determine the existing air quality conditions in the area of the Scheme. Details of these monitoring sites are presented in Table 5 1 Monitoring Locations in the Study Area of the Assessment and shown in Appendix B5.

Table 5 1 Monitoring Locations in the Study Area of the Assessment

Site ID	Name	Grid Reference	Distance (Direction)	Type <sup>a)</sup>
<b>Continuous Monitor</b>				
ID1 <sup>b)</sup>	St. Julians School	332418, 189603	4.6km North East	Urban Background
ID2	Junction 25A M4	332685, 189613	4.6km North East	Roadside
<b>Passive Diffusion Tubes</b>				
NCC2 <sup>b)</sup>	69 Glasllwch Crescent	328333, 187869	2.1km North	Roadside
NCC4	71 Glasllwch Crescent	328334, 187884	2.1km North	Roadside
NCC15	Glasllwch Crescent	328443, 187809	2.1km North	Roadside

<sup>14</sup> Newport City Council, 2015 Updating and Screening Assessment, February 2016

<sup>15</sup> Newport City Council, Air Quality Action Plan, July 2008

Site ID	Name	Grid Reference	Distance (Direction)	Type <sup>a)</sup>
NCC7 <sup>b)</sup>	Glasllwch Lane	328336, 187323	1.5km North	Roadside
NCC18 <sup>b)</sup>	Bassaleg Road 158/3	328598, 186991	1.2km North	Roadside
NCC33 <sup>b)</sup>	162 Bassaleg Road	328539, 186986	1.2km North	Roadside
NCC40 <sup>b)</sup>	158 Bassaleg Road	328590, 186992	1.2km North	Roadside
NCC41 <sup>b)</sup>	Bassaleg Road 162/3	328544, 186975	1.2km North	Roadside
NCC17	179 Malpas Road	330507, 189664	4.4km North East	Roadside
NCC19	177 Malpas Road	330510, 189680	4.4km North East	Roadside
NCC6	153 Malpas Road	330564, 189617	4.4km North East	Roadside
NCC16 <sup>b)</sup>	40 Denbigh Road	332320, 189703	4.6km North East	Roadside
NCC25	41 Denbigh Road	332301, 189712	4.6km North East	Kerbside
NCC31 <sup>b)</sup>	Buckland Cottage	334944, 189240	7.4km North East	Roadside
NCC55 <sup>b)</sup>	116 Alexandra Road	331539, 186225	2.2km East	Kerbside
ARUP17	Holiday Inn Express (A48)	328307, 185074	460m South West	Roadside
ARUP18	Holiday Inn Express (A48)	328282, 185074	460m South West	Urban Background
ARUP19 <sup>b)</sup>	Berry Hill Farm	326901, 184301	2.1km South West	Background
ARUP20	A48, Berry Hill Farm	326840, 184301	2.1km South West	Roadside
ARUP16	Brunel Street	331608, 186279	3.2km East	Urban Background
ARUP12	Newport Stadium	333500, 186600	5km East	Roadside
ARUP14	Spytty Lane	333500, 186717	5km East	Roadside
ARUP15 <sup>b)</sup>	Fosse Road	334136, 186851	6km East	Urban Background
ARUP24 <sup>b)</sup>	Lamppost Badminton Road	332707, 189615	5.8km North East	Roadside
ARUP22	Malpas Depot	330570, 189789	4.4km North East	Urban Background
<p>a) Monitoring location type is defined by NCC in its LAQM progress reports following guidance provided in LAQM TG16; location type of the M4 Corridor around Newport monitors have also been defined following LAQM TG16.</p> <p>b) Monitoring locations representative of relevant exposure e.g. schools and facades of residential properties</p>				

Monitored annual mean NO<sub>2</sub> concentrations from 2010-2015 are presented in Table 5.2. The monitored results show the annual mean NO<sub>2</sub> objective is exceeded at some roadside locations adjacent to the existing M4 corridor. The annual mean NO<sub>2</sub> objective is likely to be met at locations away from the existing M4 corridor including at the Bassaleg and Pont Ebbw roundabouts.

As shown in Table 5.3, monitored hourly mean NO<sub>2</sub> concentrations at the continuous monitors in St. Julian's and at Junction 25 of the M4 show that the hourly mean NO<sub>2</sub> objective is met with the number of hours where concentrations were recorded above 200µg/m<sup>3</sup> less than 18 times per year. Monitored results from diffusion tubes cannot be used to determine exceedences of the hourly mean

objective, however Local Air Quality Management Technical Guidance<sup>16</sup> (LAQM.TG16) states that where monitored annual mean NO<sub>2</sub> concentrations are below 60µg/m<sup>3</sup> the hourly mean NO<sub>2</sub> objective is likely to be met. No diffusion tube annual mean concentrations exceeded 60µg/m<sup>3</sup> and so the hourly mean objective is likely to be met at those locations as well.

Table 5.2 Table Monitored Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) from Continuous Monitors and Diffusion Tube Locations

Site ID	Monitoring Site	Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )					
		2010	2011	2012	2013	2014	2015
ID1	St. Julians School	26	22	22	23	22	21
ID2	Junction 25A M4		-	-	<b>59</b>	<b>56</b>	<b>54</b>
NCC2	69 Glasllwch Crescent	33	<b>40</b>	36	<b>40</b>	37	<b>40</b>
NCC4	71 Glasllwch Crescent	-	-	-	33	32	33
NCC15	Gasllwch Crescent	33	32	34	36	32	34
NCC7	Glasllwch Lane	32	35	34	<b>41</b>	35	36
NCC18	Bassaleg Road 158/3	25	36	37	<b>41</b>	38	<b>40</b>
NCC33	162 Bassaleg Road	33	32	32	34	33	27
NCC40	158 Bassaleg Road	33	34	31	32	30	32
NCC41	Bassaleg Road 162/3	30	33	34	39	35	31
NCC17	179 Malpas Road	31	34	33	33	32	31
NCC19	177 Malpas Road	28	35	35	39	38	35
NCC6	153 Malpas Road	37	<b>40</b>	39	<b>43</b>	37	<b>41</b>
NCC16	40 Denbigh Road	32	36	35	<b>41</b>	38	38
NCC25	41 Denbigh Road	26	29	28	32	29	26
NCC31	Buckland Cottage	34	<b>40</b>	<b>41</b>	<b>46</b>	<b>43</b>	<b>46</b>
NCC55	116 Alexandra Road	32	35	32	36	33	35
ARUP1 7	Holiday Inn Express (A48)	-	-	-	-	24	24
ARUP1 8	Holiday Inn Express (A48)	-	-	-	-	22	22
ARUP1 9	Berry Hill Farm	-	-	-	-	22	21
ARUP2 0	A48, Berry Hill Farm	-	-	-	-	30	34
ARUP1 6	Brunel Street	-	-	-	-	25	23
ARUP1 2	Newport Stadium	-	-	-	-	24	23
ARUP1 4	Spytty Lane	-	-	-	-	31	31

<sup>16</sup> Welsh Government, Local Air Quality Management Technical Guidance LAQM.TG16, April 2016

Site ID	Monitoring Site	Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )					
		2010	2011	2012	2013	2014	2015
ARUP1 5	Fosse Road	-	-	-	-	22	21
ARUP2 4	Lamppost Badminton Road	-	-	-	-	36	34
ARUP2 2	Malpas Depot	-	-	-	-	31	28

Note: Exceedences of the annual mean NO<sub>2</sub> objective are highlighted as bold

Table 5.3 Monitored Hourly Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) from Continuous Monitors

Site ID	Monitoring Site	No. of hours when hourly mean NO <sub>2</sub> concentrations exceeded 200µg/m <sup>3</sup>					
		2010	2011	2012	2013	2014	2015
ID1	St. Julians School	5	0	0	0	1	0
ID2	Junction 25A M4	-	-	-	12	<b>0</b>	1

Monitoring of PM<sub>10</sub> is also undertaken at St. Julians School. The 2015 NCC USA states that data capture for recent years has been poor and therefore it is difficult to identify trends in particulate matter concentrations with confidence. However, monitored concentrations in recent years, show that PM<sub>10</sub> concentrations are likely to be within the annual and daily mean PM<sub>10</sub> objectives, as shown in Table 5.4

Table 5.4 Monitored PM<sub>10</sub> Concentrations from St Julians Continuous Monitor

Site ID	Parameter	Year					
		2010	2011	2012	2013	2014	2015
ID1	Data Capture	17%	80%	90%	68%	85%	67%
	Annual Mean PM10 Concentration (µg/m3)	-	18	13	-	16	-
	No. of days when the daily average exceeds 50µg/m3	2	8	2	3	3	3

## 5.4 Regulatory and Policy Framework

### 5.4.1 European Air Quality Management

In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC). This Directive defined the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant were set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive) which sets limit values for sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM<sub>10</sub>) and lead in ambient air.

In May 2008 the Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force. This directive consolidates the above (apart from the 4th Daughter Directive, which will be brought within the new Directive at a later date) and provides a new regulatory framework for PM<sub>2.5</sub>.

The Directives were transposed into national legislation by the Air Quality Standards (Wales) Regulations 2010. Welsh Ministers have the duty of ensuring compliance with the air quality objectives across Wales.

### 5.4.2 Environment Act 1995

Part IV of the Environment Act 1995 places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy (AQS) with the aim of reducing atmospheric emissions and improving air quality. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland provides the framework for ensuring compliance with the air quality limit values based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air quality management and declare Air Quality Management Areas (AQMA) where the limit values provided in The Air Quality Standards (Wales) Regulations 2010 (and earlier versions) are exceeded.

### 5.4.3 Air Quality Objectives and EU Limit Values

Air quality limit values and objectives are quality standards for clean air set by EU and UK legislation respectively. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, 1-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long term and short term concentrations. Table 5.5 sets out these EU air quality limit values and national air quality objectives for the pollutants relevant to this assessment (NO<sub>2</sub>, PM<sub>10</sub>).

Table 5.5 Air Quality Objective and EU Limit Values

Pollutant	Averaging Period	Limit Value/Objective	Date for Compliance
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Mean	40µg/m <sup>3</sup>	Wales <sup>(A)</sup> 11 June 2010
			EU <sup>(B)</sup> 01 Jan 2010
	1 Hour Mean	200µg/m <sup>3</sup> not to be exceeded more than 18 times a year (99.8 <sup>th</sup> percentile)	Wales <sup>(A)</sup> 11 June 2010
			EU <sup>(B)</sup> 01 Jan 2010
Particulate Matter (PM <sub>10</sub> )	Annual Mean	40µg/m <sup>3</sup>	Wales <sup>(A)</sup> 11 June 2010
			EU <sup>(B)</sup> 01 Jan 2010

Pollutant	Averaging Period	Limit Value/Objective	Date for Compliance
	24 Hour Mean	50µg/m <sup>3</sup> not to be exceeded more than 35 times a year (90.4 <sup>th</sup> percentile)	Wales <sup>(A)</sup> 11 June 2010 EU <sup>(B)</sup> 01 Jan 2010
Oxides of Nitrogen (NO <sub>x</sub> ) <sup>(C)</sup>	Annual Mean	30 µg/m <sup>3</sup>	Wales <sup>(A)</sup> 31 Dec 2000 EU <sup>(B)</sup> 19 July 2001

A) The Air Quality Standards (Wales) Regulations 2010

B) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

C) For the protection of vegetation only

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that Welsh Ministers are required under European Law to ensure compliance with the air quality limit values whereas local authorities are only obliged under national legislation to undertake best efforts to comply with the air quality objectives.

The limit values for the protection of vegetation apply to locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or motorways. As stated in the EU Directive, monitoring sites need to be representative of an area of 1,000 square kilometres, the limit value does not therefore have a statutory basis in micro-scale environments such as those close to a road or other pollution source.

The United Nations Economic Commission for Europe (UNECE) and the World Health Organisation (WHO) have set a critical level for NO<sub>x</sub>, (30 µg/m<sup>3</sup>) for the protection of vegetation. Therefore, the statutory nature conservation agency's (Natural Resources Wales) policy is to apply the 30 µg/m<sup>3</sup> criterion as a benchmark, on a precautionary basis, in internationally designated conservation sites and in nationally designated Sites of Special Scientific Interest (SSSIs) designated for the protection of vegetation, regardless of proximity to towns, built-up areas, industrial installation or motorways.

#### 5.4.4 Environment (Wales) Act 2016

The Environment (Wales) Act provides legislation to plan and manage Wales' natural resources and environment. The Act does not introduce any additional targets or objectives for local air quality however a number of the policies included in the Act are anticipated to result in cleaner air. With regard to climate change and therefore regional emissions to air, Part 2 of the Act provides Welsh Ministers with powers to introduce statutory emission reduction targets, including at least an 80% reduction in greenhouse gas emissions by 2050 from the baseline<sup>17</sup>.

<sup>17</sup> Baseline is either 1990 or 1995 emission totals depending on pollutant

### 5.4.5 Well-being of Future Generations (Wales) Act 2015

The Well Being of Future Generations (Wales) Act 2015 aims to improve the social, economic, environmental and cultural well-being of Wales. It requires Welsh Ministers and other public bodies to take a long term view of the decisions that are taken by the current government. This will give a good quality of life to current and future generations. Well-being objectives were published by the Welsh Government in November 2016 and whilst there is not a specific objective for air quality, it is covered by a number of the objectives which aim to shape a healthier Wales such as:

- Help people live healthy and independent lives, and support a healthy workforce;
- Create condition to give every child the best start in life;
- Support the transition to a low carbon and climate resilient society; and
- Connect communities through sustainable and resilient infrastructure.

For road schemes, it is often the case in air quality assessment that there will be improvements and deteriorations in pollutant concentrations across the geography of the study area and therefore any reduction in air quality needs to be balanced against improvements.

### 5.4.6 Dust Nuisance

Dust is the generic term used in the British Standard document BS 6069 (Part Two) to describe particulate matter in the size range 1–75µm in diameter. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under provisions in the Environmental Protection Act 1990, dust nuisance is defined as a ‘*statutory nuisance*’.

There are currently no standards or guidelines for dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld for a statutory nuisance to occur. However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

### 5.4.7 Planning Policy and Guidance

#### National Policy and Guidance

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land use and its development can be a material planning consideration in the determination of planning applications, dependent upon the details of the Scheme.

## Planning Policy Wales

Planning Policy Wales (PPW8 January 2016) sets out land use planning policies for Wales and is supplemented by Technical Advice Notes (TAN) for a number of topics.

One of the underlying aims is the protection of the environment which includes air quality policies. The following excerpts have been taken from air quality policies relevant to the Scheme:

*“The planning system should determine whether a development is an acceptable use of land and should control other development in proximity to potential sources of pollution rather than seeking to control the processes or substances used in any particular development.”*

*“The potential for pollution affecting the use of land will be a material consideration in deciding whether to grant planning permission. Material considerations in determining applications for potentially polluting development are likely to include:*

- *Location, taking into account such considerations as the reasons for selecting the chosen site itself;*
- *Impact on health and amenity;*
- *The risk and impact of potential pollution from the development ... particularly if the development would impact on an Air Quality Management Area or a Special Area of Conservation (SAC);*
- *Prevention of nuisance;*
- *Impact on the road and other transport networks, and in particular on traffic generation”*

There are no TANs associated with air quality in the PPW.

## Newport Local Development Plan

The Newport Local Development Plan was adopted by NCC in 2015 and sets out planning policies and objectives to achieve the future vision of Newport as set out in the Local Plan. There are no specific policies or objectives related to air quality however a number of policies mention air quality and the need for areas of good air quality to be protected through the planning process and where possible make improvement in air quality through the planning process. The following policies discuss air quality:

- *GP2 General Amenity*

*“Development will be permitted where there will not be a significant adverse effect on local amenity, including in terms of noise disturbance, privacy, overbearing, light, odour and air quality.”*

- *GP7 Environmental Protection and Public Health*

*“Development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsidence, air heat, noise or light pollution, flooding, water pollution, or any other identified risk to environment, local amenity or public health and safety.”*



There are also strategic policies which consider the impact of proposals on air quality including:

- SP14 Transport Proposals

*“Transport proposals will be supported where they result in other environmental improvements including air quality, noise reduction, sustainable drainage and enhanced biodiversity.”*

Strategic Proposal 16 for Major Road Schemes acknowledges the Welsh Governments intention to take forward the Scheme and safeguards land for this purpose.

## Design Manual for Roads and Bridges (2007)

The Design Manual for Roads and Bridges (DMRB) is a guidance note published in 2007 by a consortium which consists of the Welsh Government, Highways Agency (now Highways England), Transport Scotland and the Department for Regional Development Northern Ireland (now Transport NI). Volume 11 Section 3, Part 1: HA 207/07 provides guidance on the methodology for assessing the effects of highway schemes on local and regional air quality, and this has been followed to assess the operational effects of the Scheme.

## 5.5 Methodology

### 5.5.1 Construction Phase

Since the publication of DMRB, further guidance has been released regarding local air quality effects during construction. Effects arising from the construction phase of the Scheme have therefore been assessed using the qualitative approach described in the IAQM guidance, which provides a more robust technical assessment.

The IAQM guidance considers the potential for dust emissions from the following activities:

- earthworks i.e. soil stripping, ground levelling, excavation and land capping;
- trackout i.e. incidental movement of dust and dirt from the construction or demolition site onto the public road network;
- demolition; and
- construction.

For each of these activities, the guidance considers three separate dust effects:

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in PM<sub>10</sub> exposure.

The methodology takes into account the scale on which the above effects are likely to be generated (classed as small, medium or large). The distance of the closest receptors and background PM<sub>10</sub> concentrations are taken into account in order to determine the sensitivity of the surrounding area. The sensitivity of the

area is then taken into consideration to derive an overall site risk and identify suitable mitigation measures. The receptors can be both human and ecological and are chosen based on their sensitivity to dust soiling and PM<sub>10</sub> exposure.

The four assessment steps are summarised in Appendix B6 with further descriptions of each step in the following sections.

### Step 1: Screen need for assessment

The first step is the initial screening for the need for an assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350m of the site boundary and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from site entrance(s). There are no ecological receptors within the defined study area for the construction phase therefore the construction dust assessment has focussed on human health receptors only.

### Step 2: Assess the risk of dust impacts

This step is divided into three sections, 2A, 2B and 2C, details of which are provided below.

#### Step 2A – Scale and nature of the works

Step 2A identifies the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large.

For this step, a description of the site and its surroundings has been collated to inform the overall significance and professional judgement. Each of the construction activities has been given a dust emission magnitude, based on the criteria shown in Table 5.6.

Table 5.6 Categorisation of Dust Emission Magnitude

Dust Emission Magnitude		
Small	Medium	Large
<b>Demolition</b>		
<ul style="list-style-type: none"> <li>• total building volume &lt;20,000m<sup>3</sup></li> <li>• construction material with low potential for dust release (e.g. metal cladding or timber)</li> <li>• demolition activities &lt;10m above ground</li> <li>• demolition during wetter months</li> </ul>	<ul style="list-style-type: none"> <li>• total building volume 20,000 - 50,000m<sup>3</sup></li> <li>• potentially dusty construction material</li> <li>• demolition activities 10 - 20m above ground level</li> </ul>	<ul style="list-style-type: none"> <li>• total building volume &gt;50,000m<sup>3</sup></li> <li>• potentially dusty construction material (e.g. concrete)</li> <li>• on-site crushing and screening</li> <li>• demolition activities &gt;20m above ground level</li> </ul>
<b>Earthworks</b>		
<ul style="list-style-type: none"> <li>• total site area &lt;2,500m<sup>2</sup>, soil type with large grain size (e.g. sand)</li> </ul>	<ul style="list-style-type: none"> <li>• total site area 2,500m<sup>2</sup> - 10,000m<sup>2</sup>, moderately dusty soil type (e.g. silt)</li> </ul>	<ul style="list-style-type: none"> <li>• total site area &gt;10,000m<sup>2</sup> potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size)</li> </ul>

<b>Dust Emission Magnitude</b>		
<b>Small</b>	<b>Medium</b>	<b>Large</b>
<ul style="list-style-type: none"> <li>• &lt;5 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds &lt;4m in height</li> <li>• total material moved &lt;20,000 tonnes</li> <li>• earthworks during wetter months</li> </ul>	<ul style="list-style-type: none"> <li>• 5-10 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds 4m - 8m in height</li> <li>• total material moved 20,000 - 100,000 tonnes</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;10 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds &gt;8m in height</li> <li>• total material moved &gt;100,000 tonnes</li> </ul>
<b>Construction</b>		
<ul style="list-style-type: none"> <li>• total building volume &lt;25,000 m<sup>3</sup></li> <li>• construction material with low potential for dust release (e.g. metal cladding or timber)</li> </ul>	<ul style="list-style-type: none"> <li>• total building volume 25,000m<sup>3</sup> - 100,000m<sup>3</sup></li> <li>• potentially dusty construction material (e.g. concrete)</li> <li>• piling</li> <li>• on-site concrete batching</li> </ul>	<ul style="list-style-type: none"> <li>• total building volume &gt;100,000m<sup>3</sup></li> <li>• piling</li> <li>• on-site concrete batching</li> <li>• sandblasting</li> </ul>
<b>Trackout</b>		
<ul style="list-style-type: none"> <li>• &lt;10 HDV (&gt;3.5t) trips in any one day</li> <li>• surface material with low potential for dust release</li> <li>• unpaved road length &lt;50m</li> </ul>	<ul style="list-style-type: none"> <li>• 10-50 HDV (&gt;3.5t) trips in any one day</li> <li>• moderately dusty surface material (e.g. high clay content)</li> <li>• unpaved road length 50m – 100m;</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;50 HDV (&gt;3.5t) trips in any one day</li> <li>• potentially dusty surface material (e.g. high clay content)</li> <li>• unpaved road length &gt;100m</li> </ul>

## Step 2B – Sensitivity of the Area

Step 2B defines the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity. This step takes into account a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM<sub>10</sub> the local background concentrations; and
- Site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The sensitivity of an area is based on the guidance and professional judgement. The general principles to assess sensitivity are provided in Table 5.7.

Table 5.7 Examples of Factors Defining Sensitivity of an Area

<b>Sensitivity of Surrounding Area</b>	<b>Examples</b>	
	<b>Sensitivity of People to Dust Soiling Effects</b>	<b>Sensitivities of People to the Health Effects of PM<sub>10</sub></b>
<b>Low</b>	Enjoyment of amenity would not reasonably be expected; There is property that would not	Locations where human exposure is transient; Indicative examples public footpaths,

Sensitivity of Surrounding Area	Examples	
	Sensitivity of People to Dust Soiling Effects	Sensitivities of People to the Health Effects of PM <sub>10</sub>
	<p>reasonably be expected to be diminished in appearance, aesthetics or values by soiling;</p> <p>There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land;</p> <p>Indicative examples include playing fields, farmland (unless commercially sensitive horticulture), footpaths, short term car parks and roads.</p>	<p>playing fields, parks and shopping streets.</p>
<b>Medium</b>	<p>Users would expect to enjoy a reasonably level of amenity, but would not reasonably expect to enjoy the same levels of amenity as in their home;</p> <p>The appearance, aesthetics or value of their property could be diminished by soiling;</p> <p>Indicative examples include parks and places of work.</p>	<p>Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM<sub>10</sub> (in the case of the 24-hour objectives a relevant locations would be one where individuals may be exposed for eight hours or more in a day);</p> <p>Indicative examples may include offices and shops, but will generally not include workers occupationally exposed to PM<sub>10</sub> as potential is covered by Health and Safety at Work legislation.</p>
<b>High</b>	<p>Users can reasonably expect a enjoyment of a high level of amenity the appearance, aesthetics or values of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land;</p> <p>Indicative examples include dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms.</p>	<p>Locations where members of the public are exposed over a time period relevant to the air quality objective for PM<sub>10</sub> (in the case of the 24-hour objectives a relevant locations would be one where individuals may be exposed for eight hours or more in a day);</p> <p>Indicative examples include residential properties. Hospitals and schools and residential care homes should also be considered as having equal sensitivity to residential areas.</p>

Once the specific receptors have been identified the sensitivity of these receptors is determined based on the sensitivity of the area to dust soiling effects on people and property and on the sensitivity of the area to human health. The tables used in assessing these sensitivities are shown in Table 5.8 and Table 5.9.

Table 5.8 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 5.9 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM <sub>10</sub> concentration	Number of receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<300
High	>32 µg/m <sup>3</sup>	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m <sup>3</sup>	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m <sup>3</sup>	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m <sup>3</sup>	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

### Step 2C – Defining Risk of Impacts

Step 2C takes the results from steps 2A and 2B and combines these to define the risk of impacts.

The guidance provides the matrices with which the risk of dust impacts can be defined from the results of both the dust magnitude and sensitivity of the area. The matrices for assessment are provided in Table 5.10.

Table 5.10 Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
<b>Demolition</b>			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
<b>Earthworks</b>			
High	High	High	High
Medium	Medium	Medium	Medium
Low	Low	Low	Low
<b>Construction</b>			
High	High Risk Site	Medium Risk Site	Low Risk Site
Medium	Medium Risk Site	Medium Risk Site	Low Risk Site
Low	Low Risk Site	Low Risk Site	Negligible
<b>Trackout</b>			
High	High Risk Site	Medium Risk Site	Low Risk Site
Medium	Medium Risk Site	Low Risk Site	Negligible
Low	Low Risk Site	Low Risk Site	Negligible

### Step 3: Determine site specific mitigation (if required)

Following assignment of a risk rating to each of the activities, appropriate mitigation measures have been identified. Where the risk has been assessed as negligible, no mitigation measures beyond best practice are necessary and no significant effects would be anticipated.

### Step 4: Define risks of effects and their significance

For all construction activity the aim should be to prevent significant impacts on receptors through the use of effective mitigation. Experience indicates that once mitigation measures are applied, in most cases the dust effects will be reduced to negligible levels.

### Step 5: Prepare a dust assessment report

The last step of the assessment is the preparation of a Dust Assessment Report which is covered in section 5.6.1 of this report.

## 5.5.2 Operational Phase

The assessment of local air quality effects associated with the operation of the Scheme has been undertaken following the detailed level assessment methodology set out in DMRB, Volume 11, Section 3, Part 1 Air Quality and subsequent IANs produced by Highways England. The study area of the assessment and the affected road network has been defined above and is shown in Appendix B2

The change in pollutant concentrations as a result of the Scheme has been assessed at receptors likely to be most affected up to 200m from the affected road network. These changes were determined using detailed dispersion modelling using the ADMS-Roads model created by Cambridge Environmental Research Consultants (CERC).

The assessment focuses primarily on NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub> as these are the pollutants of concern for both human and ecological receptors in relation to road vehicle emissions.

### Assessment Scenarios

The following scenarios have been used in the assessment:

- 2012 baseline scenario;
- 2012 projected baseline scenario<sup>18</sup>;
- 2017 Do-Minimum (DM) scenario: the traffic scenario at the year of opening without the Scheme; and
- 2017 Do-Something (DS) scenario; the traffic scenario at the year of opening with the Scheme.

With regard to local air quality, the opening year of the Scheme (2017) is considered to be the worst case scenario as vehicle emissions and background pollutant concentrations are anticipated to decrease over time, which is due to improvements in fuel technologies over time in the future. Therefore, the assessment has focussed on the opening year only. The traffic data provided for the DM and DS scenarios includes traffic associated with committed development in the area that is proposed to be operational by 2017.

### Traffic Data

Traffic data was provided as 24hr Annual Average Daily Traffic (AADT) flows, the percentage of Heavy Duty Vehicles (HDVs) and the average speed (kph) for all the assessment scenarios listed above. Transport modelling for the Scheme considered effects based on scenarios both with and without the M4 Corridor around Newport in operation. As the opening year of the Scheme is 2017, and the M4 Corridor around Newport would not be operational until 2022 should this be granted consent by the Welsh Minister, traffic data predicted for the without M4

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<sup>18</sup> The projected base year is produced as part of the future year NO<sub>x</sub> and NO<sub>2</sub> sensitivity testing carried out for IAN 170/12v3. It has the base year traffic modelled using the opening year vehicle emission factors and opening year background concentrations.

Corridor around Newport scenario has been used in the air quality assessment. Traffic data used for each of the assessment scenarios is shown in Appendix B1.

Emissions for each of the road sources have been determined using emission rates for Light Duty Vehicles (LDVs) and Heavy Duty Vehicles (HDVs) provided in Annex C of IAN 185/15<sup>19</sup>.

The emission rates have been selected for each link by classifying the road type (motorway, urban or rural) and applying a speed band, which is based on the average speed of the road link. As the traffic is modelled as 24hr AADT traffic, 'free flow' speed bands for each of the classified road types have been applied, as required by IAN 185/15. In addition, to account for congestion within the vicinity of junctions, 'light congestion' speed bands for each of the classified road types have been applied for those road links within 100m of junctions across the modelled road network as required by IAN 185/15. Although the methodology used considers congestion to some degree it is difficult to fully model improvements in air quality associated with congestion relief. In addition, it is the case that relieving congestion has resulted in the capacity of the junctions being increased and therefore the traffic modelling used as the basis for the air quality assessment allows more vehicles to travel through the junctions per day.

Research undertaken by Defra<sup>20</sup> has shown that there is a gap between projected vehicle emission reductions for NO<sub>x</sub> and the observed annual rate of air quality improvement. Highways England has therefore provided a set of guidance for carrying out sensitivity analysis for future year NO<sub>x</sub> and NO<sub>2</sub> concentrations to determine a range of likely NO<sub>2</sub> concentrations for the future years of assessment. Highways England has produced IAN 170/12v3<sup>21</sup> to provide a sensitivity test for the opening year which takes into account the uncertainty associated with future emission rates and background pollutant concentrations. The IAN 170/12v3 methodology provides more pessimistic results for the opening year of the Scheme, compared to using the IAN185/15 methodology alone, as it assumes future emission controls within the UK vehicle fleet are not as successful as expected. The IAN 170/12v3 assessment has been reported alongside the outcome of IAN185/15 assessment method for annual mean NO<sub>2</sub> concentrations. As IAN 170/12v3 presents a more pessimistic future scenario, these results have been used to determine the significance of the Scheme on local air quality.

## Receptors and Sensitivity

The study area of the air quality assessment comprises a 200m corridor from all routes affected by the Scheme. Receptors have been identified within this area including residential properties and schools which are representative of the likely worst case changes in air quality. The selected receptors, which also include the monitoring locations to be used for verification of the air quality model, are

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<sup>19</sup> Highways England, Interim Advice Note 185/15, Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality', January 2015

<sup>20</sup> Defra, Trends in NO<sub>x</sub> and NO<sub>2</sub> Emissions and ambient measurements in the UK, 2011

<sup>21</sup> Highways England, Interim Advice Note 170/12v3, Updated air quality advice on the assessment of future NO<sub>x</sub> and NO<sub>2</sub> projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality'



shown in Table 5.11 and Appendix B7. Human health receptors were modelled at a height of 1.5m above ground level, representative of respiration height.

Effects at ecological receptors relating to NO<sub>x</sub> concentrations and nitrogen deposition have been assessed in accordance with Annex F of DMRB HA207/07. Receptor transects for each of the assessed designated sites up to 200 metres from the source have been included to allow assessment of the drop off in emissions and deposition with increasing distance from the road. The ecological receptors are as shown in

Table 5.12 and in Appendix B7. All ecological receptor locations were modelled at a height of 0m, representative of vegetation growing at ground level.

Table 5.11 Assessed Human Health Receptors for Local Air Quality

Receptor ID	Receptor Name	Type	X	Y
HH1	The Grove, Forge Lane	Residential	328036	186355
HH2	Forge Lane	Residential	327776	186746
HH3	Bassaleg High School	Educational	327631	186786
HH4	Churchmead	Residential	327799	186873
HH5	Churchmead (off Forge Rd)	Residential	327766	186884
HH6	Forge Mews	Residential	327863	187183
HH7	Churchmead (off A467)	Residential	327853	186927
HH8	Hydrangea Close	Residential	327860	187331
HH9	Tregwilym Rd	Residential	327243	187766
HH10	Rogerstone Primary School	Educational	327304	188037
HH11	Cefn Road	Residential	327599	188469
HH12	High Cross Primary School	Educational	328141	188067
HH13	Serennu Childrens Centre	Medical	328188	188180
HH14	High Cross Road	Educational	328185	188128
HH15	71 Glasllwch Crescent	Newport Monitoring Location	328334	187884
HH16	69 Glasllwch Crescent	Newport Monitoring Location	328335	187870
HH17	Glasllwch Crescent	Newport Monitoring Location	328356	187906
HH18	162 Bassaleg Road	Residential	328536	187004
HH19	NCC33 162 Bassaleg Rd	Newport Monitoring Location	328539	186986
HH20	NCC41 162 Bassaleg Rd	Newport Monitoring Location	328544	186975
HH21	158 Bassaleg Road	Residential	328586	187004

Receptor ID	Receptor Name	Type	X	Y
HH22	NCC40 158 Bassaleg Road	Newport Monitoring Location	328590	186992
HH23	NCC18 158 Bassaleg Road	Newport Monitoring Location	328598	186991
HH24	Glasllwch Lane	Newport Monitoring Location	328336	187323
HH25	Backyard Lane	Residential	328452	187797
HH26	179 Malpas Road	Newport Monitoring Location	330507	189664
HH27	153 Malpas Road	Newport Monitoring Location	330564	189617
HH28	Aston Crescent	Residential	330868	189788
HH29	41 Denbigh Road	Newport Monitoring Location	332301	189712
HH30	40 Denbigh Road	Newport Monitoring Location	332320	189703
HH31	St Julians School	Newport Monitoring Location /Educational	332418	189603
HH32	Old Barn CM	Newport Monitoring Location	332685	189613
HH33	Arup Badminton Rd	Arup Monitoring Location	332707	189615
HH34	Christchurch Rd	Residential	334216	188890
HH35	Constable Drive	Residential	332895	189551
HH36	Buckland Cottage	Newport Monitoring Location	334944	189240
HH37	Court Meadow	Residential	337161	189691
HH38	Glan Llyn Development	Residential	335444	186539
HH39	Spytty Road 2	Residential	334191	186848
HH40	Spytty Road	Residential	334213	186866
HH41	Fosse Road	Arup Monitoring Location	334202	186887
HH42	Coleg Gwent	Educational	334059	186587
HH43	Spytty Lane	Arup Monitoring Location	333495	186701

Receptor ID	Receptor Name	Type	X	Y
HH44	Newport Athletic Stadium	Arup Monitoring Location	333511	186639
HH45	Ariel Reach	Residential	332300	186871
HH46	Brunel Street	Arup Monitoring Location	331608	186279
HH47	116 Alexandra Rd	Newport Monitoring Location	331539	186225
HH48	Watch House Parade	Residential	331577	186241
HH49	Maesglas Close	Residential	330012	185672
HH50	Maes Ebbw School	Educational	330060	185805
HH51	Maesglas Grove	Residential	329796	185689
HH52	Acorns Nurseries	Educational	329510	185763
HH53	Park Close	Residential	329528	186047
HH54	St Davids RC Primary School	Educational	329462	186095
HH55	Malpas Road	Arup Monitoring Location	330504	189700
HH56	St Brides Gardens	Residential	329578	185881
HH57	Handel Close	Residential	336058	188397

Table 5.12 Assessed Ecological Receptor Transects at Designated Sites

Receptor ID	Receptor Name	X	Y
Eco1	River Usk 20m SAC/SSSI	331534	190024
Eco2	River Usk 50m SAC/SSSI	331523	190052
Eco3	River Usk 100m SAC/SSSI	331506	190099
Eco4	River Usk 200m SAC/SSSI	331471	190193
Eco5	River Usk 20m S SAC/SSSI	331550	189949
Eco6	River Usk 50m S SAC/SSSI	331555	189919
Eco8	River Usk 100m S SAC/SSSI	331579	189771
Eco7	River Usk 200m S SAC/SSSI	331563	189870
Eco9	Langstone 20m N SSSI	338527	189472
Eco10	Langstone 50m N SSSI	338535	189501
Eco11	Langstone 100m N SSSI	338549	189549
Eco12	Langstone 200m N SSSI	338578	189645
Eco13	Redwick and Llandeenny 20m SSSI	341033	186433
Eco14	Redwick and Llandeenny 50m SSSI	341012	186454
Eco15	Redwick and Llandeenny 100m SSSI	340976	186489

Receptor ID	Receptor Name	X	Y
Eco16	Redwick and Llandeenny 200m SSSI	340905	186558
Eco17	Redwick and Llandeenny 20m S SSSI	341063	186406
Eco18	Redwick and Llandeenny 50m S SSSI	341086	186386
Eco19	Redwick and Llandeenny 100m S SSSI	341124	186354
Eco20	Redwick and Llandeenny 200m S SSSI	341200	186289
Eco21	Whitson 20m SSSI	338995	186076
Eco22	Whitson 50m SSSI	338995	186024
Eco23	Whitson 100m SSSI	338992	185970
Eco24	Whitson 200m SSSI	338989	185876
Eco25	Nash and Goldcliffe 20m SSSI	335766	186365
Eco26	Nash and Goldcliffe 50m SSSI	335765	186331
Eco27	Nash and Goldcliffe 100m SSSI	335764	186285
Eco28	Nash and Goldcliffe 200m SSSI	335760	186185
Eco29	River Usk 20m SDR SAC/SSSI	332502	186915
Eco30	River Usk 50m SDR SAC/SSSI	332497	186945
Eco31	River Usk 100m SDR SAC/SSSI	332489	186994
Eco32	River Usk 200m SDR SAC/SSSI	332474	187093
Eco33	River Usk 20m SDR S SAC/SSSI	332505	186860
Eco34	River Usk 50m SDR S SAC/SSSI	332506	186830
Eco35	River Usk 100m SDR S SAC/SSSI	332507	186765
Eco36	River Usk 200m SDR S SAC/SSSI	332510	186680

## Meteorological Data

Hourly sequential meteorological data for 2012 from the Met Office station at Rhoose Airport, located approximately 28 km south west of the Scheme, were used in this assessment. 2012 was chosen as this is the baseline scenario assessed and the year used to verify the air quality model by comparing modelled concentrations against monitored concentrations from 2012.

A wind rose derived from data obtained from the Rhoose Airport meteorological station area is shown in Appendix B8. This shows that the predominant wind direction in the area of the Scheme is westerly.

## Other model parameters

The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the roughness of the surface/ground over which the air is passing.

Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts).

Land around the Scheme can be best described as ‘parkland, open suburbia’ with a corresponding surface roughness of 0.5m.

A minimum Monin-Obukhov length of 30m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area, as it is suggested in the ADMS-Roads guidance as being suitable for ‘urban areas’.

Terrain has been included in the model using Ordnance Survey data to ensure the effect of the changes in terrain height surrounding the study area is accounted for within the assessment of effects.

The tunnel option included within the ADMS-Roads model has been used to account for the impact of the Brynglas tunnels on air quality concentrations at the exit portals of each tunnel.

## NO<sub>x</sub> to NO<sub>2</sub> conversion

The model predicts NO<sub>x</sub> roadside concentrations, which comprise principally nitric oxide (NO) and NO<sub>2</sub>. The emitted NO reacts with ozone in the atmosphere to form more NO<sub>2</sub> whilst NO<sub>2</sub> breaks down in sunlight to form NO. Since only NO<sub>2</sub> is associated with effects on human health, the limit values for the protection of human health are based on NO<sub>2</sub> rather than NO<sub>x</sub> or NO. Therefore, the amount of NO<sub>2</sub> needs to be calculated taking into account the atmospheric chemistry and the background concentrations of pollutants.

The approach for calculating the roadside conversion of NO<sub>x</sub> to NO<sub>2</sub> has followed the guidance in LAQM.TG16 and the LAQM website<sup>22</sup>. This approach allows the calculation of NO<sub>2</sub> from NO<sub>x</sub> concentrations, taking into account the difference between ambient NO<sub>x</sub> concentrations with and without the Scheme, the concentrations of ozone and the different proportions of primary NO<sub>2</sub> emissions in different years. This approach is available as a spreadsheet calculator and Version 4.1 released in June 2014 has been used in this assessment. A more recent version is available however this is to be used with Defra background concentrations with a base year of 2013. As the assessment considered a baseline year of 2012, Defra background concentrations with a base year of 2011 have been used, as discussed below, and therefore for consistency the earlier version of the NO<sub>x</sub> to NO<sub>2</sub> calculator (V4.1) has also been used.

## Background Pollutant Concentrations

Background pollutant concentrations are added to the modelled road contribution of NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub>. Mapped background concentration data available from the Defra website for each 1 km x 1 km grid square of the UK, have been used to determine the background pollutant concentrations at each of the assessed receptors. As discussed above, as a baseline year of 2012 has been assessed, background maps<sup>23</sup> released by Defra with a base year of 2011 have been used in

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<sup>22</sup> Defra, Local Air quality Management Website, <http://laqm.defra.gov.uk/>

<sup>23</sup> Defra, 2011 base year background maps, <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011>

this assessment. Defra's background maps are projected forward for each year until 2030 and therefore estimated mapped data for 2017 have been used for the opening year scenarios. Pollutant contributions in these grid squares from motorway and trunk road traffic have been removed to avoid double counting as these roads are included in the model. Annual mean background NO<sub>2</sub> and PM<sub>10</sub> concentrations used at each of the assessed human health receptors are shown in Table 5.13 .

Table 5.13 Annual Mean Background Concentrations at Assessed Receptors

Receptor ID	Receptor Name	2012		2017	
		Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )
HH1	The Grove, Forge Lane	20.3	16.1	15.7	16.6
HH2	Forge Lane	20.5	14.8	15.4	15.1
HH3	Bassaleg High School	20.5	14.8	15.4	15.1
HH4	Churchmead	20.5	14.8	15.4	15.1
HH5	Churchmead (off Forge Rd)	20.5	14.8	15.4	15.1
HH6	Forge Mews	31.7	15.4	17.2	15.1
HH7	Churchmead (off A467)	20.5	14.8	15.4	15.1
HH8	Hydrangea Close	31.7	15.4	17.2	15.1
HH9	Tregwilym Rd	31.7	15.4	17.2	15.1
HH10	Rogerstone Primary School	21.0	14.0	16.7	15.0
HH11	Cefn Road	21.0	14.0	16.7	15.0
HH12	High Cross Primary School	18.2	15.4	14.8	16.3
HH13	Serennu Childrens Centre	18.2	15.4	14.8	16.3
HH14	High Cross Road	18.2	15.4	14.8	16.3
HH15	71 Glasllwch Crescent	23.2	16.4	16.5	16.9
HH16	69 Glasllwch Crescent	23.2	16.4	16.5	16.9
HH17	Glasllwch Crescent	23.2	16.4	16.5	16.9
HH18	162 Bassaleg Road	23.2	16.4	16.5	16.9
HH19	NCC33 162 Bassaleg Rd	20.3	16.1	15.7	16.6
HH20	NCC41 162 Bassaleg Rd	20.3	16.1	15.7	16.6
HH21	158 Bassaleg Road	23.2	16.4	16.5	16.9
HH22	NCC40 158 Bassaleg Road	20.3	16.1	15.7	16.6

Receptor ID	Receptor Name	2012		2017	
		Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )
HH23	NCC18 158 Bassaleg Road	20.3	16.1	15.7	16.6
HH24	Glasllwch Lane	23.2	16.4	16.5	16.9
HH25	Backyard Lane	23.2	16.4	16.5	16.9
HH26	179 Malpas Road	21.4	16.7	18.4	17.3
HH27	153 Malpas Road	21.4	16.7	18.4	17.3
HH28	Aston Crescent	21.4	16.7	18.4	17.3
HH29	41 Denbigh Road	22.0	16.6	19.6	17.4
HH30	40 Denbigh Road	22.0	16.6	19.6	17.4
HH31	St Julians School	22.0	16.6	19.6	17.4
HH32	Old Barn CM	22.0	16.6	19.6	17.4
HH33	Arup Badminton Rd	22.0	16.6	19.6	17.4
HH34	Christchurch Rd	22.5	15.2	18.6	15.9
HH35	Constable Drive	22.0	16.6	19.6	17.4
HH36	Buckland Cottage	20.3	14.9	17.2	15.7
HH37	Court Meadow	17.8	16.0	14.3	16.7
HH38	Glan Llyn Development	27.3	14.5	15.1	14.4
HH39	Spytty Road 2	47.9	18.1	24.0	17.8
HH40	Spytty Road	47.9	18.1	24.0	17.8
HH41	Arup Fosse Road	47.9	18.1	24.0	17.8
HH42	Coleg Gwent	47.9	18.1	24.0	17.8
HH43	Arup Spytty Lane	30.7	16.2	18.5	15.5
HH44	Arup Continuous Monitor	30.7	16.2	18.5	15.5
HH45	Ariel Reach	26.7	16.2	18.2	16.2
HH46	Arup Brunel Street	28.1	16.1	20.7	16.2
HH47	NCC55 116 Alexandra Rd	28.1	16.1	20.7	16.2
HH48	Watch House Parade	28.1	16.1	20.7	16.2
HH49	Maesglas Close	25.8	15.6	20.3	15.8
HH50	Maes Ebbw School	25.8	15.6	20.3	15.8
HH51	Maesglas Grove	26.6	17.2	20.1	17.6
HH52	Acorns Nurseries	26.6	17.2	20.1	17.6
HH53	Park Close	24.6	14.8	18.8	15.0

Receptor ID	Receptor Name	2012		2017	
		Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual Mean PM <sub>10</sub> (µg/m <sup>3</sup> )
HH54	St Davids RC Primary School	24.6	14.8	18.8	15.0
HH55	Arup Malpas Road	21.4	16.7	18.4	17.3
HH56	St Brides Gardens	26.6	17.2	20.1	17.6
HH57	Handel Close	20.5	14.0	15.6	14.3

Elevated levels of NO<sub>x</sub> can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from NO<sub>x</sub> emissions can contribute to acidification and/or eutrophication of sensitive habitats leading to loss of biodiversity. The APIS website <sup>24</sup>contains critical loads for nitrogen deposition for those habitats considered sensitive to nitrogen and average nitrogen deposition rates for all designated sites in the UK. Critical loads, as well as existing nitrogen deposition rates and sensitive habitats at each of the designated sites assessed are presented in Table 5.14. These have been discussed with the ecologists for the Scheme. The DMRB HA207/07 states that nitrogen deposition rates should be reduced by 2% per year to obtain appropriate levels for assessment of the opening year.

<sup>24</sup> Air Pollution Information System, <http://www.apis.ac.uk/>, Accessed August 2016



Table 5.14 Nitrogen Deposition Critical Loads for Assessed Ecological Receptors

Designated Site	Habitat	2012 Background Annual Mean NOx (µg/m3)	2017 Background Annual Mean NOx (µg/m3)	Nitrogen Deposition (kgN/ha/yr)		
				Background N Deposition (2012) <sup>a</sup>	Background N Deposition (2017)	Critical Load
River Usk SAC/SSSI - Lower	Pioneer, low-mid, mid-upper saltmarshes	40.2	25.4	18.0	16.3	20-30 kgN/ha/yr
River Usk SAC/SSSI - Upper	Pioneer, low-mid, mid-upper saltmarshes	27.9	23.4	18.0	16.3	20-30 kgN/ha/yr
Nash & Goldcliffe SSSI	Marshy Grassland	42.0	20.5	12.6	11.4	10-20 kgN/ha/yr
Whitson SSSI	Marshy Grassland	20.7	13.8	15.4	13.9	10-20 kgN/ha/yr
Langstone - Llanmartin Meadows SSSI	Low and medium altitude hay meadows/improved grassland	21.6	17.0	15.4	13.9	20-30 kgN/ha/yr
Redwick & Llandeenny SSSI	Marshy Grassland	23.7	17.5	16.0	14.4	20-30 kgN/ha/yr
Average deposition available on APIS for 2012 – 2014 has been used for 2012 and the 2% reduction per year applied to predict background N deposition for the opening year of the Scheme, 2017						

## Model Verification

Locations where air quality monitoring was undertaken within 200m of the affected road network in 2012 have been included in the baseline scenario to provide locations where modelled and monitored concentrations can be compared. As monitored concentrations were required for a baseline scenario of 2012, none of the monitoring locations commissioned for the M4 Corridor around Newport scheme have been included. Model verification determines whether an adjustment of the modelled results is required based on monitored concentrations, this follows the methodology set out in LAQM.TG16. Table 5.15 presents the modelled and monitored concentrations for those locations which are within 200m of the affected road network. Where the % difference between modelled and monitored concentrations is positive, the model is over-predicting concentrations and where it is negative the model is under-predicting concentrations.

Table 5.15 Modelled and monitored concentrations within 200m of the affected road network

Site Name	2012 Monitored Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Baseline Modelled Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	% Difference (Modelled-Monitored/Monitored)
NCC4	36.1	33.6	-7%
NCC33	32.3	34.2	6%
NCC41	34.5	36.2	5%
NCC40	31.2	43.2	<b>39%<sup>b)</sup></b>
NCC18	36.5	38.0	4%
NCC17	33.4	32.5	-3%
NCC6	38.7	43.5	12%
NCC16	34.8	44.9	<b>29%<sup>b)</sup></b>
NCC25	27.8	46.3	<b>66%<sup>b)</sup></b>
St Julian's CM	22.0	30.8	<b>40%<sup>b)</sup></b>
NCC31	41.2	42.9	4%
NCC55	32.4	32.2	-1%
NCC7	33.5	35.7	7%
NCC15	34.0	41.2	21%
NCC19	35.3	29.4	-17%
NCC2 <sup>a)</sup>	33.3	33.5	1%

a) These locations are based on 2013 monitored data as no data is available for 2012

b) Locations where modelled concentrations are more than 25% above monitored concentrations have been highlighted as bold

Following LAQM.TG16 if modelled concentrations are not within 25% or there is a systematic under- or over-prediction of concentrations then adjustment of modelled concentrations should be undertaken. As shown in Table 5.15, at the majority of locations, modelled concentrations are within 25% of monitored concentrations and at nine locations modelled concentrations are within 10% of monitored concentrations. Locations which have modelled concentrations which are not within 25% of monitored concentrations are all over predicting i.e.

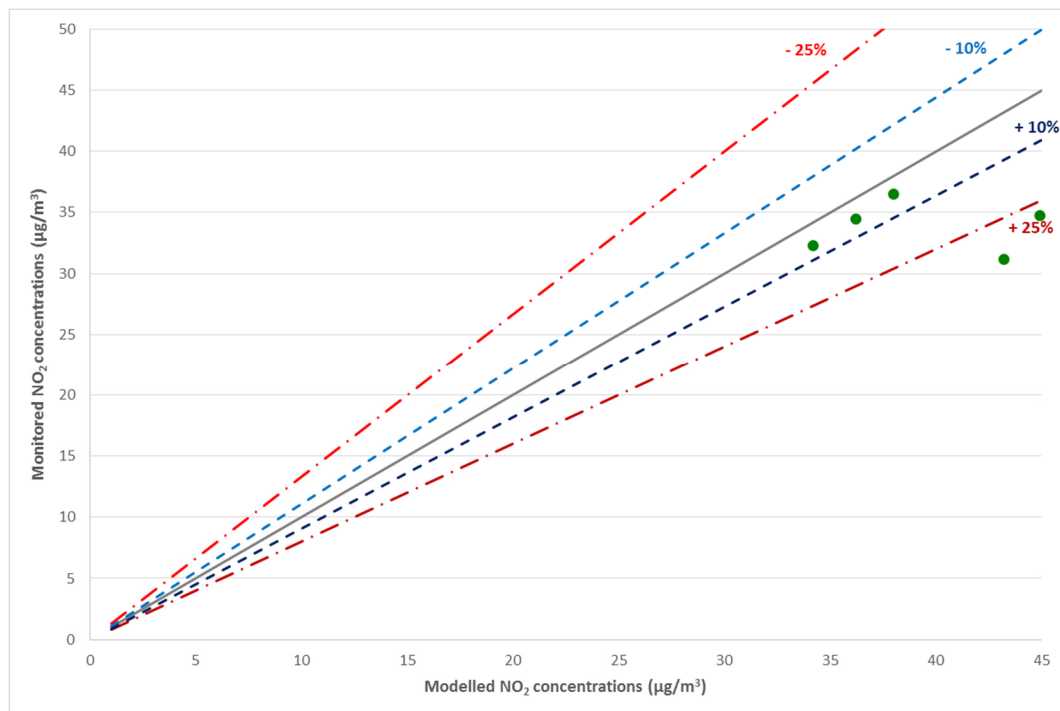
modelled concentrations are higher than monitored concentrations. These locations (Bassaleg Road, Denbigh Road and St Julian’s School) are all close to the M4 where the carriageway is in a cutting and although terrain data is included in the modelling the effect of cutting has been underestimated by the modelling.

An adjustment factor has therefore been derived for those receptors which are located adjacent to a cutting, the effect of which is underestimated by the model. The monitored and modelled road NOx contribution concentrations were plotted and the equation of the trendline based on linear progression through zero calculated. Table 5.16 shows the modelled and monitored road NOx contribution and the adjustment factor derived. Graph 1 and 2 show the performance of the model before and after adjustment at those monitoring locations adjacent to a cutting. St Julian’s continuous monitor and NCC 25 have been removed as these are kerbside and urban background locations where monitored concentrations are less than Defra background pollutant concentrations in the area.

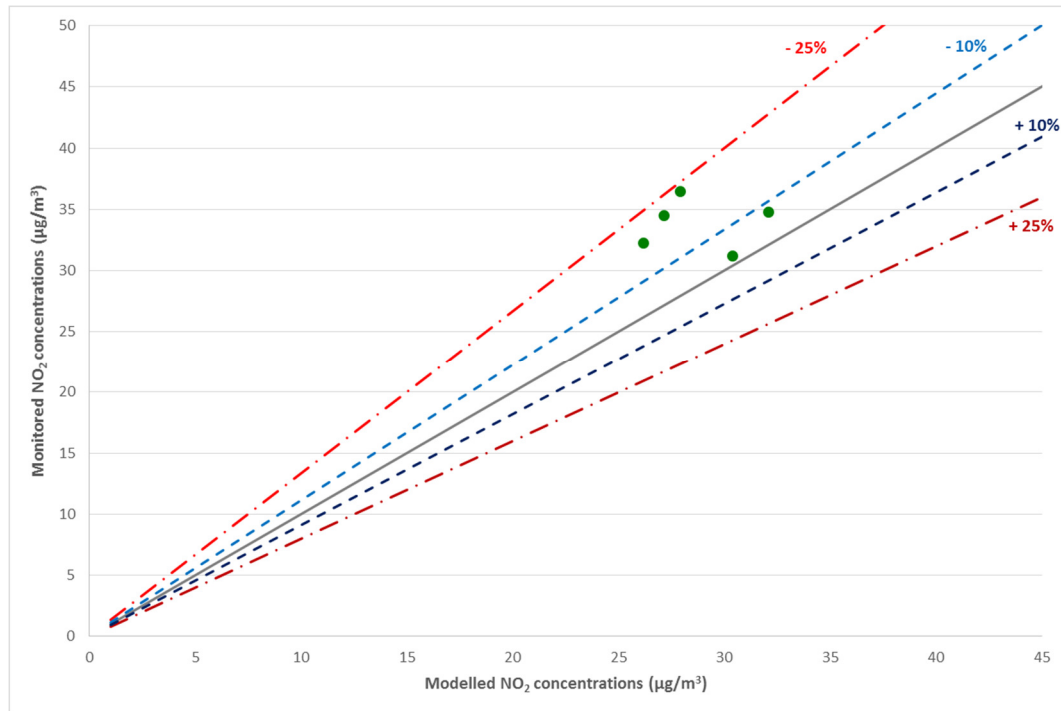
Table 5.16 Monitored and Modelled Road NOx Contribution at Monitoring Locations within a Cutting

Site Name	Total Background NO <sub>2</sub> (µg/m <sup>3</sup> )	Sector Removed Background NO <sub>2</sub> (µg/m <sup>3</sup> )	2012 Monitored Road NOx (µg/m <sup>3</sup> )	Baseline Modelled Road NOx (µg/m <sup>3</sup> )
NCC33	25.2	20.3	15.1	29.9
NCC41	25.2	20.3	20.0	34.7
NCC40	25.2	20.3	12.7	52.5
NCC18	25.2	20.3	24.7	39.1
NCC16	26.7	22.0	17.6	52.9
<b>Adjustment Factor</b>				<b>0.404</b>

Graph 1 Modelled vs Monitored Concentration before Adjustment



**Graph 2 Modelled vs Monitored Concentrations after Adjustment**



Graph 2 shows that with the adjustment factor applied at all monitoring locations adjacent to a cutting modelled concentrations are within 25% of monitored concentrations.

The adjustment factor has been applied to modelled road NO<sub>x</sub> concentrations at those receptors located adjacent to a cutting which include (HH18, HH19, HH20, HH21, HH22, HH23, HH29, HH30, HH31, HH32, HH33, HH35). Verification of modelled PM<sub>10</sub> concentrations has not been undertaken due to limited monitoring locations within the study area, it is also not considered appropriate to apply the verification factor for NO<sub>2</sub> due to the difference in how these pollutants behave in the atmosphere and difference in emission rates for each pollutant. As shown in the assessment of baseline conditions, monitoring of PM<sub>10</sub> concentrations across the study area shows levels below the PM<sub>10</sub> objectives.

### 5.5.3 Regional Assessment

The regional assessment has calculated the total emissions and the change in NO<sub>x</sub>, PM<sub>10</sub> and CO<sub>2</sub> emissions with and without the Scheme in the opening year. The mass emissions were calculated using the pollutant emission rates provided in IAN 185/15.

### 5.5.4 Assessment of Significance

#### Construction

The significance of local air quality effects as a result of dust impacts arising during construction will be assessed using professional judgement having regard to the IAQM guidance. This guidance states that with appropriate mitigation, where required, no significant effects would occur.

## Local Air Quality

Evaluation of the significance for the local air quality assessment of the operational phase has been undertaken in accordance with IAN 174/13<sup>25</sup>. This requires evaluation of significance for NO<sub>2</sub> and PM<sub>10</sub> concentrations.

The predicted pollutant concentrations in the opening year of assessment, and the change due to the Scheme, have been compared with the air quality objectives. For the local air quality assessment of human health impacts, this takes into account the guidance in Table 2.1 of IAN 174/13, based on the change in annual mean NO<sub>2</sub> and PM<sub>10</sub> concentrations (see Table 5.17). The terminology provided in IAN 174/13 has been adjusted to be equivalent to the terminology outlined in DMRB HA205/08 in assessing the magnitude of impacts which is major, moderate, minor and negligible, respectively.

Table 5.17 Descriptors for Magnitude of NO<sub>2</sub> and PM<sub>10</sub> Impacts on Human Health

Magnitude of Impact	Change in Annual Mean NO <sub>2</sub> and PM <sub>10</sub> Concentrations
Major (large)	>4 µg/m <sup>3</sup>
Moderate (medium)	>2 to 4 µg/m <sup>3</sup>
Minor (small)	>0.4 to 2 µg/m <sup>3</sup>
Negligible (imperceptible)	<0.4 µg/m <sup>3</sup>

The local air quality assessment of ecological impacts also takes account of IAN 174/13, which applies the magnitude of change based on the annual mean limit values for NO<sub>x</sub> (see Table 5.18). As above the terminology has been adjusted to be equivalent to that outlined in DMRB HA205/08.

Table 5.18 Descriptors for Magnitude of Impact of Change in NO<sub>x</sub> on Ecological Receptors

Magnitude of Impact	Change in Annual Mean NO <sub>x</sub> concentrations
Major (large)	>3 µg/m <sup>3</sup>
Moderate (medium)	>1.5 to 3 µg/m <sup>3</sup>
Minor (small)	>0.3 to 1.5 µg/m <sup>3</sup>
Negligible (imperceptible)	<0.3 µg/m <sup>3</sup>

Section 3 of IAN 174/13 describes the approach to evaluation of significant local air quality effects. The guidance in Section 3 and Table 3.1 of IAN 174/13 has been taken into account in the assessment (see Table 5.19).

<sup>25</sup> Interim Advice Note 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1, 'Air Quality (HA207/07)

Table 5.19 Overall Evaluation of Local Air Quality Significance

Key Criteria Questions	Yes/No
Is there a risk that environmental standards will be breached?	
Will there be a large change in environmental conditions?	
Will the effect continue for a long time?	
Will many people be affected?	
Is there a risk that designated sites, areas, or features will be affected?	
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	
<b>On balance is the overall effect significant?</b>	
Evidence in support of the professional judgement:	

## Regional Emissions

Evaluation of the significance of the regional air quality assessment has been undertaken using professional judgement by comparing mass emissions of pollutants as a result of the Scheme with national emissions for the transport sector in Wales. National transport emissions of CO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub> are shown in Table 5.20.

Table 5.20 National Transport Sector Emissions for Wales

Pollutant	Total Transport Sector Emissions (tonnes)
CO <sub>2</sub> <sup>a)</sup>	5,700,000
NO <sub>x</sub> <sup>b)</sup>	22,300
PM <sub>10</sub> <sup>b)</sup>	1,380

Source:

a) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2013, June 2015

b) Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2013, September 2015

For the regional air quality assessment, the magnitude of impact has been considered based on the change in pollutant emissions in tonnes per year. No specific guidance exists that indicates what change in pollutant emissions constitutes a major, moderate, minor or negligible change. Where the change in emissions as a result of the Scheme is small (<5%) compared to national emissions, the effect can be considered to be insignificant.

## 5.6 Potential Environmental Impacts

### 5.6.1 Construction Phase

Activities to be undertaken during the construction phase of the Scheme including demolition, earthworks and construction, where required, have been assessed. Each roundabout is considered to be representative of a construction site therefore

the assessment has been split to consider Pont Ebbw, Tredegar Park and Bassaleg roundabouts separately. The risk of each site giving rise to effects during the construction phase is shown in Table 5.21.

Both Pont Ebbw and Junction 28 (Tredegar House) roundabouts are considered to be low risk sites due to the lack of sensitive receptors within 20m of works. Bassaleg roundabout is considered to be medium risk given the presence of residential receptors within 50m of works. Appropriate mitigation measures have been identified and set out in section 5.7 which, when successfully implemented will result in no residual air quality effects during the construction phase of the Scheme.

Table 5.21 Evaluation and Risk Rating of Works during the Construction Phase

Activity	Dust Emission Magnitude	Sensitivity of Surrounding Area		Risk of Dust Soiling	Risk of Human Health Impacts	Justification
		Dust Soiling	Human Health			
<b>Pont Ebbw Roundabout</b>						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition required at Pont Ebbw
Earthworks	Medium	Low	Low	Low Risk	Low Risk	Area where earthworks are to be undertaken to construct the through road are between 2,500m <sup>2</sup> – 10,000m <sup>2</sup> with a moderately dusty soil type. No receptors within 100m of works, background PM <sub>10</sub> concentrations are < 24µg/m <sup>3</sup> .
Construction	Medium	Low	Low	Low Risk	Low Risk	Potentially dusty material required for construction of the through road. No receptors within 100m of works, background PM <sub>10</sub> concentrations are < 24µg/m <sup>3</sup> .
Trackout	Small	Low	Low	Negligible	Negligible	Heavy duty vehicle trips associated with the works are anticipated to be <10 trips per day. HDVs will be travelling along paved roads.



Activity	Dust Emission Magnitude	Sensitivity of Surrounding Area		Risk of Dust Soiling	Risk of Human Health Impacts	Justification
		Dust Soiling	Human Health			
<b>Junction 28 (Tredegar House) Roundabout</b>						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition required at Junction 28
Earthworks	Large	Low	Low	Low Risk	Low Risk	Bulk excavation of material for the M4 Westbound on slip, A48 northbound and cycle way and the gyratory and through road. Likely area of earthworks would be greater than 10,000m <sup>2</sup> for all works. Nearest receptor is commercial property approximately 130m from earthwork activities.
Construction	Large	Low	Low	Low Risk	Low Risk	Construction of new roads for the M4 westbound on slip, A48 Northbound, gyratory road and through road between the M4 eastbound off slip and A48 Southern Distributor Road. Construction material has the potential to be dusty. Nearest receptor is commercial property approximately 130m from construction activities.

Activity	Dust Emission Magnitude	Sensitivity of Surrounding Area		Risk of Dust Soiling	Risk of Human Health Impacts	Justification
		Dust Soiling	Human Health			
Trackout	Small	Low	Low	Negligible	Negligible	Heavy duty vehicle trips associated with the works are anticipated to be < 10 trips per day. HDVs will be travelling along paved roads.
<b>Bassaleg Roundabout</b>						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition required at Bassaleg
Earthworks	Medium	Medium	Low	Medium Risk	Low Risk	Area where earthworks are to be undertaken to adjust the position of the roundabout including widening are between 2,500m <sup>2</sup> – 10,000m <sup>2</sup> with a moderately dusty soil type.  Greater than 10 residential receptors lie within 50m of earthworks, background PM <sub>10</sub> concentrations are < 24µg/m <sup>3</sup> .

Activity	Dust Emission Magnitude	Sensitivity of Surrounding Area		Risk of Dust Soiling	Risk of Human Health Impacts	Justification
		Dust Soiling	Human Health			
Construction	Medium	Medium	Low	Medium Risk	Low Risk	Construction of additional lanes on the approach to the roundabout and through road. Construction material has the potential to be dusty. There are more than 10 residential receptors within 50m of the construction of new roads.
Trackout	Small	Low	Low	Negligible	Negligible	Heavy duty vehicle trips associated with the works are anticipated to be <10 trips per day. HDVs will be travelling along paved roads.

## 5.6.2 Operational Phase

### Human Health Receptors

Annual mean NO<sub>2</sub> and PM<sub>10</sub> concentrations have been predicted at each of the sensitive receptors shown in Table 5.11, following the process outlined in the methodology section of this chapter. For annual mean NO<sub>2</sub> concentrations, the IAN 170/12 sensitivity test for the opening year has also been reported and this has been used to determine the significance of the Scheme on annual mean NO<sub>2</sub> concentrations. The IAN170/12 results represent a more pessimistic future scenario than IAN185/15 and is therefore a conservative analysis.

#### Predicted NO<sub>2</sub> Concentrations

Annual mean NO<sub>2</sub> concentrations were predicted at the receptor locations for each scenario and are summarised in Table 5.22. No exceedences of the annual mean NO<sub>2</sub> objective are predicted for the opening year of the Scheme using the IAN 185/15 methodology. However, following application of the IAN 170/12 methodology, a sensitivity test to account for the lack of improvement in NO<sub>x</sub> emissions in the future, exceedences of the annual mean NO<sub>2</sub> objectives are predicted at four assessed receptors (HH28, HH39, HH40, HH41 and HH42).

HH28 is representative of Aston Crescent which is close to the portal of the westbound Brynglas Tunnel, the Scheme results in an improvement in predicted concentrations at this location. Receptors HH39 to HH42 are representative of receptors at the junction of the A48 Southern Distributor Road and the A4810 Steelworks Access Road. The elevated concentrations are as a result of a high background pollutant concentration estimated by Defra due to local industry within the grid square. Monitoring was undertaken by Arup at this location as part of the M4 Corridor around Newport Scheme in 2014 and 2015 (shown as Arup15 in Table 5.2) and recorded concentrations of 21.8µg/m<sup>3</sup> and 20.5µg/m<sup>3</sup> respectively. This is lower than the Defra background value applied to these receptors and as a result concentrations for the opening year are likely to be lower than predicted at these locations. Monitored concentrations are much more representative of predicted concentrations using the IAN185/15 methodology at this location.

As all modelled results predict annual mean concentrations of less than 60µg/m<sup>3</sup>, it is unlikely that the hourly mean NO<sub>2</sub> objective would be exceeded following LAQM.TG16 guidance.

Table 5.22 Predicted Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>)

Receptor	Predicted Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )				
	IAN185/15			IAN 170/12	
	Base	DM	DS	Corrected DM	Corrected DS
HH1	27.9	21.5	21.3	24.5	24.3
HH2	22.8	17.7	17.8	20.0	20.1
HH3	21.2	16.5	16.4	18.5	18.4
HH4	26.0	20.3	19.6	22.9	22.2
HH5	27.0	21.0	20.0	23.7	22.5
HH6	35.2	21.6	21.4	31.3	31.0
HH7	25.6	20.1	19.9	22.8	22.5
HH8	40.5	26.3	26.6	36.6	37.1
HH9	31.9	18.7	18.6	27.9	27.7
HH10	21.6	17.8	17.7	18.9	18.8
HH11	25.5	21.3	20.3	22.7	21.6
HH12	20.4	16.5	16.3	17.9	17.6
HH13	20.4	16.5	16.2	17.9	17.6
HH14	22.0	17.9	17.3	19.4	18.8
HH15	33.5	25.0	23.8	30.0	28.6
HH16	33.6	25.0	23.8	30.0	28.6
HH17	34.4	25.6	24.4	30.8	29.3
HH18	28.8	20.7	20.1	25.5	24.8
HH19	26.2	20.0	19.4	23.2	22.5
HH20	27.1	20.7	20.0	24.1	23.3
HH21	34.5	24.9	23.7	30.8	29.3
HH22	30.4	23.1	22.0	27.1	25.8
HH23	27.9	21.2	20.4	24.8	23.8
HH24	30.8	22.2	21.5	27.4	26.5
HH25	38.1	28.5	27.0	34.2	32.4
HH26	32.5	26.5	25.7	28.9	28.1
HH27	43.5	34.5	32.9	39.1	37.3
HH28	47.4	36.6	34.7	<b>42.7</b>	<b>40.5</b>
HH29	32.1	26.9	26.1	28.5	27.7
HH30	32.8	27.3	26.5	29.2	28.2
HH31	25.7	22.1	21.9	22.6	22.3
HH32	29.5	24.9	24.2	26.2	25.5
HH33	27.4	23.4	22.9	24.2	23.8
HH34	42.4	33.2	31.6	38.2	36.4
HH35	25.9	22.3	22.0	22.8	22.5

Receptor	Predicted Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )				
	IAN185/15			IAN 170/12	
	Base	DM	DS	Corrected DM	Corrected DS
HH36	42.9	33.8	32.0	38.9	36.8
HH37	26.1	19.7	19.2	23.1	22.4
HH38	27.1	16.4	16.5	24.6	24.7
HH39	48.3	27.2	27.2	<b>42.0</b>	<b>42.1</b>
HH40	48.5	27.3	27.4	<b>42.2</b>	<b>42.2</b>
HH41	46.8	26.0	26.0	<b>40.7</b>	<b>40.7</b>
HH42	46.5	26.0	26.0	<b>40.7</b>	<b>40.8</b>
HH43	37.8	25.5	25.6	33.8	34.0
HH44	34.8	22.9	23.0	30.8	30.9
HH45	30.6	22.0	22.1	27.1	27.2
HH46	30.5	23.5	23.6	26.9	26.9
HH47	31.0	23.9	23.9	27.3	27.4
HH48	32.0	24.7	24.7	28.3	28.4
HH49	30.6	24.9	25.0	27.1	27.3
HH50	26.7	21.9	21.8	23.4	23.4
HH51	32.4	25.6	25.7	28.8	28.9
HH52	28.5	22.5	22.5	25.1	25.0
HH53	28.0	22.1	22.0	24.5	24.4
HH54	26.0	20.6	20.5	22.8	22.7
HH55	27.2	22.5	22.0	24.0	23.5
HH56	29.9	23.6	23.5	26.3	26.3
HH57	25.7	18.5	18.3	21.2	21.0

Note: Exceedences of the Annual Mean NO<sub>2</sub> Objective are Highlighted as Bold

Table 5.23 shows the predicted change in annual mean NO<sub>2</sub> concentrations and magnitude of impact for each of the assessed receptors for both the IAN 185/15 and IAN 170/12 methodologies.

Table 5.23 Change in Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) as a result of Scheme and the Magnitude of Impact

Receptor	Predicted Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	IAN185/15		IAN 170/12	
	Change in Concentration	Magnitude of Impact	Change in Concentration	Magnitude of Impact
HH1	-0.2	Negligible	-0.3	Negligible
HH2	0.1	Negligible	0.1	Negligible
HH3	-0.1	Negligible	-0.1	Negligible
HH4	-0.6	Minor Beneficial	-0.7	Minor Beneficial
HH5	-1.0	Minor Beneficial	-1.2	Minor Beneficial
HH6	-0.2	Negligible	-0.3	Negligible
HH7	-0.3	Negligible	-0.3	Negligible
HH8	0.3	Negligible	0.5	Minor Adverse
HH9	-0.1	Negligible	-0.2	Negligible
HH10	-0.1	Negligible	-0.1	Negligible
HH11	-1.0	Minor Beneficial	-1.1	Minor Beneficial
HH12	-0.3	Negligible	-0.3	Negligible
HH13	-0.3	Negligible	-0.3	Negligible
HH14	-0.6	Minor Beneficial	-0.6	Minor Beneficial
HH15	-1.2	Minor Beneficial	-1.4	Minor Beneficial
HH16	-1.2	Minor Beneficial	-1.4	Minor Beneficial
HH17	-1.3	Minor Beneficial	-1.5	Minor Beneficial
HH18	-0.6	Minor Beneficial	-0.7	Minor Beneficial
HH19	-0.6	Minor Beneficial	-0.7	Minor Beneficial
HH20	-0.7	Minor Beneficial	-0.8	Minor Beneficial
HH21	-1.2	Minor Beneficial	-1.5	Minor Beneficial
HH22	-1.1	Minor Beneficial	-1.2	Minor Beneficial
HH23	-0.8	Minor Beneficial	-0.9	Minor Beneficial
HH24	-0.8	Minor Beneficial	-0.9	Minor Beneficial
HH25	-1.5	Minor Beneficial	-1.8	Minor Beneficial
HH26	-0.8	Minor Beneficial	-0.9	Minor Beneficial
HH27	-1.6	Minor Beneficial	-1.8	Minor Beneficial
HH28	-1.9	Minor Beneficial	-2.2	Moderate Beneficial
HH29	-0.8	Minor Beneficial	-0.8	Minor Beneficial
HH30	-0.9	Minor Beneficial	-0.9	Minor Beneficial
HH31	-0.3	Negligible	-0.3	Negligible
HH32	-0.6	Minor Beneficial	-0.7	Minor Beneficial
HH33	-0.4	Minor Beneficial	-0.5	Minor Beneficial
HH34	-1.6	Minor Beneficial	-1.9	Minor Beneficial

Receptor	Predicted Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	IAN185/15		IAN 170/12	
	Change in Concentration	Magnitude of Impact	Change in Concentration	Magnitude of Impact
HH35	-0.3	Negligible	-0.3	Negligible
HH36	-1.8	Minor Beneficial	-2.1	Moderate Beneficial
HH37	-0.6	Minor Beneficial	-0.7	Minor Beneficial
HH38	0.0	Negligible	0.1	Negligible
HH39	0.0	Negligible	0.1	Negligible
HH40	0.1	Negligible	0.1	Negligible
HH41	0.0	Negligible	0.0	Negligible
HH42	0.0	Negligible	0.0	Negligible
HH43	0.1	Negligible	0.2	Negligible
HH44	0.1	Negligible	0.1	Negligible
HH45	0.1	Negligible	0.1	Negligible
HH46	0.0	Negligible	0.0	Negligible
HH47	0.1	Negligible	0.1	Negligible
HH48	0.1	Negligible	0.1	Negligible
HH49	0.1	Negligible	0.1	Negligible
HH50	0.0	Negligible	0.0	Negligible
HH51	0.1	Negligible	0.1	Negligible
HH52	-0.1	Negligible	-0.1	Negligible
HH53	-0.2	Negligible	-0.2	Negligible
HH54	-0.1	Negligible	-0.1	Negligible
HH55	-0.4	Minor Beneficial	-0.5	Minor Beneficial
HH56	-0.1	Negligible	-0.1	Negligible
HH57	-0.2	Negligible	-0.2	Negligible

The Scheme is predicted to have a minor beneficial effect at the majority of receptors assessed, one receptor (HH8) is predicted to experience a minor adverse impact using the IAN170/12 methodology. This receptor is located at Hydrangea Close off the A467 Forge Road and the increase in concentration is as a result of increased HGV movements along this road due to opening up the capacity of Junction 28.



## Predicted PM<sub>10</sub> Concentrations

Annual mean PM<sub>10</sub> concentrations were predicted at the receptor locations for each scenario and are summarised in Table 5.24. The equation provided in LAQM.TG16 for deriving an understanding of potential exceedences of the daily mean PM<sub>10</sub> objective from predicted annual mean concentrations has been used to determine whether any exceedences of the daily mean PM<sub>10</sub> objective are likely. As annual mean PM<sub>10</sub> concentrations are predicted to be less than 50% of the annual mean PM<sub>10</sub> objective in all scenarios there is no risk of the daily mean PM<sub>10</sub> objective being exceeded. It should be noted that the IAN 170/12 methodology is not applicable to PM<sub>10</sub> concentrations.

Table 5.24 Predicted Annual Mean PM<sub>10</sub> Concentrations (µg/m<sup>3</sup>)

Receptor	Predicted Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
	Base	DM	DS
HH1	17.2	17.5	17.4
HH2	15.2	15.4	15.4
HH3	15.0	15.3	15.2
HH4	15.7	15.8	15.7
HH5	15.8	15.9	15.7
HH6	16.1	15.7	15.7
HH7	15.6	15.8	15.7
HH8	16.9	16.4	16.4
HH9	15.7	15.3	15.3
HH10	14.3	15.2	15.1
HH11	15.2	15.9	15.7
HH12	15.8	16.6	16.6
HH13	15.8	16.6	16.6
HH14	16.1	16.9	16.8
HH15	17.9	18.1	17.9
HH16	17.9	18.1	17.9
HH17	18.0	18.1	18.0
HH18	18.1	18.1	18.0
HH19	17.8	17.9	17.7
HH20	18.1	18.1	17.9
HH21	19.7	19.2	18.9
HH22	19.0	18.7	18.4
HH23	18.3	18.2	18.0
HH24	17.4	17.6	17.5
HH25	18.4	18.5	18.3
HH26	18.1	18.3	18.2
HH27	19.5	19.5	19.3
HH28	20.1	19.6	19.4

Receptor	Predicted Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
	Base	DM	DS
HH29	19.6	19.7	19.5
HH30	19.8	19.8	19.6
HH31	17.7	18.2	18.1
HH32	18.7	18.9	18.7
HH33	18.1	18.4	18.3
HH34	17.7	17.6	17.5
HH35	17.7	18.1	18.1
HH36	17.7	17.8	17.6
HH37	16.8	17.4	17.3
HH38	14.6	14.6	14.6
HH39	18.7	18.2	18.2
HH40	18.7	18.2	18.2
HH41	18.5	18.1	18.1
HH42	18.5	18.1	18.1
HH43	17.4	16.5	16.5
HH44	16.9	16.2	16.2
HH45	17.0	16.9	16.9
HH46	16.7	16.6	16.7
HH47	16.8	16.7	16.7
HH48	17.0	16.9	16.9
HH49	16.3	16.4	16.4
HH50	15.9	16.0	16.0
HH51	18.1	18.3	18.3
HH52	17.6	17.9	17.9
HH53	15.5	15.5	15.5
HH54	15.1	15.2	15.2
HH55	17.4	17.8	17.7
HH56	17.8	18.0	18.0
HH57	14.7	14.7	14.7

Table 5.25 shows the change in PM<sub>10</sub> concentrations as a result of the Scheme and the magnitude of change at each of the assessed receptors. At all assessed receptors the Scheme is predicted to have a negligible impact.

Table 5.25 Change in Annual Mean PM<sub>10</sub> Concentrations (µg/m<sup>3</sup>) as a result of Scheme and the Magnitude of Impact

Receptor	Predicted Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )	
	Change in Concentration	Magnitude of Impact
HH1	0.0	Negligible
HH2	0.0	Negligible
HH3	0.0	Negligible
HH4	-0.1	Negligible
HH5	-0.2	Negligible
HH6	0.0	Negligible
HH7	-0.1	Negligible
HH8	0.0	Negligible
HH9	0.0	Negligible
HH10	0.0	Negligible
HH11	-0.2	Negligible
HH12	0.0	Negligible
HH13	0.0	Negligible
HH14	-0.1	Negligible
HH15	-0.2	Negligible
HH16	-0.2	Negligible
HH17	-0.2	Negligible
HH18	-0.1	Negligible
HH19	-0.1	Negligible
HH20	-0.2	Negligible
HH21	-0.3	Negligible
HH22	-0.2	Negligible
HH23	-0.2	Negligible
HH24	-0.1	Negligible
HH25	-0.2	Negligible
HH26	-0.1	Negligible
HH27	-0.2	Negligible
HH28	-0.2	Negligible
HH29	-0.2	Negligible
HH30	-0.2	Negligible
HH31	-0.1	Negligible
HH32	-0.1	Negligible
HH33	-0.1	Negligible
HH34	-0.2	Negligible
HH35	-0.1	Negligible
HH36	-0.2	Negligible

Receptor	Predicted Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )	
	Change in Concentration	Magnitude of Impact
HH37	-0.1	Negligible
HH38	0.0	Negligible
HH39	0.0	Negligible
HH40	0.0	Negligible
HH41	0.0	Negligible
HH42	0.0	Negligible
HH43	0.0	Negligible
HH44	0.0	Negligible
HH45	0.0	Negligible
HH46	0.0	Negligible
HH47	0.0	Negligible
HH48	0.0	Negligible
HH49	0.0	Negligible
HH50	0.0	Negligible
HH51	0.0	Negligible
HH52	0.0	Negligible
HH53	0.0	Negligible
HH54	0.0	Negligible
HH55	0.0	Negligible
HH56	0.0	Negligible
HH57	0.0	Negligible

## Ecological Receptors

### Annual Mean NO<sub>x</sub> Concentrations

Annual mean NO<sub>x</sub> concentrations have been predicted at the ecological receptor transects shown in Table 5.26, following the process outlined in the methodology section of this chapter. For annual mean NO<sub>x</sub> concentrations, the IAN 170/12 sensitivity test for the opening year has also been reported and this has been used to determine the significance of the Scheme on annual mean NO<sub>x</sub> concentrations. The IAN170/12 results represent a more pessimistic future scenario than IAN185/15 and is therefore a conservative analysis.

The annual mean NO<sub>x</sub> objective is predicted to be exceeded at a number of designated sites, including the River USK SAC/SSSI, Langstone Llamartin Meadows SSSI and Nash & Goldcliff SSSI. This is due to their proximity to major roads. It can be seen that predicted concentrations decrease rapidly with distance from the road.

Table 5.26 Predicted Annual Mean NOx Concentrations ( $\mu\text{g}/\text{m}^3$ )

Receptor	Predicted Annual Mean NOx Concentration ( $\mu\text{g}/\text{m}^3$ )				
	IAN185/15			IAN 170/12	
	Base	DM	DS	Corrected DM	Corrected DS
Eco1	<b>48.5</b>	<b>37.4</b>	<b>35.9</b>	<b>38.7</b>	<b>37.0</b>
Eco2	<b>40.4</b>	<b>31.9</b>	<b>31.0</b>	<b>31.9</b>	<b>31.0</b>
Eco3	<b>36.1</b>	29.0	28.4	29.0	28.4
Eco4	<b>33.5</b>	27.3	26.9	27.3	26.9
Eco5	<b>74.8</b>	<b>55.8</b>	<b>52.5</b>	<b>60.5</b>	<b>56.9</b>
Eco6	<b>61.4</b>	<b>47.9</b>	<b>45.6</b>	<b>49.5</b>	<b>47.1</b>
Eco8	<b>38.4</b>	<b>31.6</b>	<b>31.0</b>	<b>31.6</b>	<b>31.0</b>
Eco7	<b>45.0</b>	<b>36.1</b>	<b>35.0</b>	<b>36.1</b>	<b>35.0</b>
Eco9	<b>40.6</b>	28.9	27.6	<b>32.4</b>	<b>30.9</b>
Eco10	<b>33.2</b>	24.2	23.4	26.2	25.4
Eco11	28.8	21.5	21.0	22.6	22.1
Eco12	25.8	19.6	19.3	20.1	19.8
Eco13	20.2	21.1	21.3	21.1	21.3
Eco14	20.2	18.9	19.0	18.9	19.0
Eco15	24.6	18.9	18.9	19.9	19.9
Eco16	24.6	18.6	18.5	19.5	19.5
Eco17	20.2	23.9	24.4	23.9	24.4
Eco18	20.2	20.2	20.4	20.2	20.4
Eco19	20.2	18.8	18.9	18.8	18.9
Eco20	20.2	18.1	18.1	18.1	18.1
Eco21	21.6	16.4	16.6	19.1	19.4
Eco22	21.6	15.3	15.4	17.9	18.0
Eco23	19.8	13.8	13.8	16.1	16.1
Eco24	19.8	13.6	13.6	15.8	15.8
Eco25	<b>43.6</b>	25.7	26.2	<b>40.2</b>	<b>40.9</b>
Eco26	<b>43.6</b>	23.1	23.3	<b>36.2</b>	<b>36.4</b>
Eco27	<b>43.6</b>	22.4	22.5	<b>35.0</b>	<b>35.1</b>
Eco28	<b>43.5</b>	21.9	21.9	<b>34.3</b>	<b>34.3</b>
Eco29	<b>50.2</b>	<b>32.4</b>	<b>32.5</b>	<b>39.8</b>	<b>39.9</b>
Eco30	<b>45.4</b>	29.0	29.0	<b>35.6</b>	<b>35.6</b>
Eco31	<b>43.4</b>	27.6	27.6	<b>33.8</b>	<b>33.7</b>
Eco32	<b>42.9</b>	<b>31.8</b>	<b>31.8</b>	<b>33.3</b>	<b>33.2</b>
Eco33	<b>54.1</b>	<b>35.3</b>	<b>35.4</b>	<b>43.3</b>	<b>43.4</b>
Eco34	<b>47.9</b>	<b>30.9</b>	<b>30.9</b>	<b>37.8</b>	<b>37.8</b>
Eco35	<b>44.8</b>	28.6	28.6	<b>35.0</b>	<b>35.0</b>

Receptor	Predicted Annual Mean NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )				
	IAN185/15			IAN 170/12	
	Base	DM	DS	Corrected DM	Corrected DS
Eco36	<b>43.6</b>	27.8	27.8	<b>34.0</b>	<b>34.0</b>

Note: Exceedences of the annual mean NO<sub>x</sub> objective are highlighted as bold

Table 5.27 shows the predicted change in annual mean NO<sub>x</sub> concentrations and magnitude of impact for each of the assessed receptor transects for both the IAN 185/15 and IAN 170/12 methodologies. Those designated sites adjacent to the M4 corridor are predicted to experience a decrease in concentrations due to a reduction in traffic using the M4 as a result of the Scheme. Those designated sites along the A48 Southern Distributor Road experience a slight increase in concentrations as a result of the Scheme. At the majority of assessed receptors the magnitude of impact is negligible however a minor adverse impact is predicted at Redwick and Llandeenny SSSI and Nash & Goldcliffe SSSI within 20m of the road.

Table 5.27 Change in Annual Mean NO<sub>x</sub> Concentrations (µg/m<sup>3</sup>) as a result of Scheme and the Magnitude of Impact

Receptor	Predicted Annual Mean NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )			
	IAN185/15		IAN 170/12	
	Change in Concentration	Magnitude of Impact	Change in Concentration	Magnitude of Impact
Eco1	-1.6	Moderate Beneficial	-1.6	Moderate Beneficial
Eco2	-0.9	Minor Beneficial	-0.9	Minor Beneficial
Eco3	-0.6	Minor Beneficial	-0.6	Minor Beneficial
Eco4	-0.4	Minor Beneficial	-0.4	Minor Beneficial
Eco5	-3.2	Major Beneficial	-3.5	Major Beneficial
Eco6	-2.3	Moderate Beneficial	-2.4	Moderate Beneficial
Eco8	-0.6	Minor Beneficial	-0.6	Minor Beneficial
Eco7	-1.1	Minor Beneficial	-1.1	Minor Beneficial
Eco9	-1.3	Minor Beneficial	-1.4	Minor Beneficial
Eco10	-0.8	Minor Beneficial	-0.9	Minor Beneficial
Eco11	-0.5	Minor Beneficial	-0.5	Minor Beneficial
Eco12	-0.3	Negligible	-0.3	Negligible
Eco13	0.2	Negligible	0.2	Negligible
Eco14	0.1	Negligible	0.1	Negligible
Eco15	0.0	Negligible	0.0	Negligible
Eco16	0.0	Negligible	0.0	Negligible
Eco17	0.5	Minor Adverse	0.5	Minor Adverse
Eco18	0.2	Negligible	0.2	Negligible
Eco19	0.1	Negligible	0.1	Negligible

Receptor	Predicted Annual Mean NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )			
	IAN185/15		IAN 170/12	
	Change in Concentration	Magnitude of Impact	Change in Concentration	Magnitude of Impact
Eco20	0.0	Negligible	0.0	Negligible
Eco21	0.2	Negligible	0.3	Negligible
Eco22	0.1	Negligible	0.1	Negligible
Eco23	0.0	Negligible	0.0	Negligible
Eco24	0.0	Negligible	0.0	Negligible
Eco25	0.5	Minor Adverse	0.7	Minor Adverse
Eco26	0.1	Negligible	0.2	Negligible
Eco27	0.0	Negligible	0.1	Negligible
Eco28	0.0	Negligible	0.0	Negligible
Eco29	0.1	Negligible	0.1	Negligible
Eco30	0.0	Negligible	0.0	Negligible
Eco31	0.0	Negligible	-0.1	Negligible
Eco32	-0.1	Negligible	-0.1	Negligible
Eco33	0.1	Negligible	0.1	Negligible
Eco34	0.0	Negligible	0.0	Negligible
Eco35	0.0	Negligible	0.0	Negligible
Eco36	0.0	Negligible	0.0	Negligible

Due to the proximity of the designated sites to the city of Newport, the M4 motorway and local industry to the south of Newport, the annual mean NO<sub>x</sub> objective does not strictly apply but has been applied on a precautionary basis. Therefore to determine the significance of effect of the Scheme on designated sites, the change in total nitrogen deposition as a result of the Scheme has also been assessed as described in the following section.

### Nitrogen Deposition

Total nitrogen deposition rates at each of the assessed receptor transects have been assessed for the Do minimum and Do something scenarios in the opening year using both the IAN185/15 and IAN 170/12 methodology, as shown in Table 5.28. The Scheme does not result in an increase in nitrogen deposition rate at any of the designated sites assessed. A maximum decrease in deposition rates of 0.2 kgN/ha/yr is predicted at the River Usk SAC/SSSI adjacent to the M4 corridor, this is due to the reduction in traffic along the M4 as a result of the Scheme. In addition, the upper critical loads (see Table 15.14) for each of the designated sites are met.

Table 5.28 Total Nitrogen Deposition Rates (kgN/ha/yr) at Designated Sites

Receptor	IAN 185/15			IAN170/12		
	DM	DS	Change in Deposition	DM	DS	Change in Deposition
Eco1	17.0	16.9	-0.1	17.2	17.2	-0.1
Eco2	16.7	16.7	0.0	16.9	16.8	0.0
Eco3	16.6	16.6	0.0	16.7	16.7	0.0
Eco4	16.5	16.5	0.0	16.6	16.6	0.0
Eco5	17.7	17.6	-0.1	18.1	17.9	-0.2
Eco6	17.4	17.2	-0.1	17.6	17.5	-0.1
Eco8	16.8	16.7	-0.1	16.9	16.9	-0.1
Eco7	16.6	16.5	0.0	16.6	16.6	0.0
Eco9	14.5	14.5	-0.1	14.9	14.8	-0.1
Eco10	14.3	14.3	0.0	14.6	14.5	0.0
Eco11	14.2	14.1	0.0	14.4	14.3	0.0
Eco12	14.1	14.0	0.0	14.2	14.2	0.0
Eco13	14.7	14.7	0.0	14.7	14.7	0.0
Eco14	14.5	14.5	0.0	14.5	14.5	0.0
Eco15	14.5	14.5	0.0	14.7	14.7	0.0
Eco16	14.5	14.5	0.0	14.7	14.7	0.0
Eco17	14.8	14.8	0.0	14.8	14.8	0.0
Eco18	14.6	14.6	0.0	14.6	14.6	0.0
Eco19	14.5	14.5	0.0	14.5	14.5	0.0
Eco20	14.5	14.5	0.0	14.5	14.5	0.0
Eco21	14.1	14.1	0.0	14.4	14.4	0.0
Eco22	14.0	14.0	0.0	14.3	14.3	0.0
Eco23	14.0	14.0	0.0	14.2	14.2	0.0
Eco24	14.0	14.0	0.0	14.2	14.2	0.0
Eco25	11.7	11.7	0.0	12.7	12.7	0.0
Eco26	11.5	11.5	0.0	12.5	12.5	0.0
Eco27	11.5	11.5	0.0	12.4	12.4	0.0
Eco28	11.5	11.5	0.0	12.4	12.4	0.0
Eco29	16.7	16.7	0.0	17.3	17.3	0.0
Eco30	16.5	16.5	0.0	17.0	17.0	0.0
Eco31	16.4	16.4	0.0	16.9	16.9	0.0
Eco32	16.4	16.4	0.0	16.6	16.6	0.0
Eco33	16.8	16.8	0.0	17.4	17.4	0.0
Eco34	16.6	16.6	0.0	17.2	17.2	0.0
Eco35	16.5	16.5	0.0	17.0	17.0	0.0
Eco36	16.4	16.4	0.0	17.0	17.0	0.0



## Regional Assessment

This section describes the effect of the Scheme on regional air quality. It should be noted that the regional air quality assessment considers only those links from the traffic model that meet the criteria outlined in Section 5.2 of this chapter and shown in Appendix B3. Total CO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub> emissions for all assessed scenarios and the change in emissions as a result of the Scheme are presented in Table 5.29.

Table 5.29 Total Emissions for All Assessed Scenarios across the Regional ARN

Pollutant	Baseline 2014	Do Minimum 2022	Do Something 2022	Change in Emissions
	Units - tonnes/year			
CO <sub>2</sub>	348,977	344,441	314,020	-30,421
NO <sub>x</sub>	1,090	748	656	-92
PM <sub>10</sub>	69	53	47	-5

As shown in Table 5.29, the Scheme would result in a decrease in emissions, including greenhouse gas emissions represented by assessed CO<sub>2</sub> emissions, on a regional scale in the opening year. It is likely that the improvements at junction 28 and relief of congestion will result in a redistribution of traffic across the network with the potential with potentially shorter journeys being made.

The change in emissions has been compared with national emissions associated with the transport sector in Wales to determine the significance of the change. As shown in Table 5.29, the change in emission as a result of the Scheme is very small (<1%) compared with national emissions. Therefore the effect of the Scheme on regional emissions is not considered to be significant.

Table 5.30 Comparison of Change in Emissions with National Transport Emissions

Pollutant	National Emissions from the Transport Sector	Changes in emissions (tonnes/year)	Percentage Change of National Emissions
		Opening Year (2022)	Opening Year (2022)
CO <sub>2</sub>	5,700,000	-30,421	-0.5%
NO <sub>x</sub>	22,300	-92	-0.4%
PM <sub>10</sub>	1,380	-5	-0.3%

### 5.6.3 Assessment of Significance

The significance of the Scheme on local air quality has been determined based on criteria outlined in IAN 174/13. In 2017, the opening year of the Scheme, no exceedences of the PM<sub>10</sub> objectives were predicted. Exceedences of the annual mean NO<sub>2</sub> objective were predicted at one property in Aston Close and properties at Fosse Road (near the junction of A48 Southern Distributor Road and A4810 Steelworks Access Road). As discussed above, monitoring data at these locations suggest that the model is over-predicting concentrations at these locations and therefore there is uncertainty as to whether these would exceed in reality. Following IAN174/13 additional modelling has been undertaken for properties within these areas to determine how many locations are predicted to exceed the

objective and the effect of the Scheme at these locations. Table 5.31 shows the number of properties which are predicted to exceed the annual mean NO<sub>2</sub> objective and the magnitude of change in concentrations, both beneficial and adverse, at these properties as a result of the Scheme. This has been used to help determine the significant of effect of the Scheme.

Table 5.31 Receptors Exceeding the Annual Mean NO<sub>2</sub> Objective

Magnitude of Change in Annual Mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Total Number of receptors with:	
	Worsening of air quality already above objective or creating of a new objective	Improvement of an air quality objective already above objective or the removal of an existing exceedence
Major (>4)	-	-
Moderate (2 to 4)	-	1
Minor (>0.4 to 2)	-	-
Negligible (<0.4)	2	-

IAN 174/13 provides guidance to the number of properties experiencing a major, moderate or minor magnitude of change as a result of the Scheme which constitute a significant effect. As the number of properties predicted to exceed the annual mean NO<sub>2</sub> objective is small and any increase in concentration is predicted to be negligible (0.1µg/m<sup>3</sup>), it is not considered that changes in air quality at these locations are significant.

In addition to the above, IAN 174/13 provides questions related to human health which must be considered to determine the significance of a Scheme.

- *“Is there a risk that environmental standards will be breached?”*

Modelling indicated there is no risk of environmental standards PM<sub>10</sub> being breached in the opening year of the Scheme. However, exceedences of the annual mean NO<sub>2</sub> objective have been predicted at a small number of receptors. Monitoring data has shown that the model is over-predicting concentrations at these locations and therefore there is uncertainty regarding the potential for an exceedence in reality. These properties have been included above in Table 5.30 and the magnitude of change as a result of the Scheme considered. At all receptors where an exceedence is predicted the Scheme has a negligible or moderate beneficial effect.

- *“Will there be a large change in environmental conditions?”*

IAN174/13 defines a change in pollutant concentrations of more than 4µg/m<sup>3</sup> as a large change. The Scheme does not result in any large changes in pollutant concentrations.

- *“Will the effect continue for a long time and will many people be affected?”*

The effect of the Scheme will be permanent, however, it is anticipated that air quality will improve in the future with the introduction of newer, cleaner vehicles into the UK fleet.

- *“Will many people be affected?”*

The study area of the air quality assessment covers an area with a large population, however, the effects of the Scheme are not predicted to be significant however the majority of locations will experience an improvement as a result of the Scheme.

- *“Is there a risk that designated sites, areas or features will be affected?”*

There is a number of designated sites across the study area which are affected by the Scheme. Total nitrogen deposition has been assessed at each of the receptor transects and the upper critical load for nitrogen deposition is met at all designated sites. The Scheme is also predicted to result in no change in nitrogen deposition at the majority of designated sites and slight beneficial impacts at some of the receptor transects assessed. The annual mean NO<sub>x</sub> objective is exceeded at a number of designated sites primarily due to background pollutant concentrations as a result of major roads nearby. The Scheme results in a minor adverse effect at the closest receptor transect from the road for both the Redwick Llandevenny SSSI and Nash & Goldcliffe SSSI. All other ecological receptors affected experience a negligible or minor beneficial effect. As discussed above, the annual mean NO<sub>x</sub> objective does not strictly apply due to the location of the designated sites.

- *“Will it be difficult to avoid, or reduce or repair or compensate for the effect?”*

The Scheme is not predicted to have any significant impacts which will need mitigation.

Table 5.32 Evaluation of Significance

Key Criteria Questions	Yes/No
Is there a risk that environmental standards will be breached?	No
Will there be a large change in environmental conditions?	No
Will the effect continue for a long time?	No
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	No
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
<b>On balance is the overall effect significant?</b>	No

The findings from each of the key questions related to human health and designated sites have provided evidence that the answers would result in a conclusion of ‘not significant’ for local air quality, as shown in Table 5.32.

## 5.6.4 Assessment of Compliance

As discussed above, Welsh Ministers have a duty to ensure compliance with the EU Directive. Compliance reporting is based on Defra’s Pollution Climate Mapping (PCM) model and is split into zones and agglomerations across the UK. The Scheme sits within the South Wales Zone (UK0041). Several roads affected by the Scheme are included in the PCM model including the M4 and some sections of the Southern Distributor Road (A48). These roads currently (2013)

show exceedences of the limit values in the PCM model, however are predicted to be well within limit values by 2020<sup>26</sup>. The Scheme would result in improvements along the M4 however negligible increases in concentrations ( $0.1\mu\text{g}/\text{m}^3$ ) are predicted on the Southern Distributor Road.

PCM predicted concentrations are higher along the M4 and A48 (M) than those predicted for the Southern Distributor Road. As increases in concentrations across the Southern Distributor Road are negligible, there is no significant risk of a delay to compliance of the South Wales zone.

## 5.7 Mitigation

The dust emitting activities assessed in Section 5.6.1 of this report can be greatly reduced or eliminated by applying the site specific mitigation measures for *medium/low risk* sites according to the IAQM guidance. The following measures from the guidance are relevant and should be included in the Construction Environmental Management Plan for the site.

### General

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan, which will include measures to control other emissions, approved by the local authority.

### Site management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on-site or off-site and the action taken to resolve the situation in the log book.

### Monitoring

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results and make an inspection log available to the local authority, when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

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<sup>26</sup> Welsh Government, Air Quality Plan for the Achievement of EU Air Quality Limit Value for Nitrogen Dioxide (NO<sub>2</sub>) in South Wales (UK0041), December 2015

## Site Maintenance

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Damping down at source for operations creating dust.
- Avoid site runoff of water or mud.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
- Cover or seed stockpiles to prevent wind whipping.
- Ensure sand and other aggregates are stored in shielded areas where possible, segregated and dampened down.

## Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.

## Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques, such as water sprays or local extraction.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use the fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as practicable after the event using wet cleaning methods.

## Waste management

- Avoid bonfires and burning of waste materials.

The residual local air quality effects during the construction phase will not be significant providing the recommended mitigation measures are implemented successfully.

As no significant effects are anticipated as a result of the operational phase no mitigation is required.

## 5.8 Summary of Air Quality Impacts

Air quality impacts during the construction phase will be negligible however mitigation measures to minimise the impact from dust have been recommended to be included in the Outline Construction Environmental Management Plan for the Scheme.

A detailed assessment of air quality impacts during the operational phase has been undertaken. This included assessing pollutant concentrations at 57 human health receptors across the study area. 43 of these properties are predicted to experience an improvement in air quality, 17 of which experience a negligible improvement (0 -  $-0.4\mu\text{g}/\text{m}^3$ ) and 26 of which experience a minor/moderate improvement ( $-0.4$  -  $-2.2\mu\text{g}/\text{m}^3$ ) as a result of the Scheme. 13 properties experience a negligible increase in concentrations (0- $0.3\mu\text{g}/\text{m}^3$ ) and one property, at Hydrangea Close, is predicted to experience a minor adverse change in pollutant concentrations ( $0.5\mu\text{g}/\text{m}^3$ ). The Scheme will relieve congestion near the junctions which will likely result in an improvement in air quality however opening up the capacity of the road may encourage more drivers to use the route resulting in increased vehicle flows overall albeit in more efficient driving conditions.

No exceedence of the air quality standards are predicted using the IAN185/15 methodology however when applying the sensitivity test (IAN 170/12) to account for uncertainty in improvements in future NO<sub>x</sub> emissions, two areas are predicted to result in an exceedence of the annual mean NO<sub>2</sub> objective. One of these areas is along the existing M4 corridor (Aston Crescent, close to the tunnel portal of the westbound Brynglas Tunnel) and one area is at the junction of the A48 Southern Distributor Road and A4810 Steelworks Access Road.

Areas adjacent to the existing M4 corridor, including the area described above where an exceedence of the annual mean NO<sub>2</sub> objective is predicted using the IAN170/12 methodology, are predicted to experience an improvement as a result of the proposed Scheme. One property, at Aston Crescent, is predicted to experience a moderate beneficial impact ( $2.0\mu\text{g}/\text{m}^3$ ) which will result in the predicted exceedence being removed. A negligible increase in concentrations ( $0.1\mu\text{g}/\text{m}^3$ ) is predicted at two properties at the junction of the A48 Southern Distributor Road and A4810 Steelworks Access Road. Monitoring data available for the A48/A4810 junction, undertaken as part of the M4 Corridor around Newport scheme between September 2013 and 2015, shows that in reality pollutant concentrations are less than 75% of the annual mean NO<sub>2</sub> objective and therefore the predicted exceedences are likely to be a result of overly conservative modelling methods.

Annual mean NO<sub>x</sub> concentrations and nitrogen deposition were also assessed at designated sites, no significant effects are anticipated for these locations.

Therefore, no significant air quality effects are anticipated as a result of the Scheme.

## 6 Cultural Heritage

### 6.1 Introduction

This chapter assesses the impact of the Scheme upon the known and potential heritage assets within the three areas of proposed works; Junction 28 (Tredegar House), Bassaleg and Pont Ebbw roundabouts. Baseline conditions are described for these sites and a study area of up to 250m surrounding them for the assessment of both direct and setting impacts, along with an assessment of predicted impacts based upon the known details of the proposed works. Where adverse impacts are predicted mitigation is proposed, where possible.

Descriptions of the Scheme are provided in Section 2.3. Activities that have the potential to affect heritage assets include: excavation within areas not previously impacted by the construction of the existing junctions, removal of vegetation within the setting of heritage assets, and erection of new signage and traffic signals within the setting of heritage assets.

### 6.2 Study Area

The study area used for the collection of data on baseline conditions is Junction 28 (Tredegar House), Bassaleg and Pont Ebbw roundabouts and a study area of up to 250m surrounding them.

### 6.3 Baseline Conditions and Valuation of Resource

For the establishment of the baseline, human occupation of the British Isles is divided into the following time periods:

Table 6 1 Definition of archaeological and historical time periods

Period name	Date range
Pleistocene	About 1.64 million to about 8,500BC
Palaeolithic (Old Stone Age)	220,000BC to 8,500BC
Mesolithic (Middle Stone Age)	8,500BC to 4,000BC
Neolithic (New Stone Age)	4,000BC to 2,200BC
Bronze Age	2,200BC to 700BC
Iron Age	700BC to AD43
Romano-British	43 to 410
Early medieval	410 to 1086
Medieval	1086 to 1536
Post-medieval	1536 to 1899
Modern	1900 to present

## 6.3.1 Junction 28 (Tredegar House)

### Designated Heritage Assets

Within the area of proposed works no designated heritage assets are recorded, however directly east lies Tredegar Park Grade II\* Historic Park and Garden and the Tredegar House and Grounds Conservation Area. Approximately 7m north-east of the J28 roundabout and on the edge of the conservation area, are a pair of gate lodges that are Grade II listed and termed as ‘Pair of lodges, gates and piers with flanking walls to north-west of Tredegar House’.

Table 6.2 Designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
n/a	Tredegar House and Grounds Conservation Area	Designated on 11th October 1978, boundaries varied December 1987, the conservation area is centred on the Grade I listed Tredegar House, stable block and orangery, the numerous Grade II and II* listed buildings grouped around the house and the whole of the adjoining park, which is itself listed Grade II*.	Medieval to post-medieval	High	Immediately adjacent
Gt48	Tredegar Park	Historic Park and Garden, Grade II* - restoration period formal walled gardens and part of park, late 18th century landscape park with later planting. 100ha park first created after c.1664 by Sir William Morgan (who built the present house). Soon after great axial tree-lined avenues were planted, the main being the oak avenue running north-west from the front of the house; double avenues focused on the Iron Age hillfort (Tredegar Fort) towards Bassaleg Church. Further development occurred in the 1790s and the late-19th century.	Post-medieval	High	Immediately adjacent
2911	Pair of lodges, gates and piers with flanking walls to NW of Tredegar House	Listed Building, Grade II - these are a well preserved example of a pair of gate lodges to a major country house, Tredegar House, which date from the late 19th century and formed the main drive entrance. There is a possibility that the gates and piers may date from the earlier 19th century.	Post-Medieval	High	Immediately adjacent



## Non-designated Heritage Assets

There are no non-designated heritage assets recorded within the area of Scheme, however five are recorded within the study area dating from the Medieval to Post-medieval period, with one site of unknown date.

Table 6.3 Non-designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
033344.0g	Gwern-y-Cleppa Deer Park	Cleppa Park whose outlines can be roughly traced on 1st-3rd editions OS map, was associated with Gwern-y-Cleppa mansion. The OS Record Card (ST 28 NE 17) identifies this as probably extant in 14th century, and belonging to another branch of the Morgan family that resided at Tredegar Park. The modern Cleppa Park business park occupies a small area of the post-medieval park.	Medieval	Low	30m
00064g	Fishpond	Tredegar, an estate belonging to Squire Morgan 'He hath there a Stately Park. He hath likewise several fishponds, with what fish well live in ponds'	Post-medieval	Low	240m
00065g	Fishpond	Tredegar, an estate belonging to Squire Morgan 'He hath there a Stately Park. He hath likewise several fishponds, with what fish well live in ponds'.	Post-medieval	Low	175m
05402g	Culvert	A. Borthwick assessment Graig-y-Saeson Farm 1992 - brick arched culvert associated with Tredegar Park.	Post-medieval	Low	130m
07560g	Enclosures	Two trapezoidal enclosures seen on RCAHMW Aerial Photo 965105 41 43 and 44.	Unknown	Low	250m

### 6.3.2 Bassaleg

## Designated Heritage Assets

There are no designated heritage assets recorded within the area of Scheme, however five are recorded within the study area. These comprise the Church of

Saint Basil (Grade II\* listed building) and four Grade II listed buildings – a tower, coach house, a cottage and a lychgate, churchyard walls and railings to the Church of Saint Basil.

Table 6.4 Designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
2913	Church of Saint Basil	Listed Building, Grade II* - a priory was founded here c.1105 by Robert de la Haye but was abandoned in 1235. Anglican parish church, restored 1878-9 by Habershon Fawckner & Co of Newport and 1902-3 by C. Busted Fowler of Cardiff with Morgan chapel, rebuilt 1916 by W.D. Caroe. The present fabric is principally 14th century to 15th century.	Medieval, post-medieval	High	220m
81806	Tower at SW corner of churchyard, attached to Tredegar Arms	Listed Building, Grade II - later C19 tower, purpose unknown, linked by short length of churchyard wall to lychgate, and attached to Tredegar Arms.	Post-medieval	High	150m
81794	Coach House to west of the Tredegar Arms Inn	Listed Building, Grade II - former coach house to adjacent inn, probably mid-19th century, painted stucco with slate roofs, single-storey, 3-bay front with gabled centre.	Post-medieval	High	165m
81803	The Cottage	Listed Building, Grade II – 19th century village house possibly associated with the Tredegar Arms Inn, and presumably built for the Tredegar estate, as it is attached to the coach-house of the inn and has similar hoodmoulds to windows.	Post-medieval	High	175m
81799	Lychgate, churchyard walls and railings to Church of Saint Basil	Listed Building, Grade II - on the south and east side of the churchyard of the Church of Saint Basil, the lychgate in the south-west corner. Lychgate of 1926, built as WWI Memorial, architect unknown, with carved figure signed by Gilbert Bayes. Oak timber frame on base walls of purple squared stone, with grey sandstone dressings,	Modern	High	135m

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
		and plain-tile roof with terracotta ridge tiles.			

## Non-designated Heritage Assets

There are no non-designated heritage assets recorded within the area of proposed works, however 19 are recorded within the study area dating from the Romano-British period to the modern period.

Table 6.5 Non-designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
RR60b	Roman Road	Caerleon-Cardiff – assumed to form part of the Antonine Itinerary <i>Iter XII</i> (the road routes of Antoninus Augustus) between Caerleon and Neath, as there was a Roman fort at Cardiff that must have been connected to the road network.	Romano-British	Medium	120m
08309g	Church	'Benedictus presbiter Bassaleg' [Benedict the priest of Bassaleg] appears as a clerical witness in LL272 (c1075). The placename is derived from the Latin 'basilica' (Knight 1993, 9-10).	Early medieval	Medium	215m
00046g	Bassaleg Priory	A monastic cell, founded 1116, dissolved 1235, dependant on Glastonbury. This house was left to farm before 1235.	Medieval	Medium	215m
00047g	Site of chapel in Bassaleg Churchyard	A small isolated chapel of Perpendicular architecture standing in the churchyard, has lately been destroyed. It had been used as a school.	Medieval	Low	220m
08143g	Bassaleg Churchyard	The churchyard is shown as irregular on the tithe map of 1844 (NRL M468); it is shown as quadrangular with a rounded W corner at the normal scale, but a detail at larger scale shows this corner as angular. The churchyard has been extended to the east.	Medieval	Low	215m

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
00058g	Site of Duffryn Court Manor house	Manor or Court house, & demesne of Marcher Lord, extant in the 14th Century.	Medieval	Medium	165m
05225g	Park pale	A feature interpreted as a lynchet or park pale (boundary fence and ditch) of the north boundary of the post-medieval deer park of Cleppa Park.	Medieval	Medium	120m
05226g	Mill	PP 20 Bassaleg fulling mill Jack (1981) locates the fulling mill of Bassaleg (156g) at SO (sic) 277 870, on uncertain evidence. A location on a watercourse is more probable, as suggested by Rees (1932).	Medieval	Low	100m
00048g	Bassaleg Bridge	4 semi-circular arches on short piers & painted ashlar breakwaters. Opened as a single track viaduct in 1826, but widened for a double track in 1863.	Medieval	Low	110m
08615g	Weir	Weir marked on the First Edition (1883) Ordnance Survey map. No further information available.	Post-medieval	Low	65m
08617g	Bassaleg School	School founded in 1674 by Roland Morgan of Bassaleg and his wife Florence, in St Basil's churchyard. A school master was appointed under license from the Bishop of Llandaff.	Post-medieval	Low	90m
08618g	Bassaleg Vicarage	Vicarage marked on the First Edition (1883) Ordnance Survey map. The current vicarage stands just in front of this building on Caerphilly Road, while its predecessor stood on Forge Road.	Post-medieval	Low	70m

PRN/ ID No.	Name	Description	Period	Importance	Distance from Scheme
08619g	Bassaleg Post Office	Post office marked on the First Edition (1883) Ordnance Survey map, on the Second Edition (1901) Ordnance Survey map this post office has moved up Caerphilly Road away from the Ebbw and is situated opposite the Tredegar Arms Public House.	Post-medieval	Low	110m
08620g	Tredegar Arms Public House	Public house called the Tredegar Arms which is marked on the First Edition (1883) Ordnance Survey map and is still in existence today. No further information available.	Post-medieval	Low	150m
08621g	Bassaleg Smithy	Smithy marked on the First Edition (1883) Ordnance Survey map. No further information available.	Post-medieval	Low	130m
08623g	Bridge Cottages	Group of three houses marked on the Bassaleg Tithe Map (1844) and labelled as Bridge Cottages on the First Edition (1883) Ordnance Survey Map.	Post-medieval	Low	220m
08627g	Tredegar Deer Park Kennels	Kennels which now house the hounds of The Tredegar Farmers Hunt, marked on the First Edition (1883) Ordnance Survey Map. No further information available.	Post-medieval	Low	215
08628g	Park Lodge	Building marked on the First Edition (1883) Ordnance Survey Map as Park Lodge, marked on the Modern Ordnance Survey Map as Deer Park House.	Post-medieval	Low	245m
08637g	Tredegar Park Golf Course Bridge	Bridge to the north of the New Dock Feeder built by apprentices from the Army Apprentices School, Chepstow in 1985 connecting the sixth and seventh fairways. The bridge was irreparably damaged by falling trees in 1996.	Modern	Low	20m

### 6.3.3 Pont Ebbw

#### Designated Heritage Assets

There are no designated heritage assets recorded within the area of the proposed works, however one is recorded within the study area, Tredegar Park (Grade II\* historic park and garden).

Table 6.6 Designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from the Scheme
Gt48	Tredegar Park	Historic Park and Garden, Grade II* - restoration period formal walled gardens and part of park, late 18th century landscape park with later planting. 100ha park first created after c.1664 by Sir William Morgan (who built the present house). Soon after great axial tree-lined avenues were planted, the main being the oak avenue running north-west from the front of the house; double avenues focused on the Iron Age hillfort (Tredegar Fort) towards Bassaleg Church. Further development occurred in the 1790s and the late-19th century.	Post-medieval	High	Immediately adjacent

#### Non-designated Heritage Assets

There are no non-designated heritage assets recorded within the area of proposed works, however nine are recorded within the study area; seven dating from the early Medieval period to the Post-medieval period, and two of unknown date.

Table 6.7 Non-designated heritage assets within the study area

PRN/ ID No.	Name	Description	Period	Importance	Distance from the Scheme
00052g	Site of Hermitage of St Gwladus	Lifris's Vita Sancti Gundleiii of c 1130 states that St Gwladus, wife of St Gwynllyw and mother of St Cadoc built a hermitage 'ripam Ebod fluminis' (Wade-Evans 1944, xii, 178-9).	Early medieval	Medium	190m
00072g	Manor House of the Lordship of Gwynllwg	Ebboth, near Pont Ebbw, in the early days of conquest was a manor of the Lordship of Gwynllwg & was held by Henry, Earl of Lancaster.	Medieval	Medium	210m

PRN/ ID No.	Name	Description	Period	Importance	Distance from the Scheme
00053g	St Gwladys Chapel	Reference in 1146 to a Chapel of St Gwladys which Laudomer built on the River Ebbw, part of a dispute between Picot chaplain of St Gwynllyw and monks of Bassaleg, resolved in favour of the former (Crouch 1988, 2).	Medieval	Low	190m
00068g	Watermill	Watermill (Remains of); Possibly 2, one extant in the 12th century, both extant in the 14th century. Described as devastated or depreciated by war. (See 0069g).	Medieval	Low	75m
00069g	Watermill	Watermill (Remains of); possibly 2, one extant in the 12th century, Both extant in the 14th century. Described as devastated or depreciated by war.	Medieval	Low	75m
00070g	Ford	The ford across the Ebbw leading to the Manor of Pencarn still exists. The road descends To the river through a cutting in the low cliff. (1957).	Medieval	Low	55m
00071g	Ford	The ford was the only communication from one bank to the other before the erection of the bridge at Pont Ebbw in the reign of Queen Elizabeth.	Post-medieval	Low	40m
00051g	The Lady's Well: St Gwladys Well	Holy well in Tredegar Park. Said to be named after Gwladys, mother of St Cadoc; one of Jones's Class A wells (wells bearing the names of saints. Trinity, God, Holy Innocents, Easter).	Unknown	Low	200m
00054g	Mound-possible burial	Lord Tredegar discovered the tumulus in which, it is said St Gwladys was buried.	Unknown	Low	190m

### 6.3.4 Prehistoric

No prehistoric remains are known within the site or study area, however directly south are the Gwent Levels, which is a landscape of outstanding historic interest. It is here that evidence for Palaeolithic and Mesolithic activity have been recorded. It is possible, therefore, that as-yet undiscovered remains dating from this period may exist.

During the Iron Age, all three sites were located within an area of the territory of the Silures (Iron Age tribe). It is here that numerous areas of settlement are recorded, including Tredegar Fort (scheduled monument) that lies approximately north-east.

### 6.3.5 Romano-British

No Romano-British remains are known within the site or study area, however 1.4km north-west of the site is the route of a Roman road from Caerleon to Cardiff, which is assumed to form part of the Antonine Itinerary *Iter XII* (the road routes of Antoninus Augustus) between Caerleon and Neath.

### 6.3.6 Early Medieval (Anglo-Saxon)

During the 6<sup>th</sup> and 7<sup>th</sup> centuries, Caerwent remained the main ecclesiastical centre of the area, however early churches were established throughout the region, including that at Bassaleg. Within the study area of Pont Ebbw roundabout, lies the site of a hermitage that was built by St Gwladus c.1130.

### 6.3.7 Medieval

Medieval activity is well represented in all three study areas, albeit none are recorded within the sites themselves.

Pre 1116, Bassaleg was the site chosen to establish a priory, Bassaleg Priory, which was founded as a cell of Glastonbury Abbey when Robert of Hay granted the ancient 'clas' church of Saint Basil to the English House. The priory was dissolved by 1235 but the priory church later became an Anglican parish church, Church of Saint Basil (Grade II listed). It was restored during 1878-1879 and again during 1902-1903, but the present fabric is principally 14<sup>th</sup> to 15<sup>th</sup> century. Further ecclesiastical sites in the study area include Bassaleg churchyard and its chapel site and, built on the River Ebbw, St Gwladys Chapel.

Within the area, manorial evidence is dominated by Tredegar House (Grade I listed) and gardens (Grade II\* historic park and garden). This was the seat of the Morgan family from the early 15<sup>th</sup> century through to the mid-20<sup>th</sup> century. The late medieval house was arranged around three courtyards with halls in the south-west and north-east wings. The surviving medieval house was incorporated into the south-western wing of the much grander, classical house built between 1664 and 1672. Alterations were undertaken in the 19<sup>th</sup> century, with the south-eastern wing being substantially rebuilt. In 1951, after the family descendants had died, the house was used as a boarding school and is now owned by Newport City Council. Tredegar Park (100ha) was first created after c.1664 by Sir William Morgan. Soon after great axial tree-lined avenues were planted, the main being the oak avenue running north-west from the front of the house; double avenues focused on the Iron Age hillfort (Tredegar Fort) towards Bassaleg Church. Further development occurred in the 1790s and the late-19<sup>th</sup> century.

Further manorial activity is evidenced at Pont Ebbw by the manor house of the Lordship of Gwynllwg, which was held by Henry, Earl of Lancaster in the mid-11<sup>th</sup> century. At Bassaleg, is the site of the Duffryn Court Manor House that was the demesne of Marcher Lord and still extant in the 14<sup>th</sup> century. Directly south-west of the Junction 28 (Tredegar House), are the outlined remains of Gwern-y-



Cleppa deer park, with its park pale, which was associated with the Gwern-y-Cleppa mansion. The deer park was extant in the 14<sup>th</sup> century and belonged to another branch of the Morgan family that resided at Tredegar Park. The deer park is now partially overlain by the modern Cleppa Park business park.

Evidence of local economy is noted by the numerous mills within the study areas, including Bassaleg fulling mill.

### 6.3.8 Post-medieval

Activity from the post-medieval period is noted within the study area of the three sites, mainly relating to settlement expansion. In Bassaleg, it was in this period that the school, post office, vicarage, smithy, Tredegar Arms public house and coach house (Grade II listed), Tredegar Deer Park kennels, and a number of cottages, including The Cottage (Grade II listed) were established.

### 6.3.9 Modern

With the exception of the roundabouts and their accompanying roads, there are no sites dating to the modern period within the Junction 28 (Tredegar House) or Pont Ebbw sites. At Bassaleg, however, two sites are recorded within the study area. Located in the northern part of the study area, is the designated Grade II listed lychgate, built as a WWI memorial in 1926, churchyard walls and railings to the Church of Saint Basil. Approximately 23m south of the roundabout is Tredegar Park Golf Course Bridge, which was built by apprentices from the Army Apprentices School, Chepstow in 1985, but was irreparably damaged by falling trees in 1996.

### 6.3.10 Unknown

There are no sites of unknown date within any of the three study areas or within the study area of Bassaleg roundabout, however at the Pont Ebbw and the Junction 28 (Tredegar House) roundabouts three are recorded. At Pont Ebbw, a holy well known as the Lady's Well/ St Gwladys Well in Tredegar Park, and a possible burial mound are noted. At the Junction 28 (Tredegar House) roundabout two trapezoidal enclosures have been identified on aerial photographs but their purpose or date are unknown.

### 6.3.11 Map Summary

In the 19<sup>th</sup> century, the three study areas are shown within an industrial post-medieval landscape to the west of Newport town, within the county of Duffryn. Whilst the Iron Age Tredegar Camp hillfort is recorded, north of Junction 28 (Tredegar House) and Ebbw roundabouts and east of Bassaleg roundabout, it is the 17th century landscaped Tredegar Park (to the south) and the post-medieval rail lines and Alexandra Docks that dominate the landscape. The Monmouthshire Section Western Valleys Line of the Great Western Railway (GWR) travels east-west through the landscape, linking to the southern branch of the Alexandra Dock Railway, with the Alexandra Dock beyond.

Early historic Ordnance Survey (OS) maps show the Bassaleg roundabout site within an area of open land to the south of the Bassaleg village, directly east of a

tree-lined avenue that leads to Tredegar Park. The Junction 28 (Tredegar House) site is shown at a road junction, where the northern road leads to Bassaleg village and the eastern road travels through Tredegar Park towards the road junction at Pont-Ebbw; where the Pont Ebbw roundabout was later to be located.

From this period to the present day, very little change is recorded within the three sites, until the upgrade of the road transport system in the late 20th century. Junction 28 (Tredegar House) was the first roundabout to be constructed in 1972 that joined the A467 and another minor road from the north, with the A48 to the east and south. All of these roads are shown sited upon embankments. By 1981, the roundabout had expanded to incorporate two routes of the A48 in the south and two slip-roads onto the M4 in the north.

Also in 1981, Pont Ebbw roundabout had been proposed and planned, incorporating one road from the west and three from the east. This had been constructed by 1992.

1996 saw the construction of Bassaleg roundabout, combining two roads from the south with three from the north. No further changes have been recorded of the three roundabouts to date.

Table 6.8 Historic maps reviewed

Year	Map	Scale
1883	OS County Series: Monmouthshire	1:2,500
1886-1887	OS County Series: Monmouthshire	1:10,560
1901	OS County Series: Monmouthshire/ Glamorganshire	1:10,560
1920	OS County Series: Monmouthshire	1:2,500
1922	OS County Series: Monmouthshire/ Glamorganshire	1:10,560
1937	OS County Series: Monmouthshire	1:2,500
1953-1954	OS County Series: Monmouthshire	1:10,560
1955	OS Plan	1:1,250
1955-1970	OS Plan	1:2,500
1964-1965	OS Plan	1:10,560
1972-1973	OS Plan	1:10,000
1981-1982	OS Plan	1:10,000
1992-1994	OS Plan	1:10,000

## 6.4 Regulatory and Policy Framework

### 6.4.1 Historic Environment (Wales) Act

The Historic Environment (Wales) Act came into force on 21st March 2016 and forms part of a suite of legislation, policy, advice and guidance that makes important improvements to the existing systems for the protection and sustainable management of the Welsh historic environment. In broad terms, the Act gives more effective protection to listed buildings and scheduled ancient monuments, enhances existing mechanisms for the sustainable management of the historic

environment, and introduces greater transparency and accountability into decisions taken on the historic environment.

The Act makes important changes to the two main UK laws that provide the legislative framework for the protection and management of the historic environment: the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990. The Act also incorporates three stand-alone provisions. The Act will:

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

### 6.4.2 Planning Policy Wales

The Welsh Government published ‘the Planning Policy Wales (PPW8)’ in January 2016, which was then updated in November 2012. This document is supplemented by a series of Technical Advice Notes (TANs) and procedural advice is given in Welsh Office Circulars and policy clarification letters. Detailed advice on the historic environment is contained in circulars:

- 60/96 Planning and the Historic Environment: Archaeology;
- 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas; and
- 1-98 Planning and the Historic Environment: Directions by the Secretary of State for Wales.

PPW ‘*Chapter 6: Conserving the historic environment*’ sets out the principal national guidance on the importance, management and safeguarding of heritage assets within the planning process. This guidance provides a framework that:

- recognises heritage assets are a non-renewable resource;
- requires an assessment and/ or evaluation of the historic environment resource affected by the proposals and an impact assessment of the Scheme on the importance of the heritage assets;
- takes into account the desirability of preserving and enhancing the importance of heritage assets and their setting;
- places weight on the conservation of designated heritage assets, such as world heritage sites, scheduled monuments, listed buildings, historic landscapes, parks and gardens, and conservation areas.

### 6.4.3 Well-being of Future Generations Act (Wales) 2015

The Well-Being of Future Generations Act 2015 places a duty on public bodies in Wales, including Welsh Government, to work towards achieving well-being goals, in order for actions to align to the Welsh Government's principles of sustainable development.

Objective 11 of the Act is to ‘Promote and enhance the culture and heritage of Wales’.

Within this objective, seven well-being goals have been set out, including:

‘A Wales of vibrant culture and thriving Welsh language – A society that promotes and protects culture, heritage.....’

#### 6.4.4 The Hedgerows Act 1997

The Hedgerows Regulations 1997 sets out the criteria for hedgerows over 30 years old, to be protected with regard to their cultural heritage aspects. These are:

- The hedgerow marks the boundary, or part of the boundary, of at least one historic parish or township; and for this purpose “historic” means existing before 1850.
- The hedgerow incorporates an archaeological feature which is (a) included in the schedule of monuments compiled by the Secretary of State under section 1 (schedule of monuments) of the Ancient Monuments and Archaeological Areas Act 1979(1); or (b) recorded at the relevant date in a Sites and Monuments Record.

#### 6.4.5 Newport Local Development Plan 2011-26, adopted plan January 2015

Newport’s LDP has a number of objectives to protect and conserve the environment, Objective 5 – conservation of the Built Environment, states:

*“To ensure that all development or use of land does not adversely affect, and seeks to preserve or enhance, the quality of the historic and built environment.”*

The Strategy therefore seeks to preserve historical quality and to ensure that new development is carefully designed.

##### *Policy CE4: Historic Landscapes, Parks, Gardens and Battlefields*

Sites included in the register of landscapes, parks and gardens of special historic interest and identified historic battlefields should be protected, conserved, enhanced and where appropriate, restored. Attention will also be given to their setting.

##### *Policy CE6: Archaeology*

Development proposals will normally be required to undertake an archaeological impact assessment before the proposal is determined:

- where groundworks and/or the installation of services are proposed within areas of recognised archaeological interest.

##### *Policy CE7: Conservation Areas*

Development within or adjacent to conservation areas will be required to:

- be designed to preserve or enhance the character or appearance of the conservation area, having regard to the conservation area appraisal where appropriate;

- use materials which are traditional, or appropriate to their context;
- complement or reflect the architectural qualities of nearby buildings which make a positive contribution to the character of the area;
- pay special attention to the settings of buildings, and avoid the loss of any existing domestic gardens and open spaces which contribute to the character of the area; and
- avoid adverse impact on any significant views, within, towards and outwards from the conservation area.

## 6.5 Methodology

The techniques employed throughout the assessment of the heritage resource are based upon those outlined in the Highways Agency's Design Manual for Roads and Bridges (DMRB)<sup>27</sup>, Volume 11, Section 3, Part 2. Guidance issued by the Chartered Institute for Archaeologists (CIfA)<sup>28</sup> has been considered and professional judgement has been relied upon to inform the assessment. Due to the nature of the proposed works being largely within land that was likely to have been affected during the construction of existing roads, and the limited visual change to the existing in operation, it was considered that significant effects upon heritage assets were unlikely. On this basis Simple Assessment was undertaken for the Scheme.

Heritage assets are first assessed to determine their potential survival and their value following the criteria set out in Table 6.9.

Table 6.9 Value of archaeological assets

Value	Typical Descriptors
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives
High	Nationally important assets (scheduled monuments, listed buildings, registered parks and gardens), Conservation areas where the focus can be demonstrated to be the presence of GI and GII* listed buildings
Medium	Designated (conservation areas) or non-designated assets that are of regional importance
Low	Assets of local importance. Assets compromised by poor preservation and/ or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.

Impacts resulting from the construction or operation of the Scheme may be direct or indirect:

- Direct impacts are those that arise as an immediate consequence of the construction or operation of the Scheme. Direct impacts may be caused by a

<sup>27</sup> Highways Agency (2007) Design Manual for Roads and Bridges Volume 11 Section 3 Part 2.

<sup>28</sup> CIfA (2014) Standard and Guidance for historic environment desk-based assessment

range of activities associated with the construction of the Scheme; for example, the removal of existing ground for the insertion of foundations and basements, which may then truncate the potential subsurface archaeological resource. This also includes impacts upon the setting of heritage assets, such as a change in visual amenity of a scheduled monument resulting from the Scheme; and

- Indirect impacts are those that arise from the Scheme via a complex route, where the connection between the Scheme and the impact is complicated, unpredictable or remote. For example, changes in local land drainage caused by the Scheme could affect palaeo-environmental deposits at a distance from the Scheme.

All potential impacts (direct or indirect) were assessed in terms of their duration (temporary or permanent) and nature (adverse or beneficial).

Adverse impacts are those that detract from the value of a heritage asset. This may be through a reduction in, or disruption of, valuable characterising components or patterns; for example, the removal of archaeological below ground deposits.

Beneficial impacts are those that contribute to the value of a heritage asset. This may be through the introduction of new, positive attributes; for example, through improved understanding of the asset, improved setting and increased public access.

The potential for a heritage asset to experience an effect from a construction or operational impact is assessed, using a combined understanding of the heritage baseline, the design and nature of the Scheme proposals, available ground-based information, consultation with the relevant authorities, and professional judgement.

Table 6.10 summarises the types of impact and magnitude, according to DMRB, Vol 11, Sec 3, Part 2.

Table 6.10: Magnitude of impact

Magnitude of Impact	Description of Impact
Major	Complete destruction/demolition of site or feature. Change to the site or feature resulting in a fundamental change in our ability to understand and appreciate the resource and its historical context and setting.
Moderate	Change to the site or feature resulting in an appreciable change in our ability to understand and appreciate the resource and its historical context and setting.
Minor	Change to the site or feature resulting in a small change in our ability to understand and appreciate the resource and its historical context and setting.
Negligible	Negligible change or no material change to the site or feature. No real change in our ability to understand and appreciate the resource and its historical context and setting.
No Change	No change

The assessed effect upon a historic asset resulting from the impacts deriving from the Scheme is then presented on a seven point scale ranging from major beneficial to major adverse (Table 6.11).

Table 6.11 Significance of effect upon historic assets

		MAGNITUDE OF CHANGE				
		No Change	Negligible	Minor	Moderate	Major
ENVIRONMENTAL VALUE	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Guidance issued by the CIfA on cultural heritage assessment specifies that documentary, cartographic and cultural heritage sources to be consulted as a minimum. The sources consulted for this assessment included:

- The Glamorgan Gwent Archaeological Trust Historic Environment Record (GGAT HER), were consulted for known heritage assets within the sites and within a surrounding radius of 250m to provide context of the area (thereafter termed ‘study area’);
- Historic Ordnance Survey 1:10,560 and 1:2,500 maps from the 19<sup>th</sup> century onwards were examined to gain an understanding of the development of the roundabout sites, and how this may affect the potential for buried archaeological remains to survive; and
- Additional readily available documentary sources were reviewed, including internet archival source, British History Online (<http://www.british-history.ac.uk/>).

The following limitations and assumptions apply to this assessment:

- The assessment is based on the detailed design details available at the time of the compilation of this report; and
- The GGAT HER is continually being updated and this work reflects the data collected at the time of the assessment.

## 6.6 Potential Environmental Impacts

The construction of the proposed works at the Junction 28 (Tredegar House) roundabout would take place predominantly within existing road boundaries, with the exception the re-routing of the A48 and the M4 slip-road. This would result in

new slip roads being routed through two undeveloped areas that do not currently lie within the existing road boundaries. Historic mapping highlights the original routes used towards the, as then, newly constructed roundabout and shows they were constructed upon areas of embankment. However, the two areas of note were not impacted upon from the previous construction works and therefore buried archaeological remains may be present within these areas.

In the eastern part of the central grassed and tree area of the Junction 28 (Tredegar House) roundabout, a new road is proposed. It is considered that the construction of the current roundabout would have removed any buried archaeological remains that may have been present. Therefore, the impact of the construction in this area would have no change.

As a result of known multi-period heritage within the area and Tredegar Park's close proximity, it is considered there limited potential for archaeological remains to be present within the two undeveloped areas in the south and the western footpath alongside the listed lodges. It is considered therefore that the impact of the construction of the proposed works, pre-mitigation, at the Junction 28 (Tredegar House) roundabout would be **slight adverse**.

The construction of the proposed works at the Bassaleg and Pont Ebbw roundabouts would take place within the existing road boundaries. Whilst the works will include routing new roads through the central grassed and tree areas of the roundabouts, it is considered that the construction of the current roundabouts would have removed any buried archaeological remains that may have been present. Therefore, the impact of the construction would have no change.

While the proposed construction works would take place within the setting of designated heritage assets, the scale of these as perceived from these assets would have a negligible effect on the significance of these assets during construction.

During operation, the appearance of the proposed scheme would be very similar to the existing situation. While there would be changes to the setting of assets within the study area, these would be negligible, which would result in a slight adverse effect (not significant) on the setting of designated heritage assets.

## 6.7 Mitigation

Given the limited potential for buried archaeological remains within two undeveloped areas in the southern area of the Junction 28 (Tredegar House) roundabout and the western footpath alongside the listed lodges, mitigation would comprise an archaeological watching brief in these specific areas only. It is proposed this would be required where construction works would involve below ground excavations. Mitigation will be undertaken according to a Written Scheme of Investigation (WSI), to be agreed with Glamorgan-Gwent Archaeological Trust (GGAT). The WSI will set out the methodology for the watching brief and the Standards and Guidance that will be followed. It is considered that due to the implementation of the archaeological watching brief, the impact of construction of the proposed works would be reduced to **negligible**. No mitigation will be required for Bassaleg and Pont Ebbw roundabouts. In operation, no mitigation will be required for any of the three sites.



## 7 Landscape Effects

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### 7.1 Introduction

The purpose of this chapter is to provide a Simple Landscape and Visual Assessment in line with IAN 135/10 (W)<sup>29</sup> for the proposed improvement works to the M4 Junction 28 in Newport. A description of the Scheme is provided in Section 2.3.

This chapter assesses the significance of the effects of the visual changes arising from the Scheme, together with the changes to the character and quality of the receiving landscape.

The existing landscape character and the visual environment have been separately surveyed and assessed. The landscape assessment identifies characteristics, features and elements which constitute this particular landscape and its character. The visual baseline identifies existing views to, across or from the Scheme site, and identifies the visual receptors, such as nearby residents or users of Public Rights of Way (PRoW) who might be affected by the Scheme.

### 7.2 Study Area

Due to the low lying nature of the Scheme and the surrounding existing topography, the study area has been defined as approximately 1.5km radius from the location of the proposed works i.e. each of the three roundabout junction locations.

### 7.3 Baseline Conditions and Receptors

#### 7.3.1 Landscape Baseline

A summary of the key LANDMAP aspects are illustrated on Figures 4 and 5 in Appendix C1 and Appendix C2. The following landscape character descriptions are taken direct from the LANDMAP Collector data produced as part of the LANDMAP study for this area. These areas are shown on Figure 6 Appendix C3. Refer to Appendix C4 for more detail information regarding each area.

#### LCA 1: Tredegar Park

This area is identical to LANDMAP Visual and Sensory aspect data for Tredegar Park. Its main characteristics are:

- *“House with formal parks and gardens and grounds located on flat valley floor partly screened off from adjacent development and busy road by mixed tree belt to the east but open to the M4 and associated noise on embankment.*
- *...mature tree avenues orientated to face the M4 to the north-west.*

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<sup>29</sup> Interim Advice Note 135/10 (W), Landscape and Visual Effects Assessment, Highways Agency, 2014

- *...large grassed areas are used for outdoor events and as a park and include a large playground.*
- *Access is from the rear and small scale uses such as craft workshops use the previous stables and outbuildings and are located next to the car park.*
- *A large linear lake enclosed by trees is an attractive feature to the north. Planting includes formal hedges and rhododendrons, and specimen and avenue trees.*
- *...very attractive with aesthetically pleasing vistas and elements of consistent character and in good condition."*

## LCA 2: M4 Corridor

This area is identical to LANDMAP Visual and Sensory aspect data for M4 and A4232. Its main characteristics are:

- *Large-scale busy roads which have a significant visual and noise effects on the adjacent landscape. Signs and lighting add to the visual clutter.*
- *They have significant planting and barriers to screen the roads more sensitive areas. Coniferous planting forms a significant element particularly close to housing to give all year round cover.*

*Some of these views are detractive, particularly where housing breaks the skyline such as a High Cross or adjacent to the Gaer fort.*

## LCA 3: Dyffryn and LG Park

This area comprises the Dyffryn and LG Park from the Visual and Sensory aspect areas and Imperial Park and Others from the Cultural Landscape aspect areas. Its main characteristics are:

- *Dyffryn- late 20<sup>th</sup>-century mixed extension to Newport fringing the Wentloog levels to the south and Tredegar Park to the West. The core of the area is the distinctive 1970s two-storey housing with its continuous sinuous built form enclosing courtyards.*
- *Commercial development lies to the west and north, the latter of which [high quality offices] is highly visible from the M4.*
- *The South are a school and playing fields and private housing estates which are beginning to encroach further on to the levels.*
- *The development, in particular, the offices, appear to occupy what was once part of Tredegar Park and their proximity to the house and existing park and gardens have an adverse effect on the setting and approach.*
- *Mature trees, remnant of the park, and on the road to the east help to integrate the development and make the area feel fairly enclosed, limiting views. Fly tipping occurs on the rural lanes to the south, visible to the rail corridor.*
- *...extensive series of separate but contiguous commercial and business park developments surrounding Tredegar Park...*

- *Large-scale nature of the LG development give this area a sense of place but these buildings are also major detractors and the various uses are disjointed although the management of landscape infrastructure is positive.*

## LCA 4: Newport Hinterland

This area is the result of a combination of LANDMAP Visual and Sensory aspect areas of Tredegar Park and Sports Grounds, New Tredegar Park Golf Course and Ebbw River Corridor with Newport Hinterland from the Cultural Landscape aspect areas. Its main characteristics are:

- *Lowland rolling farmland rising up to 120mAOD from the levels with an open character...*
- *Land use is a mix of arable and pastoral land enclosed by close trimmed hedges. The field pattern is medium scale and sinuous...*
- *Urban fringe influences are present such as south of Bassaleg and just north of the M4 approaching Cardiff. Cypress trees are used for enclosure of some properties.*
- *Detractors include pylons, masts and unmaintained farm buildings such as north east Tredegar House.*
- *While the area is generally tranquil on its north and west facing slopes the noise from the busy M4 and M48 reduce this on the south and east facing slopes.*
- *Golf course land sports ground located on the valley floor screened off from adjacent development and busy roads by strong belts of deciduous woodland. The River Ebbw runs through the middle of the course. Tree planting on the course includes a substantial number of conifers such as Cypress trees. Access is limited to one public footpath to the west.*
- *The golf course and sports facilities are well managed on a pleasant valley floor with a river passing through and enclosed by tree belts.”*
- *Formal park and playing fields located on flat valley floor partly screened off from adjacent development and busy road by mixed tree belt to the south but open to the M4 and associated noise on embankment to west. The River Ebbw runs on the northern boundary separated by a flood embankment. Planting includes formal hedges and rhododendrons, and specimen trees. Well used facility with large car park and play area.*

## LCA 5: Gaer

This area matches the area of the same name from LANDMAP Visual and Sensory aspect areas. Its main characteristics are:

- *Prominent steep sloping hill running from 91m AOD down to 20m AOD. The River Ebbw, adjacent railway and the M4 run along the bottom of the slope.*
- *The landcover is a mosaic of bracken, rough grassland, encroaching scrub and deciduous tree cover dominated by oak, hazel and birch.*
- *The key feature is a prehistoric fort on top of the hill. Deep earthworks are still highly visible and give the area a strong sense of place.*

- *There is public access throughout the area with paths crisscrossing the slopes as it is managed as an informal open space.*
- *The area is affected by noise from the M4 motorway.”  
...forms a strong edge to Newport but exhibits poor condition in parts.*

## LCA 6: Consolidated Urban Areas

This area is a combination of LANDMAP Visual and Sensory aspect areas of Newport West, High Cross and Bassaleg. Its main characteristics are:

- *Bassaleg - a village which has enlarged to become a suburb of Newport incorporating Rhiwderin and Pentrepoeth. It lies on the edge of the Ebbw valley running from 20m AOD to 50mAOD. It is primarily residential with a small commercial centre and school. The residential areas have varying and disjointed character.*
- *High Cross - primarily residential estates with small dispersed retail areas. The character of the residential areas is highly suburban with no concession to the local vernacular.*
- *West Newport - part of the city on the western side of the Usk running from hills at 109 m AOD at the Ridgeway to 10m AOD on the flat valley floor and levels... To the west there is expansion of estates, some council, which form the eastern margins of the built up area and are visible from the M4 above the Gaer fort. Stow Park and Bellevue Park are important formal open spaces... Relatively incoherent urban form with some urban elements in poor-moderate condition.*

The character of landscape areas within and surrounding the site are considered to be valued at a local authority level. The wider area does include designated sites that are of national value, but these do not influence the character of the wider landscape to the extent that overall value is of more than local authority value. The visual settings of these individual sites is assessed under visual effects in Table 7.6 below.

## Visual Baseline

Due to the location within and along the existing road infrastructure network, the Scheme site is surrounded on all sides by public receptors with close-up views. The fact that the road corridors are well screened by mature vegetation and the proposed works are low lying, means that the majority of the longer views, with the exception of those from the elevated Gaer Hill, are well screened.

The only medium to long distance views considered and assessed below relate to Tredegar Park roundabout. The first, from the grounds of Tredegar Park towards the northwest and across the M4, is designated as a Significant View and creates an interrupted visual axis from the Manor house, framed by two rows of deciduous and evergreen trees, towards Bassaleg. The M4 corridor and most of Junction 28 (Tredegar Park) is effectively screened by existing vegetation and the country park boundary stone wall which is approximately 2.5m high. The other view is from Tredegar Fort, a Scheduled Ancient Monument on top of Gaer Hill, looking towards the southwest.

## Public Visual Receptors

Public recreational routes that have views of the Scheme site include:

- National Cycle Route 4 (NCR4) – The Celtic Trail, which runs along the south-western edge of Tredegar Park, into the A48 and past the roundabout towards the A467 to Bassaleg.
- Sirhowy Valley Walk – a long distance recreational route from the built-up fringes of Newport to the mountain ridges of Mynydd Machen and Mynydd Manmoel. It passes lowland and upland farms, woodlands and riverside parks, many sites of historical interest, including Tredegar Fort, an old mill and a canal centre, before finishing near Tredegar Park.
- A local cycle route which runs southeast from Pont Ebbw roundabout, along the B4239, linking to NCR 4.
- NCR 4 and Sirhowy Valley Walk are long-distance routes and designated above the status of a standard PRow as having regional or national importance. They are all busy, well known routes and are well signposted. The visual amenity of these receptors is of **National** value.

Roads that will have views of the Scheme include:

- M4;
- A468;
- Forge Road (A467); and
- Southern Distributor Road and Docks Way (A48).

The road network in Newport is busy and set within an urban environment. The visual amenity of local road users on the routes listed above is considered to be of **local** value.

## Private Visual Receptors

The main groups of private residential receptors that will have some views of the Scheme include:

- At Bassaleg roundabout - Residential properties at the north end of Forge Lane and Court Crescent, and the southern row of houses along Churchmead.
- At Pont Ebbw roundabout – Residential properties backing to the river at St Brides Gardens.

The visual amenity of the small groups of private dwellings is considered to be valued at a **local community** level.

The sensitivity of each of the receptors listed above is discussed below in Visual Effects during Operation.

The visual impact on views identified in Figure 7 in Appendix C5 are assessed in Table 7.1.

The sensitivity of each of the receptors listed above is discussed below in Table 7.1, together with the description of views from the represented Public receptors and shown on a plan at Figure 1 in Appendix C6.

## 7.4 Regulatory and Policy Framework

### 7.4.1 International Landscape Designations

There are no international landscape designations relating to the study area or its immediate surroundings.

### 7.4.2 National Landscape Designations

The proposed works do not lie within any area which is nationally designated for its landscape value or historical and cultural value.

Tredegar Park is a Grade II\* Registered Park and Garden. Currently it is fragmented into three areas by the existing road infrastructure. The three areas orbit around Tredegar Park Roundabout which is directly adjacent to the Country Park and the sports ground, located to the southeast and northeast of the roundabout respectively.

Figure 2 in Appendix C7 shows these landscape designations on a map.

### 7.4.3 Local Landscape Designations

Newport LDP identifies a Special Landscape Area within the study area – SLA 2: West of Rhiwderin. This area is located approximately 500m to the west of Bassaleg Roundabout.

Figure 3 in Appendix C9 shows this landscape designation on a map.

### 7.4.4 Cultural and Heritage Designations

The nearest nationally important landscape site is the Gwent Levels, designated as a Landscape of Outstanding Historic Interest. Located approximately 1.2km and 2km to the southeast from the roundabouts at Pont Ebbw and Tredegar Park respectively.

Several Scheduled Monuments (SM) can be found within the study area:

- Tredegar Fort is located at the top of a hill within Tredegar Park and it lies approximately 1km away from the three roundabouts.
- Coed y Defaid Camp, another hillfort, is located within the setting of Tredegar Park, north of the M4 and approximately 750m southwest and 1.1km northwest from Bassaleg roundabout and Tredegar Park roundabout respectively.
- Castell Glas Castle Mound, a medieval motte, is located approximately 860m to the east of Pont Ebbw roundabout.
- Gwen y Cleppa Burial Chamber lies 1km to the southwest of Tredegar Park roundabout.

The nearest Listed Buildings to the site are adjacent to Tredegar Park roundabout. Prominently located on the south side of Cardiff Road and the north boundary of Tredegar Park lies a group of grade II listed features which comprise a pair of lodges, gates and piers with flanking walls.

Figure 2 in Appendix C7 shows these landscape designations on a map.

### 7.4.5 Planning Policy

National and local planning policy documents relevant to the determination of planning applications consists of:

- Planning Policy Wales (Edition 8);
- Technical Advice Note (TAN) 12: Design;
- Technical Advice Note (TAN) 18: Transport; and
- Newport Local Development Plan 2011 – 2026 (adopted January 2015).

### 7.4.6 Planning Policy Wales (Edition 8, January 2016)

The relevant national planning policy framework is provided principally by Planning Policy Wales (PPW 8, January 2016), at paragraphs 4.11 ‘Promoting sustainability through good design’ and 5.3 ‘Measures to conserve landscape and biodiversity’.

Further detail in the form of extracts from these policies can be found in Appendix C8.

### 7.4.7 Technical Advice Notes

Planning Policy Wales is supplemented by 23 Technical Advice Notes (TANs).

‘TAN 12: Design’ provides guidance on various issues to be considered when developing a project design including landscape.

‘TAN 18: Transport’ describes how to integrate land use and transport planning and explains how transport impacts should be assessed and mitigated.

Further detail in the form of extracts from these policies can be found in Appendix C8.

### 7.4.8 Well Being of Future Generations (Wales) Act 2015

The Well-Being of Future Generations (Wales) Act 2015 requires public bodies to carry out its duties ‘in pursuit of the economic, social, environmental and cultural well-being of Wales in a way that accords with the sustainable development principle’.

### 7.4.9 Local Planning Policies

Figure 3, Appendix C9 shows an extract of the LDP proposals map.

### 7.4.10 Local Development Plan

Newport’s Local Development Plan is the planning document setting out the overall spatial strategy for the plan period 2011 - 2026 and strategic policies used for consideration of development proposals.

Those relevant to this Scheme include:

- Policy SP5 Countryside;
- Policy SP8 Special Landscape Areas;
- Policy GP5 General Development Principles – Natural Environment; and
- Policy CE11 Conservation Areas.

## 7.5 Methodology

### 7.5.1 Data Collection and Guidance

This assessment has followed guidance set out in the following documents:

- ‘Guidelines for Landscape and Visual Impact Assessment’, Third Edition (Landscape Institute and the Institute of Environmental Assessment, 2013).
- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/11.
- Interim Advice Note 135/10 (W), Landscape and Visual Effects Assessment, Highways Agency, 2014 (Replaces DMRB Volume 11 Section 2 Part 5 for use in Wales).

The base line study was informed by the following guidance and policy documents:

- Planning Policy Wales (Edition 8);
- Newport Local Development Plan 2011 – 2026 Adopted 2015.

Existing background information on the study has been sourced from:

- Ordnance Survey – 1:50,000 and 1:25,000 scale maps;
- Google Earth and Street View;
- Bing maps;
- LANDMAP; and
- GIS designation data sets.

### 7.5.2 Extent of Visibility

The study area and the Zone of Visual Influence (ZVI) for each site were determined by a desktop study and a site visit conducted by a qualified landscape architect. Due to the low lying nature of the proposals and the surrounding existing topography, the study area was defined as approximately 1.5km radius from the location of the works. The actual area from which the Scheme will be visible was determined by observation from several view points within the study area and then by visiting receptors in the surrounding landscape. It is important to state that although the ZVI takes into account existing screening elements and actual topography, it still is an illustrative tool. The ZVI's for each site are plotted on Figure 1 in Appendix C6.



### 7.5.3 Receptors

This study identifies the receptors within the landscape which may be affected by the Scheme. The types of receptors assessed are described below.

#### Landscape receptors

These are individual elements of the landscape fabric and the area's landscape character that may be affected by the Scheme.

#### Landscape elements

Landscape elements include physical features such as trees and hedgerows, topography, water courses and structures. Impacts to these elements may arise where valued features are lost, gained or substantially modified as a result of the Scheme. The loss or depletion of important landscape features can adversely affect the character of the landscape. Conversely, the addition of significant beneficial features can constitute an improvement in landscape character.

#### Landscape character

Landscape character is defined as:

*"A distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse." (Natural England).*

The LANDMAP system has been developed specifically for the assessment of character in the landscape of Wales. The system has been promoted by the Countryside Council for Wales (CCW)<sup>30</sup> and implemented in partnership with Local Planning Authorities throughout Wales. Much of the methodology is underpinned by earlier work carried out by the Countryside Agency ('CA') -

*"...single unique areas which are discrete geographical areas of a particular landscape type."*

LANDMAP has evolved since it was introduced in 1997. The CCW website states that:

*"LANDMAP, the Welsh approach to landscape assessment, will achieve complete quality assured coverage in 2008. LANDMAP, introduced in 1997, was revolutionised in 2003 with the introduction of a benchmark methodology and quality assurance process to ensure consistency, accuracy and accessibility of landscape information in Wales. The approach has matured through the continued input and experience from local authority LANDMAP Managers, the aspect specialists collecting the information and the steerage from the Quality Assurance Panel resulting in an outstanding nationally consistent resource for landscape planning and decision-making."*

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<sup>30</sup> As of 1<sup>st</sup> April 2013, CCW merged with Environment Agency Wales and Forestry Commission Wales to form Natural Resources Wales (NRW)

It should also be noted that the CCW has arrived at a working definition of landscape as follows:

*"The physical reality of the environment around us, the tangible elements that give shape and diversity to our surroundings. But landscape is also the environment perceived, predominantly visually but additionally through our senses of smell, touch and hearing. Our appreciation of landscape is affected, too, by our cultural backgrounds, and by personal and professional interests. For the Countryside Council for Wales's purposes, landscape is defined as the sum of all these components" (CCW, 2001).*

LANDMAP methodology for landscape characterisation notes that landscape character areas are to be defined using the Visual & Sensory Aspect Area as a starting point, then refined by examining the data from other Aspects. The Cultural Landscape, Geological Landscape, Historical Landscape and Landscape Habitat Aspect Areas of which the site is situated are included in the assessment.

Impacts on the landscape may arise where the landscape character of the area is modified by the Scheme. It is important to place the Scheme in its landscape context.

## Visual receptors

Visual receptors are those locations from which it is possible to obtain views of the Scheme. These views may be partial or full, glimpsed or direct. Impacts on the visual amenity of a particular location may arise where features intrude into or obstruct views, or where there is some other qualitative change to the view.

Views from such receptors are illustrated by photographs taken from key representative viewpoints, which have been located on a plan presented at Figure 1, Appendix C6. Receptors may be private viewpoints, such as views from domestic residences, or public viewpoints like highways, footpaths or other places with public access.

### 7.5.4 Assessment of Effects

The landscape and visual impact assessment has been undertaken principally in accordance with DMRB and IAN135/10 (W) as a simple assessment. To ensure a proportionate and considered assessment, relevant to the Scheme, the assessors have also applied professional judgement in line with the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment (GLVIA3).

The detailed methodology for the assessment of the receptors is set out in this section. The methodology determines the degree of significance of the effect, the definitions for which are tabulated in Table 7.5.

Any effect assessed as having a level of moderate or greater is considered to be significant. Any effect assessed to have a level of moderate/minor or less is considered to be insignificant.

This assessment assigns a degree of sensitivity to landscape features and to each landscape character area identified.

The sensitivity of landscape receptors to change is assessed by combining judgements of their susceptibility to the type of change or development proposed and the value of the landscape.

## Value

Landscape value is concerned with the relative importance and quality/condition that is attached to different landscapes.

In a planning policy context, the usual basis for recognising certain important landscapes is via application of local or national landscape designations. A landscape can nonetheless be valued by different communities for many different reasons without any formal designation.

The assessment of landscape quality (condition) is based on judgements about the physical state of the landscape and about its intactness from visual, functional and ecological perspectives. It also reflects the state of repair of individual features and elements that make up the character in any one place.

## Susceptibility to Change

Susceptibility to change refers to the degree to which a particular landscape feature or character area is able to accommodate change without significant effects on its components or overall character.

It usually follows that highly valued landscapes have higher susceptibility to change but this must also be assessed in conjunction with landscape value to give an overall assessment of sensitivity.

The Criteria used to define each sensitivity rating are given below at Table 7.1.

Table 7.1 Landscape Sensitivity

Landscape Sensitivity	Definition
<b>Very high</b>	Landscapes or townscapes covered by a national or international designation for landscape value such as World Heritage Site or National Park. Key characteristics of landscape are very vulnerable to change and are unable to accommodate development without significant character change; thresholds for significant change are very low. Development conflicts directly with and would dominate landscape character.
<b>High</b>	Landscapes covered by a national designation such as AONB or Heritage Coast or a highly valued local landscape designation such as AGLV or Special Landscape Area. Key characteristics of landscape are vulnerable to change and development can be absorbed, but only in limited situations without significant character change; thresholds for significant change are low.
<b>Medium</b>	Landscapes covered by a local designation for landscape value or with many locally valued landscape features. Key characteristics of landscape are susceptible to change but with some ability to absorb development in some situations without significant character change; thresholds for significant change are intermediate.

Landscape Sensitivity	Definition
<b>Low</b>	An undesignated and relatively robust landscape, possibly with some locally valued features. Key characteristics of landscape are resilient to change and are able to absorb development in many situations without significant character change; thresholds for significant change are high.
<b>Negligible</b>	Significantly eroded landscapes with no discernible landscape pattern or landscape characteristics that would be affected by change.

## Assessing the Magnitude of Change to Landscape Features

The landscape assessment compares the constituent parts and overall character of the existing landscape with that which would result from the construction of the scheme. It verbally quantifies the degree of change in terms of size or scale, geographical extent of the change and its duration and reversibility.

The magnitude of change to the current (baseline) environment depends on a combination of factors:

- The extent to which the constituent characteristics of the landscape will be lost, gained or changed and the importance of each characteristic to the overall character of the landscape;
- The degree of contrast or integration of proposed elements with the existing or remaining features or characteristics of the receiving landscape that may detract from or add to its character;
- The extent of the geographical area over which the changes will take place: site specific, immediate site setting, landscape character area wide, or spanning several distinct character areas; and
- The duration and reversibility of effect.

The magnitude of the change to existing landscape character and features is assessed in accordance with the criteria set out in Table 7.2. These criteria can be applied to both positive and negative impacts.

Table 7.2 Magnitude of Change to the Landscape

Landscape Impact Magnitude	Definition
Very high	The Scheme will either cause a large improvement or complete loss of or major alteration to key elements/characteristics over a large area, possibly spanning several character areas. Introducing elements considered entirely uncharacteristic. Effects are likely to be long term and irreversible.
High (dominant)	The Scheme will cause either a significant improvement or deterioration of one or more key elements/features/characteristics of the landscape, typically over much of a character area. Introducing elements that may be considered to be substantially uncharacteristic or which substantially strengthen the landscape character. Effects are

Landscape Impact Magnitude	Definition
	likely to be long or medium term and irreversible or only partly reversible.
Medium (prominent)	A noticeable deterioration or improvement to the characteristic elements of a landscape, with the Scheme causing a partial change to the perception landscape character. Change would typically be to the site and its immediate setting, or may influence a small part of the Character area. Change will normally be short to medium term and at least partly reversible.
Low (present)	The Scheme will cause a minor improvement or deterioration to one or more characteristics of the landscape causing a minor change to the character of the landscape. Change will be localised and often reversible.
Negligible (No discernible Change)	The Scheme fits with the existing landscape character or does not change the character or perception of an area. Any slight effects are short term very localised and often reversible.

## Assessing the sensitivity of Visual Receptors to Change

The sensitivity of visual receptors depends on its location and context, the expectations and occupation or activity of the viewer and on the importance of the view (the latter is derived from the receptors popularity of frequency of use)

The purpose of describing the baseline visual environment is to identify the most important sensitive visual receptors around the site which have views to or across the Scheme. A visual receptor is essentially any viewer who would be likely to be affected as a result of the Scheme. The sensitivity of each visual receptor depends on:

- Its value derived from evaluation of its location and context; the relationship of a receptor to planning designations; the existence of documentation and interpretation relating to particular views; and of the receptors popularity or frequency of use.
- The susceptibility of the receptor to changes in views is derived from evaluation of the expectations and occupation or activity of the viewer and the extent to which their attention may be focused on visual amenity.

The sensitivity of any receptor is assessed using the following criteria:

Table 7.3 Visual Receptor Sensitivity

Visual Receptor Sensitivity	Indicative Definition
<b>Very high</b>	Views from within internationally and nationally designated high quality landscapes (National Parks, AONB), scheduled monuments or Grade 1 listed buildings and their setting, and from, or near to public rights of way, where the attractive nature of the environment is a major factor in the enjoyment of the experience, such as National Trails or Long distance Routes through designated landscapes. Views from large numbers of residential properties in the same location (typically 100+) Viewers have a high susceptibility to changes in views
<b>High</b>	Views from within high or medium high quality regionally designated landscapes (Areas of Great Landscape Value), parks or gardens listed in the National Gardens Register, Grade II* and II listed buildings and their settings. Views from well used public rights of way often known to and used by people from beyond the local area where the attractive nature of the countryside is a significant factor in the enjoyment of the experience, such as Long Distance Routes or National Cycle Routes.). Views from a large number of residential properties within a similar location (typically between 10-100 dwellings) Viewers have a medium to high susceptibility to changes in views
<b>Medium</b>	Views from within medium quality non-designated but locally important landscapes, outdoor sports or recreation (where the landscape is not a significant factor in the enjoyment of the sport). Views from locally valued public rights of way often passing through rural landscapes. Views from passenger trains, or people within cars on local roads. Views from single or small groups of up to 10 residential properties Viewers have a low to moderate susceptibility to changes in views
<b>Low</b>	Views from within medium-low quality non-designated but potentially locally valued landscapes. Views from less well used public rights of way which pass through less attractive landscapes or townscapes and are not used specifically for enjoyment of the scenery. Views from or near to motorways, main roads, or business premises. Viewers have a low susceptibility to changes in their views
<b>Negligible</b>	Views from within unattractive non-designated landscapes of local importance.

## Assessing the Magnitude of Visual Change

The visual assessment compares the quality of the existing view with that which would result from the construction of the scheme and then verbally quantifies the degree of change.

The magnitude of change to the current (baseline) visual environment depends on a combination of factors:

- The size and scale of change in the view;
- The proximity of the viewpoint to visible elements of the Scheme;

- The extent and composition of the view (e.g. degree of existing screening, partial, glimpsed or unobstructed views, fleeting or constant nature of view);
- The degree of contrast or integration of proposed elements with the existing or remaining features or characteristics of the receiving landscape that may detract from or add to its amenity;
- The relative direct or oblique angle of the view in relation to the receptor; and
- The duration and reversibility of effect.

The magnitude of change to visual amenity is assessed using the following criteria:

Table 7.4 Magnitude of Visual Change

Visual Impact Magnitude	Definition
Very high	Total alteration to key features or characteristics of the existing views such that post development, an open and direct existing view will be permanently, irreversibly and completely or almost completely changed by starkly contrasting elements that will occupy a large or very large proportion of the view
High (dominant)	The Scheme will contrast with and visually dominate or intrude upon the view resulting in a considerable improvement or deterioration of the view These changes may be medium or long term and are likely to be irreversible or only partly reversible. New elements will occupy a large proportion of the view
Medium (prominent)	The Scheme will be visually prominent within the view and will result in either a noticeable improvement or deterioration of the view. The change will be moderate in scale, contrast with the view and be medium term permanent and sometimes irreversible or often partly reversible
Low (present)	Minor, often temporary and reversible alterations to the view that are small in scale or do not overtly contrast with the key features or characteristics of the view such that post development the existing view will be largely unchanged despite discernible differences
Negligible (No discernible Change)	Minimal alteration to the key features or characteristics of the existing view such that post development there will be barely discernible changes or no change to the view

### Assessment of Significance

The significance of impacts is assessed using the appropriate national and international quality standards and professional judgement. For clarity and transparency, criteria have been used to attribute levels of significance. Broadly, the significance is a function of the magnitude of the impact and the sensitivity of receptors. The reversibility and duration of the effect are also important considerations.

For each assessment factor the sensitivity of the effect is combined with magnitude to give an overall score for the significance of the impact as set out in Table 7.5. The area Highlighted in Grey defines effects assessed as having a level of moderate or greater which are considered to be significant. The White area defining effects assessed to have a level of moderate/minor or less which are not considered to be significant.

Table 7.5 Matrix used as guidance in determining the significance of either Landscape or Visual Effects. This is adapted from the version provided in IEMA’s special Report entitled; The State of Environmental Impact Assessment Practice in The UK. 2011.

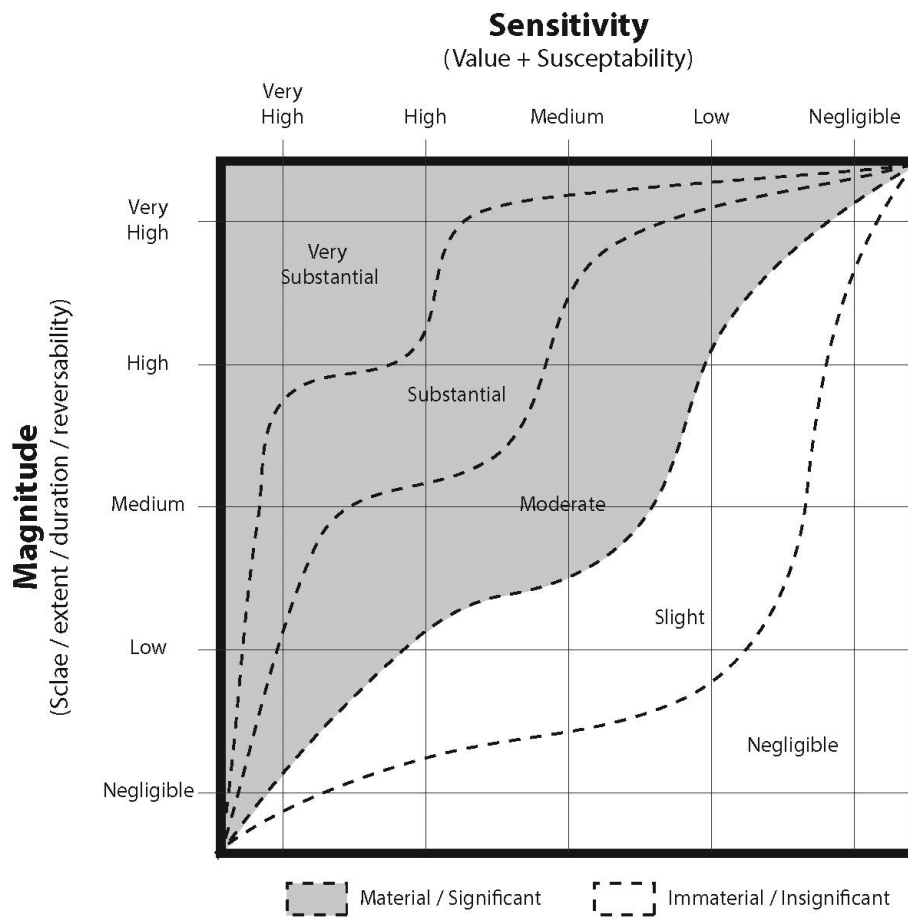




Table 7.6 Significance criteria

Impact Significance Rating	Definition
Severe	<p>These effects are generally, but not exclusively, associated with sites or features of international, international or national importance that are likely to experience very damaging or very beneficial changes of high or very high magnitude leading to permanent, irreversible loss or enhancement of resource integrity.</p> <p>The Scheme will cause complete degradation of or a very substantial improvement to the landscape character/landscape features/existing views.</p> <p>These effects are key factors in the decision-making process.</p>
Substantial	<p>These effects are generally, but not exclusively, associated with sites or features of national or regional importance that are likely to experience damaging or beneficial changes of medium to very high magnitude leading to long term irreversible loss or enhancement of resource integrity. However, a major change to a site or feature of local importance may also enter this category.</p> <p>The Scheme will cause substantial degradation or enhancement of the landscape character/landscape features/existing views.</p> <p>These effects are material factors in the decision-making process.</p>
Moderate	<p>These effects are generally, but not exclusively, associated with sites or features of regional or local importance that are likely to experience damaging or beneficial changes of low to high magnitude, often leading to reversible long or medium term loss or enhancement of resource integrity.</p> <p>The Scheme will cause noticeable degradation or enhancement of the landscape character/elements/existing views.</p> <p>These adverse effects may be important, but individually are not likely to be key decision-making factors. These effects are important in enhancing the subsequent design of the project. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall effects on a particular resource or receptor.</p>
Slight	<p>The Scheme will cause degradation or enhancements of low to medium magnitude to landscape character elements/existing views of local importance.</p> <p>These adverse effects may be raised as local factors.</p> <p>They are unlikely to be critical in the decision-making process, but are used in enhancing the subsequent design of the project.</p>
Neutral	<p>The Scheme will cause barely perceptible degradation or enhancement of the landscape character/elements/ existing views.</p> <p>Or</p> <p>Beneficial effects balance out adverse effects such that there is no overall beneficial or adverse effect</p>

### 7.5.5 Limitations to Survey Methods

The landscape character and views have been assessed from public vantage points. Although there is no right in planning law to a view from a private property, visual impact assessment protocol normally requires such views to be

considered. In this case, however, it was impractical to seek access to private properties. Potentially significant private receptors have, nonetheless, been represented from a relevant similar public viewpoint for which access was possible. All assessment work has been undertaken at ground level and on foot.

The photographic survey work and site visit were undertaken on 1 February 2015 at a time when the deciduous trees were not in leaf, therefore representing the worst case scenario since the screening effect of this vegetation is less effective at this time of the year.

The assessment is based on the detailed design proposals shown on drawings shown in Appendix A3-A5 and traffic signs drawings in Appendix C11.

At the time of this assessment an arboricultural impact assessment was not available and therefore has not been possible to accurately ascertain the full extent of existing vegetation which could potentially be impacted by the Scheme. This is particularly relevant to signage proposals and correspondent visibility splays. Hence, a worst case scenario approach is applied which assumes that the vegetation within signage visibility splays will be removed.

It is also assumed that the existing vegetation within the roundabouts will be cleared to allow for construction works.

### 7.5.6 Photography and Imaging

The photographic surveys were carried out by qualified Landscape Architects who are well versed with the methods and best practice required to produce verifiable photographs to be used in LVIA and visual representations.

Aerial imagery and topographic surveys covering much of the site were used to ascertain the areas of vegetation that would be affected by the proposed works including proposed signage.

Photographs illustrating views from each viewpoint were taken with a full frame Nikon D6100 digital camera using a fixed lens with a 50 mm focal length. Each frame was taken in landscape format, and up to 4 frames have been stitched together with 'Canon Photostitch' software. These wide panoramic views give an understanding of the visual context and, when printed at the correct height on an un-scaled A3 page, viewed at a distance of 300mm using one eye, and curved to the same radius, the photographs closely represent the view experienced from each viewpoint by a viewer's naked eye.

## 7.6 Potential Environmental Impacts

The following paragraphs include assessment of landscape effects both during construction and operation of the Scheme.

### 7.6.1 Landscape Effects during Construction

The construction phase is expected to last approximately 18 months.

This part of the assessment is intended to identify and assess any construction plant or activities which will give rise to adverse effects over and above those described below for the operational phase. In order to avoid double counting in the assessment of effects, all other construction phase effects which arise as a result of elements of the Scheme being installed throughout construction have been accounted for in the assessment of effects from the operational phase below.

These aspects of the construction phase considered likely to give rise to such effects are described below.

## Construction site

The general unattractive appearance of a construction site compared to the proposed finished built form. This will comprise exposed stockpiled materials, temporary hoardings and fences, lighting (as discussed below), welfare facilities and partly constructed structures

## Plant

Particularly tall plant such as cranes and piling rigs which will be taller than the proposed building and would therefore be visually prominent and more widely visible than the Scheme.

Other mobile plant such as excavators, dumpers, and aggregate lorries moving in and around the site. Due to their movement, they will be more eye catching than static elements of the site.

The individual types of plant will only be on site as required for short isolated phases of the construction process. However, it is assumed for the purposes of this assessment that some form of tall or mobile plant will be a feature of the construction site throughout the construction phase.

## Lighting

The vast majority of the construction work will be undertaken during daylight hours (Monday-Friday 08:00-18:00hrs). However, due to restrictions related to day time traffic management arrangements construction task lighting would be required during winter months at various times and locations along the Scheme.

The construction compounds would need periodic task lighting on winter evenings. The temporary construction compounds would also require a low level of lighting for security throughout the hours of darkness.

Construction activities would be programmed as far as possible to minimise the need for lighting. Where it is necessary to use security and construction task lighting, this would be shielded and targeted in order to minimise adverse light pollution effects on the night time environment.

## Summary of Construction Effects on Landscape and Visual Amenity during Construction

The character of the landscape areas within and surrounding the Scheme are considered to be of medium value. Visual receptors with views of the Scheme

including users of the National Cycle Routes, Recreational PRow and the visual settings of designated historic assets are highly valued and of national importance. The susceptibility of these receptors to change is reduced by the presence of detracting characteristics and visible features. For the receptors assessed, their overall sensitivity to the proposed changes as a result of temporary construction activities is considered to be **medium** or **low**.

The landscape and visual environment of the Scheme, and the area immediately surrounding it, is predominantly urban in character and visually dominated by roads, associated infrastructure and industrial, commercial and residential built form. Construction works are a regular part of this urban environment. In particular, due to the prominence of highways in this area, road works are a normal and relatively frequent occurrence. From a landscape and visual point of view, the proposed construction works will comprise localised, but relatively large scale and prolonged road works despite being more prolonged than many smaller road works projects, these will be short term (18 months) and temporary. Over and above the normal activities associated with ad hoc road works, visually intrusive elements of the construction phase, likely to give rise to landscape and visual effects, include earth moving activities and movements of large plant. The magnitude of change to views and the character of the landscape as a result of the works, over and above those predicted for the operational Scheme will be **medium**. Thus combining a medium degree of change to medium to low sensitivity receptors, the significance of construction effects will be **Slight to Moderate**, adverse and temporary in nature.

## 7.6.2 Landscape Effects during Operation

As described above under landscape baseline, the character of the landscape within and surrounding the site as a whole is considered to be of local authority value. The susceptibility of these receptors to change is reduced by the presence of urbanising elements which detract from the character of the area. The overall sensitivity of the character of the surrounding landscape to the proposed changes is considered to be **medium**.

The site and surrounding landscape are predominantly urban and characterised by roads, associated infrastructure (such as lighting, signage and barriers) and industrial, commercial and residential built form. Once operational, the Scheme will comprise slightly amended road layouts and a slight increase to the proportion of the area already occupied by highways. The central island of all three roundabouts are currently attractively landscaped and contain semi-mature or mature trees. In each case it is assumed that all these trees, shrubs and amenity grass will be lost to enable construction as well as certain stretches of vegetation along the road edges to allow for signage visibility. The layout and topography of each roundabout will be altered with the proposal of new vegetation, earth bunds and in some cases attenuation ponds.

The magnitude of change to the character of the landscape during operation of the Scheme is predicted to be **low**.

Thus combining a low/negligible degree of change to landscapes of medium sensitivity, the significance of operational effects will be **slight to moderate**, adverse and permanent in nature.

A summary of the Landscape effects can be found in Table 7.7.



Table 7.7 Assessment of Landscape effects

Landscape Character Area	Key Characteristics	Sensitivity	Predicted Changes to the character as a result of the Scheme	Magnitude of Change	Effect Significance
LCA 1 Tredegar Park	Tredegar Park comprises a manor house, associated buildings and formal park and gardens of high value and historic interest. The grounds are in good condition and used by the public. This area includes several listed buildings and is designated as a Country Park, a Registered Park and Garden and a Conservation Area. Its essential setting extends towards the north of the M4 corridor and into LCA 4.	High value, due to the history of the park, its multiple designations and current use and condition. Moderate to high susceptibility to change since, although the surrounding areas have been developed into business parks, housing suburbs and a major road corridor, the park itself still preserves its essential setting and a strong sense of place. The above results in a high sensitivity to change.	The Scheme, specifically at Tredegar Park roundabout, will cause changes to existing landscape features of the adjacent character area, such as new landform, the removal of several groups of roadside trees, the introduction of amended road layouts and a slight increase to the proportion of the area already occupied by highways. However, the Park boundary wall obscures any significant visual links between the character area and the Scheme. During operation the Scheme will not cause any noticeable changes to the character of Tredegar Park.	Negligible	Negligible
LCA 2 M4 Corridor	Large scale and busy road corridor, lined with deciduous and significant coniferous planting particularly close to more sensitive residential areas.	Low value due to the fact of being a major transport corridor and low susceptibility results in a low sensitivity to change.	The Scheme, specifically at Tredegar Park roundabout, will cause changes to existing landscape features such as the removal of several groups of roadside trees, the introduction of attenuation ponds, a new road layout and a slight increase to the proportion of the area already occupied by highways. The Scheme will cause a partial loss of vegetation within the roundabout and a permanent loss of areas of mature vegetation along edges of the M4 J28 off slip road and in the islands between the east and west carriageways of the A48 to the south of the J28 complex. This vegetation	Medium	Slight to Moderate

Landscape Character Area	Key Characteristics	Sensitivity	Predicted Changes to the character as a result of the Scheme	Magnitude of Change	Effect Significance
			removal is required where sightlines need clearing for new signage. There will also be a change of topography due to the introduction of vegetated earth bunds in certain locations to dispose of surplus material and attenuation ponds. However during operation and once the proposed vegetation is allowed to establish the effects to the character of this area will be insignificant.		
LCA 3 Dyffryn and LG Park	This area is an extensive series of separate but contiguous commercial and business park developments around Tredegar Park. Immediately adjacent on the southern side of these business parks stands the Newport suburb of Dyffryn, a 1974 experimental housing estate characterised by low rise wriggling terraces of two-storey properties densely packed around a large open green space.	Moderate to low value due to the industrial character of the area, prominent road infrastructure and mixture of fragmented housing estates, combined with a low susceptibility to accommodate change, due to the mixed character of the existing landscape, results in a low sensitivity.	The Scheme, specifically at Tredegar Park roundabout and Pont Ebbw roundabout, will cause slight changes to existing landscape features such as the removal of groups and individual trees, the introduction of amended road layouts and a slight increase to the proportion of the area already occupied by highways. During operation the Scheme will not cause any noticeable changes to the character of this area, being consistent with its current situation.	Negligible	Negligible
LCA 4 Newport Hinterland	This character area comprises a mixture of rural farmland combined with Tredegar Golf Course and Sports Grounds, all adjacent to the M4 corridor. The northwest section of this area is a Special Landscape Area under the Newport LDP	Moderate value landscape characterised by well managed rural farmland, a golf course and sports ground all in good condition. Its susceptibility to change is considered to be moderate due to its predominantly	This area will be affected by the works at the three roundabouts, being adjacent to the three locations. The construction works will cause slight changes to existing landscape features such as the removal of several groups of trees, the introduction of amended road layouts and a slight increase to the proportion of the area already occupied by highways. During	Negligible	Negligible

Landscape Character Area	Key Characteristics	Sensitivity	Predicted Changes to the character as a result of the Scheme	Magnitude of Change	Effect Significance
	proposals plan. The boundaries of Tredegar Registered Park and Garden include the Sports Ground and the area north of the M4 and west of the A467. Part of this area is also an integral component of the essential setting of Tredegar Park.	rural nature. The above elements result in a medium sensitivity.	operation the Scheme will not cause any noticeable changes to the character of this area, being consistent with its current situation.		
LCA 5 Gaer	This is a prominent sloping hill contained by the railway, the M4 and Gaer residential area. It is a mosaic of bracken, rough grassland, encroaching scrub and deciduous tree cover. Its key feature is a prehistoric fort on top of the hill with deep earthworks which give it a strong sense of place. The fort is a designated as a SAM and the area is part of the Tredegar Registered Park and Garden. It is managed as an informal open space and is crossed by Sirhowy Valley Walk long distance recreational route. The whole area is affected by noise from the M4 due to its proximity.	High value landscape due to its multiple designations and features such as the hill fort, combined with the presence of a long distance recreational route. It is considered that this has a moderate susceptibility to change since the surrounding landscape is quite heterogeneous with the presence of the M4 corridor, the business parks around Tredegar Park, the residential areas of Newport and the rural hinterland. The above results in a medium to high sensitivity to change.	Due to the distance away from the Scheme locations and the intervening infrastructure corridor of the M4 is it unlikely that the character of this area will be affected significantly both during construction or operation.	Negligible	Negligible



Landscape Character Area	Key Characteristics	Sensitivity	Predicted Changes to the character as a result of the Scheme	Magnitude of Change	Effect Significance
LCA 6 Consolidated Urban Areas	This character area includes the residential areas on the western edge of Newport and Bassaleg. It is absent of any relevant designations apart from a few listed buildings located mainly in Bassaleg.	The value of this area is considered to be low because of the relatively incoherent urban form, with some urban elements in poor-moderate condition, with a weak sense of place. The susceptibility of the area is considered to be low due to the lack of a strong character. The above results in this character area having a low sensitivity to change.	This area will be affected by the works at Pont Ebbw and Bassaleg roundabouts, with the first being adjacent to the area and the last located within it. The construction works will cause slight changes to existing landscape features such as the removal of several groups of roadside trees in the two locations the introduction of an amended road layout and a slight increase to the proportion of the area already occupied by highways. During operation the Scheme will not cause any noticeable changes to the character of this area, being consistent with the current situation.	Negligible	Negligible

### 7.6.3 Visual Effects during Operation

The visual impact on views identified in Figure 7 of Appendix C5 are assessed in Table 7.8.

Table 7.8 Assessment of visual effects for representative viewpoints (See Figure 1, Appendix C6 for Viewpoint locations)

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
1	On the north west side of Tredegar House, within the Country Park boundary. 500m from the application site. Grid Ref: ST 28727 85340	People enjoying the designated landscape and the setting of Tredegar House	Looking northwest along the Allée of trees running northwest from the house, planted as part of the original designed landscape to create a vista leading out into the wider landscape. The vista is interrupted by the M4 viaduct, visible in the middle distance above and beyond the Country Park boundary wall. The vista then continues further to the hillside beyond forming the skyline.	National value, but with a medium susceptibility to change due to the presence of the existing road infrastructure in the view - High	The proposed Scheme will not be significantly visible as the vast majority of it will be screened from views by the intervening 2.5m high stone wall. Taller elements of the scheme such as replacement street lights and signage may be barely visible amongst those already visible in front of and on the M4 viaduct.	Negligible	Slight to Negligible
2	Footway on the north side of Tredegar Park roundabout. 5m from the application site. Grid Ref: ST 28306 85778	Occasional pedestrians and motorists on the roundabout and M4 viaduct	Looking southeast with the visually dominant M4 viaduct immediately behind, the foreground of this view is dominated by the carriageways, lighting columns and signage of the existing Tredegar Park roundabout. The existing pine trees in the middle of the roundabout are prominent in the view. The high boundary wall of Tredegar Park fore shortens views of the designated landscape and house beyond.	The visual amenity of road users and pedestrians on the undesignated roadside footway is of local value and considered to be of low susceptibility to the change proposed due to the visual prominence of existing road infrastructure - Low	The layout of the road network occupying the foreground of this view will change, however the visual prominence and proportion of the view occupied by it will not change significantly. All the existing vegetation within the roundabout will be removed to enable construction, however partial replacement planting will be proposed within the same area, in addition to localised earthworks and an	Medium - Low	Slight
		Also broadly representative of the		The value of the Listed buildings and their visual settings is National, but the susceptibility of their setting			Moderate to Slight

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
		visual setting of the listed gate piers on the southeast edge of Tredegar roundabout		to change is considered to be low due to the visual dominance of the existing road infrastructure. Thus overall sensitivity is considered to be medium.	attenuation pond. A double line of trees will be proposed approximately at the centre of the image in the location of the redundant section of asphalt. A continuous grassed area will link the roundabout edge with the triangular shaped isle to the right of the view, therefore limiting views of the carriageway beyond.		
3	Footway on the southbound side of the A467, just south of the Bassaleg roundabout. 20m from the application site Grid Ref: ST 27843 86766	Road users	Looking north along the A467, the Bassaleg roundabout is clearly visible in the middle distance with a visual clutter of associated lighting columns and signs. Trees and residential properties just beyond the roundabout form a backdrop.	The value of visual amenity for road users and PRow uses is local. The fore and middle distance in this view currently includes the prominent road, roundabout and associated infrastructure. The susceptibility of these receptors to changes in their views is low, leading to a low sensitivity.	The layout of the road network occupying the middle ground of this view will suffer a minor change with the relocation of the northbound lanes slightly to the west. The visual prominence and proportion of the view occupied by the new road layout won't change significantly. However this will result in the loss of 5 mature trees along the road verge and some of the vegetation present along the earth bund beyond these trees, with the area of vegetation to be cleared increasing as one approaches the roundabout. All the vegetation within the existing roundabout will be removed to enable construction. Replacement planting will be introduced	Low	Slight
		Cyclists using NCR 4 and PRow		The value of visual amenity for NCR users is national. For the same reasons as above, the susceptibility of these receptors to changes in their views is low, leading to a medium sensitivity.			Slight

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
					within the roundabout in addition to localised earthworks, including an attenuation pond. Just to the left hand side of this view it is proposed the introduction of an acoustic barrier. This element will sit between the line of existing mature trees and a field hedge, be approximately 2.5m high and made of wood to better integrate with its surrounding.		
4	NCR crossing over Court Crescent at the northern end of Forge Lane. On the edge of the site. Grid Ref: ST 27781 86773	Residents in two most northern properties on Forge Lane	Looking northeast the roundabout occupies the fore and middle ground in this view with trees and residential properties foreshortening the views as a back drop beyond.	The value of visual amenity of residents in these properties and NCR users is National. The fore and middle distance in this view currently includes the prominent road, roundabout and associated infrastructure. The susceptibility of these receptors to changes in their views is medium to low, leading to a medium sensitivity.	The layout of the road network occupying the foreground of this view will change. The visual prominence of the Scheme and proportion of the view occupied by it will increase. The vegetation along the grass verge in the centre and right side of the photo will be lost as well as the vegetation present within the roundabout. The grass verge to the left side of the photo along with several young trees will also be removed to give way to the realignment of the road. Replacement planting will be introduced within the roundabout in addition to localised earthworks and an attenuation pond. As a result of	Medium	Moderate

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
					the vegetation loss along the verge on the right side of the photo, views from some properties along Forge Lane are likely to become more open.		
5	Grass verge immediately to the north of Bassaleg roundabout. 3m from the site Grid Ref: ST 27801 86861	Residents in seven properties on Churchmead. There is also a very short and isolated fragment of PRoW (see Fig 1), but this is inaccessible and not used for recreational purposes.	Looking south over the site, the roundabout is visible in the foreground through a line of trees and garden vegetation which offers varying degrees of visual filtering. Several semi-mature trees are visible on the nearside of the roundabout and the view is foreshortened by a back drop of dense mature woodland just beyond the roundabout.	The visual amenity of residents in these properties is of local community value. The foreground in this view currently includes the prominent road, roundabout and associated infrastructure. The susceptibility of these receptors to changes in their views is medium to low, leading to a medium sensitivity.	The layout of the road network occupying the foreground in this view will change slightly with the adjustment of the roundabout and northbound road beyond, but the visual prominence and proportion of the view occupied by it will not change significantly. The vegetation within the roundabout will be removed to enable construction works, as well as some vegetation along to top end of Forge Lane. Replacement planting will be introduced within the roundabout in addition to localised earthworks and an attenuation pond, which once established and given a few years to mature will provide visual screening to the properties on Churchmead.	Low	Slight
6	Gaer hill, south of Tredegar Fort. 600m from the site Grid Ref:	Walkers on the Sirhowy Valley	An open panoramic view looking southwest over the scrub vegetation of the hillside occupying the foreground.	Although the site is not visible from either the Sirhowy Valley Walk or the Scheduled Tredegar Fort, the	Only the proposed junction improvements at Tredegar roundabout will be visible here in the middle distance of this	Low to Medium	Moderate

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
	ST 28893 86696	Walk and the hillside to the south of the Scheduled Fort	Tredegar Park is visible in the middle ground bisected by the A48 and the M4 and large industrial and commercial buildings are visible emerging above the treeline beyond. The view extends to the coast at Cardiff and the Bristol Channel.	paths on this part of the hillside are linked to these designated receptors. The value of visual amenity of receptors here is national. The existing road infrastructure and industrial form visible reduce the receptor's susceptibility to change to medium. Thus the sensitivity of these receptors is considered to be high	view. The existing intervening trees heavily filter views of the roundabout and will be retained. Existing vegetation within the roundabout is assumed to be cleared to allow for construction works, in addition some small areas of vegetation which will also be cleared due to new road layouts and proposed signage. Partial replacement planting is proposed within the roundabout and other adjacent areas, in addition to localised earthworks an attenuation pond. It is considered that the changes brought about by the development will be minimal in this view due to intervening landform and vegetation.		
7	Entrance to the Tredegar Park Recreation Ground. Grid Ref: ST 29383 85984	Park users	Looking southeast from the car park entrance, the carriageways, and landscaped central island of the existing Pont Ebbw roundabout is visibly dominant in the foreground of this view . The existing trees in the middle of the roundabout are prominent in the view. There are glimpsed views through the intervening trees to the industrial units and woodland beyond.	The visual amenity of park users is of local authority value and considered to be of low susceptibility to the change proposed due to the visual prominence of existing road infrastructure. Thus the sensitivity of these receptors is considered to be low to medium.	The layout of the road network occupying the foreground of this view will change slightly, but the visual prominence and proportion of the view occupied by it will not change significantly. It is assumed all the vegetation within the roundabout will be cleared to enable construction works. Replacement planting is proposed within the roundabout which once	Medium	Moderate

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
					<p>established and given a few years to mature will provide visual screening from the traffic cutting through the roundabout and passing beyond it. However this view is likely to become more open than what currently is.</p> <p>Views west from the Sports ground are likely to change, as the middle distant belts of woodland alongside and screening views to the M4 and J28 will be partially removed. As a result middle distant views of the existing M4 and proposed new roads and infrastructure will be opened up and will be noticeable as a component of the setting of the park.</p>		
8	Footpath and Cycle Route on the northeast side of Pont Ebbw roundabout. 50m from the nearest proposed works Grid Ref: ST 29329 85852	Road users	Looking southwest from beside the B4237, the Pont Ebbw roundabout is clearly visible in the middle distance with a visual clutter of associated lighting and signs. Trees on the roundabout and just beyond form a backdrop.	The value of visual amenity of road users is medium. The fore and middle distance in this view currently includes the prominent road, roundabout and associated infrastructure. The susceptibility of these receptors to changes in their views is low, leading to a low sensitivity.	The layout of the road network occupying the middle ground of this view will change, with the introduction of a road cut through the centre of the roundabout. The visual prominence and proportion of the view occupied by road infrastructure will change slightly. It is assumed all the vegetation within the	Medium - Low	Slight

View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
		Cyclists using NCR 4 and Sirhowy Valley Walk		The value of visual amenity of users of the NCR and Sirhowy Valley Walk is high. For the same reasons as above, the susceptibility of these receptors to changes in their views is low, leading to a medium sensitivity	roundabout will be cleared to enable construction works, in addition the multi-stem specimen in the left side foreground of the photo will be removed. Replacement planting is proposed within the roundabout which once established and given a few years to mature will provide visual screening from the traffic cutting through the roundabout and passing beyond it. However this view is likely to become more open than what currently is.		Moderate to Slight
9	Bus Shelter outside the Semiconductor Factory south of Pont Ebbw roundabout. 20m from the nearest proposed works Grid Ref: ST 29246 85892	Pedestrians and road users	Looking east from the bus stop beside the roundabout, the Pont Ebbw roundabout is clearly visible in the foreground with a visual clutter of associated lighting and signs. Trees on and just beyond the roundabout form a backdrop in the middle distance. They screen views to all but two residential properties glimpsed between the trees in the distance.	The value of visual amenity of pedestrians and road users is medium. The foreground in this view currently includes the prominent road, roundabout and associated infrastructure. The susceptibility of these receptors to changes in their views is low, leading to a Low sensitivity	The layout of the road network occupying the middle ground of this view will change, with the road encroaching into the edge of the roundabout. The visual prominence and proportion of the view occupied by road infrastructure will change slightly. It is assumed all the vegetation within the roundabout will be cleared to enable construction works. Replacement planting is proposed within the roundabout which once established and given a few years to mature will provide visual screening from the	Medium	Slight



View No.	Location	Receptors	Description of the Existing View	Sensitivity	Predicted Changes to the View as a Result of the Scheme	Magnitude of Change	Effect Significance
					traffic cutting through the roundabout and passing beyond it. However this view is likely to become more open than what currently is.		

## 7.7 Mitigation

Embedded mitigation measures have been included in the design proposals such as replacement planting using native species, removal of redundant areas of roadways to be turned into grassed areas and re-use of surplus excavated material won from site to create attractive and naturally undulating grassed landforms to improve visual amenity and provide more effective screening.

Please refer to drawings at Appendix C10 which illustrate the Environmental Master Plans for the three roundabouts.

It is recommended that during the vegetation clearance stage this is done under an arboriculturist watching brief to further minimise the impact on existing vegetation and retaining valuable trees where possible.

These mitigation measures include:

- re-use surplus excavated material won from the site to cover or replace the disused road surfaces and where possible to create attractive and naturally undulating grassed landforms within the central areas of the roundabouts;
- any disturbed ground within or around the construction sites should be graded and cultivated prior to seeding with appropriate amenity, meadow or suitably biodiverse conservation seed mixes to be agreed with the Local Planning Authority; and
- where possible, within the operational requirements of the new road layout, looking for further opportunities to plant specimen native trees to replace those trees lost as a result of the works.

## 7.8 Summary of Effects and Mitigation

Landscape and visual effects arising from the construction phase of the Scheme are predicted to be of **Slight to Moderate** adverse significance and temporary in nature.

Whilst operational, it is predicted that there would be an overall **Negligible** effect on the character of the local landscape, with a **Slight to Moderate** effect on the LCA 2 M4 Corridor.

Whilst operational, the Scheme will have **Moderate** significant impacts on the visual amenity of residents in the three most northern properties on Forge Lane, users of Tredegar Park Recreation Ground and walkers on the Sirhowy Valley Walk and the hillside to the south of Tredegar Fort. The effects will be **Slight to Moderate** on the setting of the listed gate piers on the southeast edge of Tredegar roundabout and Cyclists using NCR 4 and Sirhowy Valley Walk at Pont Ebbw roundabout.

The effects on the visual amenity of the remaining assessed visual receptors will vary from **Slight to Negligible**.

## 8 Ecology and Nature Conservation

### 8.1 Introduction

This section of the NSER sets out the baseline ecological receptors and the predicted impacts from the proposals. In addition recommendations are made for potential mitigation or enhancement measures which should be incorporated in to the design and construction of the Scheme.

The Scheme will comprise the removal of areas of tree planting and vegetation within the existing soft estate of the road network at the three junctions as set out in Chapter 2 of this report. Sensitive ecological receptors in the vicinity of the Scheme include populations of dormice and the River Ebbw.

### 8.2 Study Area

The study area used for the collection of data on baseline conditions has been limited to the areas of proposed works and immediately adjoining land. However, where necessary, and in accordance with DMRB (Volume 10, Section 4), the study area has been expanded to allow for a consideration of European Species which could be affected by the proposals.

### 8.3 Baseline Description and Receptors

#### 8.3.1 Desk Study

#### Statutory and Non Statutory Designated Sites

A search for statutory sites has been conducted using the Multi Agency Geographic Information for the Countryside (MAGIC) website. The search showed that there are four European designated sites (Ramsar, Special Area of Conservation (SAC) and Special Protection Areas (SPA)), five nationally designated site (Sites of Special Scientific Interest (SSSI)) were identified from the search and one National Nature Reserve (NNR) was identified within 5km. The Severn Estuary has several designations, including SAC, SPA, Ramsar site and interest SSSI. All sites are detailed in Table 8.1.

Table 8.1 Description of the statutory site within 5km of the search point (ST2867486114), with approximate distances and direction.

Site	Distance	Direction	Description
Gwent Levels St Brides SSSI (NRW, 2015)	1.6km	S	They are an example of one of the most extensive areas of reclaimed wet pasture in Great Britain. The Gwent Levels reens are rich in plant species and communities, many of which are rare or absent in other Levels systems. Species include hairlike pondweed ( <i>Potamogeton trichoides</i> ) and open water emergents such as arrowhead ( <i>Sagittaria sagittifolia</i> ).  Invertebrate species such <i>Haliphus mucronatus</i> and <i>Hydrophilus piceus</i> and other nationally rare or notable species are present. Snails and dragonflies such as <i>Physa heterostropha</i> and <i>Brachytron</i>

Site	Distance	Direction	Description
			<p><i>pratense</i> are of importance to Wales. Hedgerows and reed banks provide habitat for terrestrial species such as <i>Pipunculus fonsesai</i> and <i>Tomosvaryella minima</i>.</p> <p>The reens in the St Brides area support a number of interesting plant species most notably thread-leaved water-crowfoot (<i>Ranunculus trichophyllus</i>) and small pondweed (<i>Potamogeton berchtoldii</i>). Other species include grass vetchling (<i>Lathyrus nissolia</i>) and common meadow-rue (<i>Thalictrum flavum</i>).</p> <p>The St Brides area also supports rich invertebrate communities such as the true fly <i>Chrysogaster macquarti</i> and the beetle <i>Hydaticus transversalis</i>. It is the only area on the Gwent Levels where the rare fly <i>Stenomicroa cogani</i> has been recorded.</p>
River Usk (Lower Usk)/Afon Wysg (Wysg Isaf) SSSI (NRW, 2015)	3km	E	<p>The site supports the following habitats and species covered by the EC Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna:</p> <p>Common otter (<i>Lutra lutra</i>) - Annex II and IV                      Allis shad (<i>Alosa alosa</i>) - Annex II and V                      Twaite shad (<i>Alosa fallax</i>) - Annex II and V                      Brook lamprey (<i>Lampetra planeri</i>) - Annex II                      River lamprey (<i>Lampetra fluviatilis</i>) - Annex II and V                      Bullhead (<i>Cottus gobio</i>) - Annex II                      Atlantic salmon (<i>Salmo salar</i>) - Annex II and V                      Atlantic stream crayfish (<i>Austropotamobius pallipes</i>) - Annex II and V</p> <p>Otter and Atlantic stream crayfish are also listed in schedule 5 of the Wildlife and Countryside Act 1981, as amended.</p>
River Usk (Lower Usk)/Afon Wysg (Wysg Isaf) SAC (NRW, 2015)	3km	E	<p>European importance is the river's migratory and resident fish species, including twaite shad and allis shad, lampreys (sea (<i>Petromyzon marinus</i>), river and brook) Atlantic salmon and bullhead.</p> <p>Other species features of the SAC are the water crowfoot beds and the European otter which breeds along its sheltered banks and hunts for fish in the river and its tributaries.</p>
Severn Estuary Ramsar (JNCC, 2015)	3.2km	SE	<p>The estuary's classic funnel shape, unique in Britain, is a factor causing the Severn to have the second-largest tidal range in the world (after the Bay of Fundy, Canada). This tidal regime results in plant and animal communities typical of the extreme physical conditions of liquid mud and tide swept sand and rock. The species-poor invertebrate community includes high densities of ragworms, lugworms and other invertebrates forming an important food source for passage and wintering waders.</p> <p>A further consequence of the large tidal range is the extensive intertidal zone, one of the largest in the UK, comprising mudflats, sand banks, shingle, and rocky platforms.</p>

Site	Distance	Direction	Description
			<p>Glassworts and annual sea-blite colonise the open mud, with beds of all three species of eelgrass (<i>Zostera</i>) occurring on more sheltered mud and sandbanks. Large expanses of common cord-grass also occur on the outer marshes. Heavily grazed saltmarsh fringes the estuary with a range of saltmarsh types present. The middle marsh sward is dominated by common saltmarsh-grass with typical associated species. In the upper marsh, red fescue and saltmarsh rush become more prominent.</p> <p>The site qualifies under Ramsar Criteria 1,3,4,5, 6 and 8. In addition to habitats, important species include populations of migratory fish and birds.</p>
Severn Estuary SAC (JNCC, 2015)	3.2km	SE	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p>1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1330 Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>)</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <p>1110 Sandbanks which are slightly covered by sea water all the time 1170 Reefs</p> <p>Annex II species that are a primary reason for selection of this site</p> <p>1095 Sea lamprey 1099 River lamprey 1103 Twaite shad</p>
Severn Estuary SPA (JNCC, 2015)	3.2km	SE	<p>The Severn Estuary is one of the largest estuaries in Britain and it has the second largest tidal range in the world. Its classic funnel shape and south-west orientation makes it susceptible to extreme weather conditions in the east Atlantic. There are large urban developments on the estuary including the cities of Bristol and Cardiff.</p> <p>The Severn Estuary qualifies under Article 4.1 of the Birds Directive by regularly supporting an internationally important wintering population of Bewick's swan (<i>Cygnus columbianus bewickii</i>), an Annex 1 species. During the period 1988/89 to 1992/93 a mean peak of 289 birds (1.7% of the northwest European population, 4.1 % of the British wintering population) used the estuary.</p> <p>The Severn Estuary qualifies under Article 4.2 as a wetland of international importance by regularly supporting in winter over 20,000 waterfowl. In the five year period 1988/89 to 1992/93 the average peak count was 68,026 waterfowl comprising 17,502 wildfowl and 50,524 waders.</p> <p>The Severn Estuary also qualifies under Article 4.2 by regularly supporting in winter internationally important numbers of the following 5 species of</p>

Site	Distance	Direction	Description
			<p>migratory waterfowl (average peak means for the period 1988/89 to 1992/93): 3,002 European white-fronted goose (<i>Anser albifrons albifrons</i>) (1.0% NW European, 50.0% British), 2,892 shelduck (<i>Tadorna tadorna</i>) (1.2% NW European, 3.9% British), 330 gadwall (<i>Anas strepera</i>) (2.8% NW European, 5.5% British), 41,683 dunlin (<i>Calidris alpina</i>) (2.9% east Atlantic flyway (EAF), 9.6% British) and 2,013 redshank (<i>Tringa totanus</i>) (1.3% EAF, 2.6% British).</p> <p>The Severn Estuary also supports nationally important wintering populations of a further 10 species:</p> <p>3,977 wigeon (<i>Anas penelope</i>) (1.6% British), 1,998 teal (<i>Anas crecca</i>) (2.0% British), 523 pintail (<i>Anas Acuta</i>) (2.1 % British), 1,686 pochard (<i>Athya farina</i>) (3.8% British), 913 tufted duck (<i>Aythya fuligilla</i>) (1.5% British), 227 ringed plover (<i>Charadrius hiaticula</i>) (1.0% British), 781 grey plover (<i>Pluvialis Squatarola</i>) (3.7% British), 3,096 curlew (<i>Numenius arquata</i>) (3.4% British), 246 whimbrel (<i>N. phaeopus</i>) (4.9% British total) and 3 spotted redshank (<i>Tringa erythropus</i>) (1.5% British).</p> <p>In addition, during passage periods, the estuary supports nationally important numbers of ringed plover (spring migration: 442 birds (1.4% British passage), autumn migration: 1,573 birds (5.2% British passage)) dunlin (spring: 3,510 birds (1.7% British passage), autumn: 5,500 birds (2.7% British passage)) whimbrel (spring: 246 birds (4.9% British passage), autumn: 66 birds (1.3% British passage)) and redshank (autumn: 2,456 birds (2% British passage)).</p> <p>The Severn Estuary also supports a nationally important breeding population of a migratory species.</p> <p>In 1993 2040 pairs of lesser black-backed gulls (<i>Larus fuscus</i>) bred on the islands of Steep Holm and Flat Holm within the estuary. This represents 2.5% of the British total.</p>
Severn Estuary SSSI (NRW, 2015)	3.2km	SE	<p>In the addition to the above descriptions, The SSSI is of international importance for wintering and passage wading birds, with total winter populations averaging about 44,000 birds. Numbers can be considerably higher during severe winters when, owing to its mild climate, the Severn supports wader populations that move in from the colder coasts of Britain. The SSSI holds most of the estuary's internationally important curlew and redshank populations, and most of its nationally important ringed plover and grey plover populations. Other waders which occur in significant numbers within the SSSI are common snipe (<i>Gallinago gallinago</i>), knot (<i>Calidris canutus</i>), whimbrel and turnstone (<i>Arenaria interpres</i>).</p>

Site	Distance	Direction	Description
			The SSSI is internationally important for dunlin and supports about 7.5% of the British wintering population of this species. The estuary as a whole supports about 10.5% of the British wintering population and is the single most important wintering ground of dunlin in Britain.
Newport Wetlands SSSI (NRW, 2015)	4km	SE	<p>In winter, Newport Wetlands support nationally (UK) important numbers of shoveler (<i>Anas clypeata</i>) and black-tailed godwit (<i>Limosa limosa</i>). Other over-wintering species that use the site include gadwall, wigeon, shelduck, dunlin, redshank, whimbrel and curlew.</p> <p>During the summer, the wet grasslands, saline lagoons and reedbeds on the site support an exceptional variety of breeding birds, including nationally (UK) important breeding populations of avocet (<i>Recurvirostra avosetta</i>), redshank, lapwing (<i>Vanellus vanellus</i>), water rail (<i>Rallus aquaticus</i>), Cetti's warbler (<i>Cettia cetti</i>) and bearded tit (<i>Panurus biarmicus</i>). In addition, breeding populations of ringed plover and little ringed plover (<i>C. dubius</i>) are also present.</p> <p>The aquatic invertebrate assemblage is very diverse and compares well with other similar areas in Britain. Many nationally rare and scarce species are present, including the great silver water beetle <i>Hydrophilus piceus</i>, the water beetle <i>Hydaticus transversalis</i> and the ornate brigadier soldierfly <i>Odontomyia ornate</i>. The nationally scarce spider <i>Tetragnatha striata</i> has a strong population in the reedbeds and the nationally scarce shrill carder bee (<i>Bombus sylvarum</i>) is found throughout the site. Overall, some 400 invertebrate species have been recorded at the site, several of which are confined to the Gwent Levels in Wales.</p> <p>The watercourses are rich in plant species and communities, many of which are rare or absent in other levels systems such as the notable species hairlike pondweed (<i>Potamogeton trichoides</i>). The reedbeds at Newport Wetlands are the largest within the south-east Wales area. In wetter areas with standing water, the vegetation is almost entirely composed of common reed (<i>Phragmites australis</i>). However, in drier areas, it is joined by marsh bedstraw (<i>Galium palustre</i>), hemp agrimony (<i>Eupatorium cannabinum</i>) and great willowherb (<i>Epilobium hirsutum</i>).</p> <p>In addition, the site has a number of other habitats that add to its overall wildlife value. These include hedgerows, scrub, woodland and grassland.</p>
Newport Wetlands NNR (2015)	4km	SE	This site is of special interest for its breeding and over-wintering birds, invertebrates, and aquatic and marginal flora. Also of special interest are the ditch habitat and reedbeds.
Plas Machen Wood SSSI	5km	W	A Woodland of tall coppice dominated by alder ( <i>Alnus glutinosa</i> ) with some oak ( <i>Quercus petraea</i> ) standards over a diverse ground flora.

Site	Distance	Direction	Description
(Newport City Council, 2015)			A number of streams and waterlogged areas support an interesting flora that includes plants such as tussock sedge ( <i>Carex paniculata</i> ) and yellow flag ( <i>Iris pseudacorus</i> ) which are of rare or local distribution in the County.

Non statutory designated sites within 2km of the site were provided by South East Wales Biological Records Centre (SEWBRc). These comprised a total of seven Sites of Importance for Nature Conservation (SINCs) records as shown in Table 8.2.

Table 8.2 Details of SINCs within 2km of the site

Site	Description
Afon Ebbw River (Refs: P1, TP2 and G1, G13, RO1, MF10)	Major river system with associated semi-improved neutral grassland and marshy grassland, swamp, scrub and semi-neutral woodland. Associated species include: bulbous foxtail ( <i>Alopecurus bubous</i> ) near confluence with Usk, kingfisher ( <i>Alcedo atthis</i> ), sand martin ( <i>Riparia riparia</i> ), grass snake ( <i>Natrix natrix</i> ).
Celtic Springs (Ref: MF9)	Mosaic Habitat Post-industrial mosaic habitat. Neutral grassland. Calcareous grassland.
Coed Ffynon-Oer (Ref: GR6)	Woodlands Ancient semi-natural woodland
Court Wood (Ref: GR11)	Woodlands Ancient semi-natural woodland
Gaer Fort (Ref: G2)	Mosaic habitat, neutral grassland and mammals. Large mosaic area of unimproved neutral and semi-improved acid grassland with areas of lowland heath, bracken and scrub. Large population of anthill.
Gaer Pond (Ref: G3)	Standing open water Suburban pond with tall swamp vegetation and nationally scarce fly species <i>Typhamyza bifascianta</i> .
LG Duffryn Site 1 (South Lake Drive) (Ref: MF6)	Standing open water, reed beds and birds Pond with Phragmites reedbed, and Cetti's warbler ( <i>Cettia cetti</i> ).

## Protected and Notable Species Records

Records of protected and notable flora and fauna species were provided by SEWBRc for the area within 2km of the site, with the exception of bat records which were provided for the area within 5km of the site. A summary of these records, generally post 2000, can be found below. Where possible, distances and location have been presented based on data received from SEWBRc. Protected species summarised below include European Protected Species (EPS), birds listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (WCA), and species under Schedules 5, 6, 8 and 9 of the WCA and Protection of Badgers Act (1992). Species of Principal Importance to the Conservation of Biodiversity in Wales (known as "Section 42 Species") listed in response to the requirements of Section 42 of the Natural Environment and Rural Communities Act 2006 are also included. It should be noted that Section 7 of the new Environment Act (Wales)



2016, replaces the duty in section 42 of the NERC Act 2006, but the same lists of Species and Habitats of Principal Importance form Section 7 Lists under the Act.

## Flora

A single record for bluebell (*Hyacinthoides non-scripta*) 500m north of the search point near the River Ebbw in 2012.

Newport LBAP species include bulbous foxtail (*Alopecurus bulbosus*).

A single record for the invasive species Japanese knotweed (*Fallopia japonica*) was returned from the search in 2012 near the River Ebbw <1km from the Junction 28 (Tredegar House).

## Invertebrates

Section 42 invertebrates returned from the search include:

Three records for forester moth (*Adscita stictices*) in Gaer Hill and Gaer Fort in 2000.

Six records for shrill carder bee (*Bombus (Thoracobombus) sylvarum*) from Duffryn in 2009.

A single record for white-letter hairstreak (*Satyrium w-album*) from 2011 in Duffryn. This species is also listed in Schedule 5 of the WCA.

Other Newport LBAP species include: silver-washed fritillary (*Argynnis paphia*) in 2004, and older records of a beetle species (*Helochares lividus*) from 1991.

## Amphibians

A single record for common frog (*Rana temporaria*) and a single record for common toad (*Bufo bufo*), both from 2014 approximately 1km north east of the search point.

Two records for smooth newt (*Lissotriton vulgaris*) from 2013 approximately 1km south of J258 roundabout towards the Celtic Springs Business Park.

## Reptiles

Six records for common lizard (*Zootoca vivipara*), all in Gaer Fort north of the search point from 2012 and 2013.

A single record for grass snake (*Natrix natrix*) approximately 500m south of Pont Ebbw roundabout towards Duffryn.

Fourteen slow-worm (*Anguis fragilis*) records between 2009 and 2013, with a record from Tredegar Golf Course within 500m south-east of the Bassaleg roundabout. The majority of the records were from Gaer Fort north of the search point.

## Birds

A large number of bird records were returned from the search including species listed under Schedule 1 of the WCA, Newport LBAP and S42 species. Schedule 1 species returned from the search include: brambling (*Fringilla montifringilla*), field fare (*Turdus pilaris*), hobby (*Falco subbuteo*), peregrine (*Falco peregrinus*), goshawk (*Accipiter gentilis*), hoopoe (*Upupa epops*) and redwing (*Turdus iliacus*) amongst the large list of bird data.

Three barn owl (*Tyto alba*) records, including a road kill south west towards A48(M) Junction 29 in 2007.

## Bats

There are 12 records for the common pipistrelle (*Pipistrellus pipistrellus*) from 2006 and 2007. They were mainly commuting and foraging in locations such as the River Ebbw within 500m north east of Junction 28 (Tredegar House) and Tredegar Park.

Two records for Daubenton's bat (*Myotis daubentonii*) 500m of the Pont Ebbw roundabout foraging along River Ebbw in Tredegar Park from 2007.

Two records including a confidential roost record in 2000 for noctule bat (*Nyctalus noctula*) and foraging record in 2007 by Tredegar Park, north east of Junction 28 (Tredegar House), within 500m.

Fifteen records including a confidential roost south east in Duffryn for pipistrelle bat species (*Pipistrellus* sp.) and records north-west in Rogerstone were returned from the search from 2013.

Three commuting/foraging records for soprano pipistrelle (*Pipistrellus pygmaeus*) from 2006 towards the River Ebbw south-east of the Bassaleg roundabout, with a record adjacent to Forge Road.

Two records for brown long-eared bat (*Plecotus auritus*) south west towards Duffryn in 2011.

Seven records for unspecified bat species from 2001 to 2013 to include sightings and roost records from locations such as Bassaleg, Rogerstone and Duffryn.

Four records for whiskered/Brandt's bat (*Myotis mystacinus/brandtii*) from 2006 were returned from the search. This includes foraging/commuting records along the M4/River Ebbw north of Junction 28 (Tredegar House).

## Otter

Twelve records for otter (*Lutra lutra*) including records by the River Ebbw adjacent to the east of Junction 28 (Tredegar House), Tredegar House and other locations along the River Ebbw.

In addition the County Ecologist for Newport City Council reported a dead otter found on the A48 Cardiff Road at grid reference ST285858 immediately east of the Junction 28 roundabout in 2016. This is the only recorded casualty in the study area.

## Other Mammals

Three records for hedgehog (*Erinaceus europaeus*) between 2007 and 2013, two of which were road kill within 1km of Junction 28 (Tredegar House).

A record for polecat (*Mustela putorius*) approximately 1km south of Junction 28 (Tredegar Park) on the M4 in 2006.

Both species are listed in the Newport LBAP and are S42 species.

## Other Data Sources

The National Trust provided a copy of a report on surveys undertaken of the two gatehouses adjacent to Junction 28 (Tredegar House) during 2014. This recorded the presence of bat droppings within the western gatehouse, which were identified as whiskered bat droppings by DNA analysis. Since the time of that survey, both of the gatehouses have been re-roofed and it is not known if a licence was obtained for the works or whether mitigation to allow continued use by bats was included.

Survey undertaken during 2013 by the South Wales Trunk Roads Agency for dormice along the M4 corridor, recorded a possible dormouse nest on the northern verge of the M4 at Junction 28<sup>31</sup>.

### 8.3.2 Field Surveys

The majority of habitats within the study area are predominantly man-made and intensively managed. These are shown in Appendix D1. The roundabouts at all three junctions are covered by areas of regularly mown amenity grassland with introduced shrub planting and semi-mature trees. Woodland areas are restricted to plantation woodland within the areas adjacent to the slip roads on the western side of the roundabout at Junction 28 (Tredegar House).

## Bassaleg Junction

The roundabout island at Bassaleg is dominated by amenity grassland (regularly mown) with two small ornamental shrub hedges and scattered trees including cherry (*Prunus sp.*), ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*).

Broad-leaved plantation is present to the north east of the junction bordering the River Ebbw which includes species such as poplar (*Populus sp*), holly (*Ilex aquifolium*) and laurel (*Lauraceae*). Ivy (*Hedera helix*) covers the ground and is present on trees.

Scattered broad-leaved trees are located to the west of the roundabout and are also present as a line on the verge of the north boundary carriage to the south of the roundabout. A landscape bund and associated planting is also present between the A467 and the original Forge Lane to the west.

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<sup>31</sup> Parsons Brinkerhoff. 2013. M4 J24-28 2013 Dormouse Monitoring Results. On behalf of South Wales Trunks Road Agency.

To the northwest and southeast the road verges are bounded by walls. To the northwest is an area of residential housing and associated gardens. To the southeast is a former golf courses which is currently used as an informal park. Within this area are a number of very mature pedunculate oak (*Quercus robur*) trees and substantial areas of Invasive Non Native Species (INNS) including Japanese knotweed (*Fallopia japonica*) and Indian balsam (*Impatiens glandulifera*), including some stands of knotweed immediately adjacent to the wall. No 'important' hedgerows, as defined by the Hedgerow Regulations, were identified.

The habitats present are considered to be of value within the context of the site only.

## Pont Ebbw

The roundabout at the Pont Ebbw Junction has a mixture of amenity grassland with scattered horse chestnut (*Aesculus hippocastanum*) and Scots pine (*Pinus sylvestris*) trees. There are also areas of ornamental planting around some of the trees.

To the south of the junction there are areas of plantation woodland either side of the B4239, which contain both Scot pine and broad-leaved trees. The Dock's feeder channel also runs through these areas of woodland. The INNS Indian balsam was noted in the woodland area to the west of the B4239 both near the feeder channel and on the road verges adjacent to the carriageway.

To the north of the junction, Tredegar Park is separated from the road by a boundary wall. The area adjacent to the junction is predominately hard standing parking areas, although some standard trees are present close the A48 on the western side of the junction.

On the eastern side of the junction, the River Ebbw is in close proximity to the road, separated by a strip of unmanaged grassland with cock's foot grass (*Dactylis glomerata*) the dominant species. Bramble (*Rubus fruticosus agg.*) and Japanese knotweed are also present, scattered through the sward, although the knotweed is currently restricted to the areas immediately adjacent to the river bank.

The western side of the junction is dominated by intensively mown traffic islands, although mature trees are present further to the west along the A48. No 'important' hedgerows, as defined by the Hedgerow Regulations, were identified.

The habitats present within the Highway Boundary are considered to be of value within the context of the site only, however the River Ebbw is considered to be of local importance, and is connected to areas of International Importance, namely the River Usk SAC and the Severn Estuary European Site.

## Junction 28 (Tredegar House)

The habitats at Junction 28 (Tredegar House) are also dominated by areas of regularly mown grassland and ornamental planting. The centre of the roundabout comprises amenity grassland and mixed plantation.

The embankments of the M4 carriage and the sliproads on the western side of the junction support areas of predominantly broad-leaved plantation. However two

areas of semi-improved, species rich grassland area present, one on the north western side of the roundabout and one on the island situated between the two carriageways of the A48 to the west of the junction. The former area is likely to have been seeded by the local council. The latter area appears to have developed naturally having been cut off by the roads on both sides. Scrub is starting to invade this area, predominantly bramble encroachment.

To the south of the junction a high stone wall marks the boundary of the ground of Tredegar House, with two gatehouses and steel gates within the wall adjacent to the A48 on the eastern side of the junction. To the east Tredegar Park is located beyond a low stone wall. A watercourse (Docks feeder) is present running along the wall within the park adjacent to the A48. Significant stands of the INNS Indian balsam are present along this. No 'important' hedgerows, as defined by the Hedgerow Regulations, were identified.

The habitats present are of low value and are considered to be of importance only within the context of the site.

## Potential for Protected Species

A small number of mammal paths were noted during the extended phase 1 survey, including within woodland areas at Bassaleg and Junction 28 (Tredegar House). These were considered likely to be from foxes or domestic cats.

Vegetation including scrub and trees has potential to support breeding birds in the nesting period (generally taken to be March to August inclusive for most species).

### 8.3.3 Bat Surveys

The bridge at Pont Ebbw junction over the River Ebbw was initially considered to have medium potential to support bats. However an inspection of the underneath of the bridge showed that there were no suitable roosting crevices as the underside of the three arches had previously been sprayed with concrete.

The internal inspection of the gatehouses adjacent to the scheme revealed no fresh evidence of bat droppings within the ground floor rooms. Due to health and safety constraints the roof voids could not be inspected.

The first emergence survey was undertaken on the 17<sup>th</sup> June 2015 during warm temperatures and occasional light drizzle. The second survey on the 24<sup>th</sup> June 2015 was undertaken during warm dry weather. During both surveys noctule (*Nyctalus noctula*), soprano pipistrelle (*Pipistrellus pygmaeus*) and a Myotis species (probably whiskered (*Myotis mystacinus*) or Brandt's bat (*M. brandtii*)) were recorded commuting or foraging within the vicinity of the gatehouses.

Noctules were initially recorded flying north over the gatehouses and A48 from approximately 17 minutes after the time of sunset, although bats were later recorded flying south and foraging over the grass areas within the National Trust Park. Pipistrelle and Myotis bats were recorded flying both east and west along the treelines either side of the gatehouses and crossing the gateway. These bats were foraging along the trees. Daubenton's bat (*Myotis daubentonii*) were also recorded foraging over the lake within the grounds of Tredegar House at the end of the survey.

No bats were seen to emerge from either of the gatehouses and it would appear that the re-roofing undertaken by National Trust may have affected the use of the western gatehouse by bats.

It is concluded that bats forage in the study area however no bat roosts have been identified during these surveys.

### 8.3.4 Otter Survey

The block stone bank of the River Ebbw adjacent to the Pont Ebbw junction was searched for potential resting places for otter. Although there are a number of gaps within the block stone, no evidence of otter resting was found. A single otter spraint was found, adjacent to a headwall downstream of the bridge.

### 8.3.5 Dormouse surveys

Dormice have been confirmed to be breeding within the verge of the east bound A48 and the west bound on-slip to the motorway. One litter of young was recorded with a total of three nests found. No dormice were recorded within the area between the two carriageways of the A48 or between the west bound M4 on-slip and the main M4 carriage.

Other areas where vegetation clearance may be required were not identified prior to the surveys being undertaken and it is therefore assumed on a precautionary basis that dormice could be present throughout the areas of suitable habitat within the vicinity of the Junction 28.

### 8.3.6 Reptile surveys

No reptiles were recorded under the refugia which have been placed at the site. However, it is possible that common reptiles species could be present at very low population levels and as such are included within the assessment below.

## 8.4 Regulatory and Policy Framework

A framework of international, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. The following legislation exists to protect habitats and species of nature conservation importance within England and Wales:

- The Conservation of Habitats and Species Regulations 2010 (as amended) (the ‘Habitat Regulations’) which transposes Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (‘the Habitats Directive’) into UK law; of particular relevance here is the protection this legislation gives to certain sites and species; Wildlife and Countryside Act (WCA) 1981 (as amended); of relevance here again is the protection the Act provides to sites such as SSSIs and a range of species, and for the obligations place on Welsh Ministers and other public bodies with regard to the conserving and enhancing of the features of SSSIs in the exercise of their functions;

- Natural Environment and Rural Communities (NERC) Act 2006; , including the List of Species and Habitats of Principal Importance for the Conservation of Biological Diversity in Wales;
- National Parks and Access to Countryside Act 1949; of most relevance here are designated National Parks created under the Act;
- The Hedgerow Regulations 1997; of relevance here are the criteria used and process for defining ‘Important Hedgerows’ under the Act;
- Well-being of Future Generations (Wales) Act 2015; the Act places a duty on public bodies in Wales, including Welsh Government, to work towards achieving well-being goals, in order for actions to align to the Welsh Government's principles of sustainable development. Of particular relevance to nature conservation and ecology is the objective to ‘Manage, use and enhance Wales’ natural resources to support long term wellbeing’ underpinned by defined goals including ‘A resilient Wales and a globally responsible Wales’<sup>32</sup> .
- The Environment (Wales) Act 2016; of particular relevance here are the Section 7 lists of habitats and species, which superceded the Section 42 provisions in the NERC Act. Under this Act Public Authorities will be required to report on actions they are taken to improve biodiversity and promote ecosystem resilience; and
- The Badgers Act, 1992; which affords legal protection to badgers and their setts which could be impacted during construction works.

These pieces of legislation include a number of offences relating to protected species and requirements for licences to allow construction works to proceed. In addition the Habitats Regulations set out the requirement for the consideration of the potential effects of a project on European Designated Sites (EDS). The Natural Environment and Rural Communities (NERC) Act 2006 includes a duty on all public authorities to have regard to the conserving of biodiversity in the exercise of their functions. This duty applies to government bodies, local authorities and statutory undertakers. The Act also requires lists to be published of Habitats and Species considered to be of Principal Importance for the conservation of Biological Diversity. These are referred as Section 41 habitats and species in England and Section 42 habitats and species in Wales after the sections of the Act which require the publication of lists in each devolved area.

The Environment (Wales) Act 2016 places a further duty on public bodies to conserve and enhance biodiversity in the exercise of their functions. This duty includes consideration of the resilience of ecosystems in terms of their diversity, connectivity, adaptability, scale and condition. The Act also reinforces the duties in relation to the lists of species and habitats of importance and duties to conserve and enhance those species and habitats. Particular attention has been made to the planning policy and strategy documents listed below that are applicable to assessing the impacts to the ecological resources: Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation (Highways Agency 1993);

- DMRB Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment HD44/09 Assessment of Implications (of

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<sup>32</sup> <http://gov.wales/docs/caecd/publications/161104-well-being-a-en.pdf>

Highways and/or other Roads Projects) on European Sites (including Appropriate Assessment). DMRB Volume 11, Section 4, Part 1. (Highways Agency 2009);

- Welsh Government's Action Plan for Pollinators (2013), notably Action 2.3 that seeks to create and enhance diverse and connected flowering habitats in towns, cities and developed areas, including roadside verges;
- Welsh Assembly Government: Trunk Road Estate Biodiversity Action Plan (TREBAP) 2004-2014 (which is still extant);
- UK Post-2010 Biodiversity Framework;
- Guidelines for Ecological Impact Assessment in the UK and Ireland.

## 8.5 Methodology

### 8.5.1 Desk Study

A search was undertaken for all statutory designated sites SSSI, SACs, SPA and Ramsar sites within 5km of the site using the MAGIC website.

A record search was requested from the SEWBRc to include records of legally protected species and sites of importance for Nature Conservation (at local level designation). The search also included records of Species of Principal Importance to the Conservation of Biodiversity in Wales (known as "Section 42 Species") listed in response to the requirements of Section 42 of the Natural Environment and Rural Communities Act 2006 (and now Section 7 of the Environment Act (Wales 2016).

All local ecological records from the above sources within 2km of the study area are included within the consideration of this assessment with the exception of bat species where a 5km search area has been used.

Consultation was undertaken with NRW at various stages throughout the study.

### 8.5.2 Extended Phase 1 Habitat Survey

An extended Phase 1 habitat survey was carried out in accordance with the 'Extended Phase 1' methodology as set out in Guidelines for Baseline Ecological Assessment (Institute of Environmental Assessment, 1995) was conducted throughout the study area on 30<sup>th</sup> January and 25<sup>th</sup> February 2015, with additional target notes made during the course of later surveys for dormice and reptiles. Phase 1 habitat survey is a standard technique for rapidly obtaining baseline ecological information over a large area of land. It is primarily a mapping technique and uses a standard set of habitat definitions for classifying areas of land on the basis of the vegetation present. The extended Phase 1 habitat survey provides additional information by recording signs of legally protected animals species and assessing the potential for notable fauna to occur in or adjacent to the site. These are made by using target notes to record species composition within habitats and to highlight features of ecological interest.

Although the extended Phase 1 habitat survey was undertaken during the winter months, this was considered acceptable in this instance as it was used to check habitat classifications and other findings of the previous Phase 1 habitat survey for



the project (TACP, July 2014<sup>33</sup>). Additionally, if there had been discrepancies in the results, these would have been detected during the various protected species surveys carried out during the remainder of 2015 for the project. No such discrepancies were identified.

The need for further species specific surveys, as set out below, was determined through the extended Phase 1 Habitat Survey.

### 8.5.3 Otter Survey

A survey was undertaken on 15 April 2015 of the River Ebbw adjacent to the Pont Ebbw Junction to determine if any resting places used by otter (*Lutra lutra*) are present within areas in close proximity to the proposed works. The survey methodology was based on recommendations provided by three authoritative sources (Chanin, 2003; Crawford, 2003; Strachan & Jeffries, 1996).

The bank of the river was searched for signs of otter presence including spraints (droppings), anal jelly (a glutinous excretion used for scent marking), foot prints, pathways and slides, holts (dens), couches (lying up sites) and feeding remains. Where signs were found the location was recorded and mapped and notes were made on the number and age or level of activity indicated by the signs found.

- Spraints found were recorded along with an assessment of the age using the following criteria:
- “Fresh” – spraints up to two or three days old;
- “Recent” – spraints which have dried up but have not started to break up or become bleached; and
- “Old” – spraints which have become bleached or have crumbled in to fragments.

### 8.5.4 Bat Survey

A survey was undertaken to determine the potential for bats to use the underside of the River Ebbw Bridge as a roosting site on 15<sup>th</sup> April 2015. The western abutment of the bridge is located on the boundary of the proposed works. The survey was undertaken by an experienced bat specialist to look for potential roosting sites in the form of cracks, expansion joints or loose brickwork/mortar. Searches of potential roost sites were made using torches to look for bats and signs of bat use including droppings and fur staining.

The gate houses for Tredegar House which are located adjacent to the western approach of the A48 to Junction 28 (Tredegar House) were identified as having bat potential during the Extended Phase 1 Survey. A visual inspection of the interior of the gatehouses was undertaken on the 16<sup>th</sup> June 2015, although this was limited as access was not possible to the roof voids.

Two emergence surveys were undertaken of the gatehouses following methodology as set out in the Good Practice Survey Guidelines (BCT, 2012). These were undertaken on 17 and 25 June 2015 and involved surveyors positioned

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<sup>33</sup> TACP, July 2014: Junction 28 Improvement Works Phase 1 Habitat Survey, commissioned by Parsons Brinkerhoff in June 2014.

on either side of the National Trust boundary Wall from approximately 30mins before the time of sunset, for a duration of approximately two hours. Surveyors were equipped with EM3+ and Batlogger M detectors. All bat calls recorded were analysed and the species identified using Kaleidoscope and BatExplorer software.

Trees within the footprint of the Scheme were considered to have negligible potential to support roosting bats.

### 8.5.5 Dormouse surveys

Dormice (*Muscardinus avellanarius*) have previously been recorded within the M4 soft estate further to the west and on the northern verge of the M4 at Junction 28 (Tredegar House). A survey was therefore undertaken of the areas of plantation woodland within the soft estate at Junction 28 (Tredegar House) where works are proposed. The surveys followed the methodology set out in the Dormouse Conservation Handbook (Bright, Morris, & Mitchell-Jones, 2006) and was in accordance with DMRB Volume 10 Section 4 Part 5 (HA 97/01): Nature Conservation Management in Relation to Dormice (Highways Agency, 2001).

Dormouse nest tubes were set out in March 2015 at locations shown in Appendix D2, and checked on a monthly basis. As stated in 'Nature Conservation Management in Relation to Dormice' (Highways Agency, 2001), tubes were installed and left in situ during the active season (May until November) in shrubs, hedgerows and trees.

### 8.5.6 Evaluation of Receptors and Assessment Methodology

The methodology for the evaluation of receptors and assessment of impacts follows that set out in the Guidelines for Ecological Impact Assessment in the UK and Ireland<sup>34</sup> (CIEEM, 2016) as these represent the industry standard and provide the information required by DMRB Volume 10 Section 4: Nature Conservation and the DMRB Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment. The guidelines also include the investigation of potential opportunities for enhancement and the maintaining of the resilience of ecosystems.

### Zone of impact for ecological features

All plant and animal species, habitats and integrated plant and animal communities that occur within the 'zone of impact' are defined as potential 'ecological receptors'. The zone of impact for ecological features varies, depending on the nature and behaviour of the receptors, and also the type of impact that may affect them. As a general rule in this Chapter, the assessment of individual receptors is considered for the whole of the site plus the distances listed in Table 8.3.

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<sup>34</sup> Institute of Ecology and Environmental Management. 2016. Guidelines for Ecological Impact Assessment in the UK and Ireland.

Table 8.3 Maximum Zone of Impact from Scheme Boundary for Ecological Features

Ecological feature	Maximum zone of impact from the site boundary
Internationally designated sites, e.g. Special Areas of Conservation (SACs)	5km
Nationally designated sites, including Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs)	5km
Locally designated sites - Local Nature Reserves (LNRs) and Site of Importance for Nature Conservation (SINCs)	2km
Fauna including amphibians, reptiles, mammals, birds and invertebrates.	2km

The maximum zone of impact for international and national sites was established at 5km due to potential hydrological impacts. For locally designated non-statutory sites, 2km was chosen as a maximum zone of impact given the non-statutory nature of their designation and the fact that these sites are designated for their habitat value rather than species which could be impacted upon over a larger area e.g. bats. Regarding fauna, it is largely the behaviour of species, including movement in the landscape combined with the nature of the Scheme, which determines the 2km maximum zone of impact. Protected and notable fauna species have been considered out to 2km, except for records of bats which have been included in the assessment within a radius of 5km.

### Determining value

The Chartered Institute of Ecology and Environmental Management (CIEEM) has published guidelines for Ecological Impact Assessment that recommend that the value of ecological receptors or features is determined based on a geographic frame of reference. These guidelines outline a similar approach for assessment of ecological effects as outlined in the Design Manual for Roads and Bridges, and are considered to be the industry standard for ecological assessment. For this assessment the following geographic frame of reference is used:

- International;
- National (i.e. UK);
- Regional (i.e. South Wales);
- County/Local Authority (Newport City Council);
- Local (i.e. within circa 5km); and
- Less than Local (i.e. within the context of the site and immediate vicinity).

### Valuing habitat and species

In accordance with the CIEEM guidelines, in assigning a level of value to each habitat or species considered in the assessment, it is necessary to consider its distribution and status, including a consideration of trends based on available historic records. Rarity is an important consideration because of its relationship with threat and vulnerability although since some species are inherently rare, it is necessary to consider rarity in the context of status. A habitat or species that is

rare or declining should be assigned a greater level of importance than one that is rare but known to have a stable distribution or population.

Reference is also made to the TREBAP UK Post-2010 Biodiversity Framework<sup>35</sup> and Newport City Council Local Biodiversity Action Plan<sup>36</sup> habitats and species. The presence of a habitat or species on these lists reflects the fact that it is in a sub-optimal state; however it does not necessarily imply any specific level of importance.

## Predicting and characterising ecological impacts

In accordance with CIEEM guidelines, when describing impacts reference is made to the following:

- Confidence in predictions, i.e. the level of certainty that an impact will occur as predicted, based on professional judgement and where possible evidence from other schemes – this is based on a three point scale; certain/near certain, probable and uncertain;
- Magnitude – i.e. the size of an impact in quantitative terms where possible;
- Extent – i.e. the area over which an impact occurs;
- Duration – i.e. the time for which an impact is expected to last;
- Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible; and
- Timing and frequency – i.e. whether impacts occur during critical life stages or seasons and how often impacts occur.

Both direct and indirect impacts are considered: direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor, e.g. a pollution event reducing the food source for a species such as otter or water vole.

## Significance criteria

In accordance with the CIEEM guidelines, a significant impact, in ecological terms, is defined as ‘an impact (whether negative or positive) on the integrity<sup>37</sup> of a defined site or ecosystem and/or the conservation status<sup>38</sup> of habitats or species within a given geographical area, including cumulative and in-combination

<sup>35</sup> JNCC and Defra (on behalf of the Four Countries’ Biodiversity Group). 2012. *UK Post-2010 Biodiversity Framework*. July 2012. Available from: <http://jncc.defra.gov.uk/page-6189> (Accessed 13th December 2012).

<sup>36</sup> Newport Local Biodiversity Action Plan. Newport City Council.

<sup>37</sup> Integrity is the coherence of ecological structure and function, across a site’s whole area that enables it to sustain a habitat, complex of habitats and/or the levels of populations of species.

<sup>38</sup> Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

impacts'. It is important to note however that in accordance with the CIEEM guidelines, the actual determination of whether an impact is ecologically significant is made irrespective of the value of the receptor in question. In this respect the CIEEM methodology differs from some other approaches to EIA.

The value of a feature that will be significantly affected is used to determine the geographical scale at which the impact is significant, e.g. an ecologically significant impact on a feature of county importance will be considered to represent a significant impact at a county level. This in turn is used to determine the implications in terms of legislation, policy and /or development management.

Any significant impacts remaining after mitigation (the residual impacts), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development management in determining the application.

## Mitigation and Enhancement

It is important as part of any environmental impact assessment, wherever possible, to clearly differentiate between mitigation and enhancement. These terms are used in this assessment as follows:

- Mitigation is used to refer to measures to avoid, reduce or remedy a specific negative impact.
- Enhancement is used to refer to measures that would result in positive ecological impacts but which do not relate to specific significant negative impacts or where measures are required to ensure legal compliance.

## 8.6 Potential Environmental Impacts

### 8.6.1 Construction

The vegetation clearance required for the construction of the improvements and consequential visibility splays (both for junctions and signage) will result in the loss of approximately 15,084m<sup>2</sup> of habitats including plantation woodland and scrub, ornamental trees, shrub planting amenity grassland and semi-improved grassland including some of the natural grassland located between the two carriageways of the A48.

The loss of these habitats, considered to be of limited value within the context of the site only, would be considered a permanent impact of a low magnitude which would not be significant. It is likely that substantial areas of landscape planting would be included within the design which would mitigate for the loss of existing habitats.

The loss of vegetation may affect local bird populations including effects on nesting birds subject to the timing of vegetation clearance. Desk study records of reptiles were provided 500m away from the site. Common reptile species are assumed to be present within the grassland areas and would therefore be affected by habitat loss during the construction process. This impact is considered to be a permanent impact of low magnitude which would not be significant. However, mitigation is proposed below to ensure legislative compliance with regard to these legally protected species

The loss of dormouse habitat within the Scheme footprint will require the granting of a European Protected Species Licence by Natural Resources Wales. The dormice recorded on site form part of a population of dormice that is considered to be of county value contributing to the regionally important area for dormice within South East Wales.

The construction work for the Scheme and associated infrastructure will result in the clearance of approximately 9,850m sq of trees and shrubs from various different areas around Junction 28. Of this approximately 330m sq is located on the edge of woodland where dormice have been recorded.

Although the total area of potential habitat to be lost is relatively high (0.9ha), the majority of the areas to be lost comprise areas of woodland edge immediately adjacent to the road carriageways. The exception is the area of potential habitat situated between the A48 carriageways (Area B), although dormice are considered likely to be absent from this area based on the survey results.

The loss of thin sections of habitat on the edges of larger habitat blocks is considered to be a permanent impact of minor magnitude that would not be reversible. Without enhancement and mitigation measures this impact would be considered to be significant.

There is also the risk of in-direct impacts such as the discharge of sediment laden surface water run-off in to the River Ebbw and the Dock's feeder canal. In the absence of mitigation this would be a minor indirect effect which would not be significant. It is assumed that the construction work will be undertaken in accordance with all current pollution prevent measures and other good practice guidance. Therefore the potential impact from pollution post mitigation is considered to be negligible and not significant.

## 8.6.2 Operation

No significant effects are predicted to occur during the operational phase of the Scheme, apart from any minor effects on vegetation and species populations which might occur during routine maintenance of the road network.

Consideration has also been given to any change in impact to species vulnerable to traffic collision, such as badger and otter. Once operational, although traffic may flow more freely on local roads, no increase in traffic volume is predicted. This, combined with baseline results obtained (no close badger setts or otter holts) suggests that no change in operational phase impacts on such species populations are likely to occur.

## 8.7 Mitigation and Enhancement

Mitigation, over and above plainly established and uncontroversial working methods (e.g. pollution prevention methods), will be limited to dormouse mitigation, sensitive vegetation clearance to avoid impacts to protected species/spread of invasive plants and additional landscape planting. Landscape proposals are documented in the Landscape and Visual Impact chapter. The following section provides more detail on mitigation measures.

### 8.7.1 Habitats

Within the landscape design proposals there are provisions for replacement planting using native species, removal of redundant areas of roadways to be turned into grassed areas and re-use of surplus excavated material won from site to create attractive and naturally undulating grassed landforms. There will also be attenuation drainage ponds within the proposed design. These measures will provide habitats of value to a range of species including pollinators and bird species which are currently present within the soft estate.

The following areas of different habitats will be created as part of the landscape design.

Habitat type	Area proposed
Species rich grassland	27, 551m sq
Bulb planting	2,740m sq
Specimen trees within grassland and shrub areas	125 individual specimens

The provisions of the landscape design therefore provide an enhancement in terms of the areas of habitats within the Highway Network.

### 8.7.2 Breeding Birds

All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs.

Any works affecting potential bird nesting habitat e.g. clearance of standing vegetation including trees and scrub, should be carried out outside the breeding season (generally accepted as March to August inclusive for most species). If this is not possible, any potentially suitable nesting habitat should be checked for nests by a suitably qualified ecologist immediately prior to its removal. If nests are found further work will need to be delayed until young have fledged and left the nest, and the nest is no longer in use.

### 8.7.3 Dormice

Dormice are protected under the Conservation of Habitats and Species Regulations 2010 (as amended), which protects the animals and places they use for shelter or protection from disturbance and destruction.

Regulation 41 makes it an offence to:

- a) Deliberately capture, injure or kill any wild animal of an EPS;
- b) Deliberately disturb wild animals of such a species;
- c) Deliberately takes or destroys the eggs of such a species;
- d) Damages or destroys a breeding site or resting place of such an animal.

Disturbance in the context of the offences above is disturbance which is likely to impair the ability of the animals to survive, to breed or reproduce, to nurture their young, to hibernate, to migrate; or to affect significantly the local distribution of the species.

Licences can be granted by the relevant SNCO for developments (sometime referred to as EPS Licences or Derogation Licences) providing the purposes of the licence is for “preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment”.

It is currently proposed to clear vegetation in February 2017 prior to the bird breeding season and thereby avoiding costly delays to the construction works caused by the presence of nesting birds. The mitigation strategy would therefore require the vegetation clearance to be undertaken in a two stage process as set out in the Winter Clearance methodology provided in the Dormouse Conservation Handbook (EN, 2006).

This will entail the cutting of all trees and shrubs within the clearance areas to a height of 300mm using hand tools under the supervision of a suitably qualified ecologist (named ecologist or agent) during February. Clearance of the remaining stumps and roots would not take place until after May 2017. There may be some areas where early phase works are required in advance of May 2017. In these areas clearance of the stumps will only be undertaken once a finger-tip search by a suitably qualified ecologist (named ecologist or agent) has been completed and they are confident that no dormice are present.

If dormice are found during the vegetation clearance the nest and dormouse will be placed inside a nest box by the licensed ecologist or their accredited agent. The nest box will then be moved to an area of suitable dormouse habitat within the retained habitat, outside the zone of construction. The nest, box and dormouse will be located in an area protected from frost and direct sunlight in accordance with advice given in section 5.9 of the Handbook.

Four areas of plantation woodland within the soft estate have been identified to be enhanced to provide compensatory habitat for dormice. All these areas comprise areas of even age plantation, with poor quality understorey and ground layers, resulting in low value habitat for dormice. It is therefore proposed to undertake enhancement works within these areas to increase the quality of the habitat for dormice. To achieve this the following activities are proposed:

- Selective thinning of 10% of the canopy to create gaps within the canopy and increase light levels beneath the canopy.
- Planting of other plant species which provide food sources for dormice within the shrub and ground layers, especially within areas where gaps are created within the canopy.

Erection of wooden nest boxes within the areas to provide additional nesting habitat for dormice as set out in Table 8.4 below.



Table 8.4 Number of nest boxes to be installed

Area	Size (hectares)	Number of boxes
A	0.7	21
C	1.0	30
D	0.7	21
G	0.6	18
	Total	90

The areas identified for habitat enhancement measures outlined above are isolated from other habitat areas by various roads. The areas beneath the bridges are barren in terms of dormouse connectivity comprising sloping masonry in front of the bridge abutments. It is therefore proposed to provide better linkages between the different areas of habitat including the enhancement areas and areas of retained habitat on the north and south verges of the motorway.

This will be provided by installing pipe bridges beneath the road bridges that will be constructed from plastic drainage pipes with hessian ropes and cut branches within them to create natural pathways for dormice to move between different areas. Such bridges are proposed to be installed beneath the bridges carrying the east bound on-slip (in front of the western abutment) and the main M4 carriageway (in front of both abutments). The pipe bridges will be located immediately below the bridge decks to ensure that the ends of the pipes meet with existing vegetation in to which the hessian ropes can be tied to provide connectivity. The pipe bridges will be installed to the rear of the bridge piers and therefore are not likely to require heavy engineering. It is likely that the bridges will need to be mounted on posts or trestles to avoid the need to drill in to the bridges to secure attachments to the structure.

Structures to improve and maintain connectivity of this type have previously been accepted within licence applications made by the named ecologist (Pete Wells, dormouse licence number 62680:OTH:SRA:2015).

#### 8.7.4 Reptiles

All native reptile species in the UK are subject to partial protection from intentional or reckless killing or injury only.

Habitat manipulation in accordance with standard best practice will be undertaken to avoid harm to these legally protected species, the details of which will be provided in the CEMP.

Prior to vegetation clearance being undertaken the contractor's workforce will be given a toolbox talk about reptiles, their legal protection, and what actions should be undertaken if they are encountered during the construction works.

#### 8.7.5 Invasive Plants

The CEMP will also outline necessary methods for the removal or treatment of invasive plant species as appropriate.

## 8.8 Residual Effects

The mitigation and habitat enhancement measures outlined above are considered sufficient to offset the impacts identified to occur during the construction period.

The residual effect on the dormouse population is therefore considered to be reduced to a level that would not be significant.

The other impacts predicted to occur during construction and operation are not significant and therefore no mitigation other than measures to ensure legislative compliance have been put forward and the significance of the effects is not changed.

Through the iterative design process adopted, it has been possible to avoid or minimise effects of the Scheme on ecological receptors and where this is not possible to propose measures that would mitigate these impacts in the long term and achieve enhancements for some ecological receptors. As a result, the Scheme is considered to be consistent with relevant policies.

The mitigation measures and retention of habitats included within the Scheme proposals will ensure ecosystem resilience by maintaining and increasing the extent of native woodland, scrub and hedgerow habitats and connectivity between these habitats. This contributes to the requirements of Section 6 of EWA 2016, Local BAP and TREBAP plans for planted native trees and shrubs.

The creation of species rich grassland will mitigate for the loss of grassland habitats. These areas will be created in a variety of conditions and with different floral mixes to encourage the establishment of different grassland types, which will provide further ecosystem resilience and biodiversity in the Scheme and within the wider area.

This grassland creation works will benefit pollinator populations in the area and thus contribute to the Action Plan for Pollinators. The trees and landscape planting will also contribute to the aims of this Action Plan by mitigating for the loss of and providing additional habitats.

## 9 Materials

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### 9.1 Introduction

This Chapter presents an assessment of the effect of the proposed M4 Junction 28 Improvements project on the material resources required to construct the proposed project and the effect of the use of those materials. It includes an assessment of potential impacts during construction and operation of the project from the import of primary raw materials, secondary or recycled/reused materials and manufactured construction products. This section also presents details of the materials balance and surplus materials.

The material resources assessment will follow guidance set out in DMRB Interim Advice Note (IAN) 153/11.

The above IAN has not yet been adopted in Wales. However, it is considered that the IAN reflects current best practice guidance and, as there is no suitable Welsh equivalent guidance, it has been used to inform the proposed method of assessment. It is acknowledged that references to the National Planning Policy Framework (NPPF) set out in the above IANs are not relevant in the Welsh context.

As defined in IAN 153/11, for the purposes of assessment, Materials are defined as comprising:

- The use of material resources; and
- The generation and management of waste.

### 9.2 Study Area

The study area of the material resources assessment includes the footprint of the construction works. Consideration of the potential effects outside the construction works has also been included in relation to material sources, vehicle movement (import/export), and waste management.

The study includes assessment of potential impacts during construction and operation of the project from the import of primary raw materials, from nearby quarries, secondary or recycled/reused materials and manufactured construction products. This Chapter also presents details of the materials balance and surplus materials. This includes a consideration of impacts of surplus raw materials on waste disposal and recycling facilities.

### 9.3 Baseline

The Scheme area currently comprises existing roads and verges, including earthworks.

The Preliminary Sources Study for the Scheme concluded that based on ground investigations undertaken in June 2015 the existing ground conditions comprise:

- Made Ground: typically a well graded gravelly clay or clayey gravel.
- Alluvium: soft silty slightly sandy slightly gravelly clay.

- Devensian Till: slightly clayey slightly sandy gravel with low cobble content.
- Interbedded siltstone and sandstone (Raglan Formation) / mudstone with sandstone bands – (St Maughans Formation).

Preliminary ground investigations have identified some hydrocarbon contaminants by the Bassaleg junction<sup>39</sup>. The other only potential source of contamination identified from the Preliminary Sources Study was the existing highways infrastructure. The results of contamination testing from the ground investigation indicate that the Made Ground, excluding the localised area of hydrocarbon contamination at the Bassaleg junction, is suitable for reuse within the Scheme with respect to human health and the water environment. Construction workers and any future maintenance workers will need to consider health and safety measures for any intrusive works proposed, to protect against contaminants within the soil, including PAHs; likely to be present on account of tarmac, coal and ash within the Made Ground.

As discussed in Chapter 8, the invasive species Japanese Knotweed has been locally encountered in the vicinity of the proposed works. The CEMP will outline necessary methods for the removal or treatment of invasive plant species as appropriate.

Inert and non-hazardous landfill sites are present within the vicinity of the Scheme including Docks Way landfill site (Newport), Bryn Pica Landfill Site (Aberdare), and the Trecatti Landfill Facility (Merthyr Tydfil). Waste recovery facilities in the vicinity of the Scheme include Neil Soil supplies (Cardiff), S&G Soils (Swansea), The Treatment Hub (Swansea).

## 9.4 Regulatory and Policy Framework

This Chapter has been prepared to address DMRB HA 200/08 Volume 11, Section 1, Part 1, in relation to the assessment of materials and in accordance with DMRB IAN 153/11.

The material resources assessment follows the guidance set out in DMRB Interim Advice Note 153/11. The project value is >£300,000, therefore in line with IAN 153/11 a scoping level assessment is required. Given the proposed works and the quantities of materials involved in the Scheme it is considered unlikely to have a significant effect on material resources. Therefore, it is proposed that a simple assessment is undertaken in line with IAN 153/11.

### 9.4.1 National Policy

- The National Waste Strategy Towards Zero Waste<sup>40</sup> – One Wales: One Planet 2010 provides an overarching framework for the management of all types of waste, with the overall aim of reducing residual waste to zero by 2050. It is supported by a series of sector plans which details how the outcomes, targets and Policies in Towards Zero Waste are to be implemented. The Overarching Waste Strategy Document for Wales – Article 28 of the Waste Framework

<sup>39</sup> M4J28-ARP-HGT-SWG-RP-CG-0000001 – PO3

<sup>40</sup> Welsh Government (2010) Towards Zero Waste – One Wales: One Planet, June 2010.

Directive requires EU Member States to prepare a national waste management plan.

- WRAP Cymru Delivery Plan: 2011-15<sup>41</sup> For a World Without Waste – focuses on the most important issues: minimising resource use and diverting priority materials from landfill. The Plan is divided into two themes: waste prevention and resource minimisation (including reuse) and; recycling and recovery (including preparation for reuse).
- Climate Change Strategy for Wales<sup>42</sup> 2010 – Chapter 12 “Resource efficiency and waste sector emission reduction“ sets out actions to reduce emissions in the waste sector including: reducing indirect emissions associated with resource consumption by increasing reuse, recycling and composting.
- The Well-being of Future Generations (Wales) Act 2015<sup>43</sup> – The act strengthens existing governance arrangements for improving the well-being of Wales to ensure that present needs are met without compromising the ability of future generations to meet their own needs. The act requires all public bodies to embed climate change into their decision-making. The Materials chapter particularly relates to objective 12: Manage, use and enhance Wales’ natural resources to support long term wellbeing.
- Environment (Wales) Act<sup>44</sup>: Part 1: “Sustainable management of natural resources<sup>45</sup>” 2016 – The Environment (Wales) Act includes three key features that will ensure that managing natural resources sustainably will be a core consideration in decision-making. Part 1: “Sustainable management of natural resources” provides a modern legislation for managing Wales’ natural resources that helps to tackle the challenges faced and is focused on the opportunities resources provide.
- Planning Policy Wales (Edition 8) 2016 sets out Welsh Government’s objectives in terms of waste management. The main focus of the policy is planning of future waste management facilities. However, it states that ‘waste prevention efforts at the design, construction and demolition stage should be made by developers’. It goes on to state that ‘all opportunities should be explored to incorporate re-used or recyclable materials or products into a new building or structure.’
- Policy E of Minerals Planning Policy Wales (MPPW)<sup>46</sup> aims to encourage the efficient use of minerals by promoting the appropriate use of high quality materials, and by minimising the production of waste through maximising the potential for re-use and recycling waste, where environmentally acceptable.

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<sup>41</sup> WRAP Cymru <http://www.wrapcymru.org.uk/sites/files/wrap/WRAPCymruDeliveryPlan.pdf>

<sup>42</sup> Welsh Government (2010) Climate Change Strategy for Wales, October 2010

<sup>43</sup> [http://www.legislation.gov.uk/anaw/2015/2/pdfs/anaw\\_20150002\\_en.pdf](http://www.legislation.gov.uk/anaw/2015/2/pdfs/anaw_20150002_en.pdf)

<sup>44</sup> <http://gov.wales/topics/environmentcountryside/consmanagement/natural-resources-management/environment-bill/?lang=en>

<sup>45</sup> <http://gov.wales/docs/desh/publications/150512-sustainable-management-of-natural-resources-delivery-framework-en.pdf>

<sup>46</sup> National Assembly for Wales (2000) Minerals Planning Policy Wales.

- Technical Advice Note 21 Waste<sup>47</sup> provides advice on how the land use planning system should contribute towards sustainable waste management and resource efficiency.

### 9.4.2 Local Policy

Newport Local Development Plan 2011-26, Adopted Plan January 2015 provides policy on safeguarding mineral resources (Strategic Policy 21 Minerals) and encouraging use of secondary and recycled aggregates (Strategic Policy 20 Waste Management).

### 9.4.3 Relevant Guidance

The overarching policy in relation to the handling of material resources relevant to the Scheme is the EU Waste Framework Directive 2008/98/EC. This provides the legislative framework relating to the collection, transport, recovery and disposal of waste. It includes a common definition of ‘waste’, which is ‘any substance or object which the holder discards or intends to discard’, with the term ‘discard’ including the disposal, recovery or recycling of a substance. The overall purpose of the Waste Framework Directive is to set out measures to protect the environment and human health by preventing or reducing the adverse effects of waste generation and its management, and by improving the efficiency of resource use. Member States are required by the Directive to take all the necessary measures to ensure that waste is recovered or disposed of without endangering human health or causing harm to the environment. The Directive sets a number of high-level objectives, which have influenced national waste management policy and legislation. In particular, Article 11 of the Waste Framework Directive (amended in 2008) requires that Member States take the necessary measures to achieve 70% recycling of non-hazardous construction and demolition waste by 2020.

In addition to the above Directive, reference has been made to the following guidance and legislation relating to material resources and wastes:

- Interim Advice Note (IAN) 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 ‘Environmental Assessment’.
- Interim Advice Note (IAN) 153/11 Guidance on the Environmental Assessment of Material Resources<sup>48</sup>.
- Design Manual for Road and Bridges (DMRB) Volume 11, Section 3 Part 3, Disruption Due to Construction<sup>49</sup>. This covers the effect on people and on the natural environment which can occur, mainly during construction works.
- DEFRA Environmental Permitting (England and Wales) Regulations 2010.

<sup>47</sup> Welsh Government (2014) Technical Advice Note 21: Waste, February 2014.

<sup>48</sup> Highways Agency (2011) Interim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources.

<sup>49</sup> Highways Agency (1993) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 3, Disruption Due to Construction

- DEFRA Environmental Permitting Guidance ‘The Waste Framework Directive’ for the Environmental Permitting (England and Wales) Regulations 2010.
- The Waste (England and Wales) Regulations 2011. This implements revisions to the Waste Framework Directive in England and Wales.
- The Hazardous Waste (England and Wales) Regulations 2005.
- Definition of Waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE) 2011)<sup>50</sup>.
- Newport City Council. Draft Mineral Safeguarding Supplementary Planning Guidance May 2016.

## 9.5 Methodology

The material resources assessment follows guidance set out in DMRB Interim Advice Note 153/11. The project value is >£300,000, therefore in line with IAN 153/11 a scoping level assessment is required. Given the proposed works and the quantities of material involved in the Junction 28 project it is considered unlikely to have a significant effect on material resources. Therefore, a simple assessment has been undertaken in line with IAN 153/11.

The simple assessment includes identification of the following:

- Materials required for the project, their sources and quantities;
- Anticipated waste arisings, quantities and type;
- Proposed construction methods and techniques;
- Assessment of any impacts arising from identified issues in relation to materials and waste;
- Any mitigation measures proposed, and the likely effectiveness of these measures;
- How any proposed mitigation measures will be implemented, measured and monitored;
- Statutory requirements, such as the need for a Site Waste Management Plan; and
- Conclusions about the level of potential impacts.

Two rounds of consultation on the scoping report was undertaken. The consultees included Natural Resources Wales, Cadw and Newport City Council. No comments were received related to materials and waste (Appendix A2)

### 9.5.1 Baseline Methodology

The existing baseline conditions have been assessed based on desk-top assessment to review the nature of existing materials on site that will be used in the

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<sup>50</sup> Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Development Industry Code of Practice

earthworks and remedial measures that may be required. The location of potential material sources and disposal sites have been reviewed.

Baseline information on the material resources for the Scheme have been collated through a desk study, based on the sources identified below:

- British Geological Survey 1:63,360 Sheet 249 Newport (Drift) 1969;
- British Geological Survey 1:50,000 Sheet 249 Newport (Solid) 1986;
- Squirrell, H.C. & Downing, R.A. (1969), Geology of the South Wales Coalfield Part 1. The country around Newport (Mon.) Explanation of One-inch Geological Sheet 249, New Series. Third Edition;
- Newport City Council (2015) Local Development Plan 2011-26; and
- Natural Resources Wales Public Register – list of operational waste management facilities (accessed January 2016).

The above information has been supplemented by the findings of the 2015 ground investigations.

The assessment of potential effects due to construction has been based on estimated material requirements and includes a review in terms of material volumes, sources and movements. Vehicle movements required for delivery and export of materials have been considered. The assessment of effects due to operation has been based on likely maintenance requirements.

### 9.5.2 Value of Resources

The majority of the proposed works are within the existing highway boundary and will involve minor earthworks to widen and realign the existing road.

Material resources have been identified through a combination of desk-based study and review of the Scheme design proposals. Resources considered as part of the assessment have been chosen based on the environmental value / sensitivity to changes. The environmental value / sensitivity of resources have been assessed in line with the procedures for assessing impacts given in DMRB Volume 11 Section 1 and 2.

Potential environmental effects associated with the extraction and transport of primary raw materials may include the ability of a source to accommodate the materials requirements of the Scheme and the road network to accommodate additional traffic.

Potential effects on available waste disposal and recycling facilities have been considered in relation to the volumes of materials estimated to be removed from site.

### 9.5.3 Significance criteria

For the assessment of materials, no specific methodology has been published to assign significance based on the value of a material resource and the magnitude of an impact on that resource. As suggested in the WG Environmental Advice Note,



professional judgement and the procedures for assessing impacts given in DMRB Volume 11 Section 1 and 2 have been used and are outlined in Section 4.5.3

The identified impacts were considered separately for the construction and operational phases of the Scheme. Mitigation measures are proposed to avoid, reduce or compensate the effect of the identified impacts in line with the hierarchy defined in IAN125.

## 9.6 Potential Environmental Impacts

### 9.6.1 Construction Phase

The Scheme has the potential to generate local effects during the construction phase. Potential effects during construction are listed below:

- The requirement for the import of construction materials (including primary aggregates).
- The generation of excess materials requiring removal from site to alternative sites or landfill.
- Depletion of construction material and waste management facility resource.

A summary of the predicted material resources use is presented in Table 9.1 and a summary of the predicted waste arisings is presented in Table 9.2.

Table 9.1 Summary of materials resource use

Project Activity	Material resources required for the project	Quantities of material resources required	Additional information on material resources
Earthworks	Topsoil	Some 4500m <sup>3</sup> of topsoil will be reused *	Sourced from site.
	General fill for embankments – Primary or Secondary / Recycled materials	Some 1900m <sup>3</sup> * of material will be reused in earthworks and landscaping	Sourced from site
Installation of pavement	Type 1 unbound mixture. Base, binder, and surface course. Primary or Secondary / Recycled materials	Tredegar Park=6455 m <sup>3</sup> , Bassaleg 2534m <sup>3</sup> , Pont Ebbw=4650m <sup>3</sup> (Total 13639m <sup>3</sup> )*	Sourced from local suppliers. Potentially Cemex at Taffs Well
Installation of manufactured products	Drainage, kerbs, trees, traffic signs, lighting etc.	Various quantities relative to road length and necessary safety measures.	To be established suppliers.
Operation of the road	No significant material resources required.	No significant material resources required.	

\* Please note that these figures are based on the estimates

Table 9.2 Summary of waste arisings

Project Activity	Waste arisings from the project	Quantities of waste arisings	Additional information on waste arisings
Site clearance	Vegetation surface strip, Kerbs, trees, traffic signs, lighting etc.	Quantities not available at this stage.	. Likely to be a combination of locally recycled, disposal at an inert or non-hazardous landfill site.
Earthworks (including drainage)	Surplus excavated material	Tredegar Park =15835m <sup>3</sup> , Bassaleg=2208m <sup>3</sup> , Pont Ebbw 6682m <sup>3</sup> (Total=24724m <sup>3</sup> )*	If necessary, likely to be a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site.
Installation of pavement	Surface planings	Tredegar Park=1871m <sup>3</sup> , Bassaleg 1614m <sup>3</sup> , Pont Ebbw=1487m <sup>3</sup> (Total 4972m <sup>3</sup> )*	Some will be reused as footway sub base, temporary hard standing and approximately 15-20% goes back into the tarmac mix for reuse
Installation of manufactured products	No significant waste arisings.	No significant waste arisings.	
Operation of the road	No significant waste arisings.	No significant waste arisings.	

\*Please note that these figures are based on the estimates based on the current design stage.

The import of construction materials may have an impact on material sources. The likely sources of construction material are established suppliers and are therefore considered to have a **low** sensitivity. The quantities of the common construction materials required for construction are relatively small in the context of the material suppliers and therefore the magnitude of impact is assessed to be **minor**. The significance of effect from construction is therefore **slight**.

Site clearance will include clearing existing trees, safety barriers, concrete kerbs, lighting columns, and traffic signs. It is likely that the materials will be segregated and appropriately recycled on site or disposed of at an appropriate waste handling facility.

Earthworks estimates predict a surplus of some 24724m<sup>3</sup> of general earthworks materials. If removal of materials from site is required, the location for the disposal of these materials is likely to include a combination of local recycling facilities and disposal at an inert or non-hazardous landfill site. It is anticipated that a local recycling facility will be favoured.

Construction will include milling the surface of the existing pavement. It is proposed that the surface planings will be reused as footway sub base, temporary

hard standings and approximately 15-20% will be put back into the tarmac mix for reuse in the new pavement construction.

The export of excess construction materials may have an impact on sites receiving the material. The facilities to which material will be taken are likely to be established recycling facilities or landfill sites and are therefore considered to have a **low to medium** sensitivity. The quantities of excess materials requiring disposal are relatively small and therefore the magnitude of impact is assessed to be **minor**. The significance of effect from construction is therefore **slight**.

The impact of vehicle movements associated with construction has been considered. The Scheme is in a heavily trafficked area and the import and export of construction materials will result in additional traffic. It is estimated that approximately 4500 vehicles movements are required for the import and export of materials throughout the duration of the programme, this will include import and export of pavement materials during day and night works, earthworks and miscellaneous deliveries for items such as ducting, street lighting etc. The vehicle movements associated with the Scheme will be spread over the construction period and given the high traffic capacity of the local roads and relatively small volumes of material to be imported and exported, it is considered that the increase will be insignificant.

## 9.6.2 Operational Phase

The Scheme has limited potential to generate an effect during operational phase as during normal day to day operation there are no requirements to import or export materials and the Scheme is intended to generate minimal quantities of waste.

Roads are subject to a periodic maintenance regime. Volume 7 of the DMRB requests that all new roads are built to a 40-year design life. A 40-year life can only be achieved if the highway is maintained. Maintenance is needed using a 10 year cycle of interventions. The interventions are likely to be:

- Year 10, minor intervention. Remove and replace the surface course;
- Year 20, major intervention. Remove and replace surface course, replace kerbs, upgrade drainage system. Replace road signs. Patch the binder and road base selectively.
- Year 30, minor intervention as year 10;
- Year 40, major intervention as year 20.

The Bassaleg roundabout and the J28 roundabout are owned and maintained by Newport County Council (NCC) with the exception of the slip roads which are owned and maintained by Welsh Government's South Wales Trunk Road Agency (SWTRA). Pont Ebbw is owned and maintained by Morgan Vinci on a concession basis i.e. they charge NCC for vehicles that use it.

The maintenance works will involve export of surface course planings and damaged kerbs etc. At this stage, the location for the disposal of these materials is not known, however, it is likely that road planings would be recycled and other materials processed off site for reuse. Import of materials will be required to

replace the surface course and damaged kerbs etc. At this stage the source of these materials is not known, however, it is likely to be from local suppliers.

The import and export of construction materials during maintenance works will involve significantly lower quantities of materials than during construction and will therefore have a lower impact on source sites and sites receiving the material. The facilities are likely to be established facilities and are therefore considered to have a **low to medium** sensitivity. The quantities of materials will be relatively small and therefore the magnitude of impact is assessed to be **minor**. The significance of effect from operation is therefore **slight**.

## 9.7 Mitigation

The assessment of impacts during construction and operation predicts a slight impact on material resources and waste. Procedures will be adopted by the Contractor prior to construction to control the use of materials and further reduce the impact, which shall be documented in their Site Waste Management Plan for the works.

Wherever possible site won materials should be reused in construction. Site won materials would only be reused on site if assessed as being suitable for reuse without causing unacceptable impacts on the end users and the environment. A specification for suitable material to be used in construction has been developed, in accordance with the Specification for Highway Works. As set out in the specification, testing shall be undertaken during construction to confirm that the materials used meet the specification requirements which have been developed in line with the CL:AIRE Code of Practice.

It is necessary to remove some unsuitable and excess materials from site. A Site Waste Management Plan will be produced to detail the estimated quantities of waste material and the opportunities for reuse, recycling, recovery or disposal.

The earthworks contractor current proposals include taking hard material to Countryside Recycling in Newport. Muck will be used to tip cap at TATA Llanwern with Cuddy. They are exploring recycling any of the red marl from the dig in J28 into an impermeable material for Natural Resources Wales's Crindau Pill Flood Defence scheme. Some loads of hardcore will likely go to Tarmac at Hendy for recycling. The contractor proposes to completely avoid landfill if possible.

To limit the quantities that are disposed of to landfill the materials will be sorted/processed and where necessary treated and the materials disposed of or reused as appropriate for the particular waste stream. The pre-treatment of waste material prior to disposal is a requirement of the waste regulations. By minimising the quantity of materials to be disposed of offsite the associated HGV movements will be minimised.

Due to the relatively simple nature of the construction processes involved, the small number of different types of potential surplus materials, and relatively small quantities, preparation and use of a Site Waste Management Plan is likely to be an effective approach to the mitigation of potential effects.

Construction workers and any future maintenance workers will need to consider health and safety measures for any intrusive works proposed, to protect against contaminants within the soil, including PAHs; likely to be present on account of tarmac, coal and ash within the Made Ground. Hydrocarbon contamination was identified locally near the Bassaleg junction but contamination was not identified within the other areas or the site, however localised areas of unexpected contamination may be encountered during the construction works.

Table 9.3 Summary of mitigation measures

<b>Project Activity</b>	<b>Potential impacts associated with material resource use/ waste management</b>	<b>Description of mitigation measures</b>	<b>How the measures will be implemented, measured and monitored</b>
Site clearance	Waste disposal	Identify opportunities for reuse, recycle, recover	Materials to be sorted, and where practical disposed of to recycling facilities. Site Waste Management Plan to implement, measure and monitor.
Earthworks	Use of primary resources. Waste disposal	Reuse of materials in earthworks. Limit disposal and movements	Design to maximise the earthworks balance. Site Waste Management Plan to implement, measure and monitor.
Pavement planings	Waste disposal	Reuse as sub base in footpaths. Reuse in pavement construction. Reuse elsewhere.	Design to maximise the earthworks balance. Site Waste Management Plan to implement, measure and monitor.

## 9.8 Summary

The assessment of materials has been undertaken in line with DMRB Interim Advice Note (IAN) 153/11.

The assessment of impacts during construction and operation predicts a slight impact on material resources and waste. Procedures will be adopted by the Contractor prior to construction to control the use of materials and further reduce the impact, which shall be documented in their Site Waste Management Plan for the works. The Contractor's Construction Environmental Management Plan will detail measures to be implemented to manage risks associated with excavation, export and import of materials in terms of health and safety, and the environment.

## 10 Traffic Noise and Vibration

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### 10.1 Introduction

This chapter describes the approach and methods used for the noise and vibration assessment. The purpose of the assessment is to identify any adverse or beneficial effects associated with the proposed Scheme. The following sections describe the baseline noise climate, assessment methodology, results and conclusions for a 'Simple' assessment of the Scheme at Bassaleg junction according to the HD 213/11 guidance given in the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al, 2011).

Pont Ebbw and Tredegar House junction were scoped out for further operational assessment at the Scoping stage (Section 5.3.5 of Scoping Report - 21 September 2016). This was because it was assessed that the likely noise change would not meet the required thresholds to trigger a Simple assessment, due to the distances of receptors relative to the changes of alignment.

The noise and vibration effects during the construction of the Scheme are also considered for Bassaleg and Pont Ebbw junctions. Details of proposed mitigation measures and an assessment of residual noise impacts and effects are presented. Construction noise and vibration for Tredegar House junction were scoped out for further assessment at the Scoping stage.

A glossary of acoustic terms is included at Appendix E1.

### 10.2 Study Area

The assessment study area is primarily defined in Annex A1.11 of HD 213/11 as one kilometre from the carriageway edge of the physical extents of the Scheme and the extents of any existing routes to be bypassed, improved and any proposed new routes. The calculation area is defined as 600m from all the routes identified above within the study area, and also 600m from any other affected routes within the study area. An affected route is where there is potential for a change of 1dB LA10,18h or more in the short term, or 3dB LA10,18h or more in the long term.

Additionally, the calculation area can extend outside the study area boundary if there are affected routes beyond it. The calculation area for affected routes beyond the study area is limited to 50m from the carriageway edge. For the routes outside the study area an assessment of noise change is carried out using 'Basic Noise Levels' (BNLs) where dwellings lie within 50m of affected routes. The Basic Noise Level is the noise level at a reference distance of 10m from the carriageway edge, derived using the methodology described in the Calculation of Road Traffic Noise (CRTN) (Welsh Office, 1988). For the purpose of this assessment, forecasted traffic data has been used to identify road links which would realise a predicted increase in flow of at least 25%, or decrease of 20% in the Scheme baseline year. This excludes roads with low predicted traffic flow, i.e. <1000 veh/18h day in both the Do-Something and Do-Minimum scenarios.

The study area and calculation area is shown in Figure E5.1 of Appendix E5.

## 10.3 Baseline Conditions

### 10.3.1 Existing baseline

#### Bassaleg junction

This junction lies close to two Priority Areas, identified as part of the Noise Action Planning Priority Areas (NAPPA) study for this section of highway; the first being on the northeast leg of the junction (A467). The second is approximately 400m south of the junction near Forge Lane. More extensive areas of housing are further to the north and west of the junction. To the west of the junction (approximately 170m from the existing roundabout) is Bassaleg School.

#### Pont Ebbw junction

At HD 213/11 Scoping stage it was proposed that there was a requirement for a Simple assessment in this area for construction but not for operation (Draft Scoping Report, 21 September 2016).

#### Tredegar Park junction

The junction is in excess of 500m from the nearest residential area at Pencarn Avenue to the south. There are some agricultural buildings over 300m to the northwest, although there does not appear to be any residential buildings in this area. The closest NAPPA is in excess of 1km north of this junction. To the south-southeast of the junction (approximately 400m from the existing roundabout) is the Tredegar House Country Park Caravan Club Site (for touring caravans) on the east side of the A48. Opposite the Caravan Club site on the west side of the A48 is a commercial estate. Ambient noise in these areas is expected to be dominated by highway traffic noise from both the A48 and the M4

At HD 213/11 Scoping stage it was proposed that there was no requirement for a Simple assessment in this area for construction or operation (Scoping Report, 21 September 2016).

#### Baseline noise measurement survey

A baseline noise survey is required as part of the DMRB Simple operational assessment if considered necessary to obtain noise level data to supplement the noise predictions to inform the assessment. The guidance (Paragraph A7.16) also notes that:

*'During the assessment process, measurements should not routinely be compared with calculations for the purpose of predicting changes in noise level. There is currently no methodology available to take account of the potential errors associated with comparing measurements with calculations, especially when the receptor is some distance from the noise source.'*

The purpose of the baseline noise survey was to provide data on noise climates at a sample of locations to supplement the traffic noise predictions. The survey was

also considered important to determine if any parts of the study area are dominated by noise from sources other than traffic noise, in which case the prediction results would not accurately reflect noise levels in that area.

It should be noted that, even where the noise climate is dominated by roads, some variance between existing measured noise levels and predicted noise levels for the future baseline year prior to opening of the Scheme would be expected. This might be due to differences in traffic flow levels between the present and the baseline year or meteorological conditions at the time of the survey.

A survey of baseline noise was carried on 12th January 2016, and performed in accordance with the 'Shortened measurement procedure', described in paragraph 43 of CRTN. Full details of the survey are provided in Appendix E2 which also notes that meteorological conditions were within acceptable limits for conducting traffic noise surveys.

Measurements were made at six locations around the Bassaleg junction within the Scheme assessment area. The range of measured values during the survey are presented in Table 10.1 and detailed results and method are reported in Appendix E2.

- Location 1 – on the pavement next to Court Crest Road and Forge Lane, approximately 3m from carriageway edge and 30m from Forge Road roundabout to the east.
- Location 2 – on the pavement next to Forge Road and Forge Lane, approximately 4m from main carriage way edge of the (A467) and 5m from Forge Lane to the west.
- Location 3 – on a patch of grass at the T-junction of Forge Lane and Court Crest Road approximately 5m from Forge Lane and approximately 65m from the main carriageway edge of Forge Road (A467).
- Location 4 – on the pavement next to Churchmead Road approximately 50m north of Forge Road (A467) roundabout.
- Location 5 – on a patch of grass between the River Ebbw and Forge Mews road and approximately 25m from the main carriageway edge of Forge Road (A467).
- Location 6 – on a patch of grass next to Bassaleg School main footpath accessed from Court Crest Road, approximately 220m from Forge Road roundabout to the east.

It was noted during the survey at locations at Bassaleg School and Forge Mews, that local road traffic and water over a weir contributed to the overall noise climate. Despite this, the measurement results concur with baseline predicted traffic noise levels (Appendix E6), within the expected accuracy tolerance range of the noise modelling and expected range of variance of short term survey measurements. Consequently, no adjustments have been made to the baseline traffic noise predictions.



Table 10.1 Measured baseline noise levels

Location (see Appendix Figure E2.1)	Measured noise levels (dB)		
	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Aeq</sub>
1	60 - 62	65 - 68	64 - 65
2	69 - 71	82 - 84	78 - 80
3	56 - 59	62 - 64	60 - 62
4	57	61 - 64	60 - 61
5	57 - 59	65	63
6	49 - 54	54 - 60	52 - 57

Baseline ambient noise at these measurement locations was dominated by highway traffic noise from the A467 and Forge Road. Local traffic noise was a contributing noise source away from the A467.

### 10.3.2 Future Baseline

The measured baseline noise survey data has been used for the construction noise assessment to represent baseline ambient noise levels at representative receptor locations. The future baseline (just prior scheme implementation) is considered to be very unlikely to change significantly from the current condition due to the predominance of road traffic noise.

The future baseline noise conditions for the operational traffic assessment have been determined by the CRTN noise prediction model for a forecast traffic scenario prior to construction of the Scheme. This provides detailed coverage across the entire study area. HD 213/11 makes clear that this is the preferred approach for establishing baseline noise conditions, which are then directly comparable with the prediction model noise levels with the Scheme in operation for future assessment years.

## 10.4 Regulatory and Policy Framework

### 10.4.1 Relevant Legislation

#### Legislative Framework for Construction

##### Environmental Protection Act

The Environmental Protection Act (HMSO, 1990) describes the duty of the Local Authority to take steps to abate any noise impact, including that from a construction site, deemed to be causing a statutory nuisance. Noise is outlined Part III of the Act in relation to noise as a nuisance or that is prejudicial to health.

##### Control of Pollution Act

The Control of Pollution Act (HMSO, 1974) gives the Local Authority powers to serve a notice to the developer requiring the control of site noise under Section 60 of the Act. This may include specific controls to restrict certain activities

identified as causing particular problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases. All requirements must adhere to established guidance and be consistent with best practicable means to control noise only as far as is necessary to prevent undue disturbance.

*Well-being of Future Generations (Wales) Act 2015 (Welsh Assembly Government, 2015)*

The act strengthens existing governance arrangements for improving the well-being of Wales to ensure that present needs are met without compromising the ability of future generations to meet their own needs. The relevant goal to noise would be “A healthier Wales ... A society in which peoples physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood”.

### **Legislative Framework for Operational Noise**

#### *Land Compensation Act*

The Land Compensation Act (HMSO, 1973) Part 1 entitles property or land owners to compensation if their property has been reduced in value as a result of a public project such as a new or improved highway.

#### *Noise Insulation Regulations & Noise Insulation Amendment Regulations 1988 (1975, Amended 1988) (HMSO, 1975)*

The Noise Insulation Regulations (HMSO, 1975) define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway and the contribution of the new or altered project to the noise level received at the façade. In summary, noise insulation qualification criteria require that:

- the facade noise threshold of 68dB<sub>LA10,18h</sub> is met or exceeded,
- there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun,
- the noise caused by traffic on new or altered roads makes an effective contribution of at least 1dB(A), and
- the property is 300 metres or less from the nearest point on the carriageway of a highway to which the Regulations apply.

The number of properties that are likely to be eligible for statutory insulation are identified as part of the assessment.

## **10.4.2 Planning Policy Context**

### **National Planning Policy**

#### ***Planning Policy Wales Edition 8 (Welsh Government, 2016)***

Planning Policy Wales Edition 8 - July 2016 (Welsh Government, 2016), describes the planning development policies of the Welsh Government. Chapter 13 of the policy ‘Minimising and Managing Environmental Risks and Pollution’

sets out the policy objectives with regard to noise from new development. Paragraph 13.13.1 states the policy objectives:

‘Noise can affect people’s health and well-being and have a direct impact on wildlife and local amenity. Noise levels provide an indicator of local environmental quality. The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard. Noise Action Plans, drawn up by the Welsh Ministers in relation to Wales under the Environmental Noise Directive, and the Wales Regulations, aim to prevent and reduce environmental noise where necessary and preserve environmental noise quality where it is good. They are a planning consideration in the use and development of land.’

With regard to the assessment of noise associated with development, paragraph 13.15.1 states the following:

‘Noise can be a material planning consideration, for example in proposals to use or develop land near an existing source of noise or where a proposed new development is likely to generate noise. Local planning authorities should make a careful assessment of likely noise levels and have regard to any relevant Noise Action Plan before determining such planning applications and in some circumstances it will be necessary for a technical noise assessment to be provided by the developer.’

Paragraph 13.15.2 provides guidance on noise generation near protected areas:

‘Special consideration is required where noise-generating development is likely to affect a protected species, or is proposed in or near statutorily designated areas, including urban ‘quiet areas’ designated in Noise Action Plans. The effect of noise on the enjoyment of other areas of landscape, wildlife and historic value should also be taken into account.’

### ***TAN 11 Noise (Welsh Assembly Government, 1997)***

TAN 11 (Welsh Assembly Government, 1997) provides technical guidance on noise generating development including transportation projects. In relation to highway projects TAN 11 makes reference to the Noise Insulation Regulations as described above.

### ***Local Policy***

The Newport Local Development Plan 2011-2026 Adopted Plan provided guidance and policies on noise generation and reduction.

## **10.5 Methodology**

The following sections describe the methodology used for this Simple Assessment, and associated guidance on which the methodology is based. HD 213/11 paragraph A1.16 notes that:

*‘The objective of the Simple Assessment is to undertake a sufficient assessment to identify the noise and vibration impacts associated with the road project’.*

The assessment considers noise from the construction of the scheme, and the noise from its operation at surrounding noise sensitive receptors relative to the

baseline noise. The noise impacts are compared with the relevant criteria to determine if there are significant effects. Mitigation is then considered if appropriate.

### 10.5.1 Relevant Guidance

#### ***Design Manual for Roads and Bridges – Environmental Assessment, Volume 11, Section 3, Part 7 (Highways Agency et al, 2011)***

Design Manual for Roads and Bridges (DMRB) is the regulatory standard for the design of a new road or improvements to an existing road. In particular, Volume 11 Section 3 Part 7: HD 213/11 Revision 1 (Highways Agency et al, 2011) sets out the method for assessing noise and vibration associated with road traffic. DMRB provides guidance on the selection of the Scheme assessment area and the relevant assessment years. This procedure has been adopted for the purpose of this assessment.

Based on the requirements and conditions referred to in Paragraph A1.8 of HD 213/11 above, no further operational assessment of Port Ebbw and Tredegar Park junctions was considered necessary. This was confirmed in the Scoping Report, 21 September 2016. This is because the combined effects of traffic changes and alignment changes are not assessed as likely to exceed the HD 213/11 noise change threshold values (1dB in the short term and 3dB in the long term). Although the noise change threshold values were also not met at Bassaleg junction, given the NAPPA status at this location and the potentially sensitised receptors exposed to the higher baseline noise levels, it is proposed to undertake further assessment at this location to the Simple stage assessment procedure as described in Section 10.5.2.

Construction noise effects are considered in this assessment for Bassaleg and Pont Ebbw junctions. Construction noise for Tredegar Park junction was not assessed due to the large distance to nearest receptors and the existing noise contribution from the busy A48 and M4.

#### ***Calculation of Road Traffic Noise (CRTN) (Welsh Office, 1988)***

HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise (Welsh Office, 1988) (CRTN). CRTN describes a procedure for calculating the level of noise from the highway based upon the traffic flow parameters (flow, speed and percentage heavy vehicles), road surface type, propagation distance, screening, intervening ground cover and topographical features between the highway and receptor. This is the accepted methodology to quantify traffic noise levels for use with the following assessment procedures. The predicted noise levels are expressed using the  $L_{A10,18hr}$  index - i.e. the noise level exceeded for 10% of the time over the 18 hour daytime period 06:00 to 00:00.

#### ***BS 5228-1:2009+A1:2014 and BS 5228-2 Code of Practice for noise and vibration on construction and open sites. (British Standards Institution, updated 2014)***

The British Standard BS 5228 Code of Practice for noise and vibration on

construction and open sites – Part 1:2009+A1:2014 (British Standards Institution, 2014a) and BS 5228 Part 2: 2009+A1:2014 (British Standards Institution, 2014b) provide guidance on the assessment and control of noise and vibration from construction activities. Part 1 of the Standard contains detailed information on noise reduction measures and promotes the ‘best practicable means’ approach to control noise and vibration to minimise the impact on local residents and construction workers. Part 2 of the Standard provides criteria for vibration with regard to perception and disturbance to residents and the onset of potential cosmetic or structural damage to buildings.

### 10.5.2 Operational noise and vibration

Geographical Information Systems (GIS) have been used to construct a topographically accurate 3-dimensional noise model of the study area for the Bassaleg junction. The model includes terrain data, buildings and other structures that might screen or reflect noise, ground cover types and road links. Drawings of the Scheme design and groundworks were incorporated to ensure an accurate representation of the Scheme and existing roads.

For each road link in the model, data on traffic flow, speed, proportion of heavy goods vehicles (HGVs) and road surface type were obtained from the project traffic and highways engineers for inclusion into the model. The road surface type was hot rolled asphalt, with a texture depth of 1.2mm, and building heights were assumed to be 8m. Noise level calculations according to CRTN were carried out using proprietary noise modelling software. Traffic noise levels were calculated across a grid of receptor positions over the study area, and contours of noise level exposure were established. Additional calculations were also conducted at each property facade to establish noise change at each dwelling.

The traffic data used in the model were those forecasted under the Do-Something and Do-Minimum scenarios both in the Scheme baseline year (2017) and those in the future assessment year i.e. the year of maximum projected traffic flow within 15 years of opening – in this case, the future assessment year (2032). These traffic data were included in the noise model to produce the following three scenarios:

- Do-Minimum (without the Scheme) in the baseline year (2017);
- Do-Something (with the Scheme) in the baseline year (2017); and
- Do-Something (with the Scheme) in the future assessment year (2032).

The study area and HD 213/11 calculation area are defined in Section 10.2 above.

The noise prediction model was used to calculate noise levels within the noise study area, at a height of 4m above local ground, in terms of the free-field LA10,18h index in accordance with CRTN methodology, as required by HD 213/11, for each of the three scheme scenarios as listed above. Calculations were also conducted at each property facade (applying the standard +2.5dB facade reflection correction) to establish noise levels at each dwelling.

The LA10, 18h index represents the arithmetic mean of all the hourly values of LA10 during the period between the hours of 06:00 and 24:00. The CRTN

procedure is based upon empirical data with a slightly positive wind vector component blowing downwind from source to receptor. The CRTN prediction therefore assumes an adverse wind component to represent a typical worst case scenario. The additional advice given in HD 213/11 has been adopted regarding CRTN procedures. These include revisions to vehicle classification, traffic data and corrections due to road surface.

Baseline noise survey results (as detailed in Appendix D2) were used as a general means of providing indicative information to assist in the validation of the range of predicted noise climates across the study area.

As part of the procedure for a Simple Assessment, DMRB requires that the magnitude of the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the Scheme. The magnitude scale is described in more detail in Section 10.6.

Following the HD 213/11 procedures, noise difference contour maps were produced using the results from the calculations to graphically represent the noise changes within the noise study area. The required assessment of impact magnitude is presented in Appendix E3 for the following scenarios:

- Do-Something scenario in the 2017 baseline year against the Do-Minimum scenario in the 2032 baseline year; and
- Do-Something scenario in the 2032 future assessment year against Do-Minimum scenario in the 2017 baseline year.

HD 213/11 Simple assessment also requires that a night-time noise assessment is carried out. The  $L_{\text{night}}$  descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report 'Converting the UK traffic noise index  $L_{A10,18hr}$  to EU noise indices for noise mapping' (Abbott & Nelson, 2002)<sup>51</sup> was used for predicting  $L_{\text{night}}$  noise levels. Method 3 uses daily traffic flow data converting predicted daytime noise levels ( $L_{A10,18hr}$ ) to night-time noise levels.

For the night-time noise assessment, only dwellings with a noise level over  $55\text{dB}L_{\text{night, outside}}$  (free field) are considered. The assessment of impact magnitude for night-time noise follows the same method as the daytime and is required for the following scenarios:

- Do-Something scenario in the 2032 future assessment year compared with the Do-Minimum scenario in the 2017 baseline year.

HD 213/11 Simple assessment also requires that a night-time noise assessment is carried out. The  $L_{\text{night}}$  descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report 'Converting the UK traffic noise index  $L_{A10,18hr}$  to EU noise indices for noise mapping' (Abbott & Nelson, 2002)<sup>52</sup> was used for predicting  $L_{\text{night}}$  noise levels. Method 3 uses daily traffic flow data converting

<sup>51</sup> Abbott, PG & Nelson PM (2002), PR/SE/451/02, Converting the UK traffic noise index  $L_{A10,18hr}$  to EU noise indices for noise mapping, TRL

<sup>52</sup> Abbott, PG & Nelson PM (2002), PR/SE/451/02, Converting the UK traffic noise index  $L_{A10,18hr}$  to EU noise indices for noise mapping, TRL

predicted daytime noise levels ( $L_{A10,18hr}$ ) to night-time noise levels.

For the night-time noise assessment, only dwellings with a noise level over  $55dB_{L_{night,outside}}$  (free field) are considered. The assessment of impact magnitude for night-time noise follows the same method as the daytime and is required for the following scenarios:

- Do-Something scenario in the 2032 future assessment year compared with the Do-Minimum scenario in the 2017 baseline year.

HD 213/11 requires tabulated results of noise level changes, which summarise the number of dwellings and other noise sensitive receptors subject to noise changes corresponding to each magnitude of impact in both the short term (baseline year) and long term (future assessment year), for the daytime period. To evaluate the night-time effects, only the long term impacts need to be considered. In accordance with the method, these tables are completed with noise levels calculated for the facade with the least beneficial change in noise.

The results of all the assessments have been used to consider the requirement for noise mitigation. This is discussed in Section 10.10 which considers mitigation to reduce or remove significant effects evaluated for the Scheme. The resulting noise levels and residual significant effects following additional mitigation are assessed in Section 10.10.

The determination of study area is based on the HD 213/11 guidance. As previously discussed Pont Ebbw and Tredegar House junction were scoped out for further assessment at the Scoping stage. For Simple level of assessment of operational noise at the Bassaleg junction, a quantitative noise impact study is made for all noise sensitive properties within 600 m of all Scheme roads and Sections of existing roads within 2 km of the Scheme that are predicted to be subject to a change in noise level of more than 1dB(A) as a result of the Scheme on baseline year. Existing roads subject to a change of 1dB(A) or more were identified by traffic forecasts predicting, as required by HD 213/11, an increase in flow by at least 25% or decrease by 20% in the Scheme baseline year.

This assessment has also taken into consideration the NNAPPA. There are two NAPPA identified locations within the immediate study area of the proposed Scheme.

## 10.6 Assessment Criteria and Significance of Effects

### 10.6.1 Operational noise and vibration

#### Traffic noise impact evaluation

There is no established UK guidance which clearly defines criteria for the assessment of significant effects arising from road traffic noise. The response of people to noise is subjective and sensitivity to changes in traffic noise is therefore variable across the population. Given the variability of response and the potential for non-acoustic factors to influence perceptions of noise, any assessment of significance can only represent the general community response to traffic noise.

It is common practice to use the change in noise level climate brought about by a scheme as the basis for evaluating noise impacts (i.e. the impact of the Scheme on the pre-existing noise environment and the effects this may have on the receptors in that environment).

The scale or severity of any noise change, positive or negative, requires description to indicate the degree of impact. This leads to the common practice of defining noise change impact categories with an associated semantic scale.

HD 213/11 assigns magnitude of impact descriptors associated to different levels of noise change in the short and long term. These magnitude of impact descriptors are shown in Tables 10.2 (short term) and 10.3 (long term). The different scales describe the more sensitive response observed for short term changes in traffic noise as opposed to the response to steady state differences in traffic noise.

Table 10.2 Classification of magnitude of noise impact in the short term under HD 213/11

Noise Change [dB(A)]	Magnitude of Impact in the Short term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 10.3 Classification of magnitude of noise impact in the long term HD 213/11

Noise Change [dB(A)]	Magnitude of Impact in the Long term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

The research cited by HD 213/11 demonstrates that even for those most sensitive to short term change in noise, a change of less than 1dB(A) is imperceptible and hence is a negligible impact on the environment. Equally, in the long term, a change of less than 3dB(A) is imperceptible and hence is a negligible impact on the environment.

#### *Traffic noise significance criteria - general*

As discussed above, the effect of an impact on the noise environment would depend on the type of receptor subject to the impact.

Historically the assessment of significant noise effects was often based on exceeding the Noise Insulation Regulations (NIR) qualification level (i.e. 68dB LA10,18h). This is accepted as a very high level of external noise where the noise insulation provided by a closed, single-glazed window is insufficient to maintain



internal noise levels that are consistent with quiet enjoyment of a property and restorative sleep.

HD 213/11 provides the clearest guidance to date, where clause 4.2 notes that: “*In terms of permanent impacts, a change of 1 dB(A) in the short term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long term, a 3 dB(A) change is considered perceptible. Such increases in noise should be mitigated if possible.*”

Consequently, the initial indicator for mitigation will be a change of 3dB(A) or more although other criteria, as discussed later, will be used to refine the identification of significant effects and mitigation.

HD 213/11 notes that, following a change in traffic flow, perceptible changes have been reported in the short term for traffic noise changes as small as 1dB(A). This is based on research of community response to noise indicating that people can be more sensitive to the abrupt noise change soon after opening of a new or altered scheme. The guidance notes that this heightened sensitivity to noise change is a temporary effect and the longer-term noise nuisance level after a number of years reverts to the ‘steady state’ level.

Other research suggests that the reported sensitivity to small changes in noise levels (less than 3dB) may be coloured by factors other than noise (Baughan & Huddart, 1993).

As required by HD 213/11, an assessment of the short term change in noise levels comparing the Do-Minimum condition in the baseline year against the Do-Something condition, will be undertaken.

Whilst HD 213/11 does not advocate use of absolute noise levels as a means of assessing noise impact or effects on receptors, the IEMA (Institute of Environmental Management and Assessment (2014), Guidelines for Environmental Noise Impact Assessment) guidance notes that relying solely on noise change may not be always appropriate. There are two sets of circumstance that in particular warrant some further consideration:

- Already very noisy locations: Receptors may already be exposed to very high levels of noise from other sources and hence any increase in noise may be considered unsatisfactory and hence additional effort may need to be made to reduce the projected noise increase; and
- Tranquil areas: In areas formally recognised for their tranquillity because of low noise levels, small increases in noise may again be considered significant.

#### *Proposed traffic noise significance criteria for scheme*

Arup has developed significance criteria for changes in road traffic noise at sensitive receptors. These are given below in Table 10.4.

Table 10.4 Assessment of magnitude and potential significance of impact

Change in Noise Level in the Long Term (dB(A))	Initial Indicator of Significance
+5 or greater	Potentially significant increase
+3 to +4.9	
+1 to +2.9	Unlikely to be significant
+0.9 to -0.9	Not significant
-1 to -2.9	Unlikely to be significant
-3 to -4.9	Potentially significant decrease
-5 or less	

For residential receptors, the overall significance of the effect is assessed using professional judgement by considering not only the DMRB noise impact criteria to determine potential significance, but also other factors, as discussed in later in Section 10.6.3.

#### *Road traffic vibration*

HD 213/11 recommends that the effects of vibration should also be considered where appropriate. In the case of ground-borne vibration, the likelihood of perceptible vibration being caused is particularly dependent upon the smoothness of the road surface. Research has shown that vibration levels caused by heavy vehicles travelling at 110kph over a 25mm hump (i.e. a large discontinuity consistent with poorly backfilled trench) could cause perceptible vibration at up to 40m from the road (Watts, 1990). This would infer that it is unlikely that significant levels of vibration would be generated at distances greater than this. Also, with a newly laid road surface it is a requirement of new highway construction specification that the surface would be smooth and free from any discontinuities of this magnitude. Paragraph A5.26 of HD 213/11 states: '*Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment would only be necessary in exceptional circumstances*'. No such exceptional circumstances are envisaged for the Scheme and hence no impacts or effects from groundborne vibration are predicted.

The HD 213/11 covers the potential for airborne noise, from heavy goods vehicles, to cause vibration nuisance close to main roads. As an indication of the scale of impact relative to noise effects, the guidance in HD 213/11 paragraph A6.21 states that for a given level of traffic noise exposure the percentage of people bothered very much or quite a lot by airborne vibration is 10% lower than the corresponding amount for noise nuisance. It is also noted in paragraph A6.21 that airborne vibration is expected to affect a very small percentage of people at exposure levels below 58dB<sub>LA10,18h</sub>. Also, the significance of any change in airborne traffic vibration can be considered proportional to the significance of changes in traffic noise. As such, the assessment of airborne vibration can be included within the assessment of airborne noise.

The impact of vibration effects is discussed further in Section 10.7.4.

## 10.6.2 Construction noise and vibration

Construction noise and vibration is temporary and cannot be assessed in the same way as more permanent operational impacts such as traffic noise. The national guidance and policy does not propose any specific criteria for the setting of noise limits or criteria for construction works as it is recognised that this must be judged against local needs and conditions.

Noise and vibration from the construction of the Scheme has been determined using BS 5228. This Standard provides information on the prevention and control of construction noise and vibration, and includes a procedure for predicting construction noise. Calculations of noise levels at selected receivers have been based on typical source noise levels (mainly taken from BS 5228), propagation distance, and details of the intervening ground cover, topography and screening.

Construction noise predictions are based on the anticipated programme and construction methods. Nevertheless, it has been necessary to make assumptions with the advice of the Scheme engineers regarding some aspects of the construction process (refer to Appendix D4). These are considered to provide a sufficient level of accuracy for this assessment.

### Construction noise impact evaluation

Assessment of the significance of construction noise has been carried out based upon noise change as outlined in BS 5228 Part 1, for Bassaleg and Pont Ebbw junctions. The Standard provides a number of methods for the assessment of significant effects.

The ‘ABC’ assessment method described in BS 5228–1:2009+A1:2014 will be used to establish the threshold of potential significant effect for construction noise at residential receptors.

Under this approach, the adverse impact threshold is determined at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine the assessment category: A, B or C, which then defines the adverse noise impact threshold, as described in Table 10.5. The predicted construction noise level is then compared to the appropriate noise impact threshold level.

If the  $L_{Aeq}$  construction noise level exceeds the appropriate noise impact threshold level shown in Table 10.5, then an adverse impact with the potential to cause a significant effect is identified.

Table 10.5 Threshold of potential significant effect at dwellings according to ABC method in BS 5228-1:2009 + A1:2014

Assessment category and threshold value period	Threshold value, dB		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00)	55	60	65

Assessment category and threshold value period	Threshold value, dB		
	Category A	Category B	Category C
Sundays (07:00 – 23:00)			
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply in this case as a threshold for potential significant effect.

Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made using professional judgement. This is evaluated by considering various other factors described in Section 10.6.3 such as the expected duration of the activity.

For non-residential receptors significant effects would be evaluated, on a receptor by-receptor basis, using the established impact criteria (where appropriate) and professional judgement based on the factors described in Section 10.6.3.

**Construction vibration impact evaluation**

BS 5228–2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with of 0.3mm/s Peak Particle Velocity (PPV) of 0.3mm/s. The Standard also states that a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

BS 5228–2:2009+A1:2014 also provides criteria for the potential onset of cosmetic and structural damage in light-framed and industrial buildings.

The overall significance of the effect is assessed using professional judgement by considering not only the criteria above but also other factors, as discussed later in this Section.

Ground-borne vibration during the construction of the proposed carriageway may arise due to breaking out surfaces and foundations, excavation, the use of compactors or rollers. Impacts at sensitive receptors will be dependent on their proximity to the works and the intervening ground conditions.

The effects in terms of community response are expected to be governed mainly by the time of day that the works are undertaken and whether prior notice has been given. Effects in terms of cosmetic or structural damage to buildings may also be of concern where they are exposed to levels of vibration much higher than the lowest perceptible levels.

BS 5228–2:2009+A1:2014 provides a methodology for predicting typical levels of vibration from certain types of construction activities based on case study data

and empirical models. This has been used to assess the likelihood that vibration from the works may exceed the thresholds for perception and disturbance.

### 10.6.3 Determining Significance of Effects

All of the identified sources of noise and vibration have been evaluated to determine if there would be adverse impacts and the potential to cause significant effects according to the criteria described above.

If potentially significant effects are identified, the overall assessment of significance is evaluated using professional judgement based on the following factors:

#### **Residential:**

- the magnitude of the impact and effect identified (based on overall noise level and noise change);
- the number and grouping of adversely affected dwellings and shared open areas;
- the level and character of the existing noise environment;
- any unique features of the source or receiving environment in the local area;
- combined exposure to noise and vibration;
- duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

#### **Non-residential:**

- the generic use (e.g. educational, healthcare, religious buildings or community uses) and hence relevant guidance on noise;
- the times of use;
- the design of the receptor (especially windows, doors and ventilation systems) and hence ability of receptor to experience changes in external noise environment without significant change in internal noise conditions);
- the layout - whether the most sensitive parts of the building are closest to and face the proposed Scheme or are located further from the Scheme and are on the opposite side of a building;
- duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

### 10.6.4 Receptor Sensitivity

#### **Bassaleg junction:**

The closest residential properties to the junction are those immediately to the north on Churchmead, and those immediately southwest of the junction on Forge Lane. These receptors are categorised as high sensitivity with regard to noise. The relatively high noise levels of these properties close to the junction reflect the NAPPA status of this particular location.

## Pont Ebbw junction

At HD 213/11 Scoping stage it was assessed that there was a requirement for a Simple assessment in this area for construction but not for operation (Scoping Report, 21 September 2016).

The nearest residential areas to the north and east of the junction are on Park Close and St Brides Gardens. Although residential properties are categorised as high sensitivity, the properties are some distance from the junction (approximately 100m from the closest lane alterations) and therefore less likely to be affected by small changes in alignment. Further from the junction behind Park Close is St David's R.C. Primary School. From previous noise predictions in this area, the free field noise levels from the existing traffic at Park Close and St Brides Gardens are estimated to be in the range 62.5 – 65.0dB<sub>L<sub>Aeq,18h</sub></sub> for the closest properties. Also from previous noise predictions in this area, noise levels at the school, which is further from the Scheme and partially screened, are estimated to be in the range 50.0 – 52.5dB<sub>L<sub>Aeq,18h</sub></sub>.

## Tredegar Park junction

This junction was assessed at the Scoping stage and scoped out of any requirement for HD 213/11 Simple assessment.

## 10.6.5 Limitations of the Assessment

### Construction

The assessment considers construction noise and vibration on a month-by-month basis as this is a realistic level of detail for the assessment at this stage. Noise levels would vary day-to-day; the highest daily levels may sometimes be around 5dB higher than the monthly average levels but would then be substantially lower on other days in that month. Noise and vibration from all construction activities, including short duration activities, is subject to control under the CEMP, Appendix G. and hence minimisation of noise as far as practicable as agreed with the relevant local authority by consent under the *Control of Pollution Act 1974* before the works can commence on site.

### Operation

The effects of noise and vibration from the operation of the Scheme have been assessed based on traffic modelling (detailed results are presented in Appendix D6 and in Sections 10.7 and 10.8). Other developments may affect the predicted traffic using the Scheme and these have, as far as possible, been included within the Scheme on the basis of assumed dates for committed developments to be operational. It is likely that the changes in impact associated with any variability in programme for committed developments would be negligible in terms of predicted traffic noise levels.

There would be regular planned maintenance work along the route. Given the infrequent, irregular and short duration of works likely to cause appreciable noise or vibration, maintenance work is considered unlikely to give rise to significant noise or vibration effects. It is noted in Section 10.6.1 that the response of people to noise is subjective and sensitivity to changes in traffic noise is therefore variable across the population. However, the methodology with HD 213/11 is acknowledged as the appropriate assessment procedure to represent the typical

response to traffic noise.

## 10.7 Potential Environmental Impacts

### 10.7.1 Construction Noise Before Mitigation

For the purposes of assessment, the site preparation and construction works have been divided into the following generic stages for Scheme works, which each represent distinct activities in terms of noise impact (Appendix E4) describes the plant machinery assumed for the assessment):

Stage 1. Site clearance (approx. 2 months)

Stage 2. Earthworks (approx. 4 months)

Stage 3. Surfacing (approx. 4 months)

For each stage of works, the noise levels have been predicted based on the relevant construction plant and processes operating at the appropriate distances from the nearest receptors.

In relation to noise and vibration, it has been assumed that Standard construction management measures (Best Practicable Means – BPM) would be implemented as part of the construction works. In particular, the contractor would be required to operate in accordance with the provisions of an appropriate Construction Environmental management Plan (CEMP) for the works for agreement with the local authority<sup>53</sup>. This is a ‘good practice guide’ which includes measures which would be adopted to minimise the likelihood of significant disturbance to neighbouring properties. The construction noise assessment has been based on such Best Practicable Means assumptions.

The results of the assessment of construction noise at Bassaleg and Pont Ebbw junctions are presented in Tables 10.6 and 10.7. The tables show the predicted typical monthly construction noise levels for each of the construction stages described above.

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<sup>53</sup> Newport City Council provide some information on construction noise control on their website <http://www.newport.gov.uk/en/Transport-Streets/Pollution-and-noise-control/Construction-site-noise.aspx>

Table 10.6 Phases of construction and predicted noise levels at residential locations.

Location	Baseline			Construction noise assessment		
	Ambient noise level *, dBL <sub>Aeq,daytime</sub>	ABC method category (BS 5228)	ABC threshold, dBL <sub>Aeq,daytime</sub>	Construction stage	Typical monthly predicted construction noise level*, dBL <sub>Aeq,daytime</sub>	Level above ABC threshold dB
Bassaleg Junc. Nearest residential property on Churchmead	68	C	75	1	76	1
				2	78	3
				3	75	0
Bassaleg Junc. Nearest residential property on Forge Lane	66	B	70	1	71	1
				2	75	5
				3	71	1
Pont Ebbw Junc. Nearest residential property on Park Close	66	B	70	1	66	-4
				2	70	0
				3	66	-4

\* Noise level includes correction for façade acoustic reflection (i.e. noise level at 1m from façade)

For the residential receptors shown in Table 10.4, the BS 5228 ABC threshold for potential significant effects is exceeded for the closest residences around the Bassaleg junction. Given the number of properties affected and the duration of the exceedances (potentially over several months), this is assessed as a temporary significant effect.

The closest residential properties to Pont Ebbw junction would not be exposed to noise levels which exceed the relevant ABC threshold and hence the noise effect is assessed as not significant.

The results for non-residential receptors are shown in Table 10.7.

Table 10.7 Phases of construction and predicted noise levels at non-residential locations

Location	Ambient noise level*, dBL <sub>Aeq, daytime</sub>	Typical monthly predicted construction noise level*, dBL <sub>Aeq,daytime</sub>		Worst-case excess of typical monthly construction noise above ambient, dBL <sub>Aeq</sub>
		Construction stage	dBL <sub>Aeq</sub>	
Pont Ebbw Junc. St David's R.C. Primary School	53	1	56	7
		2	60	
		3	56	

\* Noise level includes correction for façade acoustic reflection (i.e. noise level at 1m from façade)

For the non-residential receptors, the most sensitive location is St David's School. The existing ambient noise levels are estimated to exceed the guideline external



noise levels for existing schools given in the BB93<sup>54</sup> acoustics guidance. This recommends an internal noise level of no more than 35dB<sub>L<sub>Aeq</sub></sub> for teaching spaces, which would be associated with an external façade noise level of 50dB<sub>L<sub>Aeq</sub></sub> with an open window. The predicted noise level during stage 2 of the construction (earthworks) is 60dB<sub>L<sub>Aeq</sub></sub>. This is assessed as a temporary significant effect. Mitigation measures are considered in Section 10.9.

Night-time construction would be avoided for the majority of the proposed works, however, night-time working may be required for specific activities. An example of a specific activity would be tie-in works, i.e. joining existing to new road, where night-time working is likely to be required for road traffic management reasons to avoid daytime road closures. Such works are considered exceptional and would likely only occur for one or two contiguous nights at intervals throughout the works. Any such night-time works would not be considered a significant effect due to their short term impacts. Any noise effects arising from these short term construction activities would be controlled by the management processes set out in the CEMP (Appendix F1) and as described above. If any such short term works were required, surrounding residents would be informed of the necessity for the works, the times of operation and the measures put in place to minimise any disruption.

### 10.7.2 Construction Vibration Before Mitigation

Based on the types of process assumed for this assessment, there are no very vibration-intensive activities (e.g. piling or heavy vibratory plant) in close proximity to sensitive receptors. As noted in Section 10.3 a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents (BS 5228: Part 2). It is not expected that excessive levels of vibration above this level will be generated for any sustained period from the construction works. Construction vibration effects are assessed as not significant.

### 10.7.3 Operational Effects Before Mitigation

As previously described, the EIA Scoping conducted for the Scheme identified that only Bassaleg Junction should be taken forward for a DMRB Simple Assessment.

The noise effects associated with changes in lane alignment geometries (or new traffic lanes) are considered below. This Section is concerned with the assessment of changes to the existing noise climate as a direct result of the Scheme without mitigation. This assessment has been carried out in accordance with the DMRB assessment procedure and includes:

- an assessment of the daytime and night-time noise impacts and effects of the Scheme with respect to changes to the existing noise climate;
- results of the Noise Insulation Regulations (NIR) assessment.

## Noise Assessment

Daytime and night-time traffic noise levels within the Scheme study area have

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<sup>54</sup> DEPARTMENT FOR EDUCATION, EDUCATION FUNDING AGENCY (2014), Acoustic design of schools: performance standards, Building Bulletin 93

been predicted in accordance with the methodology set out in Section 10.5.2. Noise level predictions have been made for Do-Something and Do-Minimum scenarios in both the baseline year (2017) and future year (2032).

Appendix E6 gives the noise levels predicted at dwellings closest to the Scheme within the calculation area for all scenarios.

The following Appendix E3 figures show predicted daytime traffic noise levels represented in noise level contour maps:

- Figure E3.1: Do-Something scenario in the 2017 baseline year against the Do-Minimum scenario in the 2017 baseline year (short term); and
- Figure E3.2: Do-Something scenario in the 2032 future assessment year against Do-Minimum scenario in the 2017 baseline year (long term).

The following Appendix E3 figure shows predicted night-time traffic noise levels (free field) represented in noise level contour maps:

- Figure E3.3: Do-Something scenario in the 2032 future assessment year compared with the Do-Minimum scenario in the 2017 baseline year.

The following assessment considers noise impacts effects for both daytime and night-time periods in accordance with DMRB (2011) procedure.

The assessment of the magnitude of daytime noise change impact has been made based on changes in the noise climate between baseline year without the Scheme (2017) and the baseline year (2017) with Scheme, and baseline year without the Scheme (2017) and worst case future assessment year (2032) with the Scheme.

The assessment of the magnitude of night-time noise change impact has been made based on changes in the noise climate between baseline year without the Scheme (2017) and the future assessment year (2032) with the Scheme.

Subsequently an assessment of the effects for both daytime and night-time has been made. This describes whether the noise effects in an area affected by the Scheme are rated as significant or not based on the criteria described in Section 10.6.3. As noted in Section 10.6.1 the proportion of people bothered by airborne vibration is 10% lower than for noise, hence the noise assessments described below can also be taken to represent the effects of airborne vibration.

## Daytime Assessment

Based on the noise modelling results Table 10.8 and Table 10.9 give a summary of noise level changes at dwellings and other sensitive receptors in the short and long term across the entire calculation area. The noise change bands shown in each table correspond to the DMRB classification of magnitude of impact at each receptor shown in Table 10.2 and Table 10.3.

In general, it can be seen that there are more negligible noise increases in the long term and fewer in the short term. In the short term there would be more beneficial impacts including three minor beneficial impacts than in the long term. This is due to the increase in traffic flows in the future year.

All 'other' sensitive receptors (i.e. terminology in DMRB to refer to non-residential) have negligible or 'no change' impacts in the short and long term.

Table 10.8 Short term traffic noise reporting table (HD 213/11 Table A1.1)

<b>Project/Option: M4 junction 28 Bassaleg</b>				
<b>Scenario/Comparison: Do-Something unmitigated 2032 compared to Do-Minimum 2017</b>				
<b>Change in noise Level</b>		<b>DMRB Impact category (short term)</b>	<b>Daytime</b>	
			<b>Number of Dwellings</b>	<b>Number of 'other' sensitive receptors</b>
Increase in noise level, $L_{A10,18h}$	0.1 - 0.9	Negligible	591	5
	1 - 2.9	Minor adverse	0	0
	3 - 4.9	Moderate adverse	0	0
	5 +	Major adverse	0	0
No Change	0	No Change	238	3
Decrease in noise level, $L_{A10,18h}$	0.1 - 0.9	Negligible	116	0
	1 - 2.9	Minor beneficial	3	0
	3 - 4.9	Moderate beneficial	0	0
	5 +	Major beneficial	0	0

Table 10.9 Long term traffic noise reporting table (HD 213/11 Table A1.2)

<b>Project/Option: M4 junction 28 Bassaleg</b>					
<b>Scenario/Comparison: Do-Something unmitigated 2032 compared to Do-Minimum 2017</b>					
<b>Change in noise Level</b>		<b>DMRB Impact category (long term)</b>	<b>Daytime</b>		<b>Night-time Number of Dwellings</b>
			<b>Number of Dwellings</b>	<b>Number of 'other' sensitive receptors</b>	
Increase in noise level, $L_{A10,18h}$	0.1 - 2.9	Negligible	797	5	82
	3 - 4.9	Minor adverse	0	0	0
	5 - 9.9	Moderate adverse	0	0	0
	10 +	Major adverse	0	0	0
No Change	0	No Change	131	3	12
Decrease in noise level, $L_{A10,18h}$	0.1 - 2.9	Negligible	20	0	3
	3 - 4.9	Minor beneficial	0	0	0
	5 - 9.9	Moderate beneficial	0	0	0
	10 +	Major beneficial	0	0	0

Daytime noise level difference maps, Appendix E3, Figures E3.1 and E3.2, show the changes in the noise climates between the Do-Something scenarios for years 2017 and 2032 and Do-Minimum scenario 2017. Using the information from these figures, the following is a detailed assessment identifying specific noise impacts and effects. The assessment is divided into the same geographic areas as described for the baseline conditions.

### **Forge Lane – South of Bassaleg Junction**

The noise level difference map (Appendix E3 Figure E3.1) shows that noise sensitive dwellings along the length of Forge Lane, would be subject to a noise level increase of less than 1dB during the baseline year. Similarly, by the future assessment year this specific area will also realise a less than 1dB increase in noise level (Appendix E3 Figure E3.2). This is rated as a negligible impact and assessed as a not significant effect.

There are two potential Noise Insulation Regulations qualifiers within this reporting area (No.13 and 14 Forge Lane). These properties lie immediately to the south of the existing earth bunding along the northbound carriageway of the A467 (Forge Road). The predicted noise increases, and the resultant contribution from the altered highway, results in these properties meeting the conditions laid down in the Noise Insulation Regulations (NIR). Section 10.8.2 below describes possible mitigation measures which would remove these properties from NIR qualification, as well as providing beneficial noise reductions to other nearby dwellings.

It should be noted that those properties to the immediate south of Forge Lane i.e. No.27 to 31 Forge Lane, lie within an existing NAPP zone. Whilst the noise levels in this area are high, the noise level increase due to the long term scheme effects would result in an increase of less than 1dB, and therefore well below the +3dB change band in the future assessment year. As a result, this is rated as a negligible impact and assessed as a not significant effect. They would not qualify for NIR as they are situated over 300m from any altered highway connected to this scheme, and below the required 1dB contribution required from new and altered roads, as stipulated in the regulations.

### **Bassaleg Junction – Churchmead**

Dwellings within Churchmead, immediately north of Bassaleg Junction, would be subject to noise changes. Specifically, those dwellings which lie close to the A467 northbound carriageway, would be subject to a noise level increase of less than 1dB during the baseline year. The noise level increase would be well below 3dB in the future assessment year. This is rated as a negligible impact and assessed as a not significant effect.

Those dwellings which lie closest to Forge Road/Caerphilly Road, would be subject to a noise level decrease of up to 3dB during the baseline year. The noise reduction would diminish in the 2032 future assessment year, but would be classified as falling within the noise decrease change band of less than 3dB. Dwellings slightly further away from this road would see a noise level decrease of up to 1dB in the 2017 baseline year, and substantially less than 3dB increase in the future assessment year.

The main reason for the noise reduction is due to the re-configuration of the Caerphilly on-slip from Bassaleg roundabout, which results in a significant

proportion of the traffic being moved further away from these dwellings. This is rated as a negligible impact and assessed as a not significant effect.

There are no potential NIR qualifiers identified within this reporting area.

### **Bassaleg – Forge Road/Caerphilly Road**

The noise level difference map (Appendix E3 Figure E3.1) shows that noise sensitive dwellings facing directly onto Caerphilly Road, would be subject to a noise level decrease below 1dB during the baseline year, due to a slight reduction in traffic flow. In the future assessment year (Appendix E3, Figure E3.2) the predicted noise level decrease would be slightly less than 1dB, but would fall under the -3dB change band, compared to the existing baseline (DM 2017). This is rated as a negligible impact and assessed as a not significant effect. There are no NIR qualifiers identified within this area of Bassaleg.

Bassaleg School, situated approximately 160m to the west of Bassaleg Junction, will be subject to noise increases well below 3dB in the future assessment year. As this change is not considered perceptible in the long term, effects are considered to be not significant.

### **Forge Mews**

Those properties lying close to the A467 to the north of Bassaleg Junction (specifically at Forge Mews along the northbound carriageway, and Park View Gardens close to the southbound carriageway), would be subject to noise level increases below 1dB in the baseline year (Appendix E3, Figure E3.1), and well below 3dB in the future assessment year (Appendix E3, Figure E3.2).

It should be noted that those properties closest to the A467 fall within an existing NAPP zone. Whilst the noise levels in this area are high, the noise level increase for this area, whilst within the 3dB band for long term impact, will be below 1dB in the future assessment year (2032). This is rated as a negligible impact and assessed as a not significant effect.

There are no NIR qualifiers identified within this area.

### **Park View/Bassaleg Road**

Dwellings situated directly facing Park View would be subject to a noise level decrease of less than 1dB in the baseline year (Appendix E3, Figure E3.1), with a slightly smaller reduction in the future assessment year (Appendix E3, Figure E3.2). Dwellings set further back, within Park View Gardens, would be subject to noise level increases below 1dB in the baseline year, and well below 3dB in the future assessment year. Dwellings fronting onto Bassaleg Road would be subject to a noise level decrease below 1dB in the baseline year and although there would be a slight increase in the future assessment year this would be below 3dB. Dwellings further to the east and north of Bassaleg Road would be subject to a noise level decrease below 1dB in the baseline year and a slight increase but below 3dB in the future assessment year (2032). These noise level changes indicate negligible noise impact, and is therefore rated as a not significant effect.

It should be noted that those dwellings in Park View Gardens closest to the A467, fall within an existing NAPP zone. Whilst the noise levels in this area are high, the actual noise level increase due to the scheme would result in an increase just below 1dB in the future assessment year (2032). This is rated as a negligible

impact and assessed as a not significant effect.

There are no NIR qualifiers identified within this area.

### **Pye Corner**

Dwellings situated close to the A467 around Pye Corner, would be subject to a noise level increase of below 1dB in the baseline year (Appendix E3, Figure E3.1), and below 3dB in the future assessment year (Appendix E3, Figure E3.2). These noise level changes indicate negligible noise impact, and is therefore rated as not significant.

It should be noted that those properties closest to the A467 lie within an existing NAPPA zone. Whilst the noise levels in this area are high, the actual noise level increase due to the scheme would result in an increase just below 1dB in the future assessment year (2032). This is rated as a negligible impact and assessed as a not significant effect.

There are no NIR qualifiers identified within this area.

### **Assessment of Affected Routes further from the Calculation Area**

There are no affected links that would require assessment beyond 1km from any existing routes that are being bypassed or improved, and any proposed new routes (as specified in A1.11(ii) of HD 213/11). This has been assessed by examining the traffic changes on these sections of road, none of which would be associated with a change in noise level of more than 1dB in the short term, or 3dB in the long term. Consequently noise impacts within this area are considered to be negligible and changes in noise level are assessed as not significant.

### **Night-time Assessment**

DMRB HD 213/11 requires an assessment of the long term noise impacts. The long term change, Do-Something 2032 compared to Do Minimum 2017, is presented in Appendix E3, Figure C3.3. It is known that the A467 is not part of the Wales Trunk Road Network, and therefore would not be subject to a significant increase in percentage HGV traffic during night-time periods. Although the Scheme is designed to ease congestion and enable more free flowing traffic at peak times, it is not expected that there will be a significant change in the nature and composition of the traffic. It is therefore predicted that the composition of traffic within the Scheme study area would be very similar to the forecast daytime flow data. As such, it is expected that the proportion of daytime to night-time traffic flows will remain largely unchanged from the current levels as a result of the Scheme. Consequently, it is not considered that night time noise will contribute to any further significant effects than those stated in the previous sections. The noise change contours in Figure C3.3 are the same as those for the equivalent daytime scenario (Figure C3.2). This is because the 'TRL Method 3' conversion described in Section 10.5.2 uses daily traffic flow data converting predicted daytime noise levels (LA10,18hr) to night-time noise levels. Hence the change in noise level is the same as for the equivalent daytime scenario (although the absolute noise levels are different).

### **Cumulative**

The following developments have been considered in the potential operational effects assessment as described above in the assessment:

- M4 corridor around Newport;
- Former Golf Course at Tredegar Park; and
- Jubilee Park

Predicted changes in traffic flows due to these developments have been included in the noise predictions. Given the proximity of the study area to the dominating noise from the Scheme, the potential for cumulative noise from distant developments identified above is small. Therefore the assessment is considered to include all associated cumulative effects.

### 10.7.4 Vibration Assessment

No ground-borne vibration impacts are forecast. This is because, in accordance with highway construction standards, the surface of the proposed upgraded roads would be smooth with no surface irregularities of sufficient size to generate significant levels of ground-borne vibration. It is a standard requirement under the specification for new highways that the new road surfaces would be free of significant discontinuities. The size of irregularities necessary to cause perceptible ground-borne vibration is only expected in 'exceptional circumstances' as discussed in Section 10.5.4. It is not considered that any such exceptional circumstances would arise during operation of the Scheme.

## 10.8 Mitigation and Monitoring

### 10.8.1 Construction Mitigation

Best Practicable Means mitigation is assumed to control construction noise in the form of low noise emission plant and processes and noise monitoring (as specified in Annex B of BS 5228). However, based upon the construction noise assumptions, the assessment has shown that there is potential for temporary significant noise effects around the Bassaleg junction. These effects were assessed at the closest properties at Churchmead to the north, and Forge Lane to the southwest of the junction. These are conservative assumptions (i.e. worst-case) for the purpose of this assessment.

If these noise level predictions are confirmed when a more detailed construction methodology is developed, then localised acoustic screening at the construction area boundary would reduce noise levels to those closest properties to remove significant noise effects. Alternatively, other methodologies might be proposed by the contractor to minimise noise impacts, perhaps using lighter equipment or less intensive working. However, until the practicability of such measures can be confirmed with the contractor, the assessment of temporary significant effects remains. No significant effects were indicated at the closest properties to Pont Ebbw junction (Park Close), hence no additional mitigation is indicated here.

Temporary significant noise effects were assessed at St David's R.C. Primary School near Pont Ebbw Junction. Again, if the more detailed construction methodology confirms these noise levels, measures to avoid the significant noise effects would be put in place. This would take the form of acoustic screening or appropriate ventilation arrangements to allow the windows at the school to be

closed to control noise ingress during the periods of highest noise levels. Alternatively, the working hours, at least for noisier activities, might be adjusted around the more critical times in the school day to minimise noise impacts to lesson periods in particular. Depending on when the works would be carried out, there may be scope to time the noisier works during school holidays. These potential solutions would need to be reviewed by the contractor. Provided one of the above measures can be agreed between the contractor and the local authority, then residual effects are assessed as not significant.

Further information is provided in the CEMP at Appendix G.

### 10.8.2 Operational Mitigation

No significant operational effects were indicated from the assessment based upon the noise change impacts, however, two potential Noise Insulation Regulations (NIR) qualifiers have been identified therefore additional mitigation is considered.

The predicted noise level at two dwellings within Forge Lane, identified as potential NIR qualifiers, would be reduced sufficiently to remove the properties from potential NIR qualification with the inclusion of a 50m long section of 2.5m high noise barrier positioned near the Scheme in front No. 13 and 14 Forge Lane. It is anticipated that the barrier would merge with the existing earthbund and extend south, parallel to the road. The barrier location is indicated in Appendix E7. The required attenuation specification of the barrier would be determined at the detailed design stage and would specify the noise insulation performance for a highway barrier according to the standard categories given in BS EN 1793 Part 1<sup>55</sup>.

### 10.9 Assessment of Construction Effects - With Mitigation

Based upon the construction noise assumptions, the assessment has shown that there is potential for temporary significant noise effects around the Bassaleg junction. These effects were assessed at the closest properties at Churchmead to the north, and Forge Lane to the southwest of the junction. These are conservative assumptions (i.e. worst-case) for the purpose of this assessment. Practicable mitigation options would be explored with the contractor. Residual temporary significant effects are assessed at this location.

No significant effects were indicated at the closest properties to Pont Ebbw junction (Park Close), hence no additional mitigation is indicated here.

### 10.10 Assessment of Operational Effects - With Mitigation

Based on the noise modelling results, Table 10.10 and Table 10.11 give a summary of noise level changes at dwellings and other sensitive receptors in the short and long term across the calculation area including the mitigation measures.

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<sup>55</sup> BRITISH STANDARD EN 1793-2:2012. Road traffic noise reducing devices. Test method for determining the acoustic performance. Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions



The noise change bands shown in each table correspond to the DMRB classification of magnitude of impact at each receptor shown in Table 10.10 and Table 10.11

In general, it can be seen that the changes in noise levels with the mitigated Scheme are very slight, which due to the limited mitigation measures is proposed in one small area of the Scheme. Relative to the unmitigated situations (Table 10.8 and Table 10.9), in the short term there would be more beneficial impacts including an additional six minor beneficial impacts in the short term due to the proposed mitigation. In the long term there would be an additional seven dwellings subject to negligible noise decreases when compared to the unmitigated scheme. All 'other' sensitive receptors (i.e. terminology in DMRB to refer to non-residential) have either negligible or 'no change' impacts in the short and long term

Table 10.10 Short term traffic noise reporting table (DMRB Table A1.1)

<b>Project/Option: M4 junction 28 Bassaleg</b>				
<b>Scenario/Comparison: Do-Something mitigated 2017 compared to Do-Minimum 2017</b>				
<b>Change in noise Level</b>		<b>DMRB Impact category (short term)</b>	<b>Daytime</b>	
			<b>Number of Dwellings</b>	<b>Number of 'other' sensitive receptors</b>
Increase in noise level, $L_{A10,18h}$	0.1 - 0.9	Negligible	582	5
	1 - 2.9	Minor adverse	0	0
	3 - 4.9	Moderate adverse	0	0
	5 +	Major adverse	0	0
No Change	0	No Change	238	3
Decrease in noise level, $L_{A10,18h}$	0.1 - 0.9	Negligible	119	0
	1 - 2.9	Minor beneficial	9	0
	3 - 4.9	Moderate beneficial	0	0
	5 +	Major beneficial	0	0

Table 10.11 Long term traffic noise reporting table (DMRB Table A1.2)

<b>Project/Option: M4 junction 28 Bassaleg</b>					
<b>Scenario/Comparison: Do-Something mitigated 2032 compared to Do-Minimum 2017</b>					
<b>Change in noise Level</b>		<b>DMRB Impact category (long term)</b>	<b>Daytime</b>		<b>Night-time Number of Dwellings</b>
			<b>Number of Dwellings</b>	<b>Number of 'other' sensitive receptors</b>	
Increase in noise level, $L_{A10,18h}$	0.1 - 2.9	Negligible	790	5	82
	3 - 4.9	Minor adverse	0	0	0
	5 - 9.9	Moderate adverse	0	0	0
	10 +	Major adverse	0	0	0

<b>Project/Option: M4 junction 28 Bassaleg</b>					
<b>Scenario/Comparison: Do-Something mitigated 2032 compared to Do-Minimum 2017</b>					
<b>Change in noise Level</b>		<b>DMRB Impact category (long term)</b>	<b>Daytime</b>		<b>Night-time Number of Dwellings</b>
			<b>Number of Dwellings</b>	<b>Number of 'other' sensitive receptors</b>	
No Change	0	No Change	131	3	12
Decrease in noise level, L <sub>A10,18h</sub>	0.1 - 2.9	Negligible	27	0	3
	3 - 4.9	Minor beneficial	0	0	0
	5 - 9.9	Moderate beneficial	0	0	0
	10 +	Major beneficial	0	0	0

The two dwellings on Forge Lane, would be removed from potential NIR qualification with the inclusion of a 50m long section of 2.5m high noise barrier, as described in Section 10.8.2.

## 10.11 Summary of Effects

This chapter has described the standard methodologies applied to assess the noise and vibration effects associated with the Scheme according to the guidance given in DMRB noise assessment method HD 213/11. Significance criteria have been established for construction and operational noise and the noise effects quantified across the study area. An operational noise mitigation design to screen dwellings from the Scheme has been proposed.

Despite Best Practicable Means, construction noise levels may not be fully mitigated at some locations. Consequently, construction activities may still exceed BS5228 noise level criteria as shown in Table 10.6. These are rated as temporary residual effects.

No significant operational effects were indicated from the assessment, however, two potential Noise Insulation Regulations (NIR) qualifiers were identified. With inclusion of additional mitigation, in the form of a 50m long 2.5m high noise barrier, the two properties would be removed from potential NIR qualification.

As no significant effects have been determined from this assessment, it is not recommended that a further, 'Detailed Assessment' (as described in HD 213/11) is carried out.

## 11 Road Drainage and the Water Environment

This chapter describes and characterises the existing surface water and ground water bodies on site and in the surrounding area. An assessment has been made of the potential for the Scheme to affect these water bodies during the construction and operational phases of the Scheme.

A qualitative approach has been taken for the assessment of effects to the water environment, which has been adapted from the methodology set out under DMRB Volume 11 Section 3, Part 10, HD 45/09, Road Drainage and the Water Environment<sup>56</sup> (HD 45.09). The adaptations from the DMRB methodology and their reasoning are discussed in detail in the Methodology (Section 11.4).

The assessment has considered effects associated with surface and groundwater bodies, and flood risk during construction and operation of the proposed scheme. This assessment considers impacts of the Scheme on the Water Framework Directive (WFD) status of the baseline water environment for the River Ebbw and the underlying groundwater. The scheme does not include any works within the watercourses and therefore assessment of geomorphology impacts have not been considered. The assessment presented within Section 11.7 has demonstrated that the Scheme will have negligible effects on the water environment and WFD classifications, therefore a detailed WFD assessment has not been considered necessary. This approach has been confirmed with NRW.

This chapter is structured by setting out:

- A description of the current water environment baseline;
- The legislative and policy context;
- The methodology used to assess the baseline condition of the water environment;
- The methodology for the assessment of impacts;
- An assessment of the potential direct and indirect impacts of construction and operation of the Scheme on the water bodies;
- Mitigation measures to reduce any adverse impacts and a description of residual effects.

A standalone Flood Risk Statement has been prepared for the Scheme and should be read in conjunction with this chapter (See Appendix F2).

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<sup>56</sup> Design Manual For Roads And Bridges – HD 45/09 Volume 11, Section 3, Part 10 – November 2009

## 11.1 Study Area

The study area used for the collection of data to define baseline conditions extends to land within 1km of the Scheme and includes all watercourses crossed or receiving discharge from highway runoff from the Scheme.

No pollution incidents have been recorded and no NRW licenced discharges to surface waters have been identified, within the study area.

## 11.2 Baseline Description and Receptors

The baseline conditions identifies the current surface and ground water features, and their attributes in terms of Water Framework Directive (WFD) classification, water quality, surface water drainage, surface water vulnerability and local flood risk. Groundwater baseline information is also presented in terms of water quality and groundwater vulnerability.

### 11.2.1 Surface Water

The River Ebbw is located approximately 150m to the north east of the Bassaleg junction, 400m to the north east of J28 and 50m to the east of the Pont Ebbw junction. Its catchment area upstream of the Scheme is approximately 220 km<sup>2</sup>, with a mean gauged flow of 7.426 m<sup>3</sup>s<sup>-1</sup>, measured at the Rhiwderin gauging station, approximately 5km upstream of the Scheme<sup>57</sup>. It flows south east from the Scheme area in an open channel before entering the River Usk and ultimately draining into the Severn Estuary.

Within the study area shown on Figure 1, Appendix F1, the River Ebbw flows through urban areas interspersed with some open areas and farmland. Nearer to its confluence with the River Usk, the River Ebbw flows adjacent to Newport Docks and the Newport Docks landfill site.

A docks feeder watercourse (see Appendix F1) is located immediately north of J28, crossing beneath the M4 (and the slip roads) via a culvert, before flowing eastwards in an open watercourse along the northern edge of the A48 Cardiff Road and eventually joining the River Ebbw. The docks feeder bifurcates at J28 and crosses in a culvert beneath the A48 Cardiff Road to supply Tredegar House Lake.

Tredegar House estate contains two lakes located approximately 300m to the south and south east of J28. The larger lake to the south east is supplied by the bifurcated docks feeder and a second small open watercourse, with an estimated catchment area of < 1km<sup>2</sup>, that flows from the north west, beneath the M4 and J28, into the lake (see Appendix F1). The outfall from the lake is located at the southern end and enters Tredegar Reen an open channel which connects to the River Ebbw and Gwent Levels ree system.

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<sup>57</sup> National River Flow Archive. 56002 – Ebbw at Rhiwderin. Accessed at <http://nrfa.ceh.ac.uk/data/station/meanflow/56002> on 29<sup>th</sup> November 2016.

## 11.2.2 Groundwater

The Scheme site is located over a Secondary A Bedrock Aquifer and superficial geology deposits of a Secondary A Superficial Deposits Aquifer. These are described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The underlying geology for this groundwater body is the South East Valleys Southern Devonian Old Red Sandstone and Triassic Mercia Mudstone.

The groundwater is found within the alluvium deposits and is typically 1m below ground level. The site is not located within a Groundwater Source Protection Zone, there are no local abstractions of groundwater identified within the study area. This site is classified as a Minor Aquifer High in the Groundwater Vulnerability Zone classification system.

Preliminary ground investigations beneath the three junctions have shown that the alluvium has low infiltration potential. The ground investigations have identified some hydrocarbon contaminants by the Bassaleg junction. In order to reduce any risks to underlying groundwater, the ground investigation report<sup>58</sup> recommends that the hydrocarbon impacted material in the locale of Bassaleg is excavated and removed from site. Contamination was not identified within the other areas or the site, however localised areas of unexpected contamination may be encountered during the construction works.

## 11.2.3 WFD Water Body Classifications

The Scheme is located within the Severn River Basin District and falls within the Severn River Basin Management Plan<sup>59</sup>. The scheme areas of Bassaleg and Pont Ebbw are located in the 'Ebbw R - conf Ebbw Fach R to Maes-glas' WFD river water body. Downstream water bodies include the 'Usk' transitional water body and the 'Severn Lower' transitional water body. The Scheme also overlies the 'SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone' WFD groundwater body.

Table 11.1 WFD water bodies hydrologically connected to the Scheme

Name	Type	ID	Overall Status
<b>Ebbw R - conf Ebbw Fach R to Maes-glas</b>	<b>River</b>	<b>GB109056026910</b>	<b>Moderate</b>
<b>Usk</b>	<b>Transitional</b>	<b>GB530905415404</b>	<b>Moderate</b>
<b>Severn Lower</b>	<b>Transitional</b>	<b>GB530905415401</b>	<b>Moderate</b>
SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone	<b>Groundwater</b>	GB40902G201500	Good

<sup>58</sup> M4J28-ARP-HGT-SWG-RP-CG-0000002 – PO3

<sup>59</sup> Environment Agency / Natural Resources Wales. Severn River Basin Management Plan 2015.

The 'Ebbw R - conf Ebbw Fach R to Maes-glas' is classified as a Heavily Modified water body and has an overall status of Moderate, ecological potential of Moderate and chemical status of Fail, with objectives to achieve Good Ecological Potential by 2021. Reasons for the water body not achieving Good status are:

- Physical modifications related to urbanisation and flood protection;
- Modifications to the hydrological regime, the driver for which is still under investigation; and
- Tributyltin Compounds of unknown origin.

The 'Usk' WFD transitional water body is downstream of the 'Ebbw R - conf Ebbw Fach R to Maes-glas' water body and has an overall status of Moderate, ecological potential of Moderate and chemical status of Good, with an objective to achieve Good Overall Status by 2021. It is a Heavily Modified water body and is currently failing to achieve Good status due to physical modification for flood protection and invertebrates.

The 'Severn Lower' WFD transitional water body is downstream of the 'Usk' transitional water body and has an overall status of Moderate, ecological potential of Moderate and chemical status of Fail, with an objective to achieve Good Overall Status by 2021. It is a Heavily Modified Water Body and is currently failing to achieve Good Status due to physical modification for flood protection, angiosperms, brominated diphenylether (BDPE) and mercury (and its compounds).

The 'SE Valleys Southern Devonian Old Red Sandstone & Triassic Mercia Mudstone' groundwater body has an overall status of Good, quantitative status of Good and chemical status of Good, therefore achieving its objectives under the WFD as of 2015.

## 11.2.4 Flood Risk

M4 J28 and Bassaleg roundabouts to the north are both located within flooding Zone A, which are areas considered to be at little or no risk of fluvial or tidal/coastal flooding<sup>60</sup>.

Pont Ebbw roundabout is located within Flooding Zone C1 and C2. These are considered to be areas of the floodplain which are developed and serve significant infrastructure, including flood defences, and areas of the floodplain without significant flood defence infrastructure respectively. On NRW's flood risk map, areas of Pont Ebbw roundabout are designated as either at High or Medium risk of flooding. High risk indicates a risk of flooding greater than 1 in 30, whilst Medium risk indicates a risk of flooding of between 1 in 100 and 1 in 30. A Flood Risk Statement has been prepared, which includes maps of the roundabouts in relation to the flood risk zones (Appendix F2; Figures 4-9). NRW has been consulted and has approved the outcomes of the Statement.

Historical drawings show that runoff from the existing highway at J28 discharges to two surface water features, both of which supply water to the Tredegar House pond:

- the dock feeder on the north side of the existing roundabout (southern boundary of Tredegar Park) and/or;
- an unnamed watercourse that runs from Craig-y-Saeson farm to the Tredegar House land (culverted beneath highway).

At Pont Ebbw the existing road runoff outfalls to the River Ebbw via a petrol interceptor. It is proposed to replace the existing petrol interceptor and maintain the outfall in the River Ebbw.

The drainage arrangement at Bassaleg roundabout discharges via two existing outfalls which will be retained as part of the scheme. The first outfall has no pollution prevention measures and flows into a culverted minor watercourse that subsequently discharges into the River Ebbw (near to the A467 river bridge). The second outfall discharges directly into the River Ebbw at the Park View Bridge.

## 11.3 Regulatory and Policy Framework

### 11.3.1 European Legislation

#### **Water Framework Directive (WFD) 2000/60/EC**

Water Framework Directive (WFD) 2000/60/EC provides a framework for integrated management of inland surface waters and groundwater, to achieve long term protection of water bodies. It is the largest and most influential piece of European Union (EU) legislation relating to the water environment. The Directive requires all inland, estuarine and coastal waters to reach good status by 2015. It

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<sup>60</sup> Natural Resources Wales. Risk of Flooding from Rivers and the Sea: <https://naturalresources.wales/our-evidence-and-reports/maps/flood-risk-map/?lang=en>. Accessed in 29/11/2016.

requires that new and current activities in the water environment are guided by the requirements of the WFD.

### **Groundwater Directive (GWD) 2006/118/EC**

A daughter directive of the WFD, the Groundwater Directive establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater.

### **Priority Substances Directive 2013/39/EU**

The Priority Substances Directive amends Directives 2000/60/EC and 2008/105/EC with regards to priority substances, updating the list of priority substances that will apply to WFD assessment.

### **Habitats Directive 92/43/EEC & Birds Directive 2009/147/EC**

The Habitats Directive and Birds Directive ensure the conservation of a range of rare or threatened species. They establish the EU wide Natura 2000 ecological network of protected areas to safeguard against potentially damaging developments.

### **Flood Directive 2007/60/EC**

The Flood Directive aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive requires Member States to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU.

### **Urban Wastewater Treatment Directive 91/271/EEC (as amended) (UWWT Directive (consolidated))**

This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of the above mentioned waste water discharges.

## **11.3.2 National Acts**

### **Environmental Protection Act 1990**

The Act makes provision to control pollution arising from industrial and other processes for waste management.

### **Water Industry Act 1991**

The Water Industry Act relates to water supply and the provision of wastewater services in England and Wales.

### **Water Resources Act (England and Wales) 1991 (Amended 2009)**



The Water Resources Act (WRA) sets out the responsibilities of the Environment Agency (EA) and Natural Resources Wales in relation to water pollution, resource management, and flood defence, fisheries, and navigation.

The WRA deals with anti-pollution works and their operations. It allows the EA and NRW to carry out any necessary works associated with contamination risks in any controlled waters and enables the EA to serve an anti-pollution works notice on anyone they feel has caused pollution of controlled waters.

### **Land Drainage Act 1991, as amended**

The Land Drainage Act 1991 (LDA) provides powers and duties to the NRW for flood defences and river engineering projects. The LDA was amended in relation to the functions of Internal Drainage Boards (IDBs) and local authorities. IDBs are independent bodies, created under various statutes to manage land drainage in areas of special drainage need. Each IDB operates within a defined area in which they have permissive powers under the LDA to undertake flood defence works, other than on watercourses that have been designated as 'Main'.

### **Environment Act 1995**

The Environment Act set new standards for environmental management, such as requiring national strategies for air quality and waste. It also set up the Environment Agency, the Scottish Environmental Protection Agency and National Park Authorities.

### **Water Act 2003**

The Water Act 2003 amends the Water Resources Act 1991 to make provision with respect to compensation under section 61 of the Water Resources Act 1991.

### **Flood and Water Management Act 2010**

The Flood and Water Management Act 2010 (FWMA) provides an overarching framework which allows different organisations to work together and develop a shared understanding of the most suitable solutions to surface water flooding problems. The FWMA places a duty on all flood risk management authorities to co-operate with each other. It encourages the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt Sustainable Drainage Systems (SuDS) for new developments and redevelopments.

### **Environment (Wales) Act 2016**

The Act puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and joined-up way. The Act clarifies the law relating to shellfisheries, marine licencing, flood risk management and land drainage in Wales.

### **Well-being of Future Generations (Wales) Act 2015**

The Act strengthens existing governance arrangements for improving the social, economic, environmental and cultural well-being of Wales to ensure that present

needs are met without compromising the ability of future generations to meet their own needs. The Act ensures that when making decisions public bodies take into account the impact they could have on people living in Wales in the future. The relevant goal to the water environment is “A Resilient Wales... A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social and ecological resilience and the capacity to adapt to change”.

### 11.3.3 National Regulations

#### **Water Environment (England and Wales) Regulations 2003**

The WFD has been transposed in to the Water Environment Regulations 2003. WFD is delivered in England and Wales through a framework of River Basin Management Plans (RBMPs). England and Wales is divided into 11 River Basin Districts (RBDs), each consisting smaller management units known as Water bodies, including all river, lake, groundwater, coastal, and transitional waters located within that RBD.

#### **The Water Framework Directive (Standards and Classification) Directions England and Wales 2015**

The Water Framework Directive (WFD) Directions presents the updated environmental standards to be used in the second cycle of the Water Framework Directive (2000/60/EC) river basin management planning process in England and Wales. Environmental standards help assess risks to ecological quality of the water environment.

#### **Flood Risk Regulations 2009**

The Flood Risk Regulations 2009 transposes the EC Floods Directive (Directive 2007/60/EC) on the assessment and management of flood risk into domestic law in England and Wales.

#### **Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009**

These regulations transpose the provision of the EU Environmental Liability Directive into law in Wales. The regulations are based on the ‘polluter pays principle’ and seek to ensure action is taken to put right damage, rather than penalising those responsible.

#### **The Groundwater (England and Wales) Regulations 2009**

The regulations implement parts of the WFD that apply to groundwater (such as the Groundwater Directive). They supplement the Environmental Permitting Regulations 2010 and existing water pollution legislation.

#### **Water Resources (Abstraction and Impounding) Regulations SI 2006/641**

These Regulations contain provisions relating to the licensing of abstraction and impounding of water in England and Wales in the light of amendments made by the Water Act 2003 to the Water Resources Act 1991.

### **The Water Supply (Water Quality) Regulations 2010**

This legislation provides the framework for drinking water quality in England in respect of public supplies provided by water companies and licensed water suppliers. The Drinking Water Inspectorate, acting on behalf of the Secretary of State, enforces the legislation.

### **The Environmental Permitting (England and Wales) Regulations 2010 (Amended 2016)**

The regulations set out the legal requirements for permit applications and the permitting system to protect the environment. Works that are carried out in, over, under or near a main river or flood defence (including a sea defence), or within a flood plain will need to apply for Flood Risk Activity Permit. (Previously called a Flood Defence Consent.). The Regulations set out NRW as the regulator for Wales.

## **11.3.4 Planning Policy in Wales**

### **Wales Spatial Plan (Update 2008)**

The Wales Spatial Plan (WSP) sets out the planning agenda for Wales at the spatial level. Its main principle is that development should be sustainable and protect water resources and manage flood risk.

### **Planning Policy Wales Edition 8 (January 2016)**

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It specifically outlines design approaches and techniques that improve water efficiency and minimise adverse impacts on water resources, surface water quality, the ecology of rivers and groundwater. It also ensures that new development is not exposed unnecessarily to flooding.

### **Welsh Government: Taking Wales Forward 2016-2021**

Taking Wales Forward sets out the priorities of Welsh Government. It includes priorities relating to reductions in carbon emissions, delivering improvements to trunk roads and investment in flood defence / water management.

### **Technical Advice Notes**

#### **Technical Advice Note (TAN) 5: Nature Conservation and Planning (2009)**

TAN 5 provides guidance on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. It provides advice on developments affecting designated sites and habitats.

#### **Technical Advice Note (TAN) 15: Development and Flood Risk (2004)**

TAN 15 provides technical guidance which supplements the policy set out in PPW in relation to development and flooding. It advises on development and flood risk and provides a framework for the assessment of flooding.

### **Newport Local Development Plan 2011-2026**

The Adopted Plan is the key planning policy document for Newport, setting out the general location of development, its type and scale, as well as protecting key assets. The most relevant objective and policies taken into account in the assessment include:

**Objective 6 – Conservation of the Natural Environment:** To protect and enhance the quality of the natural environment, including landscape, protected habitats and species of principal importance for biodiversity in Wales (regardless of greenfield or brownfield status) and the protection of controlled waters.

**Policy SP1:** make a positive contribution to sustainable development by concentrating development in sustainable locations on brownfield land within the settlement boundary.

**Policy SP3:** development be directed away from areas where flood risk is identified as a constraint....Development will only be permitted in flood risk areas in accordance with National Guidance. Where appropriate a detailed technical assessment will be required to ensure that the development is designed to cope with the threat and consequences of flooding.

**Policy SP4:** protect water quality during and after construction and result no net increase in surface water runoff.

**Policy GP5:** development will be permitted where the proposal will not result in an unacceptable impact on water quality.

### **Severn River Basin Management Plan 2015**

River Basin Management Plans (RBMPs) are drawn up for the 10 river basin districts in England and Wales as a requirement of the Water Framework Directive. The plan for the Severn River Basin is jointly managed by the Environment Agency and Natural Resources Wales. It focuses on the protection, improvement and sustainable use of the water environment. River basin management is the approach National Resources Wales is using to ensure combined efforts achieve the improvement needed in the Severn River Basin District.

### **Severn RBD Flood Risk Management Plan**

The Severn FRMP aligns with the River Basin Management Plan to join up the approaches to water management required by both documents.

## **11.4 Methodology**

A qualitative approach has been taken to the assessment of effects to the local water environment, and has been adapted from the methodology set out under DMRB Volume 11 Section 3, Part 10, HD 45/09, Road Drainage and the Water Environment (HD 45.09). The assessment follows the principles of importance,

magnitude and significance, as set out in HD 45/09, and only differs in the exclusion of a quantitative assessment of the effects of routine runoff on water quality (e.g. HAWRAT) and spillage assessment.

The use of a qualitative approach is considered appropriate to consider impacts to water quality and flood risk. This is because the Scheme design has only a marginal increase in total impermeable area, no physical modification of any watercourses and no changes to the current drainage discharge points. On this basis it was deemed that a quantitative assessment would not be appropriate at the scoping stage.

The assessment of the water environment comprises five stages:

- Identification of all water features within 1km surrounding the site (the study area);
- A baseline appraisal of the importance of the water features identified;
- Review of the activities proposed relevant to the water environment and potential impacts identified during construction and operation of the Scheme;
- Appraisal of the magnitude of impacts of the Scheme on each water feature during construction and operation of the Scheme; and
- A final assessment of significance of impacts.

#### 11.4.1 Methodology for establishing baseline conditions

The baseline describes the environmental conditions of all surface and ground water features that may be impacted by the Scheme and the flood risk baseline information. The geographical extent of baseline data included the site and surrounding water features, up to the point at which potential effects from the Scheme are considered likely to occur.

Baseline information of the surface and ground water features were obtained from a variety of sources including:

- The Environment Agency website: What's in My Backyard? (<http://apps.environment-agency.gov.uk/wiyby/default.aspx>)
- Multi-Agency Geographical Information for the Countryside (MAGIC) website (<http://www.magic.gov.uk/>)
- Ordnance survey open data (Bing Maps) (<http://www.bing.com/maps/>)
- River Severn Basin Management Plan, River Severn Basin District, Environment Agency 2009;
- The Environment Agency Catchment Data Explorer website (<http://environment.data.gov.uk/catchment-planning/>)
- Flood Risk Statement included in Appendix F2.

All features that might be impacted by the Scheme were identified from the above sources.

The assessment considered potential impacts to various attributes of the water environment, as set out in

Table 11.2. Table 11.2 is adapted from HD 45.09, Annex IV, Table A4.1 - Water Features: Attributes and Indicators of Quality and only includes water features relevant to this assessment.

The impacts considered include construction and operational effects. During construction there is the potential impact for contamination from spillages, sediment run off from earthworks and other pollution incidents to surface water and groundwater via surface run off. During operation the potential impacts include contaminated routine runoff to surface and groundwater and pollution events as a result of accidental spillages.

The significance of the effects on the various attributes of the water environment was assessed qualitatively, based on the importance or sensitivity of the receptors in combination with the potential magnitude of any impact. The criteria used to establish the levels of sensitivity and magnitude are discussed in more detail in Sections 11.6.1 and 11.6.2 respectively.

Table 11.2 Water Features, Their Attributes and Indicators of Quality

Feature	Attribute/Service	Indicator of quality	Possible measure
River	Water Supply/quality	Amount used for water supply (potable) and chemical water quality.	Location and number of abstraction points; Volume abstracted daily; WFD chemical status class.
	Dilution of waste products	Presence of surface water discharges and effluent discharges	Daily volume of discharge (treated/untreated)
	Biodiversity	Biological Water Quality	WFD Ecological Status class
		Fisheries quality	Fisheries Status, as defined in the Freshwater Fish Directive
	Value to economy	Value of use of river	Length of river used for recreation commercially; Number of people employed; Length of river bank developed; Length of river fished commercially.
	Conveyance of flow	Presence of water courses	Number and size of water courses
Recreation	Access to river; Use of river for recreation	Length of river used for recreation (fishing, water sports) and number of clubs	
Flood Plain	Conveyance of flood flows	Presence of floodplain; Flood flows	Existing flood risk/flood return period; Location/importance of flood flow routes.
	Biodiversity	Conservation value of river corridor	Results of River Habitat Survey;

Feature	Attribute/Service	Indicator of quality	Possible measure
			Presence of designated sites; Presence of protected species.
Ponds and Reservoirs	Recreation	Access; Use for recreation	Area used for recreation (fishing, water sports)
	Water Supply	Amount used for water supply (potable) and chemical water quality	Volume abstracted daily; WFD chemical status class.
	Dilution of waste products	Presence of surface water discharges and effluent discharges	Daily volume of discharge (treated/untreated)
	Biodiversity	Biological Water Quality	WFD Ecological Status class
		Fisheries quality	Fisheries Status, as defined in the Freshwater Fish Directive
	Value to economy	Extent of employment	Number of people employed
Groundwater	Water Supply	Amount used for water supply (potable) and chemical water quality.	Location and number of abstraction points; Volume abstracted daily; WFD chemical status class.
	Soakaway	Presence of soakaways or other discharges to the ground	Location and number of discharge points Daily volume discharged
	Vulnerability	Groundwater vulnerability	Classification of aquifer vulnerability
	Biodiversity	Presence of groundwater supported wetlands	Changes to groundwater recharge, levels or flows; Status or classification of wetland
	Economic Value	Extent of use for abstractions	Number of people employed
	Conveyance of flow	Presence of groundwater supported; water courses	Changes to groundwater recharge, levels or flows

## 11.4.2 Methodology for assessing construction impacts

Effects on the water environment arising from the construction phase would depend on a number of factors including, for example, a combination of the potential for pollution and flooding, the sensitivity of the receptor and capacity to withstand potential impacts and the effectiveness of control measures.

The construction methods were assumed based on typical site development practices. Based on these construction assumptions, potential changes on the water resource attributes arising from construction of the Scheme were identified. These changes were then compared to the baseline conditions to establish the potential impacts.

## 11.4.3 Methodology for assessing operation impacts

The potential impacts arising from the operation of the Scheme were identified based on the plans provided. Changes to the baseline conditions were established and the potential impacts assessed.

Potential impacts on WFD status were identified through a review of the Scheme and considered in relation to the current Overall Status of the water body and the relevant mitigation measures.

## 11.5 Significance Criteria

The assessment of the significance of potential impacts from the Scheme was carried out by (1) valuing the sensitivity/importance of the attribute outlined in Table 11.1, (2) estimating the magnitude of the impact, and (3) assessing the significance of that impact.

### 11.5.1 Sensitivity/Importance of Water Features

The importance of each of the water resource attributes was identified based on the assessment of the services it provides and its quality, scale, rarity and substitutability.

Table 11.3 provides criteria for estimating the importance of each attribute identified based on the DMRB Volume 11 Section 3, Part 10, HD 45/09, Road Drainage and the Water Environment<sup>61</sup> (HD 45.09).

Table 11.3 Criteria for Estimating the Importance/Sensitivity of Environmental Attributes

Importance/Sensitivity	Criteria	Examples
Very High	Attribute has a high quality and rarity on regional or national scale	WFD Class 'High'; Principal aquifer providing portable

<sup>61</sup> Design Manual For Roads And Bridges – HD 45/09 Volume 11, Section 3, Part 10 – November 2009



Importance/Sensitivity	Criteria	Examples
		water to region or support of an EC designated site.
High	Attribute has a high quality and rarity on local scale	WFD Class 'Good'; Major Cyprinid Fishery; Aquifer providing local important resource.
Medium	Attribute has a medium quality and rarity on local scale	WFD Class 'Moderate'; aquifer providing water for agriculture use.
Low	Attribute has a low quality and rarity on local scale	Flood plain with limited constraints and low probability of flooding; WFD Class 'Poor'

### 11.5.2 Magnitude

The magnitude of impacts on the attributes of each water feature was established by a qualitative assessment. Table 11.4 presents the framework of the assessment to identify the magnitude of an impact, together with examples. Impacts may be either beneficial or adverse.

Table 11.4 Criteria for Determining Impact Magnitude

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute	Loss of EC designated Salmonid fishery; Change in WFD grade of river reach or limiting ability to achieve WFD objective; Compromise employment source; Increase in peak flood level (1 in 100 year event) >100 mm. Pollution of potable source of abstraction.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss in productivity of a fishery. Contribution of a significant proportion of the effluent in the receiving river, but insufficient to change its WFD grade; Reduction in the economic value of the feature. Increase in peak flood level (1 in 100 year event) >50 mm.
Minor Adverse	Results in some measurable change in attributes quality or vulnerability	Measurable degradation in attribute, but of limited size and/or proportion. Increase in peak flood level (1 in 100 year event) >10 mm.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Discharges to watercourse but not significant loss in quality, fishery productivity or biodiversity; No significant impact on the economic value of the feature; Negligible change in peak flood level.

Magnitude	Criteria	Example
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Measureable improvement in attribute, but of limited size and/or proportion. Reduction in peak flood level (1 in 100 year event) >10 mm.
Moderate Beneficial	Results in moderate improvement of attribute quality	Improvement in levels of soluble and sediment-bound pollutants. Reduction in peak flood level (1 in 100 year event) >50 mm.
Major Beneficial	Results in major improvement of attribute quality	Removal of existing polluting discharge or removal of likelihood of polluting discharge. Reduction in peak flood level (1 in 100 year event) >100 mm.

### 11.5.3 Significance

The significance of potential effects from the Scheme was assessed by comparing the importance of each of the water resource attributes, identified as the baseline, with the magnitude of the potential impact on the attributes. Table 11.5 provides the significance matrix for determining the qualitative significance of each impact on the valued attributes.

Table 11.5 Impact Significance Criteria

	Importance of Attribute			
Magnitude of Potential Impact	Very High	High	Medium	Low
Major	Very Large	Large / Very Large	Large	Slight / Moderate
Moderate	Large / Very Large	Moderate / Large	Moderate	Slight
Minor	Moderate / Large	Slight / Moderate	Slight	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

### 11.5.4 Consultation

NRW was consulted as part of the scoping opinion. The comments provided by NRW in relation to water quality and flood risk were considered in the assessment. Consultation has also been undertaken with NRW to confirm the

approach of this assessment and that a WFD assessment is not necessary. Records of this consultation are included in Appendix F2.

Newport City Council was consulted as part of the scoping opinion and provided no comments (Appendix A2). Further consultation has been sought for the NSER and as of 24<sup>th</sup> November 2016 no response has been received.

## 11.6 Potential Environmental Impacts – Before Mitigation

### Junction 28 (Tredegar House)

#### 11.6.1 Construction

##### Surface Water

During the construction phase there is a potential risk of spillages and leakages from machinery, construction chemicals spilled on the site, and silt from bare ground and muddy roadway being washed into the drainage system via surface water.

At present, contaminants and/or sediment laden surface water run-off would discharge directly from the drainage system into the unnamed water course running under the highway, the Dock Feeder and Tredegar House lake. These watercourses are considered to have a **low to medium value** due to their current quality. In the absence of any mitigations, the magnitude of a pollution incident is therefore assessed as **minor adverse**, leading to a significance of effect of temporary **slight adverse** on the water quality of the nearby watercourses.

To minimise the risk of contaminants or sediment entering these watercourses during construction all work will be managed through the preparation and implementation of a CEMP. The measures to be included in a CEMP are detailed in Section 11.8.1.

##### Groundwater

The potential seepage of contaminated surface water, as a result of an accidental pollution release into the groundwater, could cause an effect on the downstream minor aquifer. In addition, should unidentified contaminated materials become mobilised as a result of construction activities, this may have the potential to impact the groundwater. However, the CEMP would include measures to minimise the risk of spillages and manage materials identified in site as contaminate.

Due to the low permeability of the alluvium deposits below the site, the magnitude of the impact would be **minor adverse** on a groundwater body with **low** value. It is considered that the Scheme would have a **neutral** effect on the groundwater quality.

##### Flood Risk

The Scheme would be constructed just outside the flood plain, as shown in the TAN 15 and NRW flood risk maps, however depending on the extent of the construction site boundary, parts may overlap into the flood plain. Works are not proposed to the existing culverted watercourses (the unnamed watercourse running from Craig-y-Saeson farm to Tredegar House and the Docks Feeder) and therefore hydromorphology and capacity would not be impacted.

During construction surface water would continue to be discharged to the Docks Feeder and Tredegar House lake. There is no history of flooding onsite and the site currently comprises impermeable materials. As a result of this and the small area of the site at risk of flooding (as concluded in the Flood Risk Statement) the magnitude is assessed as **negligible**, leading to a significance of effect of **neutral**. Mitigations to ensure that the likelihood of pollution incidents as a result of flooding are reduced are detailed in Section 11.8.1.

## 11.6.2 Operation

### Surface Water

The storm water runoff generated from the Scheme will be collected in new drainage features such as road gullies and combined kerb drainage units. This will replicate the existing drainage strategy where possible.

Surface water runoff would be discharged via existing outfalls into the Dock Feeder and the unnamed watercourse that flows beneath the highway. Existing flows from these outfalls would be maintained through the use of flow control devices, with storage upstream of the devices provided by two attenuation ponds. The attenuation ponds, flow control devices and drainage system would be designed to accommodate the 1 in 100 year storm including 30% for climate change.

During the operation of the Scheme there is a potential risk for surface runoff, contaminated by vehicle emissions and fuel spillages, to enter the drainage system and be discharged into the Docks Feeder, the unnamed watercourse and subsequently into Tredegar House Lake. However, as the proposed scheme only has a marginal increase in total impermeable area from the baseline conditions, the magnitude of any impact is assessed as **negligible**. The significance of effects from spillages contaminating surface waters, due to the Scheme, are therefore considered to be **neutral**.

### Groundwater

The potential seepage of contaminated surface water, as a result of an accidental pollution release into the groundwater, could cause an effect on the downstream minor aquifer. However, due to the low permeability of the deposits below the site and due to the lack of any significant change in land use in relation to the current situation, the magnitude of the impact would be **negligible**. The sensitivity of groundwater is valued as of **low** importance, therefore it is considered that the Scheme would have a **neutral** effect on the groundwater quality.

### Flooding

On completion, there will be a small net increase in the impermeable area as a result of the Scheme. This is likely to result in the post development storm flows generated from impermeable surfaces being more than the pre-development storm flows. To prevent an increase in flood risk, the flow rate discharging from the existing system will be maintained through the use of flow control devices and attenuation ponds. All features would be designed to accommodate the 1 in 100 year storm including 30% for climate change. As a result the magnitude of a flooding impact from the operation of the Scheme would be **negligible**, leading to an assessment of significance of **neutral**.

## Bassaleg

### 11.6.3 Construction

#### Surface Water

During the construction phase there is a potential risk of spillages and leakages from machinery, construction chemicals spilled on the site, and silt from bare ground and muddy roadway, being washed into the drainage system via surface water.

The Scheme would retain the two surface water outfalls used by the existing drainage network. The first outfall flows into a culverted minor watercourse, and into the River Ebbw (near to the A467 river bridge). The second outfalls directly into the River Ebbw at the Park View Bridge. As such there is the potential for contaminants and sediment to be washed into the River Ebbw, which has a **medium** value. In the absence of any mitigations, the magnitude of a pollution incident is therefore assessed as **minor adverse**, leading to a significance of effect of temporary **slight adverse** on the water quality of the River Ebbw.

To minimise the risk of contaminants or sediment entering these watercourses during construction all work will be managed through the preparation and implementation of a CEMP. The measures to include in a CEMP are detailed in Section 11.8.1.

#### Groundwater

The potential seepage of contaminated surface water, as a result of an accidental pollution release into the groundwater, could cause an effect on the downstream minor aquifer. The contaminants identified during the Ground Investigations will be removed off site therefore there is only a remaining risk of unidentified contaminated materials which could become mobilised as a result of construction activities, this may have the potential to impact the groundwater. However, due to the low permeability of the alluvium deposits below the site, the magnitude of the impact would be **minor adverse** on a groundwater body with **low** value. Should materials be identified as contaminated, these will be removed from site. It is considered that the Scheme would have a **neutral** effect on the groundwater quality.

#### Flooding

The works would be located just outside the flood plain, as shown in the TAN 15 and NRW flood risk maps, and it is expected that the construction works would

not extend into the flood plain, due to their proximity and the surrounding vegetation. No works will be undertaken on the River Ebbw to impact the flow capacity or hydromorphology.

During construction surface water would continue to be discharged into the current drainage system. There is no history of flooding onsite and the site is already made up of impermeable materials. Therefore the change in the risk and impact of flooding off site from surface water would be **negligible** in magnitude. The effect of the construction phase on flooding would therefore be **neutral**.

## 11.6.4 Operation

### Surface Water

The storm water runoff generated from the Scheme will be collected in new drainage features such as road gullies and combined kerb drainage units. This replicates the existing drainage strategy where possible.

Surface water runoff would be discharged via existing outfalls into an unnamed tributary of the River Ebbw and the Ebbw itself. Existing flows from these outfalls would be maintained through the use of a flow control device, with storage upstream of the device provided by an attenuation pond. The attenuation pond, flow control device and drainage system would be designed to accommodate the 1 in 100 year storm including 30% for climate change.

During the operation of the Scheme there is a potential risk for surface runoff, contaminated by vehicle emissions and fuel spillages, to enter the drainage system and be discharged into the River Ebbw. However, as the proposed scheme represents only a marginal change in traffic volume and total impermeable area from the baseline conditions, the magnitude of any impact is assessed as **negligible**. The significance of effects from spillages contaminating surface waters, due to the Scheme, are therefore considered to be **neutral**.

### Groundwater

The potential migration of contaminated surface water, as a result of an accidental pollution release into the groundwater, could cause an effect on the downstream minor aquifer. However, due to the low permeability of the deposits below the site, the magnitude of the impact would be **minor adverse**. The groundwater resource in the study area is considered to be of **low** importance, therefore it is considered that the Scheme would have a **neutral** effect on the groundwater quality.

### Flooding

On completion, there will be a small net increase in the impermeable area as a result of the Scheme. This is likely to result in the post development storm flows generated from impermeable surfaces being more than the pre-development storm flows. To prevent an increase in flood risk, the flow rate discharging from the existing system will be maintained through the use of a flow control device and an attenuation pond. All features would be designed to accommodate the 1 in 100

year storm including 30% for climate change. As a result the magnitude of a flooding impact from the operation of the Scheme would be **negligible**, leading to an assessment of significance of **neutral**.

## Pont Ebbw

### 11.6.5 Construction

#### Surface Water

During the construction phase there is a potential risk of spillages and leakages from machinery, construction chemicals spilled on the site, and silt from bare ground and muddy roadway, being washed into the drainage system via surface water. The surface water currently discharges to the River Ebbw, which has a **medium** value, via a petrol interceptor that will be replaced and remain the sole surface water outfall for the Scheme. As the site is located within the flood plain of the River Ebbw there would be a greater risk of sediment and contaminants in runoff directly entering the river during times of flood flow.

In the absence of any mitigation, the magnitude of a pollution or flood incident is therefore assessed as **minor adverse**, leading to a significance of effect of temporary **slight adverse** on the water quality of the River Ebbw.

To minimise the risk of contaminants or sediment entering these watercourses during construction all work will be managed through the preparation and implementation of a (CEMP). The measures to be included in the CEMP are detailed in Section 11.8.1.

#### Groundwater

The potential seepage of contaminated surface water, as a result of an accidental pollution release into the groundwater, could cause an effect on the downstream minor aquifer. In addition, should unidentified contaminated materials become mobilised as a result of construction activities, this may have the potential to impact the groundwater. However, due to the low permeability of the alluvium deposits below the site, the magnitude of the impact would be **minor adverse**. The groundwater resource in the study area is considered to be of **low** importance, therefore it is considered that the Scheme would have a **neutral** effect on the groundwater quality.

#### Flooding

Pont Ebbw roundabout is located within Flood Zone C1 and C2 (TAN 15) and High or Medium risk zones (NRW flood risk maps). Construction works would therefore take place within the flood plain, and works would be at risk of flooding and causing contamination of flood water during flood events. The risk of contamination is assessed under the surface water section above. The works will not impact on the hydromorphology or capacity of the River Ebbw itself.

The River Ebbw and its floodplain in this area are considered to be of **medium** importance. During construction there is the potential for temporary loss of flood

plain capacity and surface water would continue to be discharged from the site into the River Ebbw. There is no history of flooding onsite and the site is already made up of impermeable materials. Due to the temporary loss of floodplain capacity, the magnitude of a flooding impact is assessed as **minor adverse** and therefore it is considered that the significance of effect would be **temporary slight adverse**.

### 11.6.6 Operation

#### Surface Water

The storm water runoff generated from the Scheme will be collected in new drainage features such as road gullies and combined kerb drainage units. This replicates the existing drainage strategy where possible.

Surface water runoff would continue to be discharged into the River Ebbw via the replaced petrol interceptor. Currently the existing outfall discharges storm flows into the River Ebbw approximately 400m upstream of where the River Ebbw is under tidal influence, and as the existing development is already located within the floodplain, it is therefore considered that the net increase in impermeable area of the proposed scheme when compared to the existing baseline is negligible.

During the operation of the Scheme any surface water runoff contaminated by vehicle emissions and fuel spillages will pass through the replaced petrol interceptor before being discharged into the River Ebbw. As a result the magnitude of the impact on the water quality of the River Ebbw would be considered **negligible**. The significance of effects from spillages contaminating the River Ebbw, due to the Scheme, are therefore considered to be **neutral**.

#### Groundwater

The potential seepage of contaminated surface water, as a result of an accidental pollution release into the groundwater could cause an effect on the downstream major aquifer. However, due to the low permeability of the deposits below the site and due to the lack of any significant change in land use in relation to the current situation, the magnitude of the impact would be **minor adverse**. The groundwater resource in the study area is considered to be of **low** importance, therefore it is considered that the Scheme would have a **neutral** effect on the groundwater quality.

#### Flooding

As the Scheme is located wholly in the floodplain of the River Ebbw and is located 400m upstream of River Ebbw's tidal influence, the risk of flooding impacts have been considered in the wider flooding context. Under the 1 in 100 year plus 30% for climate change design storm the site would be inundated and therefore the highways drainage would not be operational. Therefore greater discharge from the increased impermeable area of the Scheme during a 1 in 100 year plus 30% for climate change storm would not be relevant and as such the magnitude of the impact of a flood event would be **negligible**. This approach has



been agreed with NRW (Appendix F2). It is therefore considered that the significance of the effect would be **neutral**.

## 11.7 Mitigation

### 11.7.1 During Construction

During the construction of the Scheme, mitigations to reduce the risk of contaminants or sediment in surface runoff entering watercourses will be included in a CCEMP) Mitigations should be selected in accordance with existing good practice guidance, such as the Guidance for Pollution Prevention (GPPs)<sup>62</sup>, particularly those relating to:

- Understanding your environmental responsibilities – good environmental practices (PPG 1);
- Above ground oil storage tanks (PPG 2);
- Use and design of oil separators in surface water drainage systems (PPG3);
- Treatment and disposal of sewage where no foul sewer is available (PPG 4);
- Works and maintenance in or near water (PPG 5);
- Working at construction and demolition sites (PPG 6);
- Safe storage – The safe operation of refuelling facilities (PPG 7);
- Safe storage and disposal of used oils (PPG 8);
- Vehicle washing and cleaning (PPG 13);
- Managing fire water and major spillages (PPG 18);
- Pollution incident response planning (PPG 21);
- Incident response – dealing with spills (PPG 22); and
- Safe storage – drums and intermediate bulk containers (PPG 26).

Although GPPs have been revoked they have not yet been replaced and are considered valid in terms of best practice principles. The following mitigation should be included in a CEMP.

The risk of contaminants entering the water environment should be minimised by:

- Requiring the use of bunded oil storage containers, designated vehicle refuelling points with spill kits and, where appropriate, site runoff detention ponds with petrol interceptors;
- Siting storage and refuelling areas out of the floodplain and away from any watercourses; and
- Preparing a spill response plan.

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<sup>62</sup> NetRegs: Guidance for Pollution Prevention List. Accessed at <http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/> on 29<sup>th</sup> November 2016.

The risk of sediment entering the water environment should be minimised by:

- Providing a designated area of hand standing (with a sump to collect runoff) for plant/wheel washing;
- Locating stockpiles away from watercourses; and
- Using bunds or silt fences to retain sediment in runoff where needed.

The entire Pont Ebbw site and part of the J28 site are within the floodplain. For J28, the area of the site within the floodplain should, if possible, remain clear of storage and welfare facilities to reduce the likelihood of a flood event causing a pollution incident. This measure may not be possible at the Pont Ebbw site as it is entirely in the floodplain. However additional mitigations should be considered:

- Works should be timed to avoid periods of the year at the highest risk of flood flows (e.g. avoiding October to March);
- Sediment stockpiles, storage facilities and refuelling areas should be located offsite in an area not at risk of flooding;
- Bare surfaces that will remain exposed for a prolonged period should be vegetated; and
- An emergency plan to secure or remove sources of contaminants (e.g. fuel/chemical storage) in the event of a forecasted flood flow.
- All construction work carried out within a flood plain would require a Flood Risk Activity Permit, issued by NRW, prior to the works commencing. The permit would include an assessment of flood risk and water contamination due to the construction works and identification of mitigations to manage these risks.
- Additionally, works will be staged to ensure the drainage system is installed early in the construction period, prior to the roadway being laid, allowing for the drainage system to be used to manage runoff of water and sediment during construction.

### 11.7.2 During Operation

During the operation of the Scheme, no significant adverse effects have been identified. This is due to the minor changes represented in each roundabout design, which do not represent significant changes from the baseline conditions and due to a number of design mitigations which are detailed below.

For the J28 roundabout the marginal increase in impermeable area and subsequent increase in runoff will not lead to an increase in the existing discharge rate from the drainage network as flow control devices and two attenuation ponds provide additional storage to the capacity of a 1 in 100 year plus 30% for climate change storm.

For the Bassaleg roundabout the slight increase in impermeable area and subsequent increase in runoff will not lead to an increase in the existing discharge rate from the drainage network as a flow control device and attenuation pond

provides additional storage to the capacity of a 1 in 100 year plus 30% for climate change storm.

For the Pont Ebbw roundabout the increase in impermeable area and subsequent increase in runoff have not been mitigated against due to the floodplain location of the site. In the event of a 1 in 100 year plus 30% for climate change storm the entire site will be inundated and the additional runoff discharged into the River Ebbw from the highway will be not be relevant during such a flood. Additionally flows discharged from the site during storm flows (when the River Ebbw is not in flood) pose little to no impact to overall flood levels due to the tidal nature of the river 400m downstream. Finally, surface water discharging from the Scheme will flow through a petrol interceptor before entering the River Ebbw, reducing the likelihood of a pollution incident in this watercourse.

## 11.8 Summary

Table 11.6 below provides a summary of the assessment of the significance of potential impacts from the Scheme.

Table 11.6 Summary assessment of the significance of potential impacts

Water Feature	Attribute	Quality	Importance / Sensitivity	Impact	Magnitude	Significance
River Ebbw	Moderately sized and heavily modified water body.  Potential uses for recreation and fishing.  No abstraction identified.  No licenced discharges identified.	Chemical Status – Fail  Ecological Status - Moderate	Medium	Risk of spillage / pollution during construction  Contaminants and/or sediment laden surface water run-off during operation  Pont Ebbw – risk to the site of river flooding during construction	Minor adverse during construction  Negligible during operation	Slight adverse impact to water quality and onsite flooding during construction.  Neutral during operation.
Docks feeder	Modified water body, culverted in places.  No abstraction identified.  No licenced discharges identified.	Low ecological value within the context of the site only.	Low-Medium	Risk of spillage / pollution during construction  Contaminants and/or sediment laden surface water run-off during operation	Minor adverse during construction  Negligible during operation	Neutral
Tredegar House Lake west (small)	Potential uses for recreation and fishing.  No abstraction identified.  No licenced discharges identified.	Not identified as being of any particular ecological value.	Low-Medium	Risk of spillage / pollution during construction  Contaminants and/or sediment laden surface water run-off during operation	Minor adverse during construction  Negligible during operation	Neutral
Tredegar House Lake east (larger)	Potential uses for recreation and fishing.	Not identified as being of any particular ecological value.	Low-Medium	Risk of spillage / pollution during construction	Minor adverse during construction	Neutral

Water Feature	Attribute	Quality	Importance / Sensitivity	Impact	Magnitude	Significance
	No abstraction identified.  No licenced discharges identified.			Contaminants and/or sediment laden surface water run-off during operation	Negligible during operation	
Unnamed watercourse that runs from Craig-y-Saeson farm to the Tredegar House land (culverted beneath highway)	Small watercourse  No known recreational use.  No abstraction identified.  No licenced discharges identified.	Not identified as being of any particular ecological value.	Low	Risk of spillage / pollution during construction  Contaminants and/or sediment laden surface water run-off during operation	Minor adverse during construction  Negligible during operation	Neutral
Secondary A Bedrock Aquifer and superficial geology deposits of a Secondary A Superficial Deposits Aquifer  Minor Aquifer	The site is not located within a Groundwater Source Protection Zone, there are no local abstractions of groundwater identified within the study area and the site is also not located within a vulnerability zone.	Good Quantitative Quality.  Good chemical quality.	Low	Potential seepage of contaminated surface water, as a result of an accidental pollution release  Pollution through mobilisation of contaminants during construction	Minor adverse	Neutral

## 12 Assessment of cumulative effects

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### 12.1 Introduction

Cumulative effects result from multiple actions on receptors or resources occurring in combination over time. This chapter analyses two types of cumulative effect:

- **Type (i) Cumulative effects** – these are the combined action of a number of environmental topic specific impacts upon a single receptor/resource which arise from a single project and which may occur simultaneously or concurrently. This is sometimes referred to as the ‘inter-relationships’ between different environmental effects.
- **Type (ii) Cumulative effects** – these are effects that arise as a result of the proposed project in combination with other proposed, but not yet built, projects, where there is a potential for effects to overlap either spatially or temporally.

### 12.2 Regulatory and Policy Context

#### 12.2.1 Relevant legislation

The requirement for cumulative effects assessment (CEA) is set out in Article 4(3) and Article 5(1) of the Environmental Impact Assessment (EIA) Directive<sup>63</sup>. Article 5 (1) states that assessments should assess “the direct effects of any indirect, secondary, cumulative, short, medium and long term, temporary, positive and negative effects of the project”.

The EIA Directive is implemented in the UK through the Town and Country Planning (EIA) Regulations 2011 (as amended) and the need for cumulative effects assessment is set out in Schedule 4 which lists the information required within an ES, .... “a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative effects....”.

As described in Section 11.10.1, the interpretation of what constitutes cumulative effects is generally taken to be effects which result from multiple actions on receptors and resources and over time and are generally additive or interactive (synergistic) in nature. Cumulative impacts can also be considered as: ‘...impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.’ (European Commission 1999).

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<sup>63</sup> EIA directive (85/337/EEC) as amended by the Council Directives 97/11/EC, 2003/35/EC and 2009/31/EC and codified by 2011/92/EU. The EIA Directive has recently been amended. The UK has until May 2017 to transpose the new directive into UK legislation. The amended directive does not change the requirement to address cumulative effects.

## 12.2.2 Policy context

None of the local policy relates specifically to cumulative effects in relation to highways schemes. However they do identify the need to consider cumulative effects when considering development.

The adopted Newport Local Development Plan (LDP) (Newport City Council, 2015) identifies the importance of identifying cumulative effects in relation to renewable energy developments, particularly wind turbines. Other references to cumulative effects relate to a requirement for development near existing residential areas to not adversely affect 'local residential amenity, either in its own right or cumulatively with other uses'.

The Cardiff Local Development Plan (Cardiff Council, 2016) refers to cumulative impacts on amenity, quality and character of the countryside and landscape as a result of residential conversions, retail, small scale developments in the green belt and the countryside.

## 12.3 Assessment methodology

### 12.3.1 Relevant guidance

There is currently no standard methodology for cumulative effects assessment although there is a range of guidance available. The following guidance has been taken into consideration during the preparation of this CEA:

- DMRB Vol. 11, Section 2, Part 5 (HA 205/08) Principles of Environmental Assessment – Assessment and Management of Environmental Effects (Highways Agency et al., 2008).
- Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2015).
- Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2012).

All of this guidance is relevant to this assessment although the DMRB guidance is particularly relevant due to the highways nature of the Scheme. However, the Planning Inspectorate guidance provides the most recent best practice guidance on the assessment of cumulative effects for major infrastructure schemes.

### DMRB Guidance

The DMRB guidance set out in HA 205/08 makes a distinction between two different types of cumulative effects, i.e. Type I and Type 2 (as described in Section 12.1).

#### **Type (i) Cumulative Effects from a single project (inter-relationships)**

The guidance defines Type (i) effects as those that arise from the combined action of a number of different environmental topic specific impacts upon a single receptor/resource.

## **Type (ii) Cumulative Effects from different projects**

Type (ii) effects may arise from the combined impact of a number of different reasonably foreseeable proposed developments, in combination with the project being assessed, on a single receptor/ resource. This can include multiple impacts of the same or similar type from a number of projects upon the same receptor/resource.

In section IV of the guidance it emphasises that when considered in isolation, the environmental effects of any single project upon any single receptor/ resource may not be significant. However, when individual effects are considered in combination, the resulting cumulative effect may be significant.

The DMRB guidance defines ‘reasonably foreseeable’ to be other development projects that are committed. It states that these should include (but not be limited to):

- Trunk road and motorway projects which have been confirmed (i.e., gone through the statutory processes); and
- Development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken’.

The following factors are identified within the guidance as needing consideration when determining the significance of both types of cumulative effects:

- Which receptors/resources are affected?
- How will the activity or activities affect the condition of the receptor/resource?
- What are the probabilities of such effects occurring?
- What ability does the receptor/resource have to absorb further effects before change becomes irreversible?

## **Planning Inspectorate Guidance**

The Planning Inspectorate does not explicitly distinguish between Type (i) and Type (ii) cumulative effects. However, the two pieces of guidance listed above do imply the distinction:

### **Type (i) Cumulative Effects from a single project (inter-relationships)**

With respect to inter-relationships, the Planning Inspectorate’s Advice Note Nine (Planning Inspectorate, 2012) states that:

*‘The ES should not be a series of separate unrelated topic reports. The interrelationship between aspects of the proposed development should be assessed and careful consideration should be given by the developer to explain how interrelationships have been assessed in order to address the environmental impacts of the proposal as a whole. It need not necessarily follow that the maximum adverse impact in terms of any one topic impact would automatically result in the maximum potential impact when a number of topic impacts are considered collectively. In addition, individual impacts may not be significant but could become significant when their inter-relationship is assessed. It will be for*




*the developer to demonstrate that the likely significant impacts of the project have been properly assessed.'*

**Type (ii) Cumulative Effects from different projects**

Planning Inspectorate Advice Note 17 (Planning Inspectorate, 2015) provides a systematic approach to cumulative effects assessment. The guidance only covers type (ii) cumulative effects.

Within the guidance a wider range of future projects is recommended for inclusion within the CEA and these are tiered according to the level of detail that is likely to be available for each tier:

<b>Tier 1</b>	<b>Projects under construction;</b> <b>Permitted application(s), whether under the Planning Act, 2008 or other regimes, but not yet implemented;</b> <b>Submitted application(s), whether under the Planning Act, 2008 or other regimes, but not yet determined;</b>	Decreasing level of detail likely to be available. 
Tier 2	Projects on the Planning Inspectorate’s Programme of Projects where a scoping report has been submitted;	
Tier 3	Projects on the Planning Inspectorate’s Programme of Projects where a scoping report has not been submitted; Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward	

The less information that is available for the future projects (i.e. environmental impacts predicted, project definition), the less likely that the CEA will be able to make any robust assessment in relation to these projects. Whilst projects that are Tier 2 and Tier 3 as defined by the Planning Inspectorate guidance are referenced within this assessment, it is considered that there is limited value in including schemes for which there is no environmental assessment information available. As the Scheme is also not a National Significant Infrastructure Project (NSIP), it is considered that the inclusion of Development Plans and programmes will not add value to the cumulative effects assessment of the Scheme.

This assessment has utilised the guidance from both DMRB and the Planning Inspectorate.

**12.3.2 Assessment criteria**

This assessment does not aim to assign significant levels to any of the cumulative effects identified. Rather, a judgement has been made on whether the cumulative effects are likely to be more or less significant than the effects identified for the Scheme alone.

### 12.3.3 Study Area

With regards to both types of cumulative effects (Type (i) and Type (ii)), the study area is the same as that defined for each environmental topic in Chapters 7 - 11. This is outlined in Table 12.1 along with the identification of what type of impact is likely and the zone of influence, i.e. the area over which the effect of impact is likely to be experienced.

### 12.3.4 Consultation

The list of projects considered within the Type (ii) Cumulative Effects assessment has been obtained through desk top research, based primarily on developments considered within the traffic modelling. The developments included within the traffic modelling have been agreed in consultation with the local authority; however, no further consultation has been carried out to agree a list for the cumulative effects assessment.

### 12.3.5 Limitations of assessment

Assessment of cumulative effects is limited by the level of information that is available for each of the topic assessments. For combined effects from a single project (i.e. interrelated effects), this is not usually a limiting factor as information and assessment outcomes are readily available from the project team. However, when consideration is given to effects that may arise as a result of impacts from other committed projects (i.e. Type (ii) effects), the assessment becomes limited by the amount of information that is made publically available.

Table 12.1 Study areas, potential impacts and receptors for ES environmental topics

Environmental topic	Study area for assessments	Potential impact (Construction and Operation)	Receptor resource
Air quality	Within 350m of construction works Within 200m of roads that meet criteria set out in DMRB HA207/07 Vol 11, Section 3, Part 1 during operation	Reduction in air quality from: dust emissions during construction exhaust emissions from vehicles during construction and operation	People and wildlife living and working within the study area distances (i.e. 350m and 200m)
Cultural heritage	Junction 28 (Tredegar House) and a study area up to 250m surrounding Bassaleg and Pont Ebbw roundabouts.	Change in the setting of cultural heritage Loss of heritage assets	Setting of heritage resource Visitors to the heritage assets
Landscape	1.5km radius from Scheme	Change in character of the landscape	People Designated and non-designated landscapes
Ecology	Footprint of construction works and immediately adjoining land	Disturbance, fragmentation, loss, wildlife casualties, creation of barriers to movement, lighting	Protected species, habitats, ecologically designated sites
Materials	Footprint of construction works/material sources/vehicle movements/waste management	Waste generated from construction	Waste disposal resources
Traffic noise and vibration	Noise sensitive properties within 600m of all scheme roads and sections of existing roads within 2km of the scheme that are predicted to have a change in noise level of more than 1dB (A) as a result of the scheme in the baseline year.	Noise and vibration generated during construction and operation	People within 600m of all scheme roads
Road drainage and water	1km radius from scheme	Generation of silt and oil laden runoff which may contaminate water resources. Changes to flood risk as a result of the construction activities and new scheme.	Surface water, groundwater, structures, assets and people within any flood risk zones.

## 12.4 Assessment of Type (i) Cumulative Effects from the Scheme on Single Receptors or Resources

This section looks at the assessment of Type (i) effects. This covers consideration of how receptors and/or resources may be affected by different environmental effects that occur from this Scheme simultaneously or concurrently. For example, locations may experience impacts from changes in noise, air quality and visual amenity all at the same time. As such, these effects are referred to as ‘inter-related’ effects.

The majority of assessments within this ES inherently consider the inter-related effects of the Scheme on receptors or receptor groups which are therefore already taken account of within the topic chapter assessments. These are not repeated in this chapter and have been scoped out of the Type (i) cumulative effects assessment. A list of the topics that have been scoped out of the assessment due to inter-related effects already being intrinsically covered within the topic assessments include:

- Cultural heritage;
- Ecology;
- Materials; and
- Road drainage and water

Receptors are likely to experience inter-related effects are people living in, or using the area near the Scheme, e.g. people using Public Rights of Way (PROW). It is considered that there is the potential for effects related to air quality, visual impact, noise and vibration to have the potential to combine together to affect people. Cumulative impacts could potentially be incurred by nearby residents, school children at St Davids RC Primary School, visitors to Tredegar House (highest sensitivity), users of the PROW (medium sensitivity), and road users (low sensitivity). This assessment considers all of these receptors and how in-combination effects may affect them.

Table 12.3 outlines the inter-related effects of air, noise and vibration and visual amenity effects on these sensitive receptors based on the findings of the relevant detailed environmental topic chapters and assuming mitigation is in place. Due to the temporal separation of construction and operational phases, a distinction has been made between the effects from these two phases.

Table 12.2 Cumulative ‘In-combination’ Effects from J28

Receptor/ Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of landscape and visual impact following mitigation	Comments and significance of in-combination effects
<b>Construction effects</b>				
Visitors to Tredegar House	Not considered within the noise assessment as noise effects are not judged to be significant	Not significant	Slight to moderate adverse landscape and visual effects which will be temporary in nature	No in-combination effects are considered likely to be experienced by this receptor.
Residents on Forge Lane	Given the number of properties affected and the duration of the exceedances (potentially over several months), this is assessed as a significant effect although it is temporary.	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	Residents on Forge Lane are likely to experience an in-combination effect from noise and deterioration of visual amenity during the construction phase which is considered to have an increased adverse effect than the impacts experienced in isolation. These effects are temporary.
Residents on Park Close	No significant effects	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	No in-combination effects are considered likely to be experienced by this receptor.
Residents on Churchmead	Given the number of properties affected and the duration of the exceedances (potentially over several months), this is assessed as a temporary significant effect.	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	Residents on Churchmead are likely to experience an in-combination effect from noise and visual amenity during the construction phase which is considered to have an increased adverse effect above the impacts experienced in isolation. These effects are judged to be temporary.
St David’s R.C. Primary School	No significant effects	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	No in-combination effects are considered likely to be experienced by this receptor.
Users of PROW adjacent to project	Not assessed within the noise assessment	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	No in-combination effects are considered likely to be experienced by this receptor.

<b>Receptor/ Environmental Resource</b>	<b>Significance of noise impact following mitigation</b>	<b>Significance of air quality impact following mitigation</b>	<b>Significance of landscape and visual impact following mitigation</b>	<b>Comments and significance of in-combination effects</b>
Road Users	Not assessed within the noise assessment	Not significant	Moderate to Slight, adverse and temporary landscape and visual effects.	No in-combination effects are considered likely to be experienced by this receptor.
<b>Operation Effects</b>				
Visitors to Tredegar House	No Significant effects	No Significant effects	No significant effects	No in-combination effects are considered likely to be experienced by this receptor.
Residents on Forge Lane	No Significant effects	No Significant effects	Moderate significant adverse impacts on the visual amenity of residents in two most northern properties on Forge Lane	No in-combination effects are considered likely to be experienced by this receptor.
Residents on Park Close	No Significant effects	No Significant effects	Slight to negligible adverse effects on the visual amenity	No in-combination effects are considered likely to be experienced by this receptor.
Residents on Churchmead	No Significant effects	No Significant effects	Slight to negligible adverse effects on the visual amenity	No in-combination effects are considered likely to be experienced by this receptor.
St David's R.C. Primary School	No Significant effects	No Significant effects	Slight to negligible adverse effects on the visual amenity	No in-combination effects are considered likely to be experienced by this receptor.
Users of PROW adjacent to project	No Significant effects	No Significant effects	Slight to negligible adverse effects on the visual amenity	No in-combination effects are considered likely to be experienced by this receptor.
Road Users	No Significant effects	No Significant effects	Slight to negligible adverse effects on the visual amenity	No in-combination effects are considered likely to be experienced by this receptor.

### 12.4.1 Summary of Type (i) cumulative effects

People living on Forge Lane and Churchmead are predicted likely to experience inter-related effects from noise and visual amenity during the construction phase which is likely to lead to an increased adverse effect. These effects are judged to be temporary, for the duration of construction only.

It is considered that there will be no operational inter-related effects.

### 12.4.2 Mitigation and monitoring

Environmental effects that arise from construction of the Scheme will be mitigated and monitored through the CEMP. A pre-CEMP is set out in Appendix G.

## 12.5 Assessment of Type (ii) Cumulative Effects – In combination effects

This section considers the effects that may occur simultaneously or concurrently as a result of the in combination effects from the Scheme with reasonably ‘foreseeable projects’. As stated above in Section 12.3.1 this should include (but not necessarily be limited to):

- Trunk road and motorway projects which have been confirmed (i.e., gone through the statutory processes);
- Development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken; and
- Projects where a scoping report has been submitted to the Local Planning Authority.

In terms of ‘trunk road and motorway projects which have been confirmed’, the M4 Corridor around Newport (M4 CaN) project needs to be considered. An Environmental Statement for this project was submitted in March 2016.

Other developments which are relevant to the cumulative effects assessment have been identified through desk top research. An initial list of developments was taken from those that were used within the traffic modelling for J28. These represented developments from Cardiff to Monmouthshire, not all of which are considered to have potential to add any cumulative effects to the environmental impacts identified for J28, either based on their geographical distance from the project or because they have not yet received planning permission. Table 12.2 lists these developments and identifies those considered to have the potential to have cumulative effects with the Scheme.

It should be noted that traffic associated with these developments is included in the traffic modelling only for years when the developments are proposed to be operational e.g. The M4CaN is not included in the modelled baseline year (2017) as it would not yet be operational. As the air quality and noise assessments of operational effects are based on traffic data which includes the developments listed in Table 12.4, any cumulative effects are inherent within the results outlined in the air quality and noise chapters of this report. No further cumulative effects

would be anticipated, therefore operational air quality and noise effects are not considered further.

Where it was identified that cumulative impacts may arise, further details are given in Sections 12.5.1, 12.5.2, and 12.5.3. Relevant mitigation measures are also identified.



Table 12.3 Cumulative Effects from other projects

Development	County	Status	Development classification	Total size (ha)	Units	App. Distance from J28	Tier (as defined by Planning)	Potential to have cumulative effects on environment?	Justification for potential cumulative effects
M4 Corridor around Newport	Newport /Cardiff	In planning	Motorway	n/a	n/a	1.5km from closest point	1	Yes	The M4CaN is a major motorway development that is currently planned for within the National Transport Plan (2011) and for which the EIA is being prepared. Details of potential environmental impacts have been taken from the submitted ES (March 2016). See section 12.5.1 for further detail.
Brynglas Tunnels	Newport	Underway	Refurbishment and routine maintenance	n/a	n/a	Approx 6km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.
Llanwern Village	Newport	Under construction	Housing	44	1,100	8km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.
Pirelli	Newport	Under construction	Housing	6.5	250	5km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.

Development	County	Status	Development classification	Total size (ha)	Units	App. Distance from J28	Tier (as defined by Planning)	Potential to have cumulative effects on environment?	Justification for potential cumulative effects
Glebelands	Newport	Permitted	Housing	2.83	153	5km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.
Former Tredegar Park Golf Course	Newport	Under construction	Housing	9.3	150	1km	1	Yes	This development is very close to J28. From the limited environmental information available, the proposals at the golf Course appear to have a significant effect on flooding (surface water drainage). See section 12.5.2 for more details
Allt Yr Yn Campus	Newport	Under construction	Housing	5.7	125	3km	1	No	The distance from J28 makes any cumulative effects unlikely. This development is not considered further.
Monmouthshire Bank sidings	Newport	Under construction	Housing	11.3	575	1.74km	1	No	This development is relatively close to J28; however there is already a substantial residential area between the two sites as well as the South Wales Mainline Railway. It is therefore considered that cumulative effects on receptors would be unlikely.
Penmaen Wharf	Newport	Permitted	Housing	0.83	160	2.75km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.
Former Sainsbury's	Newport	Subject to s106	Housing	2.1	140	3.5km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.

Development	County	Status	Development classification	Total size (ha)	Units	App. Distance from J28	Tier (as defined by Planning)	Potential to have cumulative effects on environment?	Justification for potential cumulative effects
City Vizion	Newport	Under construction	Housing	3.2	464	3.3km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. The construction is also likely to be completed before construction for the Scheme starts. This development is not considered further.
Lysagts Village	Newport	Under construction	Housing	11.8	517	4km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. The construction is also likely to be completed before construction for the Scheme starts. This development is not considered further.
Former Bettws Comprehensive	Newport	Under construction	Housing	5.9	229	4km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. The construction is also likely to be completed before construction for the Scheme starts. This development is not considered further.
Lysagts Park	Newport	Under construction	Housing	5.8	176	4km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. The construction is also likely to be completed before construction for the Scheme starts. This development is not considered further.
Glan Llyn	Newport	Under construction	Housing	193	4,000	7km	1	No	The distance from J28 makes any cumulative effects on receptors unlikely. This development is not considered further.

Development	County	Status	Development classification	Total size (ha)	Units	App. Distance from J28	Tier (as defined by Planning)	Potential to have cumulative effects on environment?	Justification for potential cumulative effects
Jubilee Park	Newport	Under construction	Housing	40	1,200	1.5km	1	Yes	Jubilee Park is a significant residential development that is very close to J28. A review of the Jubilee Park Environmental Statement <sup>64</sup> has identified which topics may experience cumulative effects with the Scheme. See section 12.5.3 for more details.
Opposite Belmont Lodge	Newport	Permitted	Housing	6.92	122	7.3km	1	No	The distance from J28 makes any cumulative effects unlikely. This development is not considered further.
Friars Walk, Newport	Newport	Permitted	Retail / Restaurant/ Cinema		36,366	3.5km	1	No	The distance from J28 makes any cumulative effects unlikely. This development is not considered further.

<sup>64</sup> Jubilee Park, Rogerstone Environmental Statement, September 2012.

## 12.5.1 M4CaN

The M4CaNs a significant highway proposal that would see the construction of a new M4 motorway between Junctions 23 and 29, including a new crossing of the River Usk south of Newport. A full Environmental Statement for the M4CaN has been completed (March 2016) and a review has been made to identify the likelihood of cumulative effects with the proposed J28 improvements.

- Air quality – Due to different construction periods, no significant adverse cumulative effect on air quality is predicted. Cumulative operational impacts are intrinsic to the overall air quality impact assessment for both schemes and do not need to be considered here.
- Noise – Due to the different construction periods, no significant adverse cumulative effect on noise is predicted. During operation, the M4CaN would divert a significant proportion of the traffic away from J28 which would therefore reduce the noise in this area. There would therefore be a beneficial cumulative effect.
- Landscape and Visual - A new motorway to the south of Newport would cross the River Usk and the Gwent Levels and introduce significant new infrastructure into the landscape. The landscape of the route corridor is sensitive to change due to visual, cultural and ecological components; particularly due to the relatively flat topography. A new motorway would likely contribute to loss of tranquillity in the Gwent levels. Due to the scale and new location of the works, the significance of the effect on landscape is considered to be major negative within the ES of the M4CaN. Whilst the J28 proposals have identified a few moderately adverse significant effects, these are predominately during the construction phase and would not experience cumulative effects with the M4CaN (due to different construction programmes). Where effects have been identified during operation of J28, these are more localised and are again unlikely to experience cumulative effects due to the distance between the schemes.
- Archaeology and Cultural Heritage - A new motorway to the south of Newport would cross the Gwent Levels Historic Landscape and affect land with significant archaeological sensitivity. The M4CaN ES predicts that there are likely to be major significant negative effects on cultural heritage as a result of the proposals for the M4CaN. Within the J28 assessment the potential for buried archaeological remains is identified within undeveloped areas in the southern area of the Junction 28 (Tredegar House) roundabout. For the Scheme, this NSER identifies a Written Scheme of Investigation to support wider mitigation strategies during construction and therefore would not experience cumulative effects with the M4CaN project due to different construction programmes.
- Water Environment – Effects were only identified for the scheme with regards to the water environment during construction. As these two projects are not likely to be constructed at the same time, no cumulative effects are predicted. Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential impacts associated with sediment-bound pollutants, only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is

likely to be sufficiently diluted with natural sediment. Based on this, M4 corridor around Newport is not assessed cumulatively in this regards.

- Ecology and Nature Conservation – the M4CaN would likely result in significant adverse ecological effects. This Scheme only has concerns in relation to Dormice habitat which could be compounded by the M4CaN. There is therefore likely to be a greater adverse cumulative effect on dormice habitat. However, as a European Protected Species licence will be sought and a comprehensive mitigation/enhancement strategy will be implemented during the construction phase of the Scheme, the effects from J28 will not in more significant cumulative effects
- Materials – effects on material use will be experienced during the construction phases which will not align for these projects. No cumulative effects are predicted.

### 12.5.2 Former Tredegar Park Golf Course

The former Tredegar Park Golf Course has received planning permission and is under construction.

- Air quality – No significant adverse cumulative construction effects would be anticipated for air quality given the different construction programmes. Cumulative operational impacts are intrinsic to the overall air quality impact assessment for both schemes and do not need to be considered here.
- Noise – Due to the different construction periods, no significant adverse cumulative effect on noise is predicted. Predicted changes in traffic flows due to this developments have been included in noise models and therefore the existing assessment includes all associated cumulative effects.
- Landscape and visual – From the information currently available, no significant landscape and visual effects have been identified as resulting from the housing development on the former golf course. The J28 Scheme are predicted to result in moderately significant adverse effects during the construction phase, though these impacts will be temporary in nature and short lived. During operation, the Scheme is predicted to result in an overall negligible effect on the character of the local landscape, a moderately significant impact on the visual amenity of residents in two properties on Forge Lane, and a moderate to slight adverse impacts on the setting of the listed gate piers on the edge of Tredegar roundabout. It is reasonable to assume that mitigation in the form of visual screens will be erected between the former golf course development and the Scheme. Taking the above into account, the nature of work, and considering that each development will need to incorporate mitigation to reduce adverse effects as far as is practicable, significant cumulative landscape effects are not considered likely.
- Archaeology and heritage – A planning condition for the former Golf Course at Tredegar Park details the need for an archaeological record of a deer shelter before removal. Combined with a watching brief during excavations for this Scheme, it is therefore considered there will be no significant adverse cumulative effect as any archaeological remains will be recorded.
- Water environment - Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential

impacts associated with sediment-bound pollutants only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment. Whilst the two schemes are within these distances, J28 risk to surface water would be negligible and it is not considered there would be any cumulative effects.

- Ecology and Nature Conservation - Dormice have not been identified as a sensitive receptor for the works associated with the development of the former Golf Course at Tredegar House (including flood alleviation works) and therefore cumulative effects are not predicted. The only significant impact from the Scheme relates to the loss of dormice habitat, which with mitigation is reduced to a non-significant impact.
- Materials – No significant adverse effects has been recorded.

### 12.5.3 Jubilee Park

Jubilee Park is a large residential development for up to 1,200 homes, covering an area of 40 ha, which is currently under construction. A review of the Environmental Statement that was submitted for the proposed development in 2012 has been reviewed with the cumulative assessment concluding the following:

- Air quality – Due to the distance of the Jubilee Park development from the Scheme, no significant adverse cumulative effect is predicted for air quality during construction. Cumulative operational impacts are intrinsic to the overall air quality impact assessment for both schemes and do not need to be considered here.
- Noise – Jubilee Park is not considered to have any significant noise effects during construction or operation. However, in combination with the construction noise from the Scheme, it is possible that this would add to the exceedances of BS5228 noise level criteria at some locations. These would be temporary effects.
- Landscape and Visual – The site at Jubilee Park is being redeveloped from previous industrial use. The visual and landscape amenity was therefore assessed as being beneficial in the ES. The cumulative effect with the Schemes not considered to be significant.
- Archaeology and Heritage – During construction of Jubilee Park, it is considered that there will be a negligible impact on the environment as a result of loss of archaeological deposits at the Tydu Works, and at Tregwilym Fach Farm. Within this 8 assessment, the potential for buried archaeological remains is identified within two undeveloped areas in the southern area of the Junction 28 (Tredegar House) roundabout and the western footpath alongside the listed lodges. Mitigation for both of these areas is proposed to comprise an archaeological watching brief in these specific areas. Therefore, due to the implementation of best practice mitigation no significant cumulative impacts are likely.
- Water environment – Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. Based on this, Jubilee Park is not assessed cumulatively, and in this regards no significant cumulative impact is likely with the Scheme.

- Ecology and Nature conservation – The only significant impact from these projects and this Scheme is in relation to the loss of dormice habitat, which with the inclusion of mitigation is considered to be reduced to a non-significant impact. There are therefore no cumulative ecological effects.
- Material resources – No significant effects have been recorded for either this Scheme or Jubilee Park. There are therefore no cumulative material resource effects.



## 13 Environmental Management

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### 13.1 Introduction

The NSER has set out the potential impacts of the Scheme and identified how these can be mitigated. In addition to the mitigation measures, various environmental enhancement measures have also been recommended.

To ensure these measures are implemented and to ensure compliance with relevant legislation, it is essential there is an effective Environmental Management Plan throughout the pre-construction, construction, and operational phases of the Scheme including maintenance and aftercare

At this stage, a draft outline Construction Environmental Management Plan (Outline CEMP) has been prepared (Appendix G) which includes a list of all mitigation measures from each of the technical chapters covered in the NSER. The Outline CEMP will be refined and expanded into a CEMP prior to construction start, as more design and construction information becomes available and there is more certainty in terms of the Scheme layout, construction methods and programme.

### 13.2 Environmental Management System (EMS)

The Contractor will operate a Scheme specific Environmental Management System (EMS) in compliance with BS EN ISO 14001 and ISO 14004, and the requirements of Volume 10 of the DMRB.

The EMS will include:

- targets and commitments to continual improvement, sustainable construction objectives, prevention of pollution and waste, compliance with legislation and the requirements of Statutory Environmental Bodies;
- framework for setting and reviewing objectives and targets;
- monitoring and review process that audits and reports on compliance;
- guidance for the future operation and maintenance of the Scheme.

The Contractor will appoint an Environmental Clerk of Works (ECoW) and/or Environmental Coordinator (ECO) to implement the EMS. The Contractor shall make his staff, sub-Contractors and suppliers, aware of:

- the legislative requirement to comply with the EMS;
- the significant environmental impacts, actual or potential and with due reference to the NSER, of their work activities and the environmental benefits of improved personal performance;
- their roles and responsibilities in meeting the requirements of the EMS including remedial and emergency procedures;
- the potential consequences of departure from operating procedures including references to good practice and statutory guidance; and
- environmental hold points at which construction work shall cease until the Environmental Co-ordinator agrees that work can proceed.

### 13.3 Construction Environmental Management Plan (CEMP)

In accordance with DMRB Volume 11 Section 2 Part 6 HD 48/08, the CEMP will be the fundamental document for implementing environmental compliance and best practice on site during the construction phase and the aftercare period.

The CEMP will contain all current environmental management plans (such as the Site Waste Management Plan, Materials Management Plan etc.), method statements, risk assessments, certificates, health & safety plans, the register of environmental commitments, quality assurance procedures, in order to manage the construction site effectively.

The CEMP sets out the environmental management and monitoring measures to be adopted and implemented throughout the construction phase. The aim of the CEMP is to assist the contractor implement the necessary mitigation measures identified in the NSER which will prevent or reduce environmental effects associated with construction activities.

A draft Outline CEMP is provided in Appendix G1. The Outline CEMP is a 'live' document and the Contractor will be required to refine it as a CEMP prior to commencing construction. The contractor will be required to develop the CEMP with information on the construction programme and methodology.

The purpose of a CEMP is to mitigate and manage the environmental effects of the Scheme. The CEMP will:

- Record environmental risks and identify how they will be managed during the construction period;
- Provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action will take place;
- Record the objectives, commitments and mitigation measures to be implemented together with the programme and date of achievement;
- Identify the key staff structures and responsibilities associated with the delivery of the project and environmental control and communication and training requirements as necessary;
- Act as a continuous link and main reference document for environmental issues between the design, construction and the maintenance and operation stages of the Scheme;
- Demonstrate how construction activities and supporting design will properly integrate the requirements of environmental legislation, policy, good practice and those of the environmental regulatory authorities and third parties;
- Describe the contractor's proposals for ensuring that the requirements of the environmental design are achieved, or are in the process of being achieved, during the Contract Period;
- Act as a vehicle for transferring key environmental information into the Handover Environmental Management Plan (HEMP) for operational management. This will include details of the asset, short and long term management requirements and any monitoring or other environmental commitments;

## 13.4 Environmental Policy

The CEMP will be based on the Contractors' Environmental Policy Statement. This is a declaration of intent to ensure that works are effectively managed, environmental impacts are minimised and the operation and environmental management of activities are subject to continual improvement. This will be achieved by proactively developing solutions to minimise environmental impacts during the construction period.

The policy would be implemented by adopting a number of principles, including the maintenance and improvement of the Environmental Management System to ensure that operations comply with all relevant environmental legislation.

## 13.5 Status of the CEMP

The CEMP is a 'live' document. At this stage, a draft outline CEMP (Appendix G) has been produced for the NSER. There will be a number of management plans, which will be contained within the CEMP, as the detailed design and construction of the scheme progress.

Prior to construction, the contractor will take the draft outline CEMP and develop the CEMP using updates from pre-construction surveys, or modifications as a result of the detailed design process. The CEMP would then be agreed with key stakeholders and the local planning authorities. Consultation with these key stakeholders will take place before construction begins.

During construction, the CEMP would be revised to take into account any modifications to the design, changes in external factors (for example, regulations or standards), any unforeseen circumstances (for example, unknown areas of contaminated land), and address any failings in environmental performance arising from routine inspections.

Towards the end of the construction period the CEMP will be refined into a Handover Environmental Management Plan (HEMP) which will contain essential environmental information needed by the organisation responsible for the future maintenance and operation of the scheme.

There shall be two copies of the CEMP, one to be held on site and the other off site. Both copies are to be kept up to date with weekly site record details, meeting notes, consents, correspondence etc. At the end of the contract period the completed CEMP will be handed over to the WG.

## 13.6 Roles and Responsibilities

### 13.6.1 Environmental Coordinator (ECO)

The Environmental Coordinator (ECO) will be suitable qualified and experienced Chartered Member of an appropriate environmental professional body. The ECO shall oversee the Environmental Compliance throughout the construction and aftercare of the Scheme. The ECO will have experience of overseeing and reporting on sustainable construction requirements.

The Contractor's ECO will undertake the following roles:

- Update of Environmental Proposal Plans;
- Preparation of and obtaining Licences and consents (where relevant);
- Produce the Construction Environmental Management Plan (CEMP) including its ongoing review and update throughout the construction phase;
- Update the Register of Environmental Commitments and Actions; and
- Oversee integration of Environmental elements of the Specification for Highways Works Appendices.

The ECO's responsibility typically includes:

- The authority to direct members of the Contractor's site staff on environmental issues.
- The report on the use of materials (including Timber) in the monthly environmental reports.
- Arrange and undertake regular site inspection visits. Having the authority to stop works believed to be detrimental to the environment, not in accordance with commitments made by the Welsh Government or in contravention of any consents and licences granted for the purpose of undertaking works within, adjacent or affecting environmental areas.
- Be familiar with the process of highway design, construction, and supervision and have an appropriate level of knowledge of good industry practice.
- Be responsible for the production of clear and concise Method Statements required to meet licence conditions and requirements for European Protected Species, UK Protected Species, Discharge Consents and other measures made to comply with statutory provisions.
- Be Responsible for overseeing and auditing the implementation of the EMS, CEMP, environmental mitigation measures and aftercare.
- Be Responsible for ensuring that adequate environmental training is provided for the Contractor's staff.
- Assist in the development and delivery of environmental training for site personnel and subcontractors.
- Report on compliance with sustainable construction objectives, targets and records.
- Report on compliance and monitoring of commitments resulting from the statutory procedures, including any from a Public Inquiry (if appropriate).
- Ensure consistency and compliance with legislation, policy and guidance.
- Provide advice and liaise with the construction team to ensure that environmental risks are identified and appropriate controls are developed and included within method statements.
- Provide a schedule and procedures for monitoring and reporting. All incidents and near misses must be reported in line with the Costain Capture system. The reporting procedures must follow the SHE plan.
- Provide an Environmental Monitoring Report for each year of construction and Environmental Performance Report for each year of the aftercare period.

### 13.6.2 Environmental Clerk of Works (ECoW)

The ECoW will be competent in environmental management of construction, managing environmental surveys and overseeing and auditing implementation of environmental mitigation and compliance with environmental management systems, preferably in relation to highway schemes or similar in environmentally sensitive areas. The ECoW will be a Chartered Member of an appropriate environmental professional body. The ECoW is the Environmental Coordinator's representative on site and will:

- Have the authority to direct members of the Contractor's site staff on
- Be familiar with the process of highway design, construction, and supervision.
- Be experienced in environmental site supervision and have an appropriate level of knowledge of good industry practice.
- Undertake site inspections where necessary.
- Be responsible for ensuring all relevant licences, consents and method statements are in place prior to construction activities.
- Be responsible for maintaining and updating the CEMP and the REAC.
- Shall promote awareness of the SWMP, identifying opportunities to improve waste management on site and monitoring performance.
- Be responsible for overseeing and auditing the implementation of the CEMP and environmental mitigation measures on site during KS6.
- Be responsible for identifying training needs and providing environmental training including inductions, tool box talks etc. for the Contractor's site staff.
- Be able to demonstrate an understanding of the relevant environmental and ecological legislation and requirements for consents and licences and the constraints that they impose upon the operation and timing of works.
- Ensure consistency and compliance with legislation, policy and guidance during the construction period.
- Monitor construction activities to ensure that identified and appropriate control measures are effective and in compliance with the CEMP.
- Manage the environmental monitoring programme and review of the routine reports.
- Provide advice and assistance to site personnel on environmental matters.
- Undertake monitoring when required. For example, Interim site visits during each year of the aftercare period shall be arranged and attended by the Contractor's Environmental Co-Ordinator. ECO to review performance with respect to landscape maintenance, the mitigation measures and ensure the establishment and development of the soft landscape works.
- Ensure correct procedures are followed in the event of an environmental incident.
- Assist the site foreman in maintaining environmental records.

## 14 Conclusion and Summary Mitigation Tables

This NSER has reported on the environmental assessment undertaken for the Scheme and has been carried out in accordance with current legislation and guidance. It has identified potential environment effects associated with the Scheme under a number of environmental topic headings and also describes how potential adverse impacts could be avoided, mitigated or compensated. Table 14.1 summarises the key mitigation measures that are recommended and agreed to reduce the environmental impact of the Scheme.

### 14.1 Air Quality

Residential and commercial properties have been identified within 350m of the Scheme which could be temporarily affected by dust during construction. The Scheme is identified as being of medium risk of giving rise to short term dust generating activities during construction. Therefore, mitigation measures have been recommended which when implemented effectively would ensure that the effect of the Scheme would be insignificant during the construction phase.

During the operational phase, the Scheme has been assessed to have an insignificant effect on local air quality and no exceedences of the air quality objectives are predicted in the opening year of the Scheme.

### 14.2 Cultural Heritage

The impact of the Scheme on the cultural heritage would be limited. It would be confined to impacts on any potential buried archaeological remains within the undeveloped area at Junction 28. An archaeological watching brief has been recommended at specific locations where construction works would involve below ground excavations.

### 14.3 Landscape and Visual Effects

The landscape and visual environment of the site, and the area immediately surrounding it, is predominantly urban in character and visually dominated by roads, associated infrastructure and industrial, commercial and residential built form.

During the construction phase there are predicted to be slight to moderate adverse landscape and visual effects, these however will be temporary in nature.

Whilst operational, the Scheme will have moderate adverse significant effects on the visual amenity of residents in the three most northern properties on Forge Lane, users of Tredegar Park Recreation Ground and walkers on the Sirhowy Valley Walk and the hillside to the south of Tredegar Fort. The effects will be moderate to slight adverse on the setting of the listed gate piers on the southeast edge of Tredegar roundabout and Cyclists using NCR 4 and Sirhowy Valley Walk at Pont Ebbw roundabout.

The effects on the visual amenity of the remaining assessed visual receptors will vary from slight adverse to negligible.

## 14.4 Nature Conservation

The construction of the Scheme will result in the loss of dormouse habitat which is considered to be a significant impact. However, a suite of mitigation and enhancement measures for dormice will be set out under a European Protected Species Licence, including sensitive vegetation clearance, issued by Natural Resources Wales, with the aim of implementing habitat enhancement measures and improved connectivity. These are considered to reduce the scale of the impact on dormice to levels that would not constitute a significant effect.

Other impacts such as habitat loss are not considered to be significant due to the low ecological value of the receptors.

## 14.5 Materials

The Scheme does not involve major earthworks and has minimal requirements for the import and export of materials. Where possible, site won materials will be reused within the construction and development of the site waste management plan will aim to minimise waste. The overall impact on material resources is considered to be negligible.

## 14.6 Noise and Vibration

Despite Best Practicable Means, construction noise levels may not be fully mitigated at some locations. Consequently, construction activities may still exceed BS5228 noise level criteria, these are rated as temporary adverse residual effects.

No significant operational effects were indicated from the assessment, however, two potential Noise Insulation Regulations (NIR) qualifiers were identified. With the inclusion of additional mitigation measures, in the form of a 50m long 2.5m high noise barrier, the two properties would be removed from potential NIR qualification. An operational noise mitigation design to screen dwellings from the Scheme has been proposed.

## 14.7 Road Drainage and the Water Environment

The Scheme is located in an area that includes surface water bodies and areas of identified flood risk.

Following consultations with NRW it was agreed that there would be no impact to flooding as the majority of the works were within the current highway boundary. There will be no land raising in the areas which are subject to flooding risk and no works will be carried out in rivers and with this in mind NRW has confirmed a WFD assessment is not required.

There will be a minor increase in impermeable road surface accompanied with additional drainage for the Scheme. Road drainage will continue to be discharged via the existing discharge points. During construction, works will be undertaken in accordance with all current pollution and prevention measures and relevant measures will be included in the CEMP to mitigate any risk of impacts to the water environment. During operation the Scheme no negative impacts on the water environment have been identified.

Table 14.1 Summary of recommended mitigation measures

Mitigation Item No.	Approximate Location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
Air Quality						
1	Throughout worksite, with special attention to adherence close to properties	To reduce the risk of construction dust nuisance	Comprehensive measures to reduce on-site dust emissions and impacts off-site (see Section 5.1.6 outlined in the Outline CEMP in Appendix G.	During construction	Regular visual inspection of deposition at site boundaries close to properties	Consultation by contractor with local authorities confirming proposed mitigation measures
Cultural Heritage						
1	J28 (Tredegar House)	Ensure that a record is made of possible historic remains, according to a Written Scheme of Investigation (WSI)	A watching brief will be maintained within the undeveloped areas in the southern area of J28 and the western footpath alongside the listed lodges.	During Construction	The works would require to be monitored by the Employer's Representative	Notify NCC archaeologist where appropriate WSI to be agreed with Glamorgan-Gwent Archaeological Trust (GGAT)
Landscape						
1	Scheme Wide	To reduce adverse landscape and visual effects from construction activities	Re-use surplus excavated material won from the site to cover or replace the disused road surfaces and where possible to create attractive and naturally undulating grassed landforms within the central areas of the roundabouts. Any disturbed ground within or around the construction sites should be graded and cultivated prior to seeding with appropriate amenity,	During detail design, construction and on completion of the scheme.	Inspect proposed vegetation for failure and replace specimens as necessary and as agreed through contract during the rectification period.	NCC-preconstruction



			meadow or conservation grass mixes with suitable biodiversity mix to be agreed with the Local Planning Authority. Where possible, within the operational requirements of the new road layout, look for further opportunities to plant specimen native trees to replace those trees lost as a result of the works.			
2	Bassaleg	Provide visual screening to nearby residential properties.	Introduce line of shrubs at the top of the bank at Forge Lane to provide visual screening from adjacent properties. If necessary look for opportunities to plant more trees at the back of the bank.	During detail design stage and construction.	The works may require the presence of an arboriculturist during construction.	NCC - preconstruction
Nature Conservation						
1	Areas of trees	To protect remaining trees, and minimise tree loss where possible	Root protection zones (RPZ)	During construction	Ensure RPZ are maintained throughout construction	NCC
2	Scheme wide	Minimise habitat loss where possible	Planting to compensate for the loss of trees and shrubs	On completion of the scheme	As per Landscape Plan	NCC preconstruction
3	Potential bird nesting habitat	To protect nesting birds	If works are to be carried out within the nesting period a qualified ecologist must check for nesting birds	March to August	Works may need to be monitored by a qualified ecologist	N/A
4	Potential reptile habitat	To protect reptiles	If reptiles found in ongoing surveys mitigation measures to be agreed and detailed in the CEMP	Pre-construction, during construction	Works may need to be monitored by a qualified ecologist	NRW/NCC
5	Potential dormouse habitat	To protect dormice	sensitive vegetation clearance, habitat enhancement and improved connectivity measures subject to NRW licence application	Pre-construction, during construction	Works will need to be supervised and monitored by a qualified ecologist named on the licence	NRW
6	Invasive species	To prevent the spread if invasive species	Removal or treatment methods to be detailed in the CEMP	Pre-construction, during construction	Works may need to be monitored by a qualified ecologist	NRW/NCC

Material Resources						
1	Throughout worksite - site clearance	Minimise import and export of material	Identify opportunities for reuse, recycle, recover. Materials to be sorted, and where practical disposed of to recycling facilities.	Pre-construction, during construction	Site Waste Management Plan to implement, measure and monitor.	N/A
2	Throughout worksite – Earthworks - Use of primary resources	Minimise import of material	Reuse of materials in earthworks. Design to maximise the earthworks balance.	Pre-construction, during construction	Site Waste Management Plan to implement, measure and monitor.	N/A
3	Throughout worksite - Waste disposal	Minimise export of materials from site	Minimise import and export of material. Limit disposal and movements. Design to maximise the earthworks balance.	Pre-construction, during construction	Site Waste Management Plan to implement, measure and monitor.	N/A
4	Throughout worksite - Pavement planings - Waste disposal	Minimise import and export of material	Reuse as sub base in footpaths. Reuse in pavement construction. Reuse elsewhere.	Pre-construction, during construction	Site Waste Management Plan to implement, measure and monitor.	N/A
Noise and Vibration						
1	Bassaleg junction	Reduce noise from construction activities associated with the scheme at noise sensitive dwellings.  Reduce noise from operation and remove potential noise insulation regulation qualifiers.	Deployment of suitable noise mitigation measures carried out in accordance with best practice (e.g. . appropriate timing of noisy activities, temporary use of acoustic barriers if appropriate, potential use of noise sensitive equipment) As detailed in the Outline CEMP in Appendix G.  Inclusion of additional mitigation, in the form of a 50m long 2.5m high noise barrier.	To coincide with construction activities	None	With NCC as and when required by construction contractor

2	Pont Ebbw junction	Reduce noise from construction activities associated with the scheme build at noise sensitive dwellings	Deployment of suitable noise mitigation measures carried out in accordance with best practice (i.e. appropriate timing of noisy activities, temporary use of acoustic barriers if appropriate, potential use of noise sensitive equipment.) As detailed in the Outline CEMP in Appendix G.	To coincide with construction activities	None	With NCC as and when required by construction contractor
3	Pont Ebbw junction	Reduce noise from construction activities associated with the scheme build at St Julians School.	Deployment of suitable noise mitigation measures carried out in accordance with best practice (i.e. timing of noisy activities, acoustic barriers if appropriate, potential use of noise sensitive equipment etc.)	To coincide with construction activities	None	With NCC as and when required by construction contractor
Road Drainage and the Water Environment						
1	Scheme Wide	To reduce the risk of pollution of the water environment	Attenuation ponds and associated petrol interceptors if appropriate (see Section 11.8.2 and Outline CEMP in Appendix G.	To be included in the scheme design, for use during construction and operation	Mitigation measures to be incorporated in the site CEMP	N/A
2	Scheme wide	Reduction of risk of pollution of the water environment	Appropriate best practice methods to be incorporated in Outline CEMP for all construction works (See Section 11.8.1 and Outline CEMP in Appendix G.	During construction	Potential monitoring at outfall locations	To be incorporated into site engineers inspection duties
3	Flood Plain	Protect the flood plain	Flood Risk Activity Permit, issued by NRW. The permit would include assessment of risk to flood risk and water contamination due to the construction works and identification of mitigation to manage these risks.	Prior to the works commencing	Mitigation measures to be incorporated in the site CEMP	NRW


## **Appendix A**

### **Site Location Plan and Scheme Layout**

# A1 Figure 1 Site Location Plan

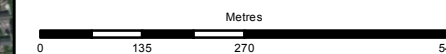
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**Legend**  
 Roundabout Locations

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P1	26-01-15	TR	AM	SH
Revision	Date	By	Chkd	Appd



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Client



Llywodraeth Cymru  
 Welsh Government

Job Title

**M4 - J28 Improvements**

Drawing Title

**Site Location Plan**

Scale at A3

**1:10,000**

Job No  
**240226-40**

Drawing Status  
**Preliminary**

Drawing No  
**001**

Revision  
**P1**

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

## **A2 Natural Resources Wales, Cadw and Newport City Council Consultation Responses**

---

**FAO: Simon Butler**

Arup  
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Capital Waterside  
Cardiff  
CF10 4QP

Ebost/Email:

[southeastplanning@naturalresourceswales.gov.uk](mailto:southeastplanning@naturalresourceswales.gov.uk)

Ffôn/Phone: 03000 653018

16 November 2016

Annwyl Syr/Madam / Dear Sir/Madam

**M4 J28 Improvement Project: Draft Non-Statutory Environmental Report**

Thank you for consulting us on the Draft Non-Statutory Environmental Report, which we received on 1 November 2016.

Information received:

-Non-Statutory Environmental Report - dated 1 November 2016.

-Statement to Inform an Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010 - dated 3 November 2016.

Based on the above information we advise the following:

**Statement to Inform an Appropriate Assessment (SIAA)**

With respect to Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended), we concur with the conclusion that there is no likely significant effect on the European sites arising from the proposed scheme, either alone or in combination with other plans and projects.

**European Protected Species**

We note from the Non-Statutory Environmental Report that surveys undertaken have identified evidence of use of the River Ebbw by otter and the presence of dormice in suitable habitat at J28. Section 8.6.1 identifies that the scheme will result in the loss of dormouse habitat.

We welcome the mitigation measures detailed in Section 8.7.2 regarding dormice and those set out within the SIAA regarding otter. We advise that the scheme is undertaken in accordance with these measures.



**Flood risk**

We confirm that we are satisfied with the Flood Risk Statement contained in Appendix E - Reference M4J28-ARP-HDR-SWG-RP-CD-000001, P04, dated 22 December 2015.

Should you have any further queries, please do not hesitate to contact us

Yn gywir / Yours faithfully

**Gemma Beynon****Arweinydd Tîm Cynllunio Datblygu/Team Leader Development Planning**

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Ffôn/Phone: 03000 653018

6 December 2016

Annwyl Syr/Madam / Dear Sir/Madam

### **M4 J28 Improvement Project: Final Draft Non-Statutory Environmental Report**

Thank you for consulting us on the final draft Non-Statutory Environmental Report (NSER), which we received on 1<sup>st</sup> December 2016.

You have confirmed to us via email (email from Amanda Murdock, Arup, dated 5<sup>th</sup> December 2016), that there have been no design changes to the J28 Scheme since the previous issue on 1<sup>st</sup> November 2016 and that the reported impact in the J28 NSER is unchanged.

We understand the following amendments have been made since the 1<sup>st</sup> November 2016 issue:

- Clarification of legislation and guidance;
- Further detail of survey and assessment methodologies;
- Inclusion of an extra 260m<sup>2</sup> planting for visual screening along Forge Lane; and
- Additional information detailing construction mitigation and best practice.

On the basis of the above, we can confirm that our response dated 16<sup>th</sup> November remains unchanged.

Should you have any further queries, please do not hesitate to contact us

Yn gywir / Yours faithfully

**Gemma Beynon**

**Arweinydd Tîm Cynllunio Datblygu/Team Leader Development Planning**

## Amanda Murdock

---

**From:** Katie Godfrey (Ecology Officer) <Katie.Godfrey@newport.gov.uk>  
**Sent:** 09 January 2017 15:55  
**To:** Amanda Murdock  
**Cc:** Joanne Gossage (Green Services Manager)  
**Subject:** RE: J28 - SIAA

Dear Amanda,

The only comment I have regarding the scheme is could I have the contact details of the ECoW (Ecological Clerk of Works) so I have a point of contact when work commences. No further comments.

Kind regards

**Katie Godfrey**  
**Ecology Officer/ Swyddog Ecoleg**  
**Green Services/Gwasanaethau Gwyrdd**  
**Newport City Council/Cyngor Dinas Casnewydd**

-----  
01633 656656

[katie.godfrey@newport.gov.uk](mailto:katie.godfrey@newport.gov.uk)

[www.newport.gov.uk](http://www.newport.gov.uk)

**NOTE: I do not work Fridays**

---

**From:** Amanda Murdock [mailto:amanda.murdock@arup.com]  
**Sent:** 09 January 2017 15:51  
**To:** Katie Godfrey (Ecology Officer)  
**Cc:** Joanne Gossage (Green Services Manager)  
**Subject:** J28 - SIAA

Dear Katie

Thank you for all your help with regards to the J28 Improvements project.

I tried to call you today to let you know I will be issuing the J28 SIAA to the client at 4:30pm today. I would be grateful if you could let me know if you have any comments, If I do not hear from you I will assume you are content with the outcome of the report. I will of course forward you the details of the ECoW in due course.

Kind regards  
Amanda

**Amanda Murdock**  
Environmental Scientist | UKMEA Consulting  
BSc MSc

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Pan fyddwch yn anfon e-bost at Gyngor Dinas Casnewydd, rydych yn cydsynio i'r Cyngor fonitro a darllen unrhyw e-byst o'r fath at ddibenion cydymffurfio â diogelwch ac â deddfwriaeth. I weld yr ymwadiad llawn ewch i <http://www.newport.gov.uk/ymwadiad>

## Amanda Murdock

---

**Subject:** FW: FW: M4 J28 Improvement Project: Non-Statutory Environmental Report (Final) - Formal Consultation

**From:** [Denise.Harris@wales.gsi.gov.uk](mailto:Denise.Harris@wales.gsi.gov.uk) [<mailto:Denise.Harris@wales.gsi.gov.uk>]

**Sent:** 13 December 2016 14:59

**To:** Simon Butler

**Subject:** M4 J28 Improvement Project: Non-Statutory Environmental Report (Final) - Formal Consultation

Dear Mr Butler

The non-statutory environmental report has considered the impact of the proposed highways works on the historic environment and concluded that apart from the possible impact on unrecorded non-designated archaeological features there will be no impact on any historic environment assets or their settings.

We concur with this assessment.

Regards

Denise Harris

Rheolwr Gwaith Achos/ Casework Manager

Diogelu a Pholisi, Gwasanaeth Amgylchedd Hanesyddol (Cadw) / Protection and Policy, Historic Environment Service (Cadw)

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---

**From:** Simon Butler [<mailto:Simon.Butler@arup.com>]

**Sent:** 01 December 2016 19:09

**To:** Maylan, Neil (ESNR-Tourism, Heritage & Sport-Cadw)

**Subject:** M4 J28 Improvement Project: Non-Statutory Environmental Report (Final) - Formal Consultation

Dear Neil,

In connection with the highway improvements proposed at M4 J28, Arup is submitting the final draft Non-Statutory Environmental Report (NSER) to Cadw for its review and comment.

---

**From:** Maylan, Neil (CADW) [mailto:Neil.Maylan@Wales.GSI.Gov.UK]

**Sent:** 02 June 2015 12:59

**To:** Gary Davies

**Cc:** Amanda Murdock; 'Powell, Melanie'; 'Palmer, Keith'; Dixon, Mark (EST - Transport); 'ljones@tacp.co.uk'; 'John Lee (John.Lee@costain.com)'; 'Thomas Kenyon'

**Subject:** RE: M4 J28 Improvements - screening and scoping[Reviewed by GD 15-05-2015]

Hi Gary

Having looked carefully at the cultural heritage section of the Environmental Screening and Scoping Report and considered the likely impact of the proposed development on the setting of the Grade I Tredegar House, the Grade II\* Tredegar House Park and Garden and the scheduled ancient monuments of Gaer Hillfort and Gwern y Cleppa Chambered Tomb, it is my opinion that this will not reach the level which would constitute EIA Development.

In reference to the scoping of the cultural heritage section of the voluntary EIA, we would strongly recommend that the work is carried out by an accredited archaeologist, preferably a Member of the Chartered Institute for Archaeologists. We also strongly recommend that you expand your search area to include all designated historic assets that will have a view of the proposed works. This would ensure that the impact of the work on the setting of the designated assets is fully covered in the assessment.

Best wishes

Neil

Neil Maylan

Senior Archaeological Planning Officer / Uwch Swyddog Cynllunio Archeolegol

Historic Environment Branch / Cangen Amgylchedd Hanesyddol

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---

**From:** Gary Davies [<mailto:gary.davies@arup.com>]  
**Sent:** 15 May 2015 17:58  
**To:** Maylan, Neil (CADW)  
**Cc:** Amanda Murdock; 'Powell, Melanie'; Palmer, Keith; Dixon, Mark (EST - Transport); 'ljones@tacp.co.uk'; John Lee ([John.Lee@costain.com](mailto:John.Lee@costain.com)); Thomas Kenyon  
**Subject:** M4 J28 Improvements - screening and scoping[Reviewed by GD 15-05-2015]

Hi Neil

Apologies for the delay but please find attached a copy of the screening and scoping report for CADW's review and comment. The report is supplemented with a covering letter too.

On behalf of our client, we are consulting with CADW seeking endorsement that that the proposed M4 J28 Improvements scheme does not constitute EIA development and therefore that an Environmental Statement is not required.

A combined Screening and Scoping Report for a non-statutory EIA has been prepared and is attached for your perusal. It provides a description of the proposed development site and project components, an outline of the methodology and key environmental issues associated with the construction and operation of the project.

We would appreciate any comments you may have on this scoping and would be grateful if an expedient response to this request could be provided.

Should you wish to query any aspect of the above or require further clarification, please do not hesitate to contact Amanda Murdock who is the Environmental Coordinator on (029) 2047 3727 or by email (cc'd above).

Regards

**Gary Davies**

Associate | Civil Engineer

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---

**From:** Gary Davies  
**Sent:** 17 April 2015 14:46  
**To:** 'Maylan, Neil (CADW)'  
**Subject:** RE: M4 J28 Improvements - Postponed ELG[Reviewed by GD 17-04-2015]

Hia Neil

I'm afraid that we've had to postpone the ELG meeting scheduled for Monday 20<sup>th</sup> April. My colleague Amanda Murdock will be in contact with you shortly to arrange another suitable date and time.

Regards

**Gary Davies**

Associate | Civil Engineer

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---

**From:** Maylan, Neil (CADW) [<mailto:MaylanN@Wales.GSI.Gov.UK>]  
**Sent:** 16 March 2015 12:29  
**To:** Amanda Murdock  
**Subject:** RE: M4 J28 Improvements - Revised ELG date

Hi Amanda

Currently I can make the meeting on the 20<sup>th</sup> April

Best wishes

Neil

Neil Maylan  
Senior Archaeological Planning Officer / Uwch Swyddog Cynllunio Archeolegol

Historic Environment Branch / Cangen Amgylchedd Hanesyddol  
Cadw, Plas Carew, 5/7 Cefn Coed, Parc Nantgarw, Cardiff / Caerdydd CF15 7QQ  
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---

**From:** Amanda Murdock [<mailto:amanda.murdock@arup.com>]

**Sent:** 16 March 2015 10:24

**To:** Katie Godfrey; [Judith@ggat.org.uk](mailto:Judith@ggat.org.uk); [David.Orme@newport.gov.uk](mailto:David.Orme@newport.gov.uk); Maylan, Neil (CADW);

[John.Pearson@nationaltrust.org.uk](mailto:John.Pearson@nationaltrust.org.uk); Beynon, Gemma; [environmental.health@newport.org.uk](mailto:environmental.health@newport.org.uk); Gary Davies; Dixon, Mark (EST - Transport); Lee Jones

**Cc:** Collinwood, Luci (EST - Transport); Richard Sanders; [Melanie.Powell@pbworld.com](mailto:Melanie.Powell@pbworld.com); [John.Lee@costain.com](mailto:John.Lee@costain.com)

**Subject:** M4 J28 Improvements - Revised ELG date

Dear All

The ELG to be held this Wednesday (18 March) has been postponed as unfortunately NRW are now unable to attend.



We will now hold the meeting on Monday 20 April, 2:30pm at the Arup offices in Cardiff Bay. I would be grateful if you could confirm whether you are able to attend. I will send out an agenda nearer to the date.

I apologise for any inconvenience caused.

Kind regards  
Amanda

**Amanda Murdock**  
Environmental Scientist | Consulting

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4 Pierhead Street, Capital Waterside Cardiff CF10 4QP United Kingdom  
t +44 29 2047 3727  
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---

**From:** Amanda Murdock  
**Sent:** 03 March 2015 15:57  
**To:** Katie Godfrey; [Judith@ggat.org.uk](mailto:Judith@ggat.org.uk); [David.Orme@newport.gov.uk](mailto:David.Orme@newport.gov.uk); Maylan, Neil (CADW); [John.Pearson@nationaltrust.org.uk](mailto:John.Pearson@nationaltrust.org.uk); Beynon, Gemma; [environmental.health@newport.org.uk](mailto:environmental.health@newport.org.uk); Gary Davies; [mark.dixon@wales.gsi.gov.uk](mailto:mark.dixon@wales.gsi.gov.uk)  
**Cc:** [luci.collinwood@cymru.gsi.gov.uk](mailto:luci.collinwood@cymru.gsi.gov.uk); Richard Sanders; Lee Jones; [Melanie.Powell@pbworld.com](mailto:Melanie.Powell@pbworld.com); [John.Lee@costain.com](mailto:John.Lee@costain.com)  
**Subject:** M4 J28 Improvements - ELG date

Dear All

Thank you for confirming your available dates for an ELG meeting for M4 J28 Improvements. I can confirm that the meeting will be held on Wednesday 18 March, 2:30pm at the Arup offices in Cardiff Bay. I will send an agenda out nearer the date.

Kind regards  
Amanda

**Amanda Murdock**  
Environmental Scientist | Consulting

**Arup**  
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Wrth adael Mewnrwyd Ddiogel y Llywodraeth nid oedd unrhyw feirws yn gysylltiedig â'r neges hon.

Mr Simon Butler  
Arup  
4 Pierhead Street  
CARDIFF  
CF10 4QP

Ebost/Email:  
gemma.beynon@naturalresourceswales.gov.uk  
Ffôn/Phone: 03000 653018

10 June 2015

Annwyl Mr Butler / Dear Mr Butler

**PROPOSED M4 J28 IMPROVEMENTS SCHEME AT M4 JUNCTION 28 TREDEGAR PARK, A48 SOUTHERN DISTRIBUTOR ROAD, PONT EBBW ROUNDABOUT, A467 FORGE ROUNDABOUT**

Thank you for referring the revised Scoping and Screening Report for the above project.

**European Protected Species**

We note from Section 5.1.2 of the Screening and Scoping Report (dated 11 May 2015) that the Phase 1 Habitat survey concludes there is habitat that is potentially suitable for reptiles and dormice. Otter and bat activity has also been recorded in the area (SEWBREC).

We welcome that additional surveys for a number of species are proposed as part of the non-statutory EIA.

The non-statutory EIA should clearly set out the results of these additional survey, and include an assessment of impacts and whether these are likely. Should there be any impacts as a result of the proposed scheme the non-statutory EIA should clearly set out details of mitigation and compensation. These details will need to be sufficient to demonstrate that, for European Protected Species, the scheme could pass the three EPS licensing tests.

We would therefore expect to see:

- survey for appropriate species based on habitat types
- assessment of impacts
- mitigation / compensation as appropriate and proportionate to the impacts.

**Fisheries**

Our understanding is that no work is to take place in the River. However it should be noted that any work in river is restricted from 15th October to 15th May. The time of year at which

the works are carried out should be discussed with ourselves to ensure free passage for migrating fish and no detriment to spawning fish.

Please note under the terms of the Salmon and Freshwater Fisheries Act 1975, it is an offence to disturb spawning fish or their habitat.

**Flood risk**

We confirm that based on the Flood Risk Statement contained in Appendix E of the Screening and Scoping Report, a Flood Consequences Assessment (FCA) is not required for the proposed scheme.

Should you have any further queries, please do not hesitate to contact me.

Yn ddiffuant / Yours Sincerely



**Gemma Beynon**  
**Arweinydd Tîm Cynllunio Datblygu/Team Leader Development Planning**

Ebost/Email: [gemma.beynon@cyfoethnaturiolcymru.gov.uk](mailto:gemma.beynon@cyfoethnaturiolcymru.gov.uk)

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Steve Davies  
JG/SD/ TBM/J28 /01idor/lett03  
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240226  
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NCC

Streetscene  
Y-Strydynun



Civic Centre/Canolfan Ddinesig  
Newport/Casnewydd  
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NP20 4UR

Simon Westwood  
Arup  
4 Pierhaed Street  
Capital Waterside  
Cardiff  
CF10 4QP

14<sup>th</sup> December 2016

Dear Simon

**JUNCTION 28 IMPROVEMENT PROJECT  
NON STATUTORY ENVIRONMENTAL REPORT  
Landscape and Ecological Comments**

**Landscape**

There is no significant impact on important views from Tredegar Park and The Gaer. There will be the usual high impact and disruption on nearby views during construction; this includes National cycle route and some PROWs.

The mature planting scheme on Junction 28 was undertaken for the Ryder Cup in 2010 and these were funded by WAG. Also, the planting on Bassaleg roundabout was undertaken with the local community in 2009 through a scheme called tree o'clock that was funded by the BBC. The community engagement strategy will need to take this into account and will need to discuss this issue with local members.

Thank you for your correspondence and documents relating to the highway improvements proposed at M4 J28 submitted to Newport City Council for Review and comment. In compliance with your request the reports and drawings have been reviewed by Landscape and Ecology officers of the council and their comments are as follows.

It has been agreed (email correspondence Wednesday 14<sup>th</sup> December) that larger species of trees will be planted to compensate for those lost. The agreed tree species list is as follows:

**Pont Ebbw roundabout**

Corylus colurna ( Turkish hazel);

Liriodendron tulipifera "Fastigiatum";

Quercus robur "fastigiata Koster"

### **Additional trees**

Liquidambar styraciflua;

Prunus avium "plena";

Betula utilis "Silver Shadow";

Further details of bulb planting e.g. species, will be required at a later stage.

### **Ecology**

Provided all licences are obtained and compensation habitat for dormice is completed in accordance with those licences there should not be any issues. We confirm that as discussed:

- All necessary surveys have been undertaken and the proposed mitigation is acceptable.
- Ecologist is satisfied with proposed tree species list.
- Grassland areas will need to be managed as wildflower meadows and cut once a year.

Please contact Katie Godfrey if you wish to discuss these in any further detail.

Matters relating to Active Travel and footpaths will be sent separately.

Yours sincerely



PP  
Joanne Gossage  
**Green Services Manager**  
For Streetscene and City Services  
Newport City Council

---

**From:** Lloyd Jones [mailto:Lloyd.Jones@newport.gov.uk]  
**Sent:** 10 July 2015 11:05  
**To:** Gary Davies  
**Subject:** M4 J28 Improvements - Confidential

Dear Gary,

Thank you for consulting Newport City Council on the combined screening and scoping report for the above scheme.

I have undertaken the necessary internal consultations that include the Council's Highway Section and Ecologist.

Following a comprehensive review of the supporting information, I can confirm that I have no comments to make.

Regards,

Lloyd Jones MRTPI  
Principal Planning Officer/*Prif Swyddog Cynllunio*  
Regeneration Investment and Housing/*Adfywio Buddsoddi a Thai*  
Newport City Council/*Cyngor Dinas Casnewydd*  
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Begin forwarded message:

**From:** "Michelle Tett (Principal Environmental Health Officer)" <[Michelle.Tett@newport.gov.uk](mailto:Michelle.Tett@newport.gov.uk)>  
**Date:** 15 December 2016 at 16:54:15 GMT  
**To:** "[Simon.Butler@arup.com](mailto:Simon.Butler@arup.com)" <[Simon.Butler@arup.com](mailto:Simon.Butler@arup.com)>  
**Cc:** "Jonathan Keen (Environmental Health Manager)" <[Jonathan.Keen@newport.gov.uk](mailto:Jonathan.Keen@newport.gov.uk)>, "Peter Mackintosh (Senior Scientific Officer)" <[Peter.Mackintosh@newport.gov.uk](mailto:Peter.Mackintosh@newport.gov.uk)>  
**Subject:** M4 J28 - Non-Statutory Environmental Report (NSER)

Dear Simon,

In regards to the highways improvements proposed at M4 Junction 28. The Environmental Protection team, within Newport City Council would like to make comment on the final draft Non-Statutory Environmental Report (NSER).

**Noise Priority Action Area (Between Tredegar and Bassaleg roundabout)**

I would like to draw your attention to the Welsh Government Noise Action Plan for Wales. There is a noise priority action area between Tredegar and Bassaleg roundabout. I can provide a more a detailed map showing the specific area, if required. In the Welsh Government Noise Action Plan for Wales on page 98 of the document Bullet point 10.5 (a) part iii. It explains that Newport City Council will take priority areas into consideration in its road resurfacing work so as to reflect the statements in section 10.2 of this action plan.

Environmental Health support the Welsh Governments objectives in this area of work and therefore recommend that you do consider the type of road resurfacing work/techniques applied. I would appreciate if you could confirm in writing that a consideration to the type of road resurfacing work/techniques has been applied to this project to reduce road traffic noise.

**Air Quality**

Air Quality and its associated health impacts are caused by road traffic emissions from the burning fossil fuels. The operational phase of the development is unlikely to have a significant impact on the areas which are considered already highly vulnerable to traffic fumes (known as air quality management areas). However, the construction phase will have an impact on the background concentrations of air quality. Within the Outline Construction Management Plan some elements of how dust and vehicle trips will be kept to a minimum have been outlined. However, I would appreciate if HGVs and construction vehicles serving the project avoid routes where AQMAs are present. Once this outline plan has been expanded I would appreciate if it could be sent to the council for further comment.

Additionally, site workers may be exposed to areas of poor air quality near the carriageway where the hourly air quality objective is likely to be breached. It would be useful to have comments upon the risk, monitoring and management of site workers exposure to poor air quality from working next to the carriageway where it is highly likely to exceed the hourly mean air quality standards.

**Contaminated Land**

There are no significant areas of potentially contaminated land that are known within the area of the development. However as indicated in the assessment it is agreed that a watching brief will be maintained, in which if any ground works encounter unusual ground conditions that may indicate contamination the councils Environmental Health team will be informed. Furthermore, if any soils are imported to site they shall be chemically tested for their suitability prior to installation.

Regards  
Michelle Tett

Prif Swyddog Iechyd yr Amgylchedd/ Principal Environmental Health Officer  
Y Gyfraith a Rheoleiddio/ Law & Regulation  
Cyngor Dinas Casnewydd/ Newport City Council  
01633 851704  
[Michelle.tett@newport.gov.uk](mailto:Michelle.tett@newport.gov.uk)

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Ffôn/Phone: 03000 653018

22 December 2016

Annwyl Syr/Madam / Dear Sir/Madam

### **M4 J28 Improvement Project: Statement to Inform an Appropriate Assessment (SIAA)**

Thank you for notifying us of an amendments to the final Statement to Inform an Appropriate Assessment (SIAA), which we received on 12<sup>th</sup> December 2016

Information received:

-Statement to Inform an Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010 - dated 12 December 2016

We understand that an amendment has been made in Section 7, third bullet point of the SIAA, where the Brynglas Tunnels project has been identified as a project for consideration of in-combination effects.

With respect to Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended), we concur with the conclusion that there is no likely significant effect on the European sites arising from the proposed scheme, either alone or in combination with other plans and projects.

Should you have any further queries, please do not hesitate to contact us

Yn gywir / Yours faithfully

**Gemma Beynon**

**Arweinydd Tîm Cynllunio Datblygu/Team Leader Development Planning**

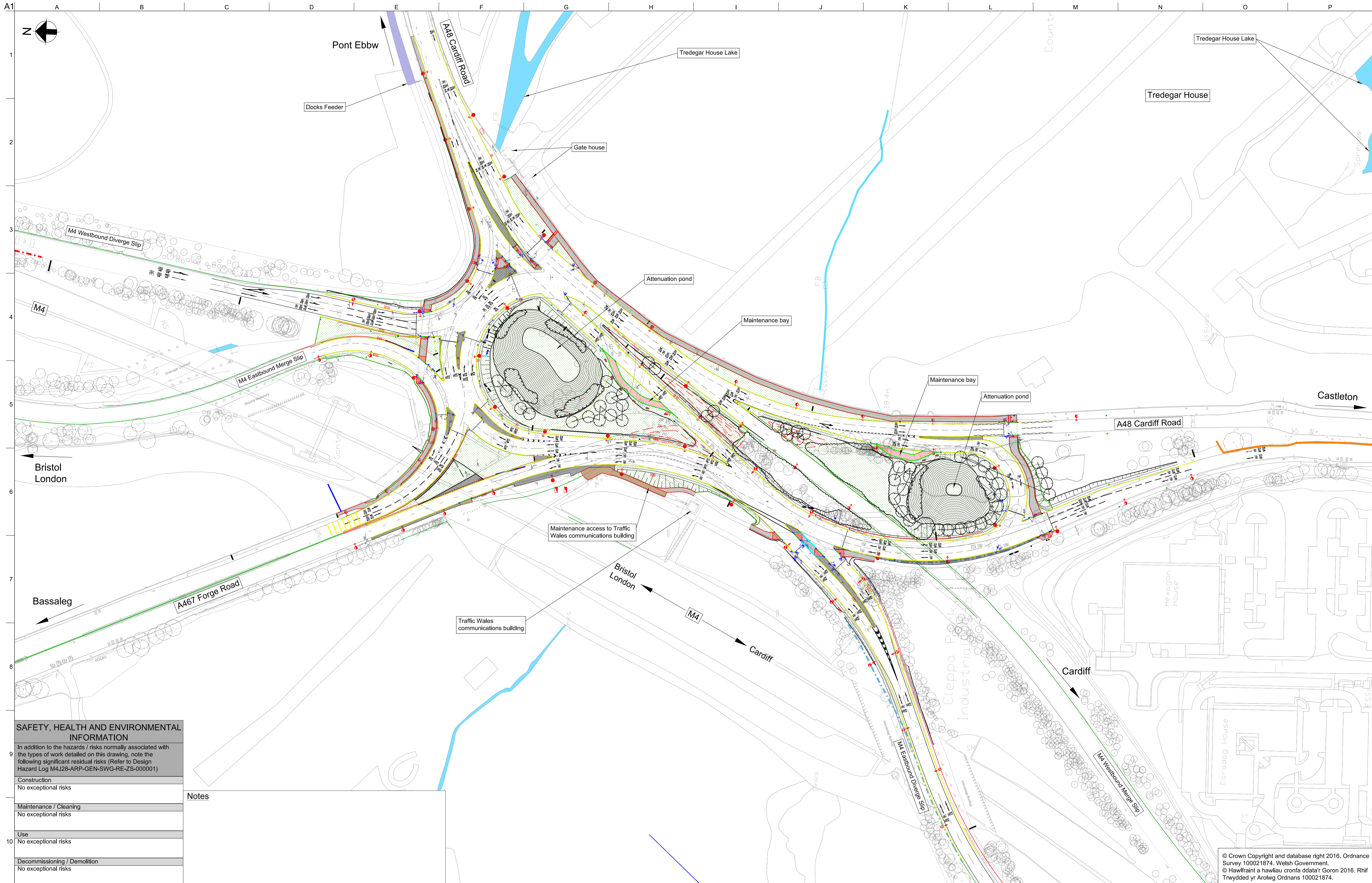
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Ffôn/Tel: 03000 653018



## A3 Scheme Layout – Junction 28 (Tredegar House)

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**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ZS-000001)

Construction	No exceptional risks
Maintenance / Cleaning	No exceptional risks
Use	No exceptional risks
Decommissioning / Demolition	No exceptional risks

**Notes**

- Legend**
- Lighting Unit
  - Feeder Pillar
  - Signage
  - Traffic Signals

P05	30/11/16	AJ	SW	RS
Final Issue				
Issue	Date	By	Chkd	Appd

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Client  
  
Lywodraeth Cymru  
Welsh Government

Project Title  
**M4 J28 Improvements**

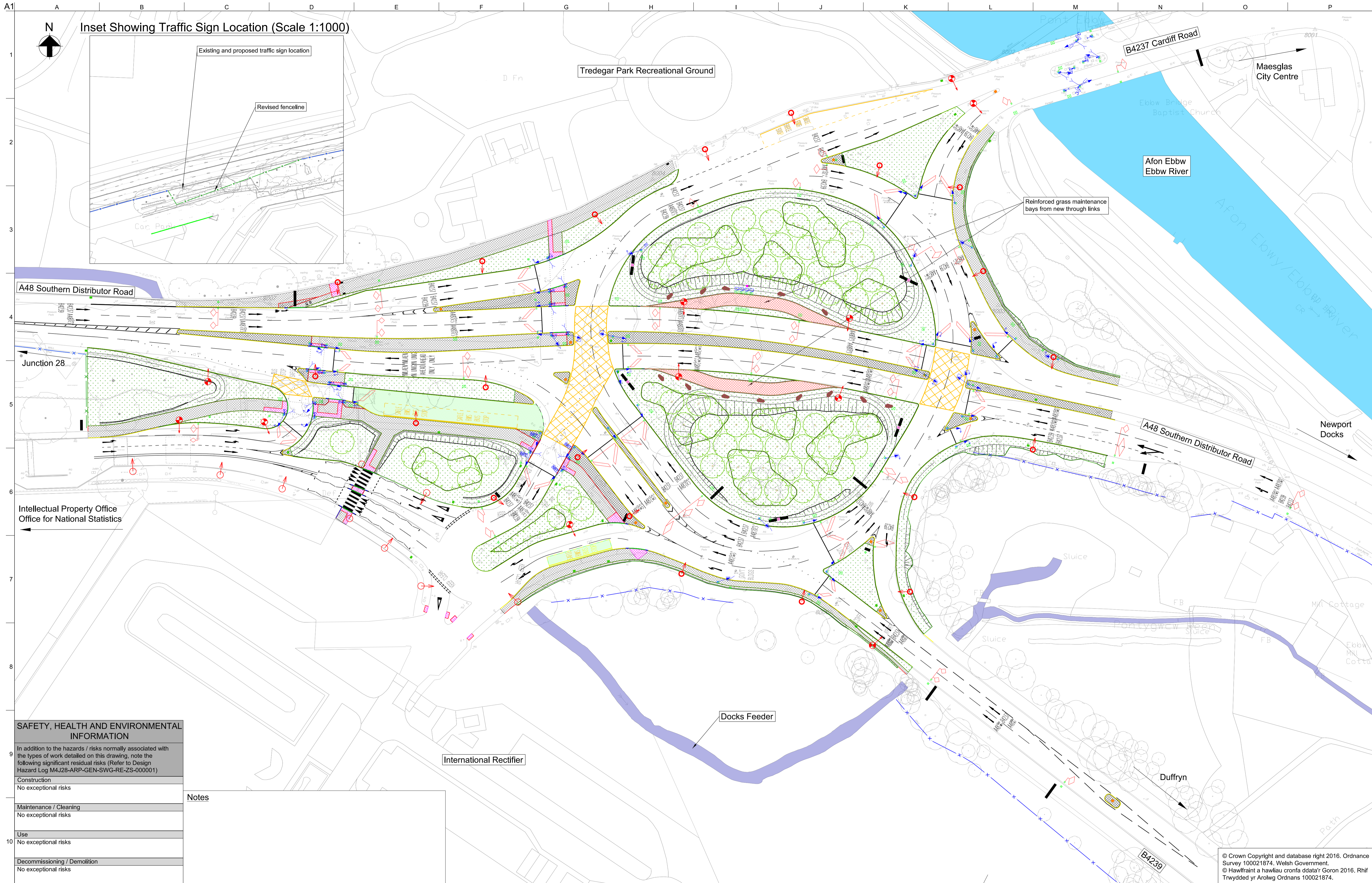
Drawing Title  
**Junction 28 General Arrangement**

Scale at A1 1:1000

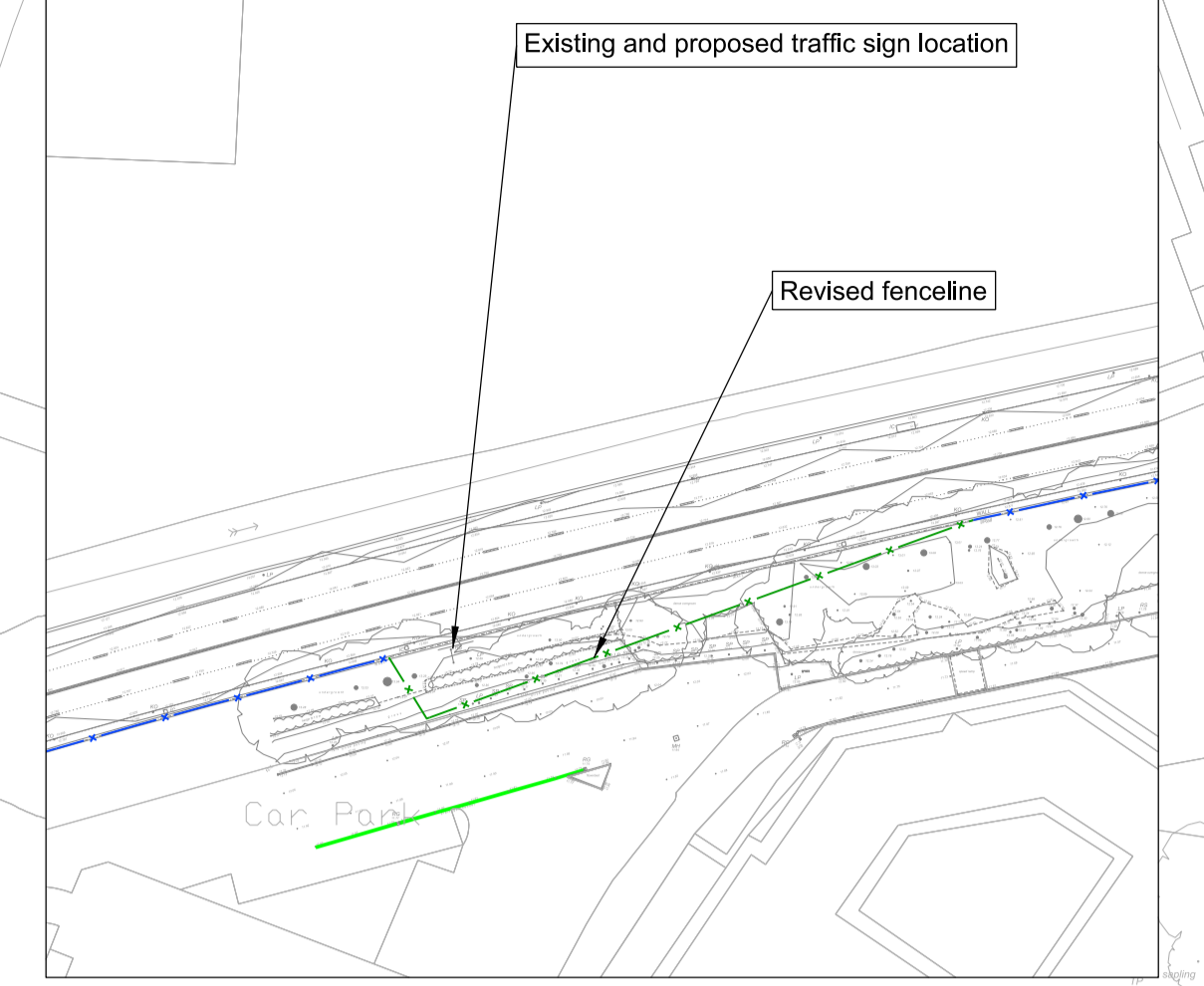
Role	Civil Engineer - Highways
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Rev	P05
Name	M4J28-ARP-HGN-J28-DR-CH-000001

## **A4**     **Scheme Layout – Pont Ebbw Roundabout**

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Inset Showing Traffic Sign Location (Scale 1:1000)



A1  
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A B C D E F G H I J K L M N O P

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In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ZS-000001)

Construction	No exceptional risks
Maintenance / Cleaning	No exceptional risks
Use	No exceptional risks
Decommissioning / Demolition	No exceptional risks

**Notes**

- Legend**
- Footway
  - Tactile Paving
  - Concrete Paving
  - Grass Concrete Paving
  - Vegetation
  - Existing fence to be retained
  - Proposed fence
  - Bus Stop (Green Surfacing)
  - Signage
  - Lighting Column
  - Traffic Signals

International Rectifier

Docks Feeder

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Issue	Date	By	Chkd	Appd

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Client  
  
Llywodraeth Cymru  
Welsh Government

Project Title  
**M4 J28**  
Improvements

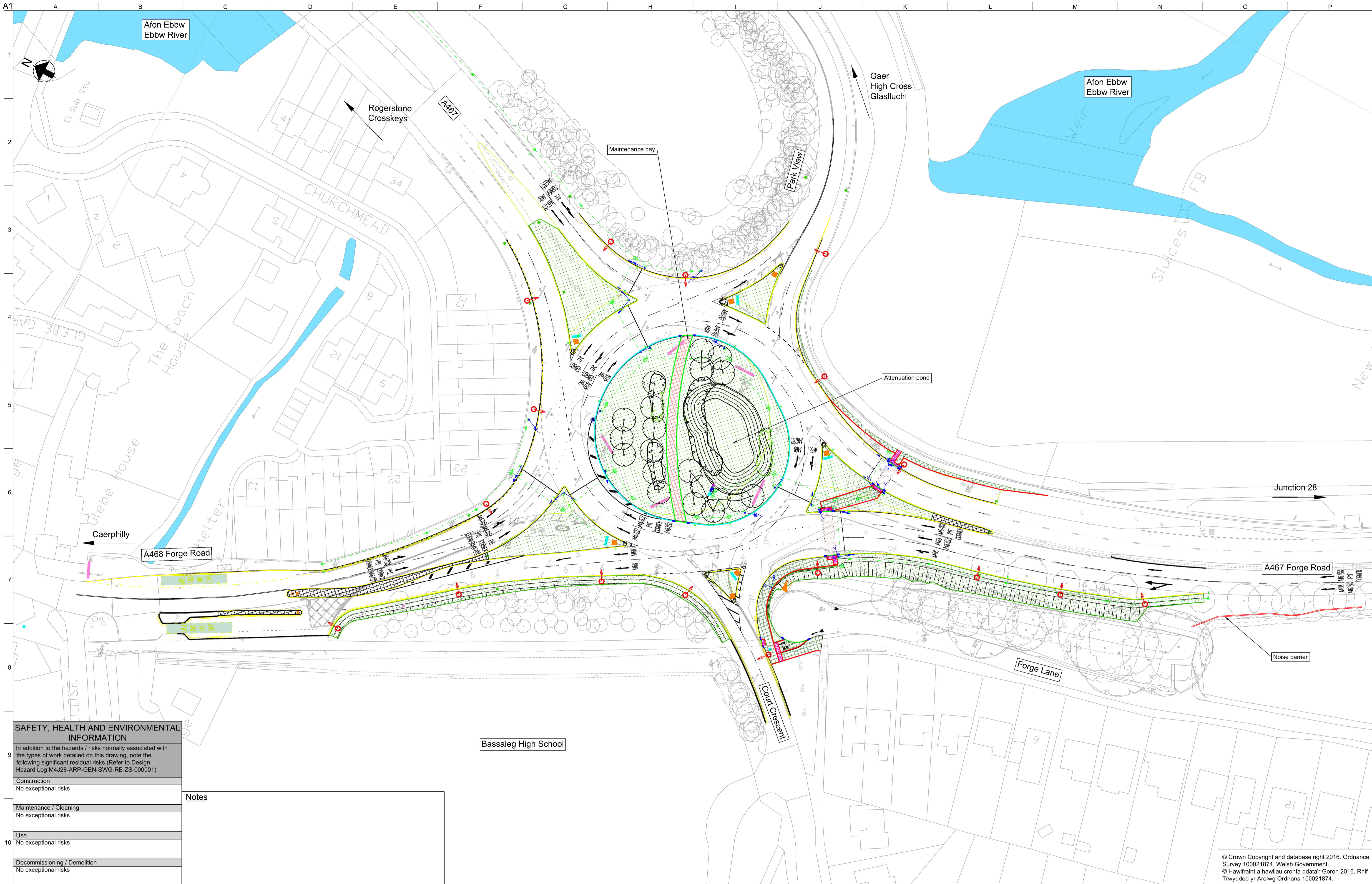
Drawing Title  
**Pont Ebbw Junction**  
General Arrangement

Scale at A1: 1:500

Role	Civil Engineer - Highways
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Name	
Rev	P05
<b>M4J28-ARP-HGN-EBW-DR-CH-000002</b>	

## **A5**    **Scheme Layout – Bassaleg Roundabout**

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**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ZS-000001)

Construction	No exceptional risks
Maintenance / Cleaning	No exceptional risks
Use	No exceptional risks
Decommissioning / Demolition	No exceptional risks

**Notes**


**Legend**

- Lighting Unit
- Feeder Pillar
- Signage
- Traffic Signals

P05	30/11/16	TS	SW	RS
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Issue	Date	By	Chkd	Appd

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Client  
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 Welsh Government

**COSTAIN**

Project Title  
**M4 J28**  
 Improvements

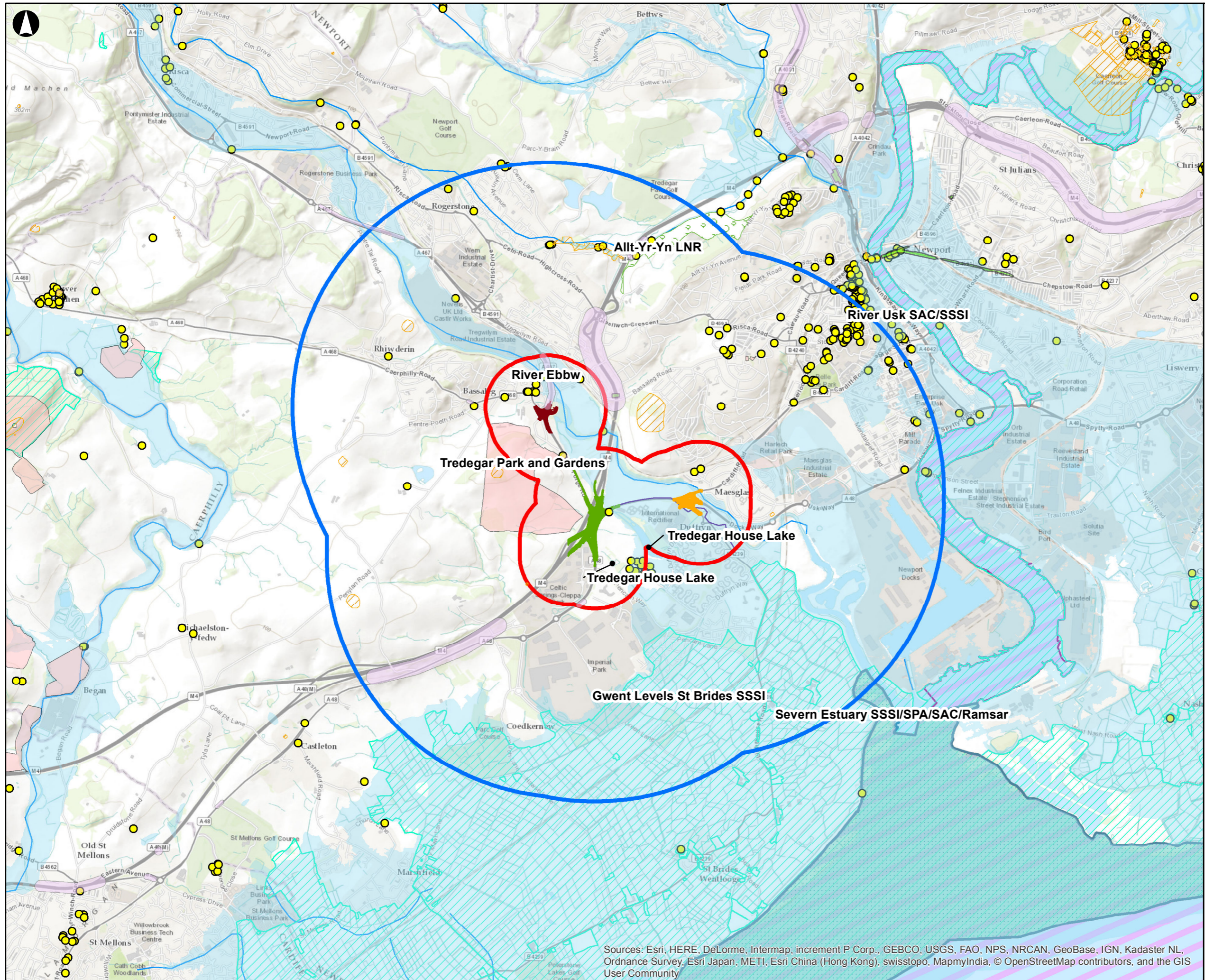
Drawing Title  
**Bassaleg Junction**  
 General Arrangement

Scale at A1: 1:500

Role	Civil Engineer - Highways
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Rev	P05
Name	M4J28-ARP-HGN-BSG-DR-CH-000001

## A6 Environmental Constraints Plan

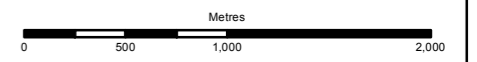
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- Legend**
- NAPPA
  - AQMA
  - Bassleg Junction
  - Pont Ebbw Junction
  - Scheduled Monuments
  - 500m Study Area
  - 2km\_buffer
  - Registered Parks and Gardens
  - Flood Risk
  - Listed Buildings
  - Ramsar
  - Special Protection Areas (SPA)
  - Sites of Special Scientific Interest (SSSI)
  - Special Areas of Conservation (SAC)
  - Local Nature Reserve
  - Tredegar Junction
  - river
  - Dock\_feeder

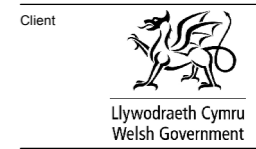
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Revision	Date	By	Chkd	Appd



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**M4 - J28 Improvements**

Drawing Title  
**Preliminary Environmental Constraints - 2km**

Scale at A3  
**1:37,189**

Job No  
**240226-40**

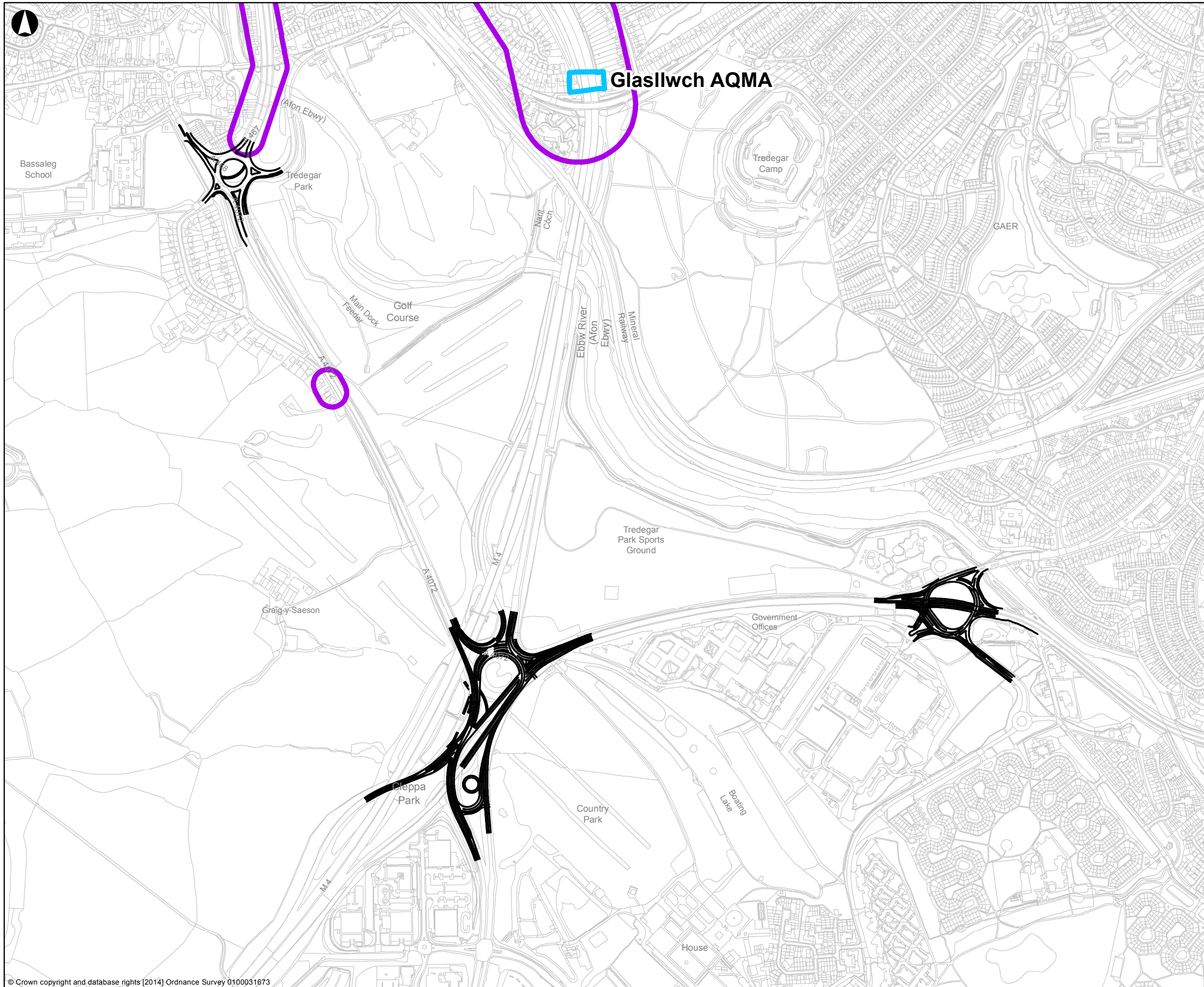
Drawing Status  
**Preliminary**




Drawing No  
**001**

Revision  
**P1**

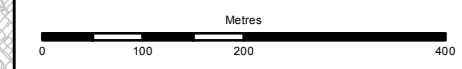
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community






- Legend**
-  Noise Action Priority Plan Area (NAPPA)
  -  Air Quality Management Areas (AQMA)
  -  Junction

P01.1	2016-11-28	FG	AM	GD
Issue	Date	By	Chkd	Appd



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 Job Title  
**M4 Junction 28**

**Air Quality Management Areas (AQMA) and Noise Action Priority Plan Area (NAPPA)**

Scale at A3  
**1:7,500**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>001</b>	Issue <b>P01.1</b>

## **Appendix B**

### **Air Quality Appendix**

## B1 Traffic Data

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Appendix B1 – Traffic Data

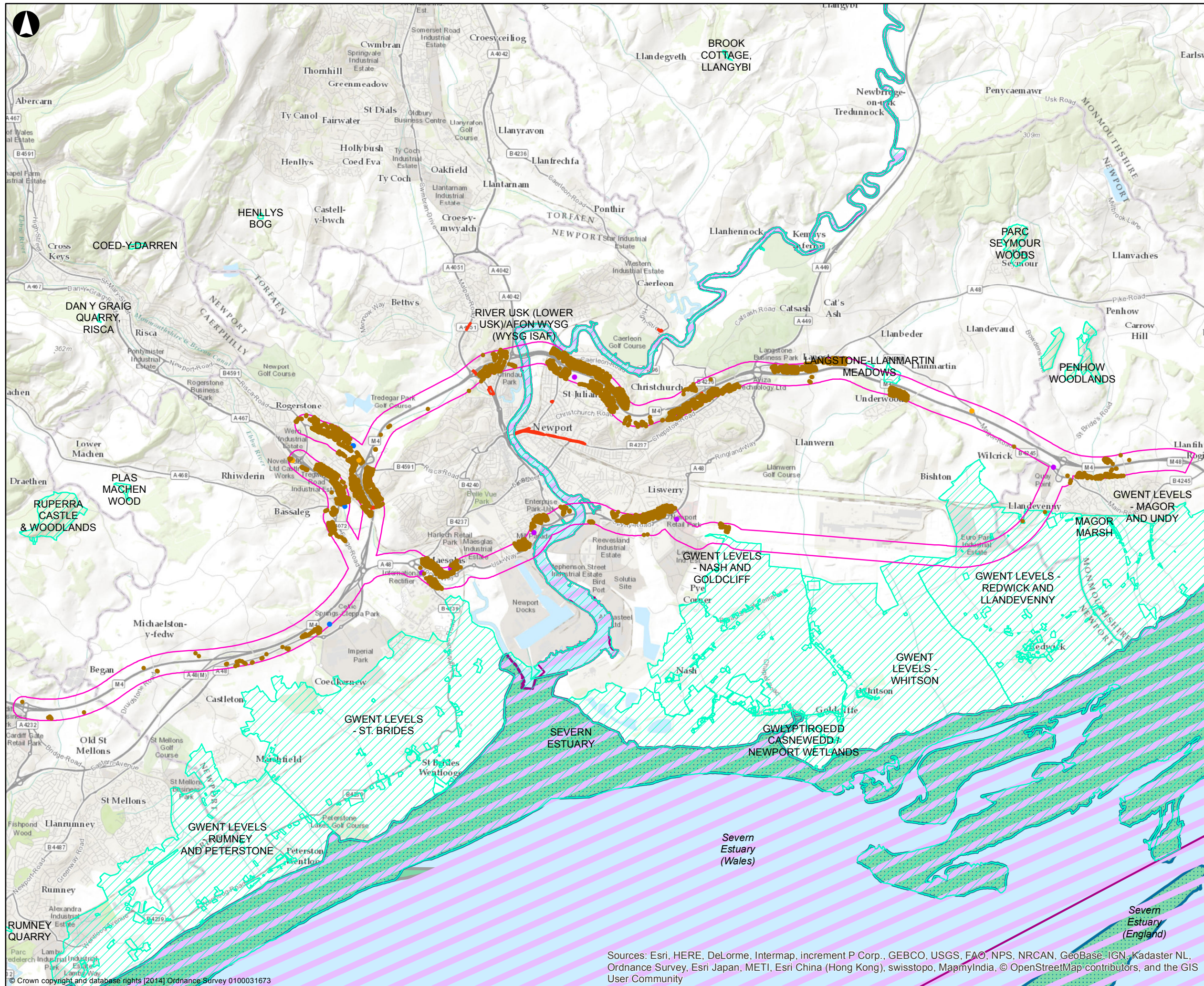
Road Name	Base 2012			Do Minimum 2017			Do Something 2017			Change as a Result of the Proposed Scheme		
	AADT	HGVs	Spd (kph)	AADT	HGVs	Spd (kph)	AADT	HGVs	Spd (kph)	AADT	HGVs	Spd (kph)
M4 Eastbound Carriageway J30 to J29	29,790	3,500	107	33,190	3,390	106	29,580	3,630	107	-3,610	240	1
M4 Westbound Carriageway J30 to J29	28,770	3,450	107	32,050	3,340	106	26,250	3,530	107	-5,800	190	1
M4 Eastbound Carriageway J29 to J28	52,490	5,160	109	58,400	5,050	107	51,270	5,480	109	-7,130	430	2
M4 Westbound Carriageway J29 to J28	50,440	5,010	100	56,300	4,880	98	46,380	5,320	101	-9,920	440	3
Forge Road (J28 to Bassaleg Rdbt)	30,360	1,520	98	31,840	1,480	98	37,,300	1,720	97	5,460	240	-1
Forge Road north of Bassaleg Rdbt	26,000	1,600	103	30,800	1,620	103	23,020	1,940	104	-7,780	320	1
M4 Eastbound Carriageway J28 to J27	49,910	4,400	92	56,680	4,170	88	47,760	4,360	93	-8,920	190	5
M4 Westbound Carriageway J28 to J27	52,080	4,630	95	56,600	4,290	94	46,740	4,660	97	-9,860	370	4
High Cross Road	18,100	200	45	20,100	160	45	16,620	180	45	-3,480	20	0
M4 Eastbound Carriageway J27 to J26	50,500	4,400	98	56,830	4,190	95	49,040	4,420	99	-7,790	230	4
M4 Westbound Carriageway J27 to J26	53,670	4,730	94	58,450	4,390	92	50,210	4,770	96	-8,240	380	4
M4 Eastbound Carriageway J26 to J25a	34,980	3,830	88	39,580	3,600	86	34,730	3,750	89	-4,850	150	3
M4 Westbound Carriageway J26 to J25a	34,230	4,230	81	37,600	3,,900	79	32,400	4,250	82	-5,200	350	3
M4 Eastbound Carriageway J25a to J25	45,130	4,450	94	51,410	4,190	92	44,770	4,450	94	-6,640	260	2
M4 Westbound Carriageway J25a to J25	44,370	4,690	92	49,440	4,380	90	42,230	4,790	93	-7,210	410	3
M4 Eastbound Carriageway J25 to J24	46,510	4,480	93	52,800	4,220	91	45,870	4,480	93	-6,930	260	2
M4 Westbound Carriageway J25 to J24	46,040	4,750	91	51,030	4,430	89	43,740	4,860	92	-7,290	430	3
M4 Eastbound Carriageway J24 to J23a	38,680	4,800	106	43,370	4,360	104	38,350	4,700	106	-5,020	340	2

Appendix B1 – Traffic Data

Road Name	Base 2012			Do Minimum 2017			Do Something 2017			Change as a Result of the Proposed Scheme		
	AADT	HGVs	Spd (Kph)	AADT	HGVs	Spd (Kph)	AADT	HGVs	Spd (Kph)	AADT	HGVs	Spd (Kph)
M4 Westbound Carriageway J24 to J23a	38,650	4,490	107	42,010	3,610	106	35,980	3,980	108	-6,030	370	2
M4 Eastbound Carriageway J23a to J23	35,740	5,150	105	40,970	5,290	104	36,830	5,840	105	-4,140	550	1
M4 Westbound Carriageway J23a to J23	32,580	4,340	106	36,990	4,420	105	31,150	4,970	107	-5,840	550	1
A4810 Steelworks Access Road	2,160	420	88	8,460	2,700	80	8,560	3,060	80	100	360	0
A48 Spytty Road (West of A4810)	33,980	2,460	84	35,200	2,760	84	34,980	3,120	84	-220	360	0
A48 SDR (West of Usk Way)	24,800	2,080	85	27,440	2,320	85	28,640	2,720	84	1,200	400	0
A48 Docks Way	25,940	1,960	85	27,440	2,120	85	29,860	2,480	84	2,420	360	0
A48 SDR (Pont Ebbw to J28)	32,140	2,100	84	34,480	2,340	84	37,220	2,680	84	2,740	340	-1

## **B2 Study Area of Local Air Quality Assessment**

---



**Legend**

**Buildings**

- Education
- Medical
- Residential Institution
- Dwelling

Buffer 200m

Sites of Special Scientific Interest (SSSI)

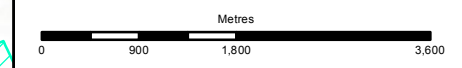
Special Areas of Conservation (SAC)

Special Protection Areas (SPA)

Ramsar

AQMA

P0	2015-11-20	RC	AM	GD
Issue	Date	By	Chkd	Appd



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Job Title

**M4 Junction 28**

**Study Area of Local Air Quality Assessment**

Scale at A3

**1:70,000**

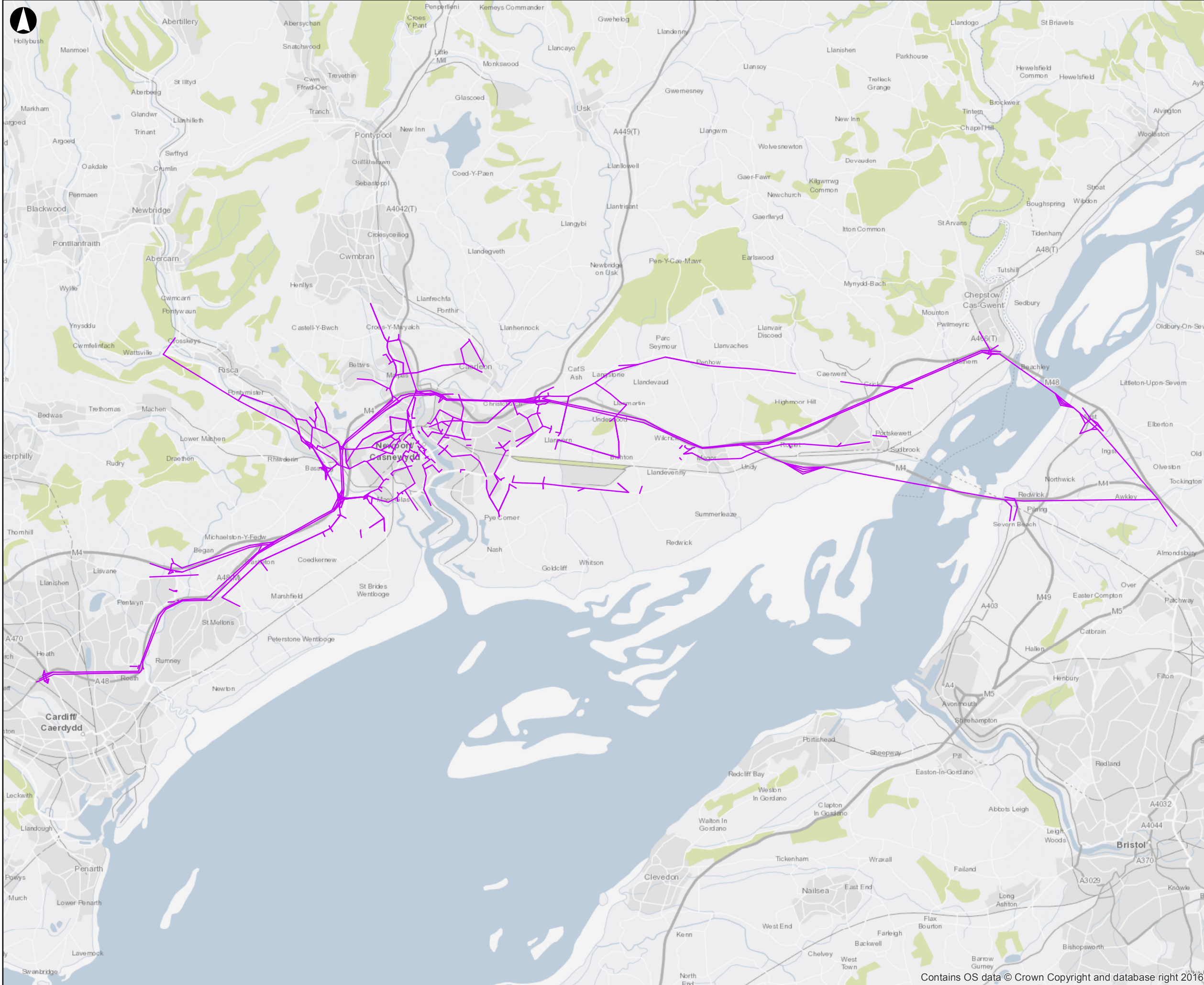
Job No	Drawing Status
<b>240226-00</b>	<b>Preliminary</b>
Drawing No	Issue
<b>001</b>	<b>P0</b>

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

## **B3 Study Area of Regional Air Quality Assessment**

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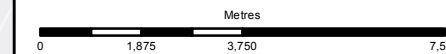




**Legend**  
 — Regional Affected Road Network

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P1	07-09-16	LAS	LAS	LAS
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Job Title

**M4 - J28 Improvements**

Drawing Title

**Study Area for Regional  
 Air Quality Assessment**

Scale at A3

**1:140,000**

Job No  
**240226**

Drawing Status  
**Preliminary**

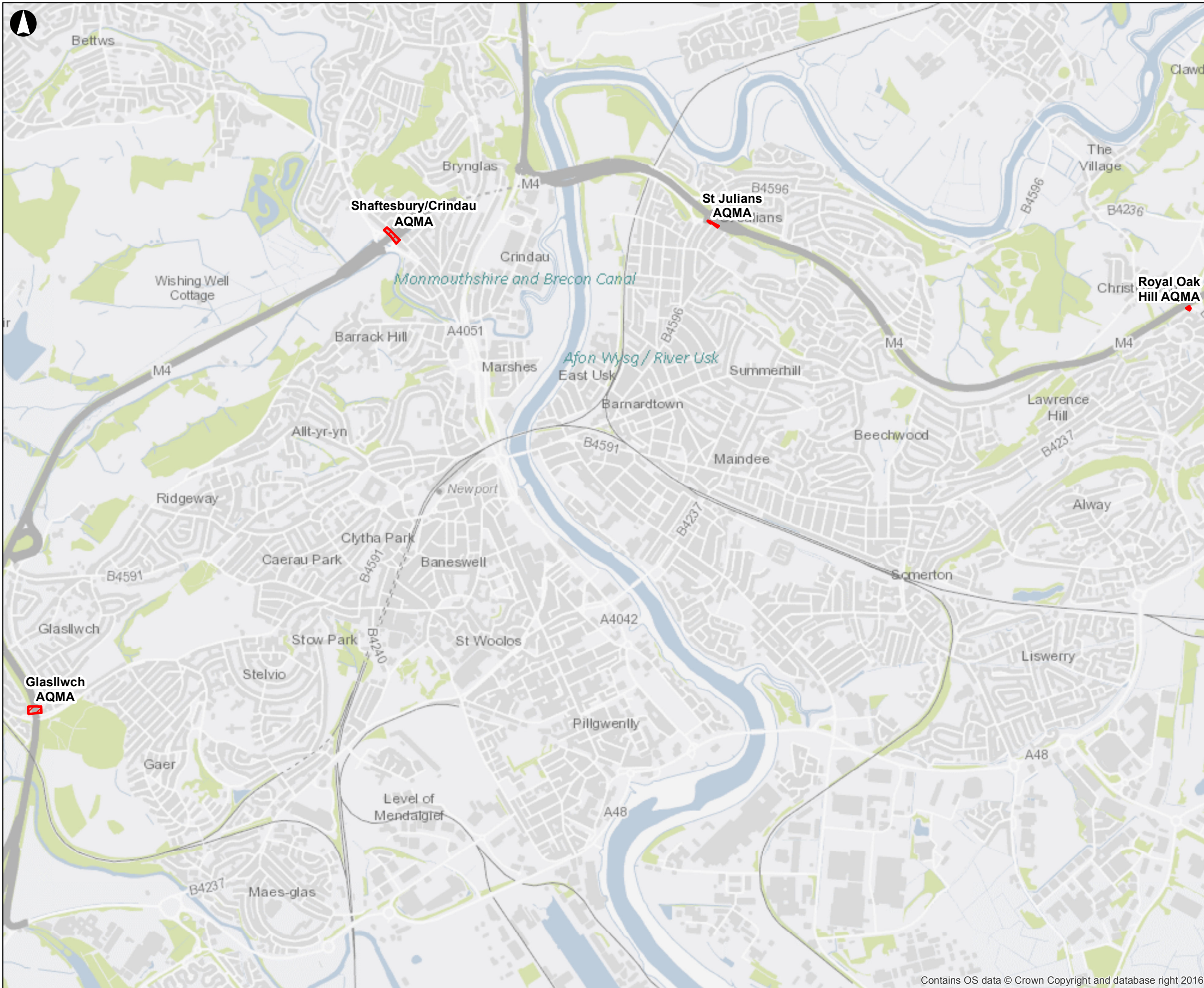
Drawing No  
**001**

Revision  
**P1**

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## B4 Air Quality Management Areas

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**Legend**  
 Air Quality Management Areas

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 0 270 540 1,080

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Job Title  
**M4 - J28 Improvements**

Drawing Title  
**Air Quality Management Areas  
 Affected by the Proposed Scheme**

Scale at A3  
**1:20,000**

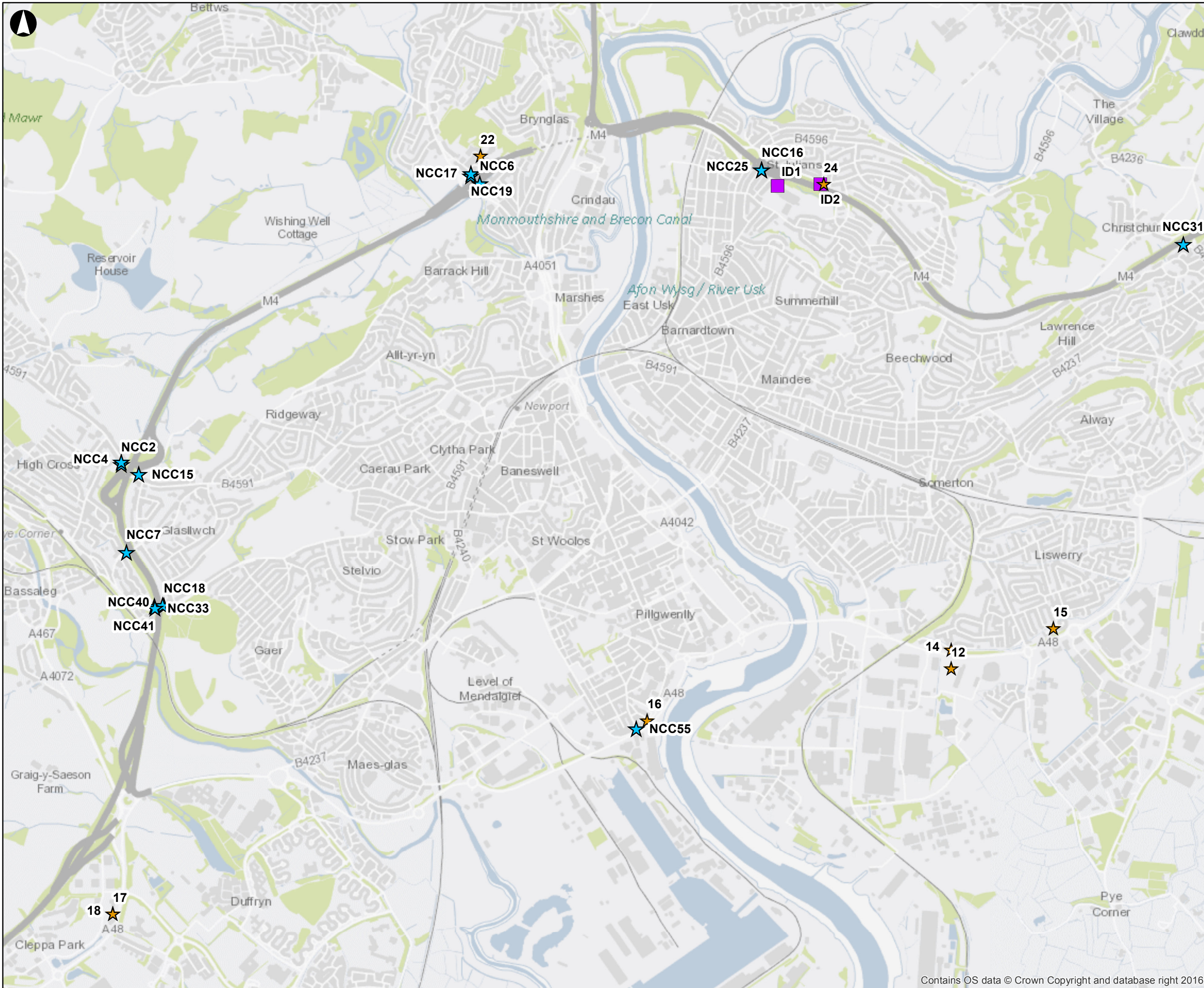
Job No <b>240226</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>001</b>	Revision <b>P1</b>
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## B5 Monitoring Locations

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- Legend**
- ★ M4 Corridor around Newport Monitoring
  - ★ NCC Diffusion Tube Locations
  - NCC Continuous Monitoring

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Metres

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Job Title

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Drawing Title

Air Quality Monitoring Locations

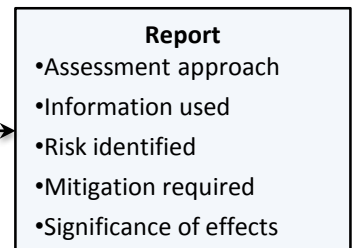
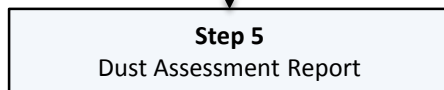
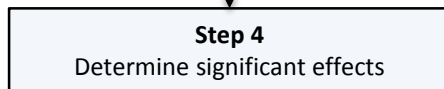
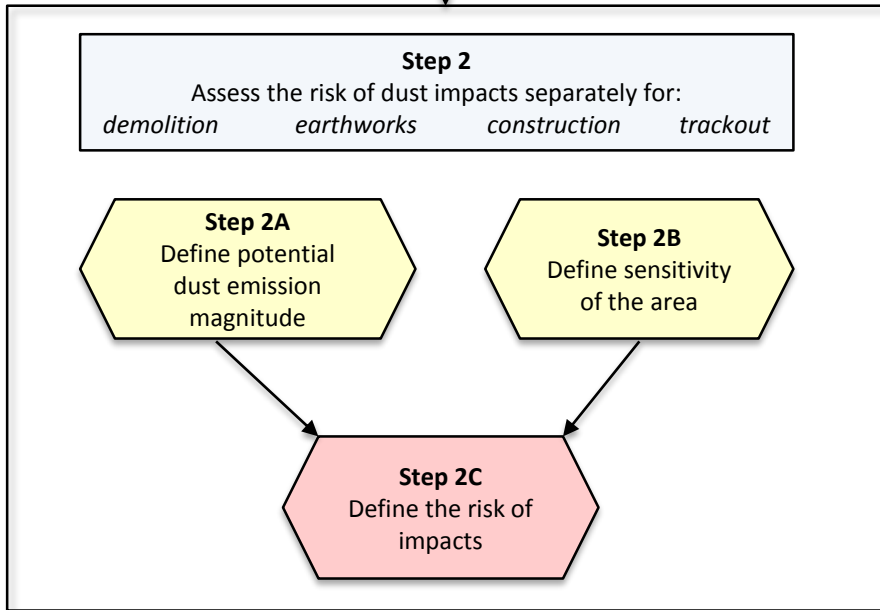
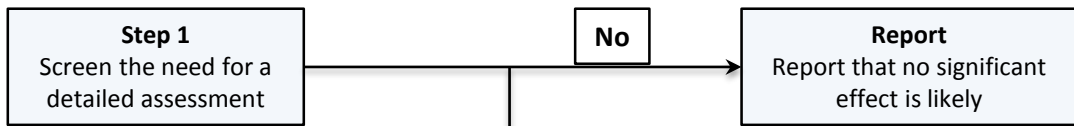
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240226	Preliminary
Drawing No	Revision
001	P1

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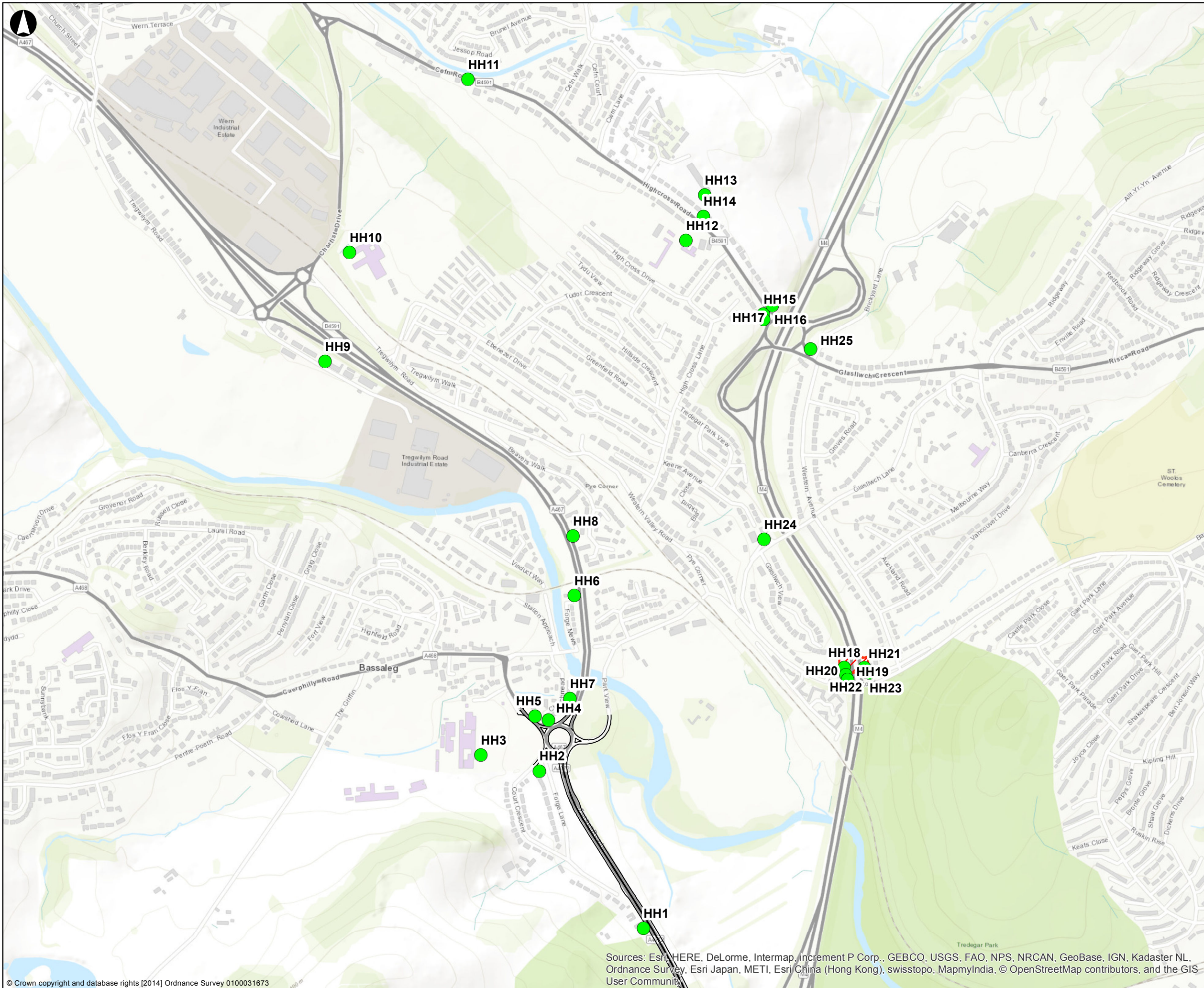
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## **B7**    **Air Quality Receptors Assessed**

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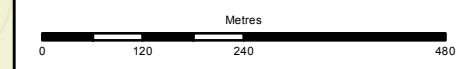


**Legend**

- Receptors Assessed
- AQMA

P0	2016-07-25	LAS	LAS	LAS
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Job Title  
**M4 Junction 28**

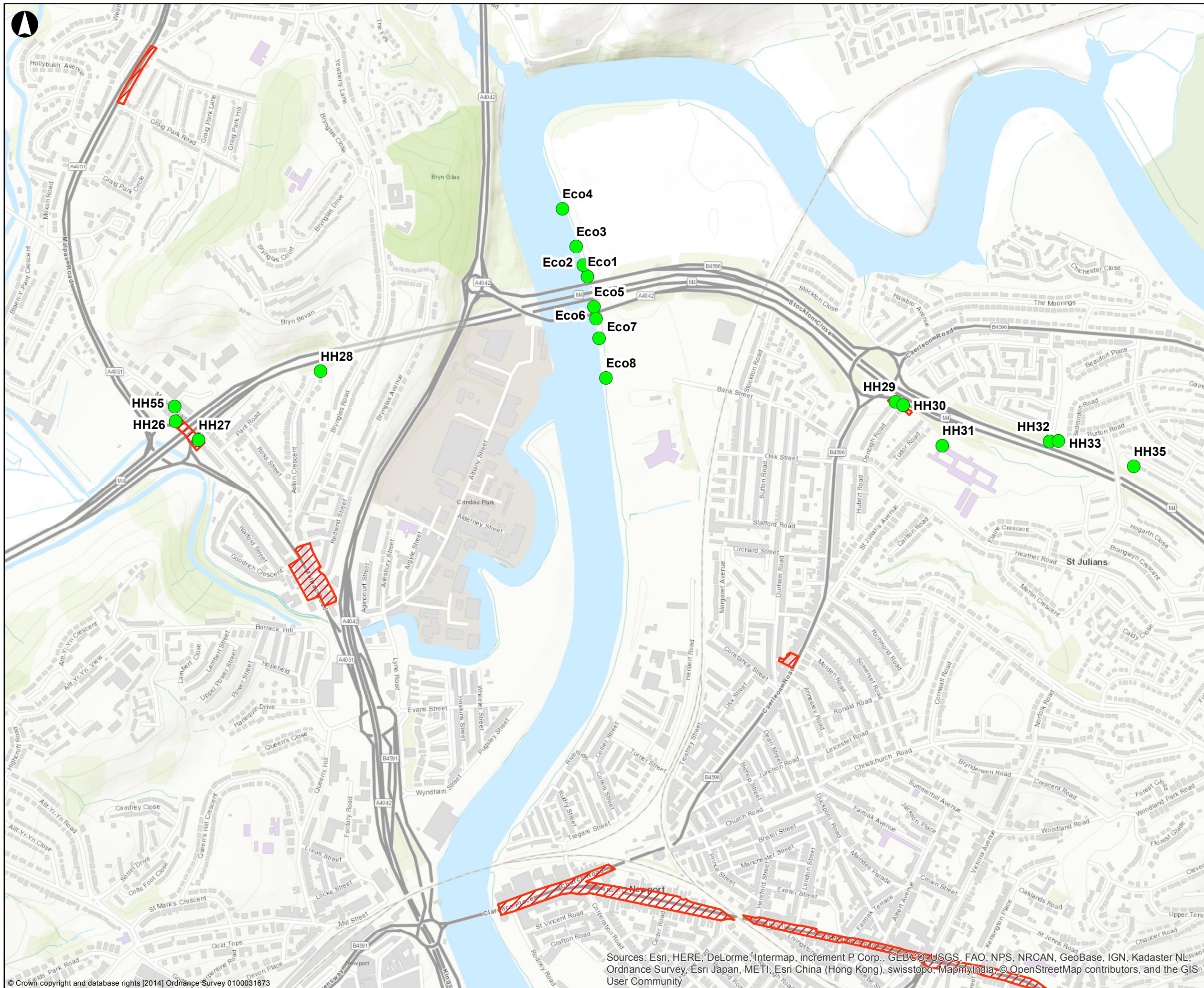
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Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>001</b>	Issue <b>P0</b>
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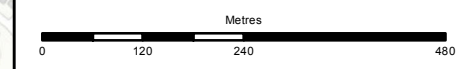
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



**Legend**

- Receptors Assessed
- ▨ AQMA


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Job Title  
**M4 Junction 28**

**Receptor Locations Assessed - Sheet 2**

Scale at A3  
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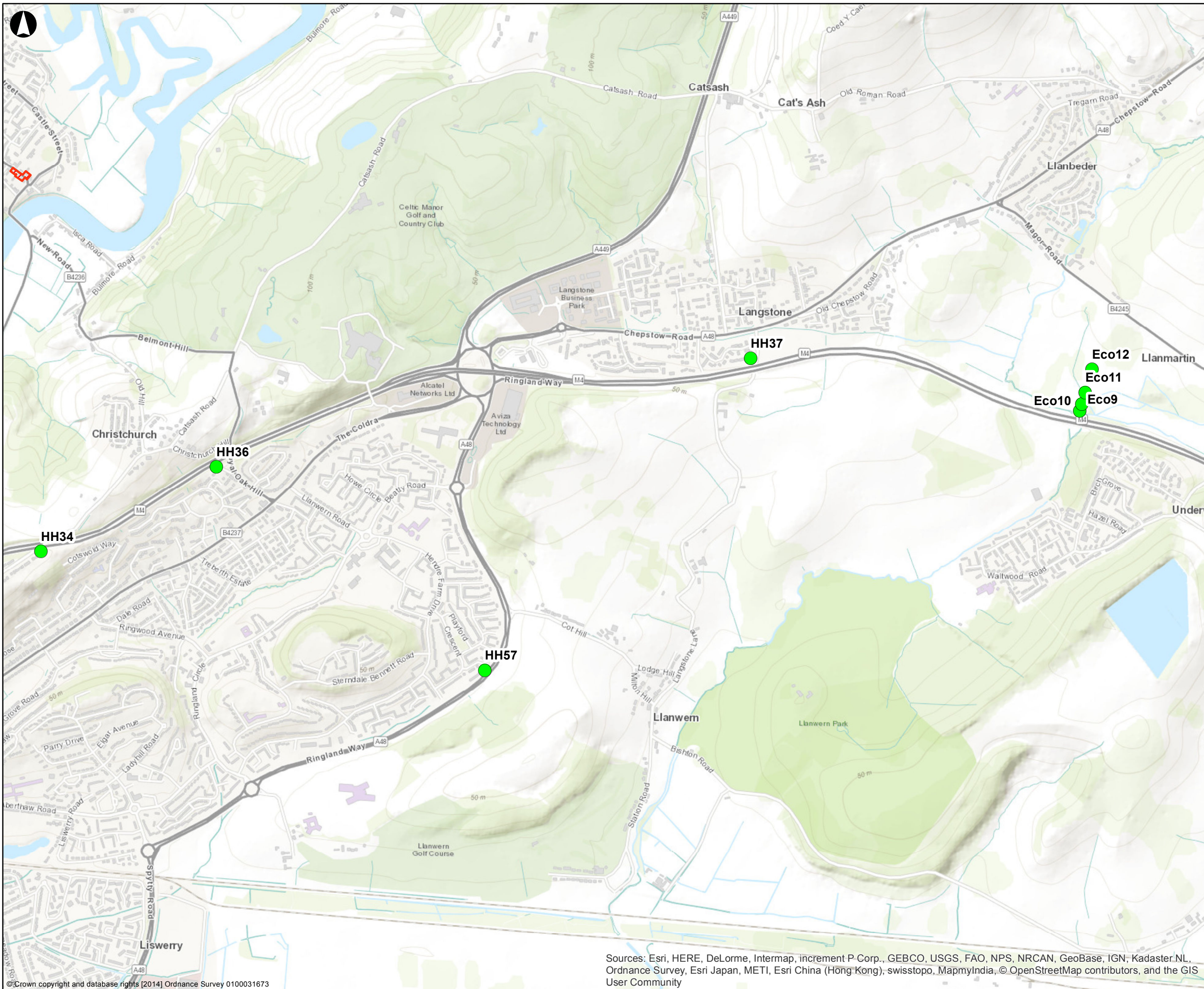
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Drawing Status  
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Drawing No  
**001**

Issue  
**P0**

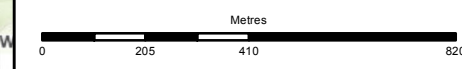
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Legend


- Receptors Assessed
- AQMA

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**M4 Junction 28**

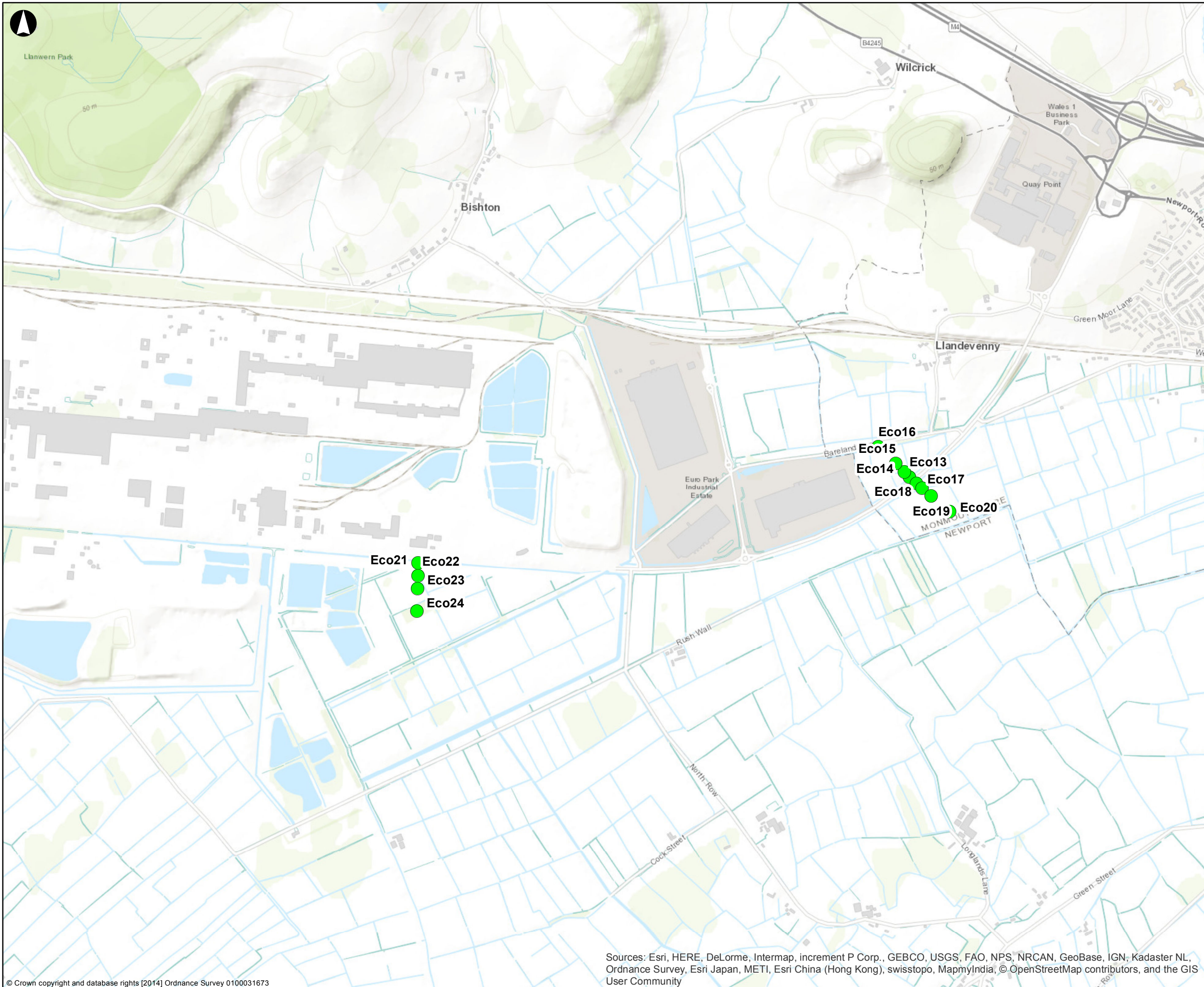
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 Assessed - Sheet 3**

Scale at A3  
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Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>001</b>	Issue <b>P0</b>
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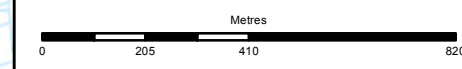


**Legend**

- Receptors
- Assessed
- AQMA

P0	2016-07-25	LAS	LAS	LAS
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Job Title  
**M4 Junction 28**

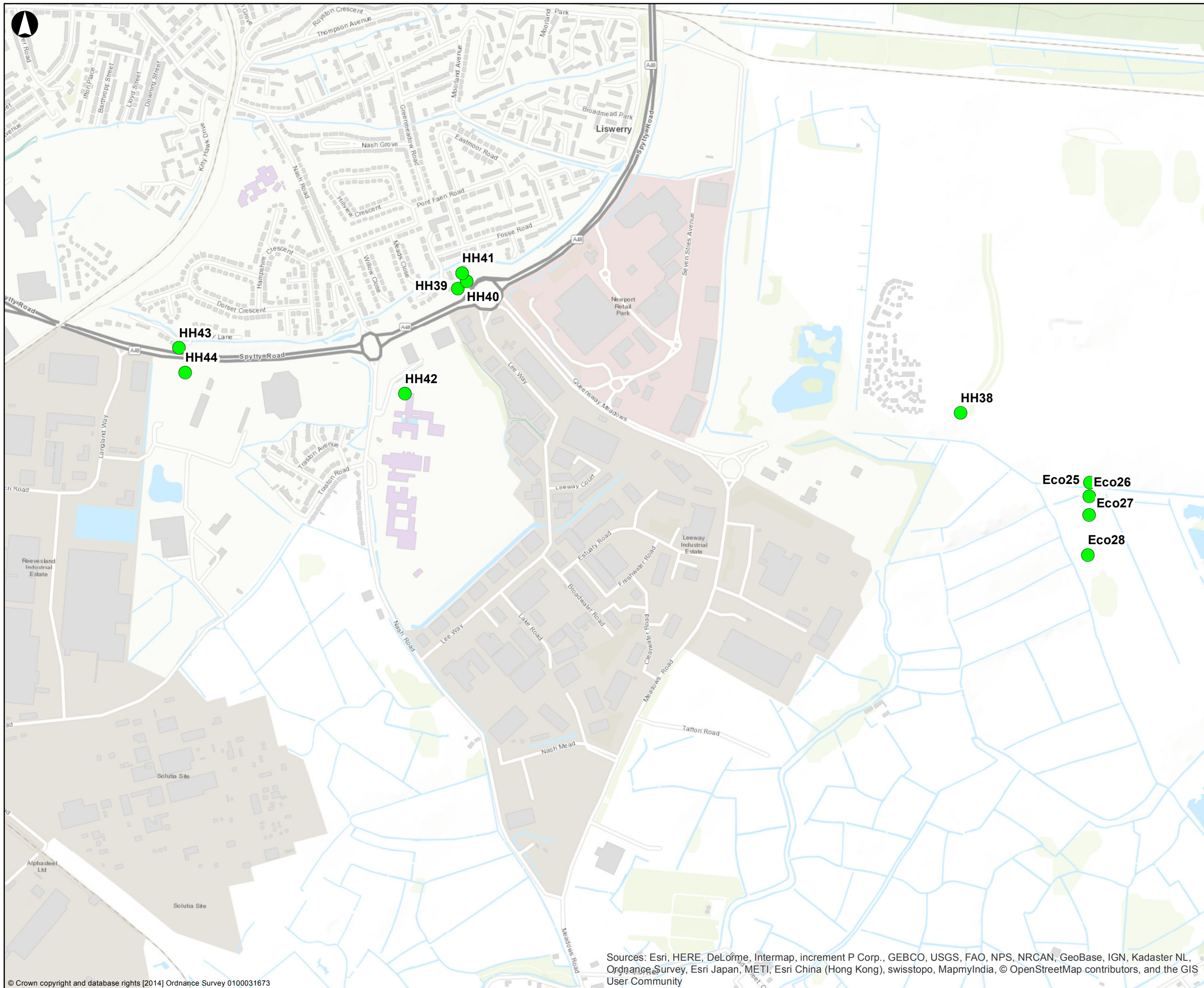
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Assessed - Sheet 4**

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Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>001</b>	Issue <b>P0</b>
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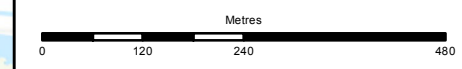


**Legend**

- Receptors Assessed
- ▨ AQMA

P0	2016-07-25	LAS	LAS	LAS
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Issue	Date	By	Chkd	Appd



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Welsh Government**

Job Title  
**M4 Junction 28**

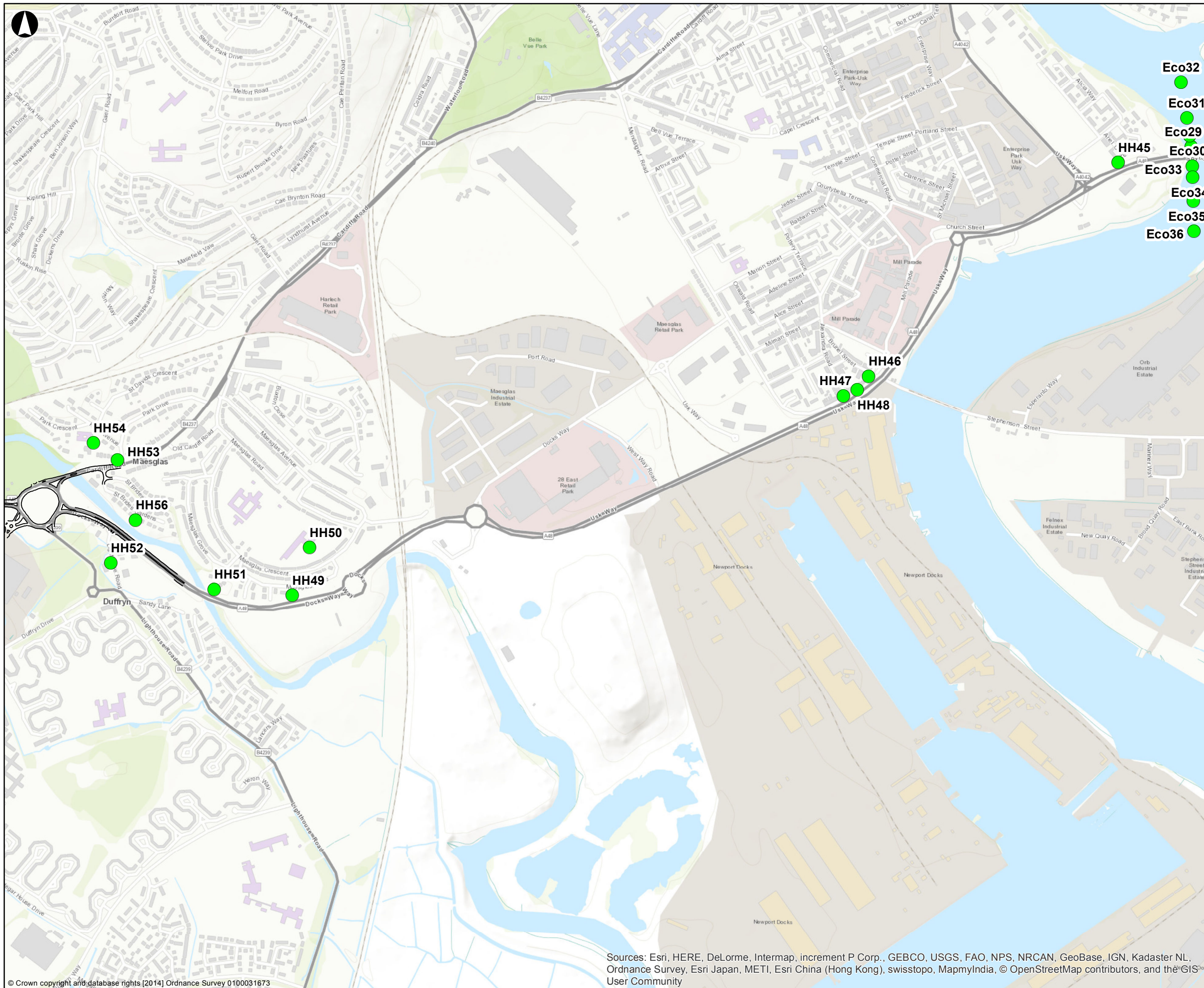
**Receptor Locations  
Assessed - Sheet 5**

Scale at A3  
**1:9,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>001</b>	Issue <b>P0</b>
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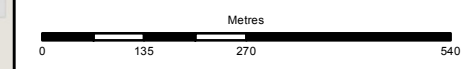
**Legend**

- Receptors Assessed
- Scheme design
- AQMA

- Eco32 ●
- Eco31 ●
- Eco29 ●
- HH45 ●
- Eco30 ●
- Eco33 ●
- Eco34 ●
- Eco35 ●
- Eco36 ●

P0	2016-07-25	LAS	LAS	LAS
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Issue	Date	By	Chkd	Appd
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Thrafnidiaeth  
Llywodraeth Cymru  
Parc Cathays  
Caerdydd  
CF10 3NQ

**Llywodraeth Cymru  
Welsh Government**

Job Title  
**M4 Junction 28**

**Receptor Locations  
Assessed - Sheet 6**

Scale at A3  
**1:10,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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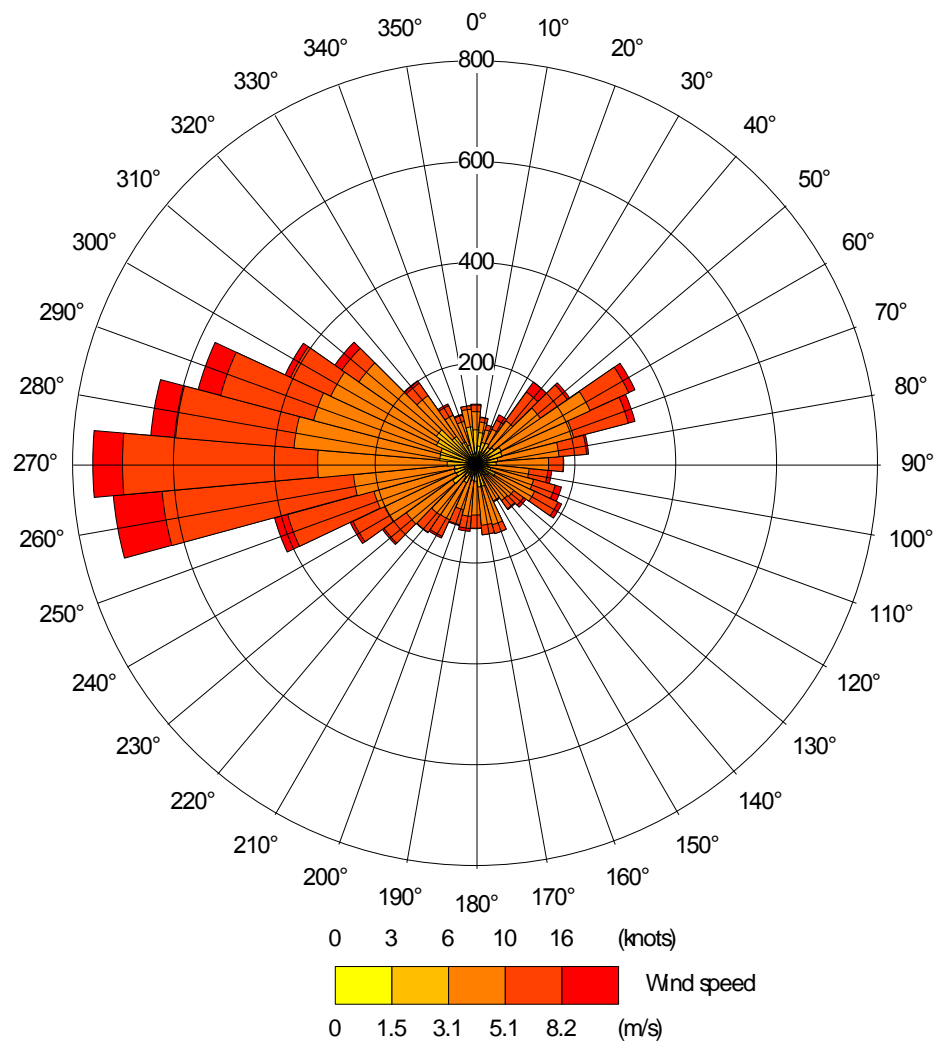
Drawing No <b>001</b>	Issue <b>P0</b>
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Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

## B8 Meteorological Data

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# Appendix B8 – Wind Rose from Rhoose Airport, 2012 Meteorological Data



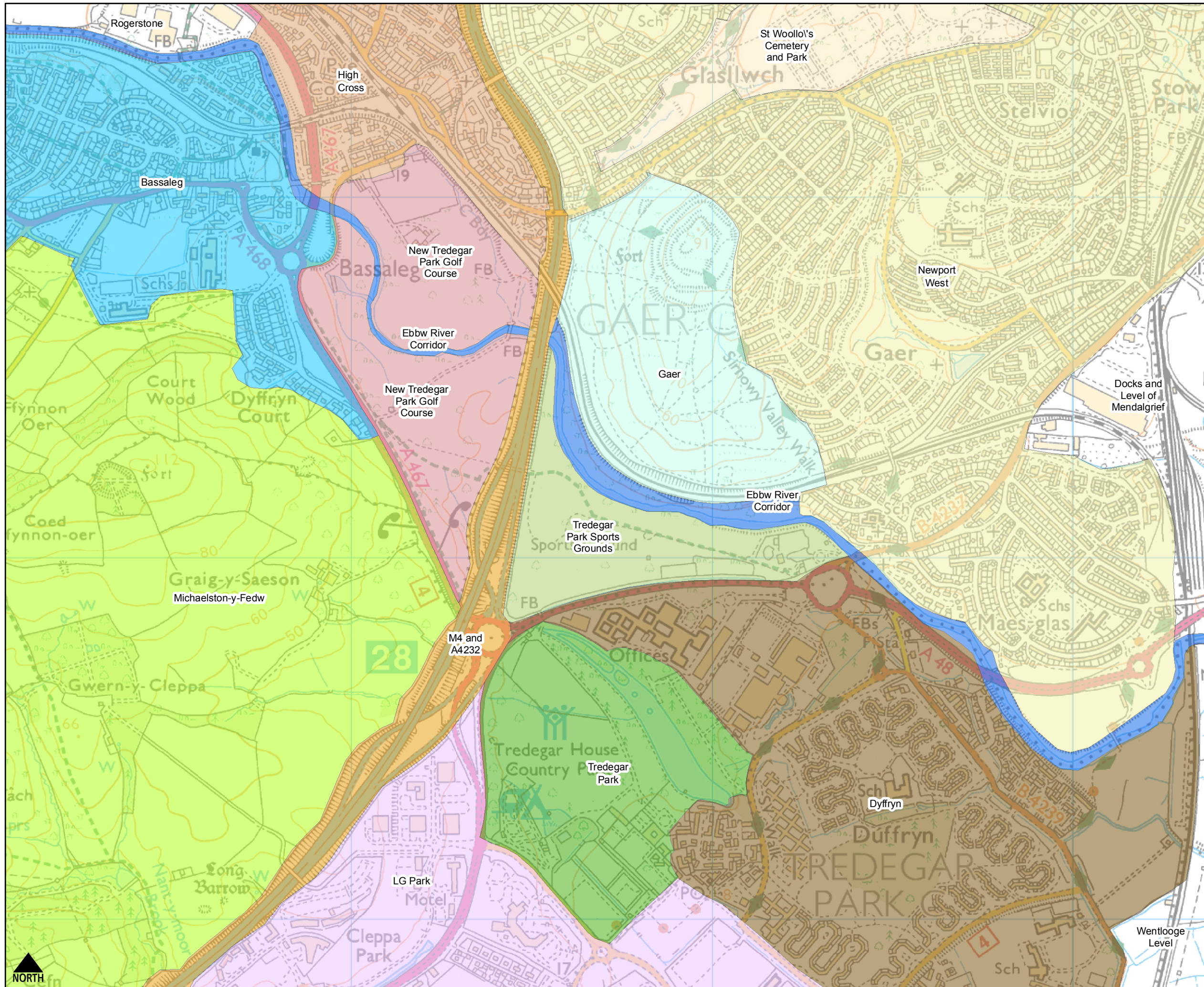


## Appendix C

### Landscape and Visual Appendix

## C1 Figure 4 LANDMAP Visual Sensory

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### Legend

#### Visual and Sensory Aspect Areas

- Bassaleg
- Dyffryn
- Ebbw River Corridor
- Gaer
- High Cross
- LG Park
- M4 and A4232
- Michaelston-y-Fedw
- New Tredegar Park Golf Course
- Newport West
- St Woollo's Cemetery and Park
- Tredegar Park
- Tredegar Park Sports Grounds

P0	2015-02-20	NM	BO	ES
Issue	Date	By	Chkd	Appd

Metres

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Client  
**Costain Group Plc**

Job Title  
**M4 J28 Improvements**

## LANDMAP

### Visual and Sensory Aspect Areas

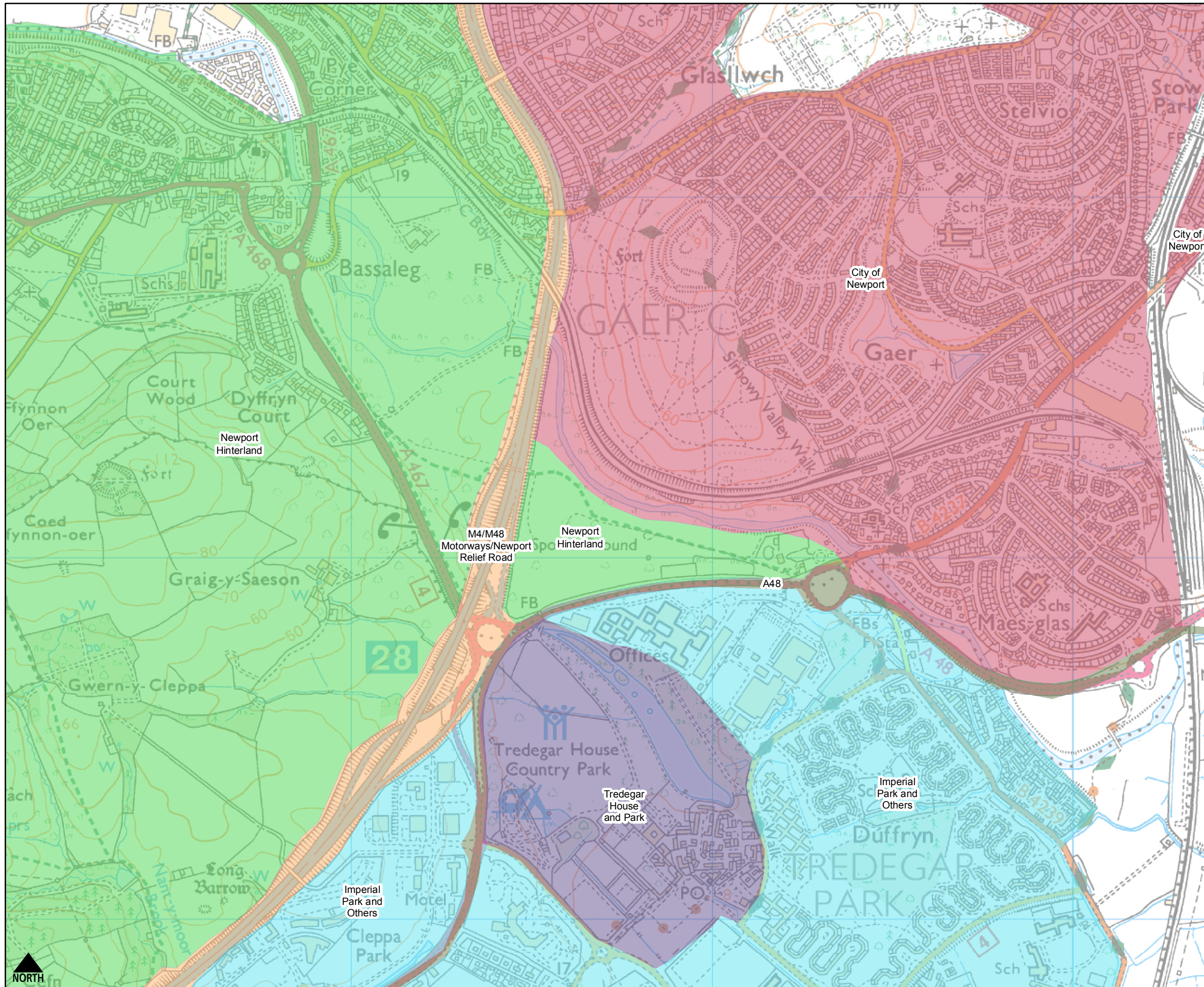
Scale at A3  
**1:10,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>Figure 4</b>	Issue <b>P0</b>



## C2 Figure 5 LANDMAP Cultural

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**Legend**

**Cultural Landscape Areas**

- A48
- City of Newport
- Imperial Park and Others
- M4/M48 Motorways / Newport Relief Road
- Newport Hinterland
- Tredegar House and Park

P0	2015-02-20	NM	BO	ES
Issue	Date	By	Chkd	Appd

Metres

0 135 270 540

**ARUP**

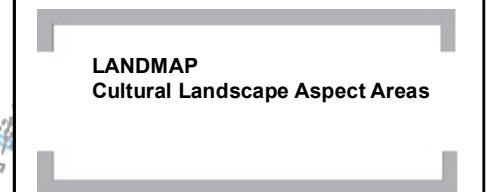
4 Pierhead Street  
Cardiff CF10 4QP  
Tel +44 29 2047 3727 Fax +44 29 2047 2277  
www.arup.com

Client

**Costain Group Plc**

Job Title

**M4 J28 Improvements**



Scale at A3

**1:10,000**

Job No  
**240226-00**

Drawing Status  
**Preliminary**

Drawing No  
**Figure 5**

Issue  
**P0**



## C3 Figure 6 Landscape Character Areas

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## C4 LANDMAP Aspect Areas

### C4.1 Cultural Landscape

#### Tredegar House and Park

This area is classified as “Associations/Notional Expressions/Customs/Leisure/Recreation (Level 4)” within the Cultural Landscape LANDMAP Assessment. Ref NWPRTCL011

The summary description states:

“Tredegar House (Grade I) is the grandest and most exuberant country house in the old county of Gwent, and one of the outstanding houses of the Restoration period in the whole of Britain, and was occupied for some five and a half centuries by the Morgans of Tredegar (later ennobled in the mid-19th century). The Park originally extended over a huge acreage but in 1951 the heir to the third Viscount sold the house and immediate grounds to the Sisters of St Joseph who ran a school for Catholic girls in the house. The then Newport County Borough Council bought house and grounds in 1974. Since then much of the parkland has been given over to comprehensive inward investment development, but the Tredegar House and its immediate surroundings have been restored and imaginatively enhanced into one of the best (if not the best) country house visitor experiences in Wales, it being unfussy and unmarshalled, allowing freedom of exploration, in contrast to the noli me tangere approach of the National Trust. There remains sufficient landscape attached to Tredegar House for its setting not to have been wholly compromised, though some of the architecture of the business parks that press in on all sides, and the unfortunate alignment (for want of a few feet) of the M4 underpass interrupts most abruptly the view along the visually important avenue to the north. Nonetheless, and despite contraction, the remains of the parkland associated with Tredegar House is on the Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales, and graded II\*.”

LANDMAP classifies this Aspect Area as being of Outstanding value (Outstanding both as high grade registered landscape and as a well-managed visitor attraction in an exceptional historic house).

#### Imperial Park and Others

This area is classified as “Influences/Material expressions/Urban/Other Urban (specify) (Level 4)” within the Cultural Landscape LANDMAP Assessment. Ref NWPRTCL026

The summary description states:

“This area to the west of Newport and adjacent to both the M4 motorway and A48 is an extensive series of separate but contiguous commercial and business park developments surrounding Tredegar Park... They have been largely built on former parkland... Immediately adjacent on the southern side of these business parks stands the Newport suburb of Duffryn, developed since 1974 in the Tredegar House parkland... It consists mostly of the last major council estate, but there are also the celebrated Inmos factory and other business and government buildings... The housing estate is remarkable for being the largest experiment in "perimeter planning" attempted in the UK... Low rise is combined with high density by ingeniously packed wriggling terraces of two-storey housing into a perimeter band that encloses open ground, including a triangular tract of woodland...”

LANDMAP classifies this Aspect Area as being of Outstanding value.

#### Newport Hinterland

This area is classified as “Influences/Material expressions/Rural/Other Rural (specify) (Level 4)” within the Cultural Landscape LANDMAP Assessment. Ref NWPRTCL026

The summary description states:

“This Aspect Area embraces an eclectic mixture of cultural attributes, ranging from prehistory through Roman and Norman to historic and modern transport routes. It is not a simple matter to

classify it as the rural hinterland is torn from its original evolved historic context in a truncated administrative setting and is dominated by the urban sprawl of the City itself. There are many features of considerable cultural importance, such as the Roman Fortress town of Caerleon, Penhow and Pencoed Castles on the edge of Wentwood, the Monmouthshire and Brecon Canals, and the supra-important Gwent and Wentlooge Levels where small and distinctive historic hamlets may be encountered in the carefully planned and controlled drained landscape. The area also contains relatively modern settlements like Parc Seymour, Underwood, Bettws, High Cross, Rogerstone, Rhiwderin and Underwood, all satellite residential areas. The expanse of the truncated Llanwern Steelworks lies beyond the City boundaries, but a large proportion of it is planned to be an extension of the greater urban area. Motorways and major highways and the railways dominate the central part of this landscape, being both a means of rapid access or of rapid bypass of the region. Apart from the Levels and the communications routes, Caerleon and the Celtic Manor Resort there is little of high cultural importance.”

LANDMAP classifies this Aspect Area as being of High value.

#### City of Newport

This area is classified as “Influences/Material expressions/Urban/Other Urban (specify) (Level 4)” within the Cultural Landscape LANDMAP Assessment. Ref NWPRTCL025

The summary description states:

“This Aspect Area embraces an eclectic mixture of cultural attributes, ranging from prehistory through Roman and Norman to historic and modern transport routes. It is not a simple matter to classify it as the rural hinterland is torn from its original evolved historic context in a truncated administrative setting and is dominated by the urban sprawl of the City itself. There are many features of considerable cultural importance, such as the Roman Fortress town of Caerleon, Penhow and Pencoed Castles on the edge of Wentwood, the Monmouthshire and Brecon Canals, and the supra-important Gwent and Wentlooge Levels where small and distinctive historic hamlets may be encountered in the carefully planned and controlled drained landscape. The area also contains relatively modern settlements like Parc Seymour, Underwood, Bettws, High Cross, Rogerstone, Rhiwderin and Underwood, all satellite residential areas. The expanse of the truncated Llanwern Steelworks lies beyond the City boundaries, but a large proportion of it is planned to be an extension of the greater urban area. Motorways and major highways and the railways dominate the central part of this landscape, being both a means of rapid access or of rapid bypass of the region. Apart from the Levels and the communications routes, Caerleon and the Celtic Manor Resort there is little of high cultural importance.”

LANDMAP classifies this Aspect Area as being of High value.



## C4.2 Visual & Sensory Aspect Areas

### Bassaleg

For this area the site and its surroundings are classified as “Development/Built Land/Urban (Level 3)” within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS045

The summary description of from the Visual and Sensory Extended Results table states:

“Bassaleg- a village which has enlarged to become a suburb of Newport incorporating Rhiwderin and Pentrepoeth. It lies on the edge of the Ebbw valley running from 20m AOD to 50mAOD. It is primarily residential with a small commercial centre and school. The residential areas have varying and disjointed character. Bassaleg has a traditional village character running to old bridge with church but this has been expanded significantly with prominent council estates Rising up the hill to the west. Pentrepoeth is primarily private estates and is well treed. Rhiwderin character of terrace sappears possibly associated with historic small scale industry. The settlement appears to be extending west and southwards and the surrounding countryside is under pressure. The character of the new development is highly suburban with little concession to the local vernacular.” LANDMAP classifies this Aspect Area as being of ‘low’ value with a ‘week’ sense of place and relatively incoherent urban form with urban and landscape elements in poor – moderate condition.

### Dyffryn

For this area the site and its surroundings are classified as “Development/Built Land/Urban (Level 3)” within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS039

The summary description of from the Visual and Sensory Extended Results table states:

“Dyffryn- late 20th-century mixed extension to Newport fringing the Wentlooge levels to the south and Tredegar Park to the West. The core of the area is the distinctive 1970s two-storey housing with its continuous sinuous built form enclosing courtyards. Commercial development lies to the west and north, the latter of which [ high quality offices] is highly visible from the M4. The South are a school and playing fields and private housing estates which are beginning to encroach further on to the levels. The development, in particular, the offices, appear to occupy what was once part of Tredegar Park and their proximity to the house and existing park and gardens have an adverse effect on the setting and approach. Mature trees, remnant of the park, and on the road to the east help to integrate the development and make the area feel fairly enclosed, limiting views. Fly tipping occurs on the rural lanes to the south, visible to the rail corridor.” LANDMAP classifies this Aspect Area as being of ‘moderate’ value and states that it contains sinuous housing forms that are highly distinctive and offices within parkland setting are noticeable although the area does detract from the setting of Tredegar Park.

### Ebbw River Corridor

For this area the site and its surroundings are classified as “Water/Inland Water (Including Associated Edge)/River (Level 3)” within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS022

The summary description of from the Visual and Sensory Extended Results table states:

“River corridor of the River Ebbw including watercourse, adjacent embankments and riparian vegetation. The river is in its lower reaches forming a sinuous course where it is within natural boundaries but it is canalised in parts with concrete walls and weirs. The surrounding valley floor is protected from flooding by an embankment which also divorces the river from the flat land including parks adjacent. Japanese knotweed is in evidence. Where there is a natural bank there is strong riparian vegetation including alders. Some adjacent land uses including industry back onto the river and public access along its banks is discontinuous, also interrupted by roads and other transport corridors. The river is fast flowing but becomes tidal in its lower reaches with mud banks.”

LANDMAP classifies this Aspect Area as being of ‘moderate’ value and states “The river has very attractive stretches where it is a natural watercourse with riparian vegetation, allowing pleasant views in which the water is a natural focus but there are detractors adjacent and the river is modified in parts giving it a variable character”

#### Gaer

For this area the site and its surroundings are classified as “Lowland/Lowland Valleys/Open Lowland Valleys (Level 3)” within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS019

The summary description of from the Visual and Sensory Extended Results table states:

“Prominent steep sloping hill running from 91m AOD down to 20m AOD. The River Ebbw, adjacent railway and the M4 run along the bottom of the slope. The landcover is a mosaic of bracken, rough grassland, encroaching scrub and deciduous tree cover dominated by oak, hazel and birch. The key feature is a prehistoric fort on top of the hill. Deep earthworks are still highly visible and give the area a strong sense of place. Houses on the outskirts of Newport are visible on the skyline, only partially screened by trees. There is public access throughout the area with paths crisscrossing the slopes as it is managed as an informal open space. Steel railings separate housing from the area and are showing signs of age in places. The area is affected by noise from the M4 motorway.”

LANDMAP classifies this Aspect Area as being of ‘high’ value and states “A distinctive hill fort on a prominent hill with attractive mosaic forms a strong edge to Newport but exhibits poor condition in parts”

#### High Cross

For this area the site and its surroundings are classified as "Development/Built Land/Urban (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS046

The summary description of from the Visual and Sensory Extended Results table states:

"High Cross and Rogerstone mid to late 20C suburb of Newport running north of the M4. It lies on the valley side of the Ebbw rising to 79 m AOD. High Cross is older than the recent estates extending the settlement boundaries to the north and to the West. Housing reaches the ridge on the south eastern edge. It is primarily residential estates with small dispersed retail areas. Important landscape features include the canal, Cefn Wood and the adjacent open land on the valley side and the recreation ground and open land on the Ebbw valley floor. The character of

the residential areas is highly suburban with no concession to the local vernacular."

LANDMAP classifies this Aspect Area as being of 'low' value (Relatively incoherent urban form with urban and landscape elements in poor/moderate condition which has a weak sense of place).

#### LG Park

For this area the site and its surroundings are classified as "Development/Built Land/Urban (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS038

The summary description of from the Visual and Sensory Extended Results table states:

"LG and Cleppa Park- Primarily late 20th century commercial and industrial area with some small scale recent housing on the western fringe. The area is served by the A48 and bounded to the north by the M4 which has glimpses of various buildings which are located very close to the motorway. An arched pedestrian bridge in Newport colours of green and gold acts as a gateway to the area from the West and is visible from the M4. However, the area is dominated by the LG complex which consists of large-scale buildings which have not been used for the purpose for which they were built. The area is therefore relatively quiet. The buildings are set in a planned parkland with strong landscape infrastructure including bunds, mass woodland planting and lakes. Dual carriageway access roads serve this complex and the as yet unused site to the south and are instead now used as a gypsy encampment. The complex fringes the levels to the south at 10 m AOD. The planting infrastructure still appears to be managed. Cleppa Park is still being developed north of the A48 and there are substantial landscape features such as formal water bodies. The smaller business Park for innovation is located further east, south of the A48. This is joined by a tortuous route to the LG development. The area also includes sports ground in retail superstore southeast Duffryn estate."

LANDMAP classifies this Aspect Area as being of 'low' value and states "Large-scale nature of the LG development give this area a sense of place but these buildings are also major detractors and the various uses are disjointed although the management of landscape infrastructure is positive."

#### Michaelston-y-Fedw

For this area the site and its surroundings are classified as "Lowland/Rolling Lowland/Open Rolling Lowland (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS002

The summary description of from the Visual and Sensory Extended Results table states:

"Lowland rolling farmland rising up to 120mAOD from the levels with an open character allowing long views to the Severn estuary to the south and to the Coal field plateau to the north. Land use is a mix of arable and pastoral land enclosed by close trimmed hedges. The field pattern is medium scale and sinuous generally with larger, more open rectangular fields around Penylan. Small blocks of deciduous woodland and copses are evident particularly towards the east. Boundary trees such as oak are present in places. Tree cover forms important skylines in places. Settlement consists of scattered farmhouses and dwellings some suburban in character linked by narrow lanes. Urban fringe influences are present such as south of Bassaleg and just north of the M4 approaching Cardiff.

Cypress trees are used for enclosure of some properties. "Horsiculture" is also in evidence. Detractors include pylons, masts and unmaintained farm buildings such as north east Tredegar House. While the area is generally tranquil on its north and west facing slopes the noise from the busy M4 and M48 reduce this on the south and east facing slopes."

LANDMAP classifies this Aspect Area as being of 'moderate' value with pleasant rural farmland in good condition slightly affected by urban fringes and the adjacent M4.

#### New Tredegar Park Golf Course

For this area the site and its surroundings are classified as

"Development/Developed Unbuilt Land/Amenity Land (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS020

The summary description of from the Visual and Sensory Extended Results table states:

"Golf course land sports ground located on the valley floor screened off from adjacent development and busy roads by strong belts of deciduous woodland. The River Ebbw runs through the middle of the course. Tree planting on the course includes a substantial number of conifers such as Cypress trees. Access is limited to one public footpath to the west."

LANDMAP classifies this Aspect Area as being of 'moderate' value and states

"The golf course and sports facilities are well managed on a pleasant valley floor with a river passing through and enclosed by tree belts."

#### Newport West

For this area the site and its surroundings are classified as "Development/Built Land/Urban (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS056

The summary description of from the Visual and Sensory Extended Results table states:

"West Newport- part of the city on the western side of the Usk running from hills at 109 m AOD at the Ridgeway to 10m AOD on the flat valley floor and levels. The area includes the Victorian retail centre of Newport, close to the Usk, with vibrant Main Street and relatively new mall. The Portland stone art deco Civic Centre is dominant on a hill overlooking the city and visible from the station and railway. Stow Hill to the south with the church of St Woolos is the other main landmark of note. The most affluent houses, detached and semi-detached, lie north of the civic centre on the higher ground, some with views to the countryside to the north on the Ridgeway. Victorian development of terraces lie to the south towards the docks. To the west there is expansion of estates, some council, which form the eastern margins of the built up area and are visible from the M4 above the Gaer fort. Stow Park and Bellevue Park are important formal open spaces. The A4042 cuts a strong swathe into the town centre, with traffic dominating this area."

LANDMAP classifies this Aspect Area as being of 'low' value due to relatively incoherent urban form with some urban elements in poor-moderate condition.

#### Tredegar Park Sports Ground

For this area the site and its surroundings are classified as

"Development/Developed Unbuilt Land/Amenity Land (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS021

The summary description of from the Visual and Sensory Extended Results table states:

“Formal park and playing fields located on flat valley floor partly screened off from adjacent development and busy road by mixed tree belt to the south but open to the M4 and associated noise on embankment to west. The River Ebbw runs on the northern boundary separated by a flood embankment. Planting includes formal hedges and rhododendrons, and specimen trees. Well used facility with large car park and play area.”

LANDMAP classifies this Aspect Area as being of ‘moderate’ value due to the well managed park and facilities on a pleasant valley floor with rivers passing through and enclosed by trees.

#### Tredegar Park

For this area the site and its surroundings are classified as

“Development/Developed Unbuilt Land/Amenity Land (Level 3)” within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS023

The summary description of from the Visual and Sensory Extended Results table states:

“Tredegar Park- House with formal parks and gardens and grounds located on flat valley floor partly screened off from adjacent development and busy road by mixed tree belt to the east but open to the M4 and associated noise on embankment. The house with associated mature tree avenues is orientated to face the M4 to the north-west. These large grassed areas are used for outdoor events and as a park and include a large playground. Access is from the rear and small scale uses such as craft workshops use the previous stables and outbuildings and are located next to the car park. A large linear lake enclosed by trees is an attractive feature to the north. Planting includes formal hedges and rhododendrons, and specimen and avenue trees.”

LANDMAP classifies this Aspect Area as being of ‘high’ value and states

“Tredegar House and surrounding formal and informal parklands are very attractive with aesthetically pleasing vistas and elements of consistent character and in good condition”

#### M4 and A4232

For this area the site and its surroundings are classified as

"Development/Developed Unbuilt Land/Road Corridor (Level 3)" within the Visual and Sensory LANDMAP Assessment. Ref NWPRTVS012

The summary description of from the Visual and Sensory Extended Results table states:

"M4 and A449 T corridors- large-scale busy roads which have a significant visual and noise effects on the adjacent landscape. Signs and lighting add to the visual clutter. They have significant planting and barriers to screen the roads more sensitive areas. Coniferous planting forms a significant element particularly close to housing to give all year round cover. Views are possible across the levels to the Severn estuary from the western part of the M4. There are also extensive views toward Newport including distinctive features such as the Transporter Bridge and less distinctive features such as nearby suburbs and settlements. Some of these views are detractive, particularly where housing breaks the skyline such as a High Cross or adjacent to the Gaer fort."

LANDMAP classifies this Aspect Area as being of 'Low' value and states " The roads are visually intrusive albeit in good condition with consistent character"

## C5 Figure 7 Photo Sheets

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Field of view: 76 degrees  
Grid reference: ST 28727 85340  
Viewpoint elevation: m AOD  
Viewer height: 13m  
Viewing distance @ A3: 300mm



VP 1. Existing view looking northwest from Tradegar House Country Park

Field of view: 76 degrees  
Grid reference: ST 28306 85778  
Viewpoint elevation: 23m AOD  
Viewer height: 1.6m  
Viewing distance @ A3: 300mm



VP 2. Existing view looking southeast from the southwestern footpath at Tradegar roundabout

NOTES:

ARUP

Issue	Date	By	Chkd	Appd
P0	13-02-2015	AD	BWO	ES

Job No: 240226-00  
Preliminary

M4 J28 Improvements  
Figure 7a

Field of view: 76 degrees  
 Grid reference: ST 27843 86766  
 Viewpoint elevation: 30m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 3. Existing view looking northwest from public footpath adjacent to Forge Road A467

Field of view: 76 degrees  
 Grid reference: ST 27781 86773  
 Viewpoint elevation: 29m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 4. Existing view looking east from Court Crescent

NOTES:

ARUP

Issue	Date	By	Chkd	Appd
P0	13-02-2015	AD	BWO	ES

Job No: 240226-00  
 Preliminary

M4 J28 Improvements  
 Figure 7b



Field of view: 76 degrees  
 Grid reference: ST 27801 86861  
 Viewpoint elevation: 28m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 5. Existing view looking south from residential properties to the north of Bassaleg roundabout

Field of view: 76 degrees  
 Grid reference: ST 28855 86380  
 Viewpoint elevation: 50m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 6. Existing view looking southwest from Tradegar Park, south of Tradegar Fort

NOTES:

**ARUP**

Issue	Date	By	Chkd	Appd
P0	13-02-2015	AD	BWO	ES

Job No: 240226-00  
 Preliminary

M4 J28 Improvements  
 Figure 7c

Field of view: 76 degrees  
 Grid reference: ST 29307 85987  
 Viewpoint elevation: 11m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 7. Existing view looking southeast from the entrance to the Tradegar Park Recreation Ground car park

Field of view: 76 degrees  
 Grid reference: ST 29383 85984  
 Viewpoint elevation: 11m AOD  
 Viewer height: 1.6m  
 Viewing distance @ A3: 300mm



VP 8. Existing view looking southwest from cycle and footpath south of Cardiff Road, B4237

NOTES:

**ARUP**

Issue	Date	By	Chkd	Appd
P0	13-02-2015	AD	BWO	ES

Job No: 240226-00  
 Preliminary

**M4 J28 Improvements  
 Figure 7d**

Field of view: 76 degrees  
Grid reference: ST 29246 85892  
Viewpoint elevation: 11m AOD  
Viewer height: 1.6m  
Viewing distance @ A3: 300mm



VP 9. Existing view looking east from bus stop adjacent to the Office of National Statistics access road

NOTES:

ARUP

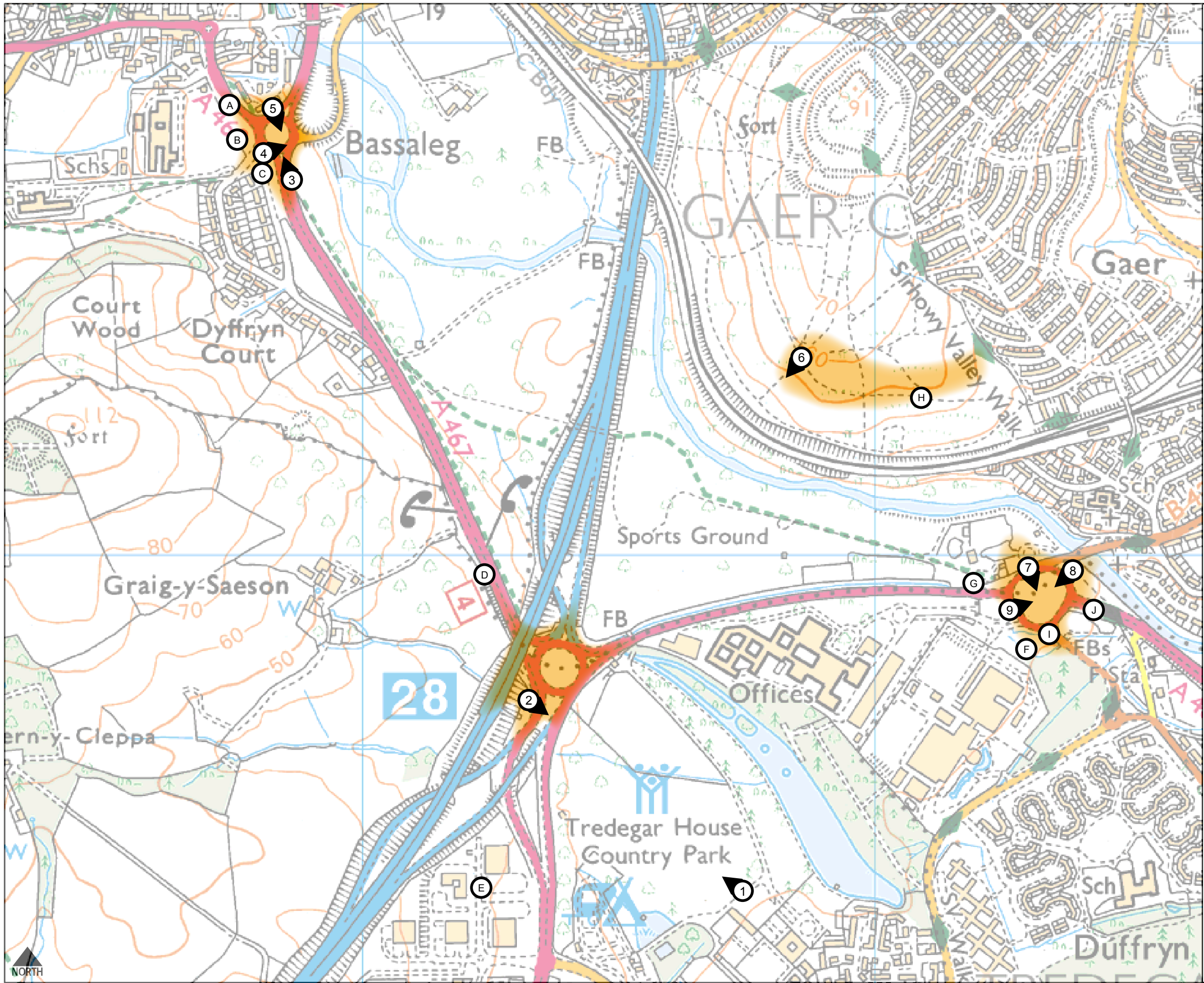
Issue	Date	By	Chkd	Appd
P0	13-02-2015	AD	BWO	ES

Job No: 240226-00  
Preliminary




M4 J28 Improvements  
Figure 7e

## C6 Figure 1 Viewpoint Locations and ZTV

---



**Legend**

-  Viewpoint Locations
-  Viewpoints Not Included
-  Zone of Visual Influence (ZVI)

P0	2015-02-24	NM	BO	ES
Issue	Date	By	Chkd	Appd

Metres

0 95 190 380

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Job Title  
**M4 J28 Improvements**

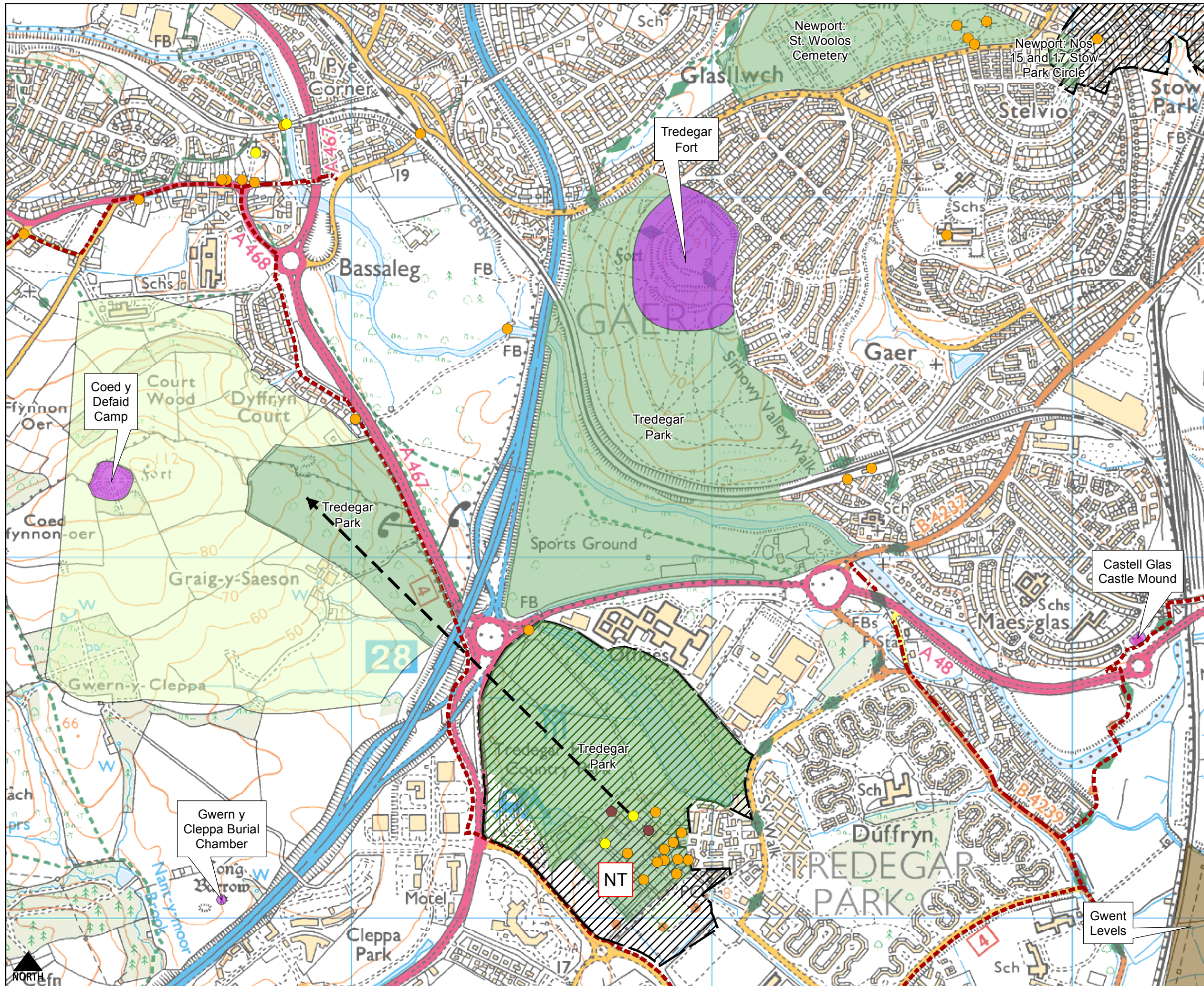
**Viewpoint Locations and Zone of Visual Influence (ZVI)**

Scale at A3  
**1:7,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>Figure 1</b>	Issue <b>P0</b>

## C7 Figure 2 Landscape Designations

---



### Legend

Listed Buildings

- I
- II
- II\*

National Trust Property

Scheduled Monument

Significant View

Country Parks

Registered Parks and Gardens

Essential Setting for Registered Parks and Gardens

Historic Landscape

Conservation Area

National Cycle Network Links

National Cycle Route

P1	2016-09-06	NM	BO	SB
Issue	Date	By	Chkd	Appd

Metres

0 135 270 540

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**M4 J28 Improvements**

Landscape Designations

Scale at A3  
**1:10,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>Figure 2</b>	Issue <b>P1</b>

## C8 Landscape Planning Policy

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National and local planning policy document relevant to the determination of planning applications consists of:

Planning Policy Wales (Edition 8);

Technical Advice Note (TAN) 12: Design;

Technical Advice Note (TAN) 18: Transport; and

Newport Local Development Plan 2011 – 2026 (Adopted January 2015).

### Planning Policy Wales (Edition 8, January 2016)

The relevant national planning policy framework is provided principally by Planning Policy Wales (PPW 8, January 2016).

Para 4.11 ‘Promoting sustainability through good design’ states

4.11.1 Design is taken to mean the relationship between all elements of the natural and built environment. To create sustainable development, design must go beyond aesthetics and include the social, environmental and economic aspects of the development, including its construction, operation and management, and its relationship to its surroundings.

4.11.9 The visual appearance of proposed development, its scale and its relationship to its surroundings and context are material planning considerations.

Para 5.2 ‘Caring for biodiversity’ states:

Trees and woodlands

5.2.9 Trees, woodlands and hedgerows are of great importance, both as wildlife habitats and in terms of their contribution to landscape character and beauty. They also play a role in tackling climate change by trapping carbon and can provide a sustainable energy source. Local planning authorities should seek to protect trees, groups of trees and areas of woodland where they have natural heritage value or contribute to the character or amenity of a particular locality. Ancient and semi-natural woodlands are irreplaceable habitats of high biodiversity value which should be protected from development that would result in significant damage.

Para 5.3 ‘Measures to conserve landscape and biodiversity’ states:

Statutory designations

5.3.1 Many of the most important areas of landscape quality and nature conservation have been statutorily designated. These statutorily designated sites make a vital contribution to protecting landscape and biodiversity and can also be important in providing opportunities for sustainable economic and social development.

5.3.2 While the value of all the landscapes of Wales is recognised the local planning authorities should have regard to the relative significance of international, national and local designations in considering the weight to be attached to nature conservation interests and should take care to avoid placing unnecessary constraints on development.

### Technical Advice Notes

Planning Policy Wales is supplemented by 23 Technical Advice Notes (TANs).



‘TAN 12: Design’ provides guidance on various issues to be considered when developing a project design including landscape. This document states in para. 5.5.2 that:

In general terms, good design will almost always be dependent on working within the natural constraints and the historic character of the landscape and this should be the starting point from which the design of development evolves... It is particularly important that proposals to amend or create new landscape are not considered as an afterthought and that the long-term impact of development on the landscape is fully understood.

‘TAN 18: Transport’ describes how to integrate land use and transport planning and explains how transport impacts should be assessed and mitigated. This document states in para. 9.10 that:

Adverse impacts associated with transport infrastructure projects, on the natural, historic and built environment should be minimised. Wherever possible new routes should follow existing gradients, using existing landforms and landscape features to reduce noise and visual impact, subject to safety environmental and economic considerations. Transport schemes should where necessary provide mitigation measures to minimise the impacts caused by the construction and operation of transport infrastructure.

## Local Planning Policies

### Local Development Plan

Newport’s Local Development Plan 2011-2026 is an important planning document setting out the overall spatial strategy for the plan period and strategic policies used for consideration of development proposals.

Policy SP8 Special Landscape Areas states:

Special Landscape Areas (SLAs) are designated as follows within which proposals will be required to contribute positively to the area through high quality design, materials and management schemes that demonstrate a clear appreciation of the area’s special features:

North of Bettws

West of Rhiwderin

Wentlooge Levels

River Usk

Caldicot Levels

Wentwood

2.32 Developers will be required to ensure that proposals do not impact or affect the intrinsic character, quality, feature or conservation value of the SLA. Designs will be required to be of a high standard, appropriate in scale and massing, integrated sympathetically into the landscape as well as ensuring long term management. Supplementary Planning Guidance will provide detail concerning the value, management and maintenance of the areas.

Policy SP9 Conservation of the Natural, Historic and Built Environment states:

The conservation, enhancement and management of recognised sites within the natural, historic and built environment will be sought in all proposals.

2.34 ...The protection, retention, safeguarding, conservation and enhancement of heritage assets will be sought, and where new development is proposed that affects the building or site or its setting, this should be of the highest quality.

Policy GP2 General Development Principles – General Amenity states:

Development will be permitted where, as applicable:

- i) there will not be a significant adverse effect on local amenity, including in terms of noise, disturbance, privacy, overbearing, light, odours and air quality;
- ii) the proposed use and form of development will not be detrimental to the visual amenities of nearby occupiers or the character or appearance of the surrounding area;

Policy GP5 General Development Principles – Natural Environment states:

Development will be permitted where, as applicable:

- v) There would be no unacceptable impact on landscape quality;
- vi) The proposal includes an appropriate landscape scheme, which enhances the site and the wider context including green infrastructure and biodiversity networks;
- vii) The proposal includes appropriate tree planting or retention where appropriate and does not result in the unacceptable loss of or harm to trees, woodland or hedgerows that have wildlife or amenity value.

Policy GP6 General Development Principles – Quality of Design states:

Good quality design will be sought in all forms of development. The aim is to create a safe, accessible, attractive and convenient environment. In considering development proposals the following fundamental design principles should be addressed:

- i) context of the site: all development should be sensitive to the unique qualities of the site and respond positively to the character of the area;

Policy CE4 Historic Landscapes, Parks, Gardens and Battlefields states:

Sites included in the register of landscapes, parks and gardens of special historic interest and identified historic battlefields should be protected, conserved, enhanced and where appropriate, restored. Attention will also be given to their setting.

4.22 ...The site designation process includes denotation of the site's essential setting and significant views which are important considerations in ensuring that the historic and visual characteristics of the historic parks and gardens are conserved.

Policy CE11 Conservation Areas states:

Development within of adjacent to Conservation Areas will be required to:

Be designed to preserve or enhance the recognised character of the area, having regard to the Conservation Area Appraisal where appropriate.

Avoid the removal of existing historic features, including traditional shopfronts and joinery.

Use materials which are traditional, or appropriate to their context.

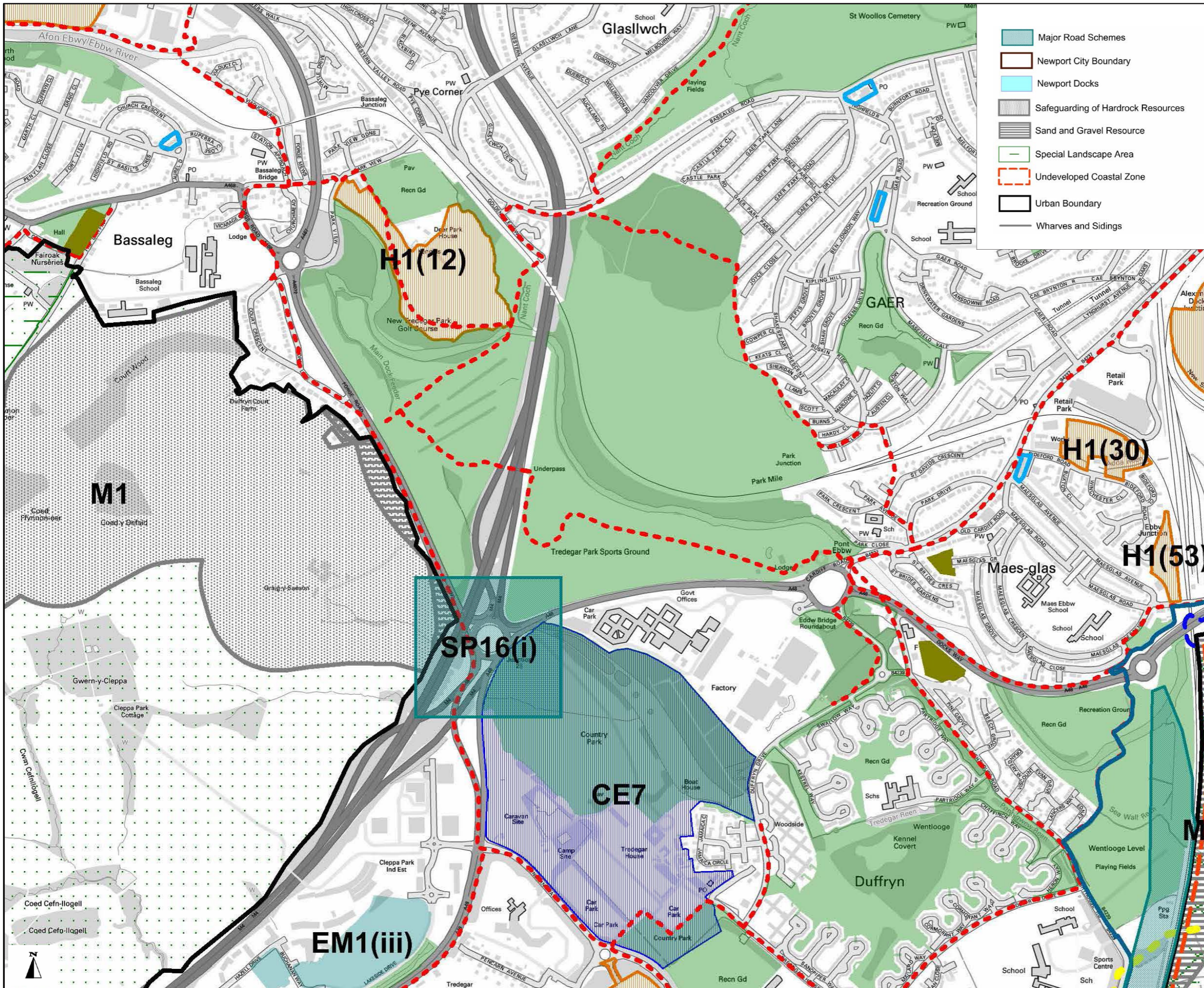
Complement or reflect the architectural qualities of the nearby buildings which make a positive contribution to the character of the area.

Pay special attention to the settings of buildings, and avoid the loss of any existing domestic gardens and open spaces which contribute to the character of the area.

Avoid adverse impact on any significant views, within, towards and outwards from the Conservation Area.

## C9 Figure 3 LDP Proposals Plan

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- Major Road Schemes
- Newport City Boundary
- Newport Docks
- Safeguarding of Hardrock Resources
- Sand and Gravel Resource
- Special Landscape Area
- Undeveloped Coastal Zone
- Urban Boundary
- Wharves and Sidings

- Allotments
- All Wales Coastal Path
- Archaeologically Sensitive Area
- Celtic Manor Resort
- Conservation Area
- Countryside
- Developed Coastal Zone
- District Centres (See Inset Plans DC1-10)
- Indicative Education Sites
- Employment
- Environmental Space
- Green Belt
- Green Wedge
- Gypsy and Traveller Residential Accommodation
- Housing Sites
- Inset Boundary
- Leisure and Sporting Facilities
- Local Centres
- Long Distance Walk / Cycleway

P1	2016-09-06	NM	BO	SB
Issue	Date	By	Chkd	Appd

0 135 270 540 Metres

**ARUP**  
 4 Pierhead Street  
 Cardiff CF10 4QP  
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 www.arup.com

Client  
**Costain Group Plc**  
 Job Title  
**M4 J28 KS3**

**Extract from Newport LDP  
 Proposals Plan - West**

Scale at A3  
**1:10,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>Figure 3</b>	Issue <b>P1</b>

## C10 Landscape Design Proposals

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**Environmental Functions - DMRB Volume 10 section 0 part 2**

Ref	Dataset	Core Data	As-and-When
EFA	Visual Screening	•	
EFB	Landscape Integration	•	
EFC	Enhancing the Built Environment	•	
EFD	Nature Conservation and Biodiversity	•	
EFE	Visual Amenity	•	
EFF	Heritage	•	
EFG	Auditory Amenity	•	
EFH	Water Quality	•	

**Landscape Elements - DMTB Volume 10 section 0 part 3**

Ref	Dataset	Core Data	As-and-When
LE1.1	Amenity Grass Areas	•	
LE1.2	Grassland with Bulbs	•	
LE1.3	Species Rich (or Conservation) Grassland	•	
LE1.4	Rock and Scree	•	
LE1.5	Heath and Moorland	•	
LE1.6	Open Grassland	•	

LE2.1	Woodland	•	
LE2.2	Woodland Edge	•	
LE2.3	High Forest	•	
LE2.4	Linear Belts of Shrubs and Trees	•	
LE2.5	Shrubs with Intermittent Trees	•	
LE2.6	Shrubs	•	
LE2.7	Scattered Trees	•	
LE2.8	Scrub	•	

Ref	Dataset	Core Data	As-and-When
LE3.1	Amenity Tree and Shrub Planting	•	
LE3.2	Ornamental Shrubs	•	
LE3.3	Groundcover	•	
LE3.4	Climbers and Trailers	•	

LE4.1	Ornamental Species Hedges !	•	
LE4.2	Native Species Hedges !	•	
LE4.3	Native Species Hedgerows !	•	
LE4.4	Native Hedgerows with Trees	•	
LE5.1	Individual Trees	•	

LE6.1	Water Bodies and Associated Plants	•	
LE6.2	Banks and Ditches	•	
LE6.3	Reed Beds	•	
LE6.4	Marsh and Wet Grassland	•	
LE7	Hard Landscape Features	•	

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ZS-000001)

**Construction**  
No exceptional risks

**Maintenance / Cleaning**  
No exceptional risks

**Use**  
No exceptional risks

**Decommissioning / Demolition**  
No exceptional risks

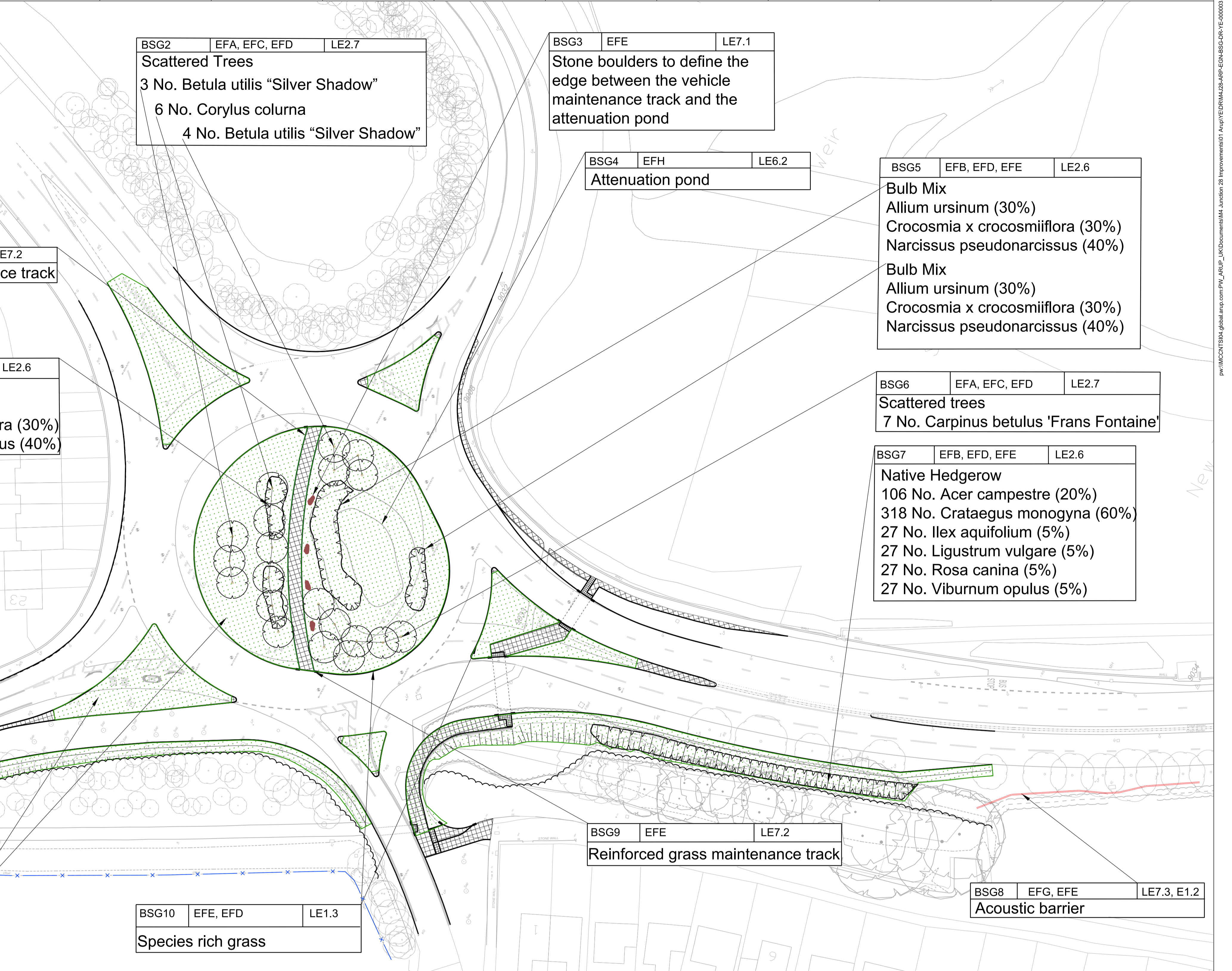
**Notes**

- Refer to Specification M4J28-ARP-GEN-SWG-SP-CX-000014 before commencing the works detailed within this drawing.
- Existing trees and vegetation within the roundabout shall be removed to enable construction as per drawing M4J28-ARP-HSC-BSG-DR-CH-000001
- For details of surfaces, refer to drawing M4J28-ARP-HKF-BSG-DR-CH-000001
- For vegetation clearance and protection, refer to drawing M4J28-ARP-HSC-BSG-DR-CH-000001
- This drawing is to be read in conjunction with the Designer's Risk Assessment

**Legend**

	Proposed Trees		Bulb mix/Native Hedgerow
	Species Rich Grass		Stone Boulders
	Fence		

TABLE NO.	ENVIRONMENTAL FUNCTIONS	LANDSCAPE ELEMENTS
<b>NOTES</b>		



BSG2 | EFA, EFC, EFD | LE2.7  
**Scattered Trees**  
 3 No. *Betula utilis* "Silver Shadow"  
 6 No. *Corylus colurna*  
 4 No. *Betula utilis* "Silver Shadow"

BSG3 | EFE | LE7.1  
**Stone boulders to define the edge between the vehicle maintenance track and the attenuation pond**

BSG4 | EFH | LE6.2  
**Attenuation pond**

BSG5 | EFB, EFD, EFE | LE2.6  
**Bulb Mix**  
*Allium ursinum* (30%)  
*Crocsmia x crocosmiiflora* (30%)  
*Narcissus pseudonarcissus* (40%)  
**Bulb Mix**  
*Allium ursinum* (30%)  
*Crocsmia x crocosmiiflora* (30%)  
*Narcissus pseudonarcissus* (40%)

BSG1 | EFE | LE7.2  
**Reinforced grass maintenance track**

BSG12 | EFB, EFD, EFE | LE2.6  
**Bulb Mix**  
*Allium ursinum* (30%)  
*Crocsmia x crocosmiiflora* (30%)  
*Narcissus pseudonarcissus* (40%)

BSG6 | EFA, EFC, EFD | LE2.7  
**Scattered trees**  
 7 No. *Carpinus betulus* 'Frans Fontaine'

BSG7 | EFB, EFD, EFE | LE2.6  
**Native Hedgerow**  
 106 No. *Acer campestre* (20%)  
 318 No. *Crataegus monogyna* (60%)  
 27 No. *Ilex aquifolium* (5%)  
 27 No. *Ligustrum vulgare* (5%)  
 27 No. *Rosa canina* (5%)  
 27 No. *Viburnum opulus* (5%)

BSG9 | EFE | LE7.2  
**Reinforced grass maintenance track**

BSG8 | EFG, EFE | LE7.3, E1.2  
**Acoustic barrier**

BSG11 | EFE, EFD | LE1.3  
**Species rich grass**

BSG10 | EFE, EFD | LE1.3  
**Species rich grass**

**Environmental Elements - DMRB Volume 10 section 0 part 4**

Ref	Dataset	Core Data	As-and-When
E1.1	Noise-Reducing Surface		•
E1.2	Noise Barrier-Built Elements		•
E1.3	Noise-Reducing Earthworks		•
E2.1	Water Pollution Control Measures		•
E2.2	Surface-Water Outfalls	•	
E2.3	Soakaways		•
E3.1	Protected Species	•	
E3.2	Ecological Protection Measures	•	
E4.1	Injurious Weeds	•	•
E4.2	Legislated Pests		•

Issue	Date	By	Chkd	Appd
P02	23/12/16	RD	SW	RS
Updated following NCC comments				



Client  
 Project Title  
 Drawing Title  
**Environmental Masterplan  
 Bassaleg Junction**

Scale at A1 1:500

Role	Specialist Designer - Environmental
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Rev	P02
Name	M4J28-ARP-EGN-BSG-DR-YE-000003

J28-1	EFE, EFD	LE1.3
Scattered trees 4 No. Prunus avium "plena"		

Environmental Functions - DMRB Volume 10 section 0 part 2			
Ref	Dataset	Core Data	As-and-When
EFA	Visual Screening	•	
EFB	Landscape Integration	•	
EFC	Enhancing the Built Environment	•	
EFD	Nature Conservation and Biodiversity	•	
EFE	Visual Amenity	•	
EFF	Heritage	•	
EFG	Auditory Amenity	•	
EFH	Water Quality	•	

Landscape Elements - DMTB Volume 10 section 0 part 3			
Ref	Dataset	Core Data	As-and-When
LE1.1	Amenity Grass Areas	•	
LE1.2	Grassland with Bulbs	•	
LE1.3	Species Rich (or Conservation)	•	
LE1.4	Grassland	•	
LE1.5	Rock and Scree	•	
LE1.6	Heath and Moorland	•	
LE1.7	Open Grassland	•	

LE2.1	Woodland	•	
LE2.2	Woodland Edge	•	
LE2.3	High Forest	•	
LE2.4	Linear Belts of Shrubs and Trees	•	
LE2.5	Shrubs with Intermittent Trees	•	
LE2.6	Shrubs	•	
LE2.7	Scattered Trees	•	
LE2.8	Scrub	•	

Ref	Dataset	Core Data	As-and-When
LE3.1	Amenity Tree and Shrub Planting	•	
LE3.2	Ornamental Shrubs	•	
LE3.3	Groundcover	•	
LE3.4	Climbers and Trailers	•	

LE4.1	Ornamental Species Hedges !	•	
LE4.2	Native Species Hedges !	•	
LE4.3	Native Species Hedgerows !	•	
LE4.4	Native Hedgerows with Trees	•	

LE5.1	Individual Trees	•	
LE6.1	Water Bodies and Associated Plants	•	
LE6.2	Banks and Ditches	•	
LE6.3	Reed Beds	•	
LE6.4	Marsh and Wet Grassland	•	
LE7	Hard Landscape Features	•	

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ES-000001)

Construction	Maintenance / Cleaning	Use	Decommissioning / Demolition
No exceptional risks	No exceptional risks	No exceptional risks	No exceptional risks

- Notes**
- Refer to Specification M4J28-ARP-GEN-SWG-SP-CX-000014 before commencing the works detailed within this drawing.
  - Existing trees and vegetation within the roundabout shall be removed to enable construction as per drawing M4J28-ARP-HSC-J28-DR-CH-000001
  - For details of surfaces, refer to drawing M4J28-ARP-HKF-J28-DR-CH-000001
  - For vegetation clearance and protection, refer to drawing M4J28-ARP-HSC-J28-DR-CH-000001
  - This drawing is to be read in conjunction with the Designer's Risk Assessment

Environmental Elements - DMRB Volume 10 section 0 part 4			
Ref	Dataset	Core Data	As-and-When
E1.1	Noise-Reducing Surface		•
E1.2	Noise Barrier-Built Elements		•
E1.3	Noise-Reducing Earthworks		•
E2.1	Water Pollution Control Measures		•
E2.2	Surface-Water Outfalls	•	
E2.3	Soakaways		•
E3.1	Protected Species	•	
E3.2	Ecological Protection Measures	•	
E4.1	Injurious Weeds	•	•
E4.2	Legislated Pests		•

**Legend**

- Proposed Trees
- Species Rich Grass (refer to appendix 30/5)
- Fence (Various types)
- Bulb Mix
- Stone Boulders

TABLE NO.	ENVIRONMENTAL FUNCTIONS	LANDSCAPE ELEMENTS
NOTES		

Issue	Date	By	Chkd	Appd
P02	23/12/16	RD	SW	RS
Updated following NCC comments				

**ARUP**  
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Client  
**Lywodraeth Cymru**  
Welsh Government

**COSTAIN**

Project Title  
**M4 J28 Improvements**

Drawing Title  
**Environmental Master Plan Junction 28**

Scale at A1: 1:1000

Role	Specialist Designer - Environmental
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Rev	P02
Name	M4J28-ARP-EGN-J28-DR-YE-000003



Environmental Functions - DMRB Volume 10 section 0 part 2			
Ref	Dataset	Core Data	As-and-When
EFA	Visual Screening	•	
EFB	Landscape Integration	•	
EFC	Enhancing the Built Environment	•	
efd	Nature Conservation and Biodiversity	•	
EFE	Visual Amenity	•	
EFF	Heritage	•	
EFG	Auditory Amenity	•	
EFH	Water Quality	•	

Landscape Elements - DMTB Volume 10 section 0 part 3			
Ref	Dataset	Core Data	As-and-When
LE1.1	Amenity Grass Areas	•	
LE1.2	Grassland with Bulbs	•	
LE1.3	Species Rich (or Conservation)	•	
LE1.4	Grassland	•	
LE1.5	Heath and Moorland	•	
LE1.6	Open Grassland	•	
LE2.1	Woodland	•	
LE2.2	Woodland Edge	•	
LE2.3	High Forest	•	
LE2.4	Linear Belts of Shrubs and Trees	•	
LE2.5	Shrubs with Intermittent Trees	•	
LE2.6	Shrubs	•	
LE2.7	Scattered Trees	•	
LE2.8	Scrub	•	

Ref	Dataset	Core Data	As-and-When
LE3.1	Amenity Tree and Shrub Planting	•	
LE3.2	Ornamental Shrubs	•	
LE3.3	Groundcover	•	
LE3.4	Climbers and Trailers	•	
LE4.1	Ornamental Species Hedges !	•	
LE4.2	Native Species Hedges !	•	
LE4.3	Native Species Hedgerows !	•	
LE4.4	Native Hedgerows with Trees	•	
LE5.1	Individual Trees	•	

Ref	Dataset	Core Data	As-and-When
LE6.1	Water Bodies and Associated Plants	•	
LE6.2	Banks and Ditches	•	
LE6.3	Reed Beds	•	
LE6.4	Marsh and Wet Grassland	•	
LE7	Hard Landscape Features	•	

Ref	Dataset	Core Data	As-and-When
LE4.1	Ornamental Species Hedges !	•	
LE4.2	Native Species Hedges !	•	
LE4.3	Native Species Hedgerows !	•	
LE4.4	Native Hedgerows with Trees	•	

Ref	Dataset	Core Data	As-and-When
LE6.1	Water Bodies and Associated Plants	•	
LE6.2	Banks and Ditches	•	
LE6.3	Reed Beds	•	
LE6.4	Marsh and Wet Grassland	•	
LE7	Hard Landscape Features	•	

Ref	Dataset	Core Data	As-and-When
LE3.1	Amenity Tree and Shrub Planting	•	
LE3.2	Ornamental Shrubs	•	
LE3.3	Groundcover	•	
LE3.4	Climbers and Trailers	•	

Ref	Dataset	Core Data	As-and-When
LE4.1	Ornamental Species Hedges !	•	
LE4.2	Native Species Hedges !	•	
LE4.3	Native Species Hedgerows !	•	
LE4.4	Native Hedgerows with Trees	•	

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-ZS-000001)
<b>Construction</b>
No exceptional risks
<b>Maintenance / Cleaning</b>
No exceptional risks
<b>Use</b>
No exceptional risks
<b>Decommissioning / Demolition</b>
No exceptional risks

**Notes**

1. Refer to Specification M4J28-ARP-GEN-SWG-SP-CX-000014 before commencing the works detailed within this drawing.
2. Existing trees and vegetation within the roundabout shall be removed to enable construction as per drawing M4J28-ARP-HSC-EBW-DR-CH-000001
3. For details of surfaces, refer to drawing M4J28-ARP-HKF-EBW-DR-CH-000001
4. For vegetation clearance and protection, refer to drawing M4J28-ARP-HSC-EBW-DR-CH-000001
5. This drawing is to be read in conjunction with the Designer's Risk Assessment

Legend
Proposed Trees
Bulb mix
Species Rich Grass
Stone Boulders
Fence

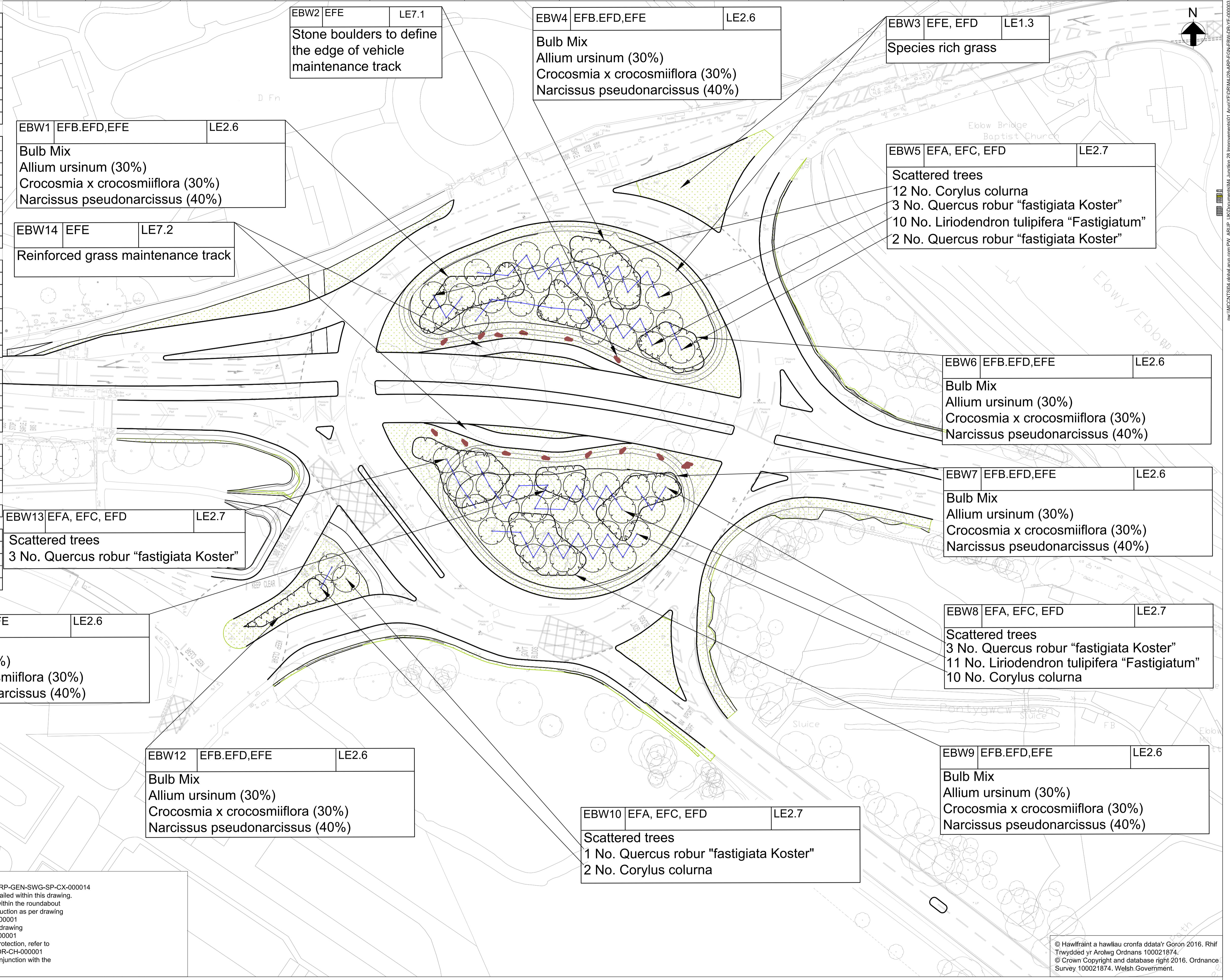


TABLE NO.	ENVIRONMENTAL FUNCTIONS	LANDSCAPE ELEMENTS
NOTES		

Issue	Date	By	Chkd	Appd
P02	23/12/16	RD	SW	RS
Updated following NCC comments				

**ARUP**

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Client

Lywodraeth Cymru  
Welsh Government

Project Title

**M4 J28**  
Improvements

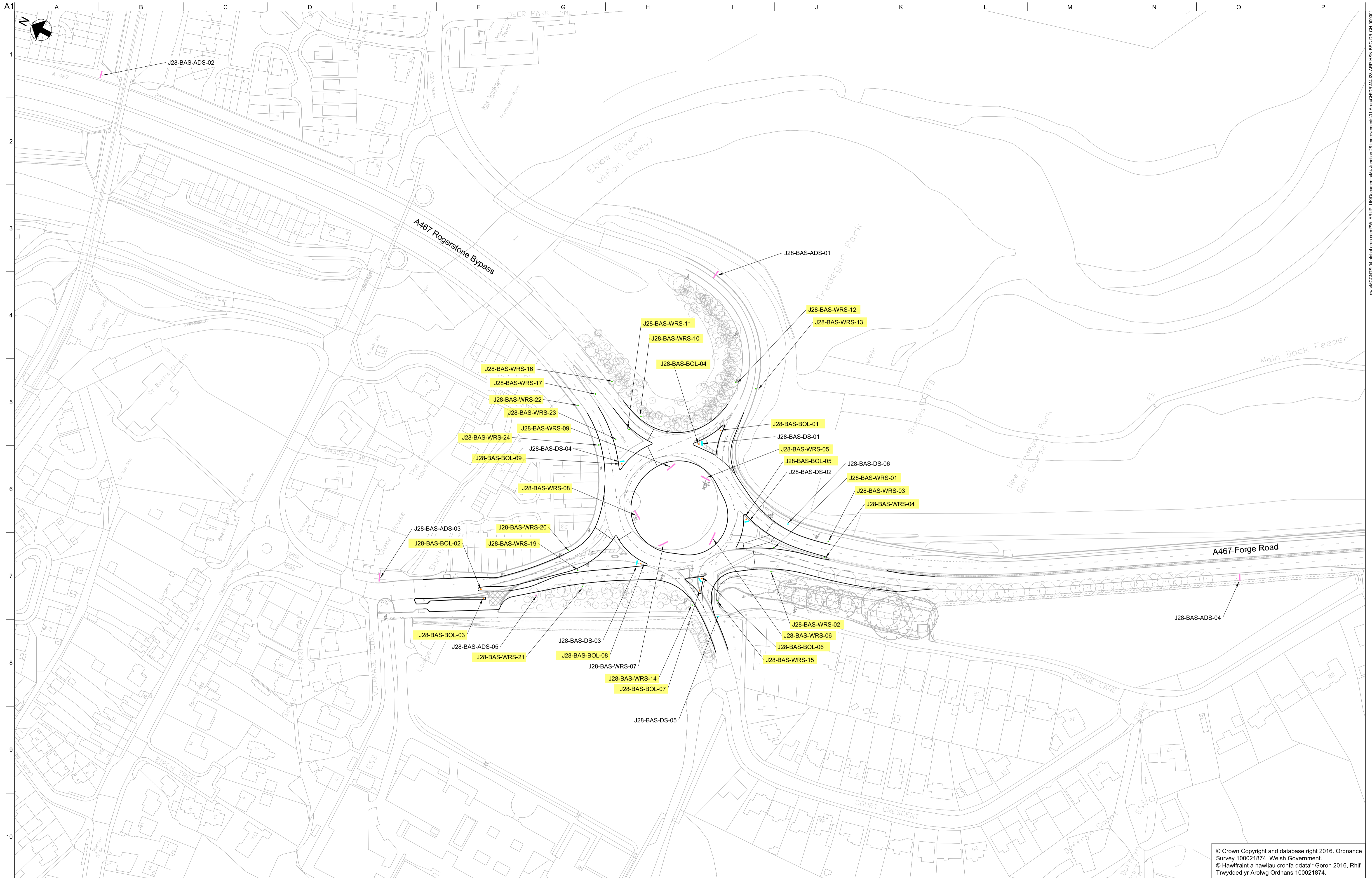
Drawing Title

Environmental Master Plan  
Pont Ebbw Junction

Scale at A1	1:500
Role	Specialist Designer - Environmental
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Rev	P02
Name	M4J28-ARP-EGN-EBW-DR-YE-000003

## C11 Traffic Signs

---



**Notes**

**J28-BAS-WRS-XX** Traffic Sign Illumination required

For Individual traffic sign face design refer to Traffic Signs Booklet

For post and foundations details refer to:  
M4J28-ARP-HSN-BSG-SH-CH-000001  
M4J28-ARP-HSN-J28-SH-CH-000001  
M4J28-ARP-HSN-EBW-SH-CH-000001  
M4J28-ARP-HSN-SWG-SH-CH-000001

Temporary signs not shown, location to be agreed prior to construction.  
Contractor to make a suitable allowance for these signs, or discuss with designer.

— Proposed Advance Direction Sign Location  
— Proposed Direction Sign Location  
— Proposed Warning/Regulatory Sign Location  
— Proposed Illuminated Bollard

P02	17/05/16	AC	SW	RS
For Review				
Issue	Date	By	Chkd	Appd

**ARUP**

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www.arup.com

Client

Llywodraeth Cymru  
Welsh Government

Project Title

**M4 J28**  
Improvements

Drawing Title

**Bassaleg Junction  
Traffic Signs**

Scale at A1 1:1000

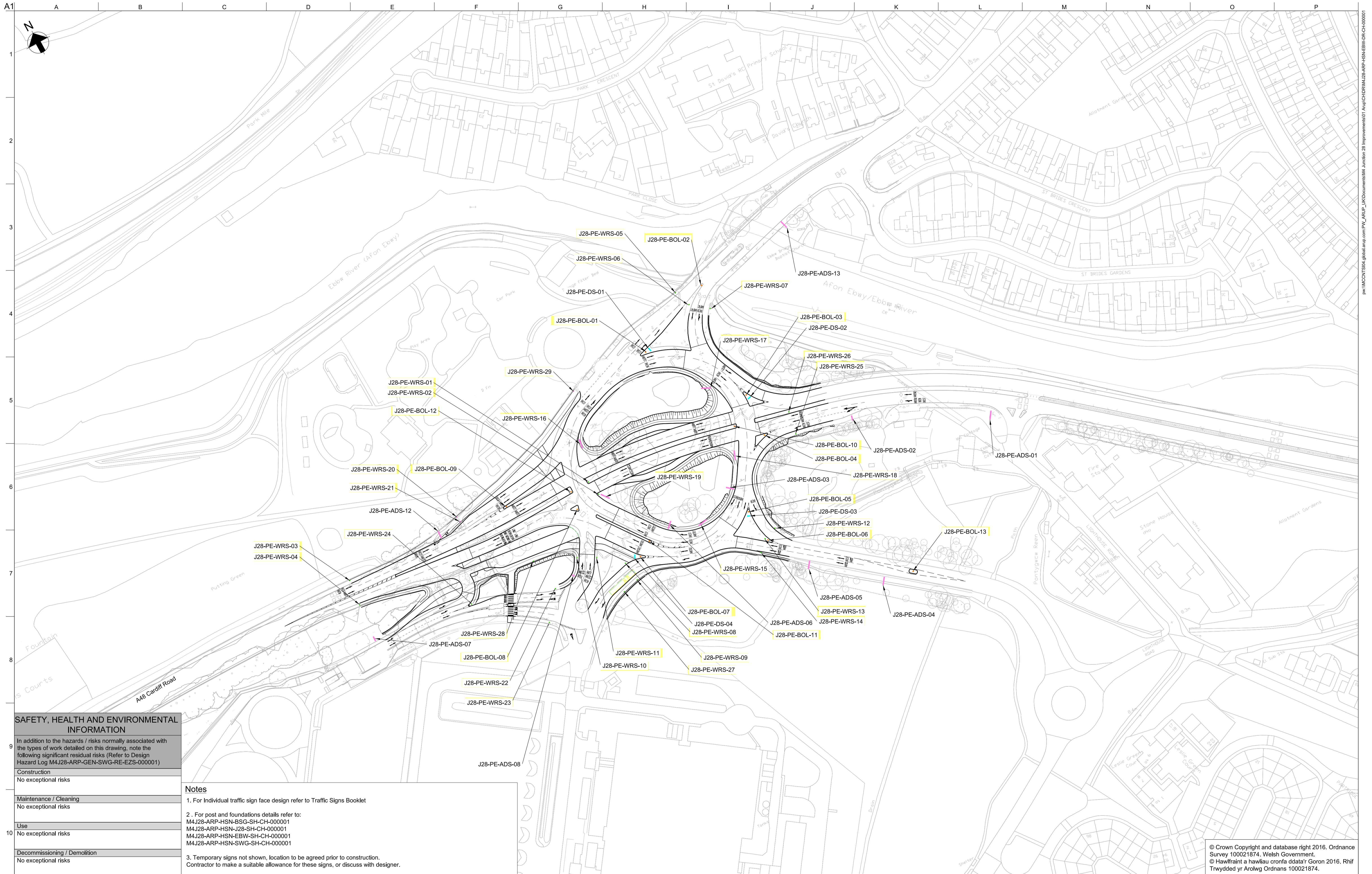
Role Civil Engineer - Highways

Suitability S3 - Fit for internal review and comment

Arup Job No **240226-00** Rev **P02**

Name **M4J28-ARP-HSN-BSG-DR-CH-000001**

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**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Refer to Design Hazard Log M4J28-ARP-GEN-SWG-RE-EZS-000001)

Construction	No exceptional risks
Maintenance / Cleaning	No exceptional risks
Use	No exceptional risks
Decommissioning / Demolition	No exceptional risks

**Notes**

- For individual traffic sign face design refer to Traffic Signs Booklet
- For post and foundations details refer to:  
 M4J28-ARP-HSN-BSG-SH-CH-000001  
 M4J28-ARP-HSN-J28-SH-CH-000001  
 M4J28-ARP-HSN-EBW-SH-CH-000001  
 M4J28-ARP-HSN-SWG-SH-CH-000001
- Temporary signs not shown, location to be agreed prior to construction. Contractor to make a suitable allowance for these signs, or discuss with designer.

**Legend**

J28-PE-WRS-XX	Traffic Sign Illumination required
	Proposed Advance Direction Sign Location
	Proposed Direction Sign Location
	Proposed Warning/Regulatory Sign Location
	Proposed Illuminated Bollard

P03	20/07/16	JP	SW	RS
IPO Option 5				
Issue	Date	By	Chkd	Appd

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 Cardiff, CF10 4DP  
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 www.arup.com

Client  
  
 Llywodraeth Cymru  
 Welsh Government

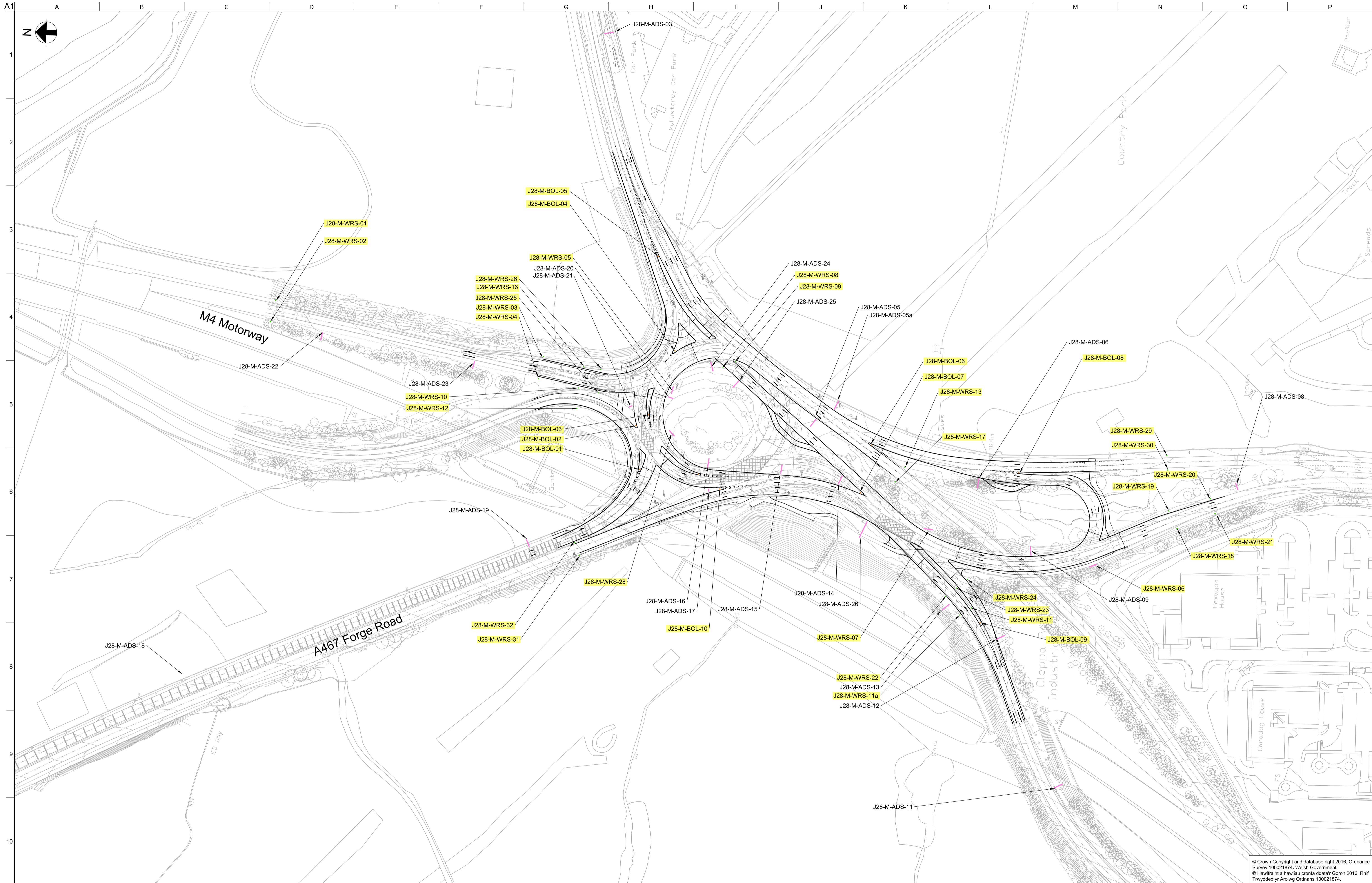
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Project Title  
**M4 J28 Improvements**

Drawing Title  
**Pont Ebbw Junction Traffic Signs**

Scale at A1 1:1000

Role	Civil Engineer - Highways
Suitability	S3 - Fit for internal review and comment
Arup Job No	240226-00
Name	M4J28-ARP-HSN-EBW-DR-CH-000001
Rev	P03



**Notes**

- J28-M-WRS-XX Traffic Sign Illumination required
- Proposed Advance Direction Sign Location
- Proposed Direction Sign Location
- Proposed Warning/Regulatory Sign Location
- Proposed Illuminated Bollard

For individual traffic sign face design refer to Traffic Signs Booklet

For post and foundations details refer to:  
 M4J28-ARP-HSN-BSG-SH-CH-000001  
 M4J28-ARP-HSN-J28-SH-CH-000001  
 M4J28-ARP-HSN-EBW-SH-CH-000001  
 M4J28-ARP-HSN-SWG-SH-CH-000001

Temporary signs not shown, location to be agreed prior to construction.  
 Contractor to make a suitable allowance for these signs, or discuss with designer.

P02	17/05/16	AC	SW	RS
For Review				
Issue	Date	By	Chkd	Appd

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Project Title

**M4 J28 Improvements**

Drawing Title

**Junction 28 Traffic Signs**

Scale at A1 1:1250

Role  
Civil Engineer - Highways

Suitability  
S3 - Fit for internal review and comment

Rev  
P02

Arup Job No  
**240226-00**

Name  
**M4J28-ARP-HSN-J28-DR-CH-000001**

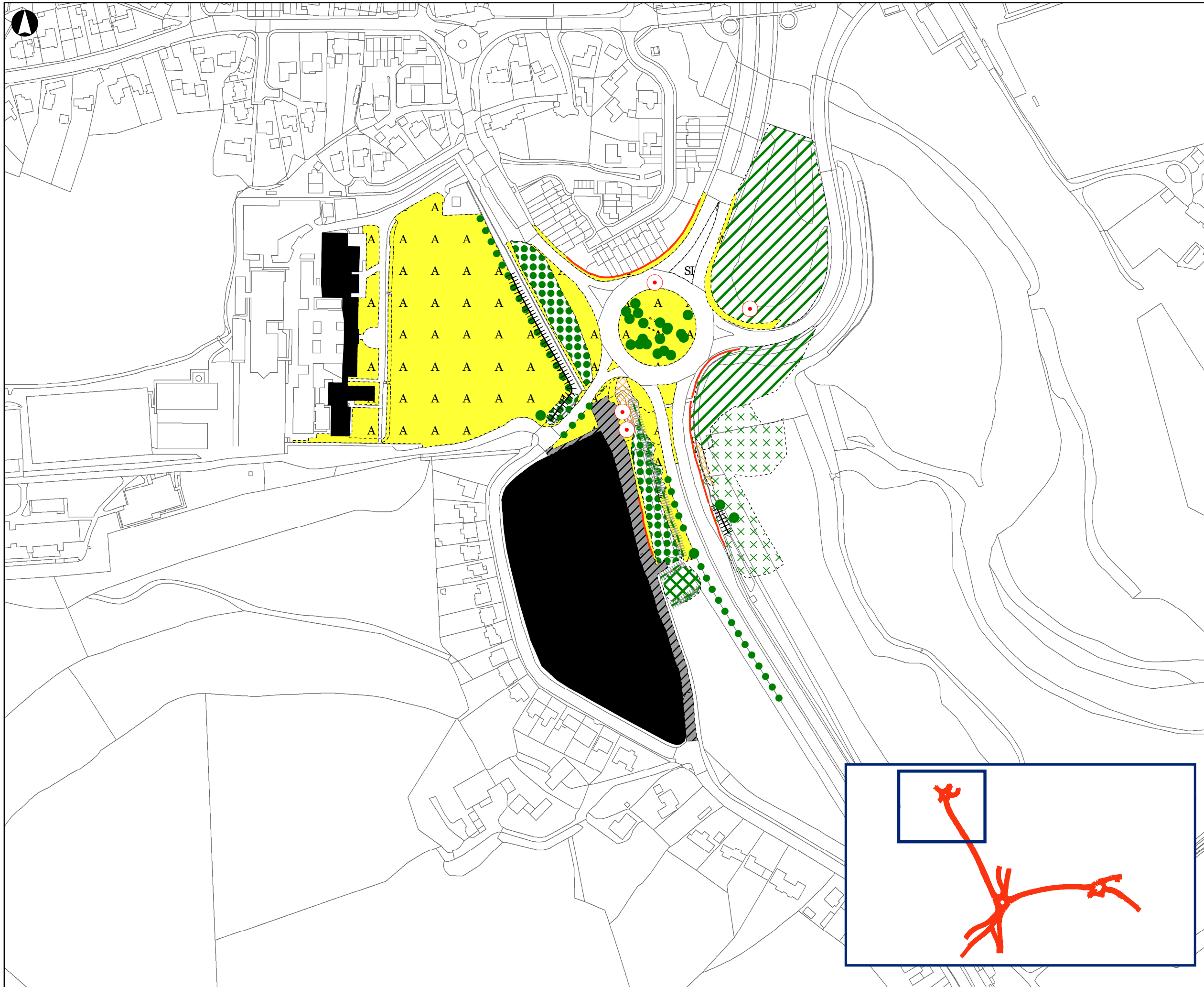
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## Appendix D

### Ecology Appendix

## D1 Extended Phase 1 Habitat Plans

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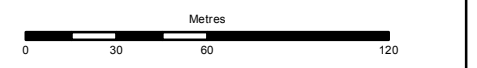


**Legend**

	Scattered broad-leaved trees		Scattered scrub
	Scattered coniferous trees		Scattered broad-leaved trees
	Japanese knotweed		Scattered coniferous trees
	Target note		Scattered mixed trees
	Broad-leaved tree line		Semi-improved neutral grassland
	Running water		Improved grassland
	Species-poor intact hedge		Marshy grassland
	Species poor defunct hedge with fence		Poor semi-improved grassland
	Fence		Tall ruderal
	Wall		Running water
	Wall with fence		Amenity grassland
	Dry ditch		Introduced shrub
	Broad-leaved plantation		Buildings
	Mixed woodland		Tarmac
	Mixed plantation		
	Dense scrub		

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Ordnance Survey 0100031673

P0	2015-03-18	FG	MM	PW
Issue	Date	By	Chkd	Appd



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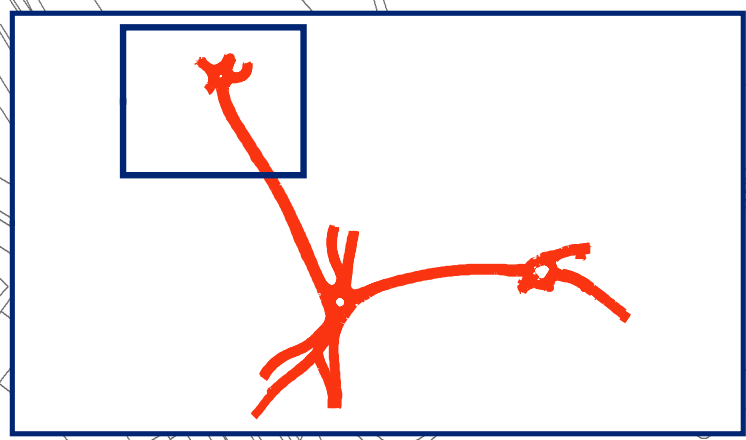
**Llywodraeth Cymru  
Welsh Government**

Job Title  
**M4 Junction 28**

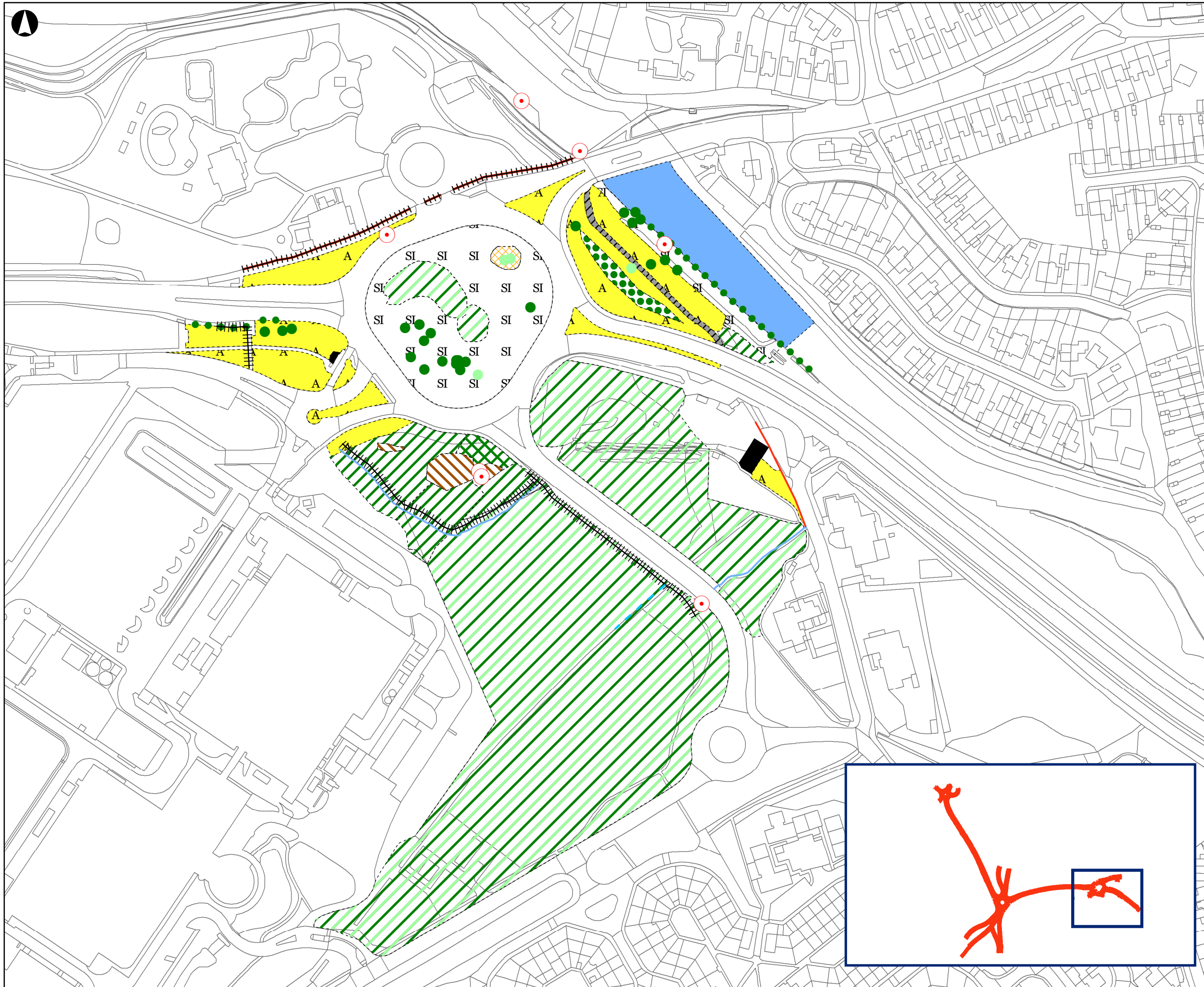
**Extended Phase 1 Habitat Survey:  
Bassaleg Roundabout**

Scale at A3  
**1:2,500**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>001</b>	Issue <b>P0</b>







- Legend**
- Scattered broad-leaved trees
  - Scattered coniferous trees
  - ✕ Japanese knotweed
  - Target note
  - Broad-leaved tree line
  - Running water
  - Species-poor intact hedge
  - Species poor defunct hedge with fence
  - Fence
  - Wall
  - Wall with fence
  - - - Dry ditch
  - ▨ Broad-leaved plantation
  - ▨ Mixed woodland
  - ▨ Mixed plantation
  - ▨ Dense scrub
  - Scattered scrub
  - Scattered broad-leaved trees
  - Scattered coniferous trees
  - Scattered mixed trees
  - Semi-improved neutral grassland
  - Improved grassland
  - Marshy grassland
  - Poor semi-improved grassland
  - Tall ruderal
  - Running water
  - Amenity grassland
  - Introduced shrub
  - Buildings
  - Tarmac

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Ordnance Survey 0100031673

P0	2015-03-18	FG	MM	PW
Issue	Date	By	Chkd	Appd


Metres

0 25 50 100

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**Llywodraeth Cymru  
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Job Title

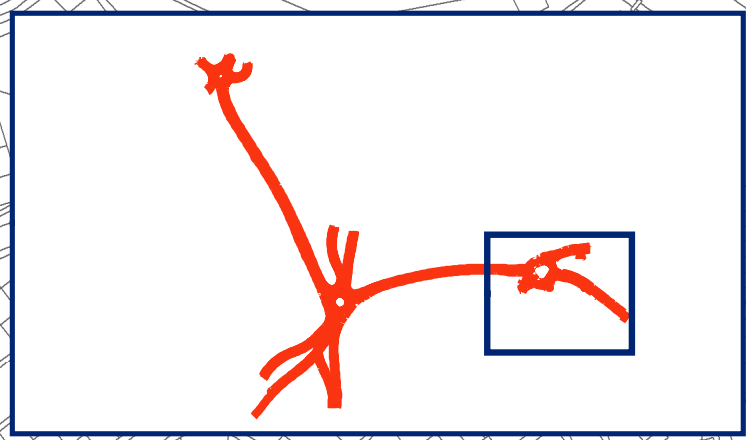
**M4 Junction 28**

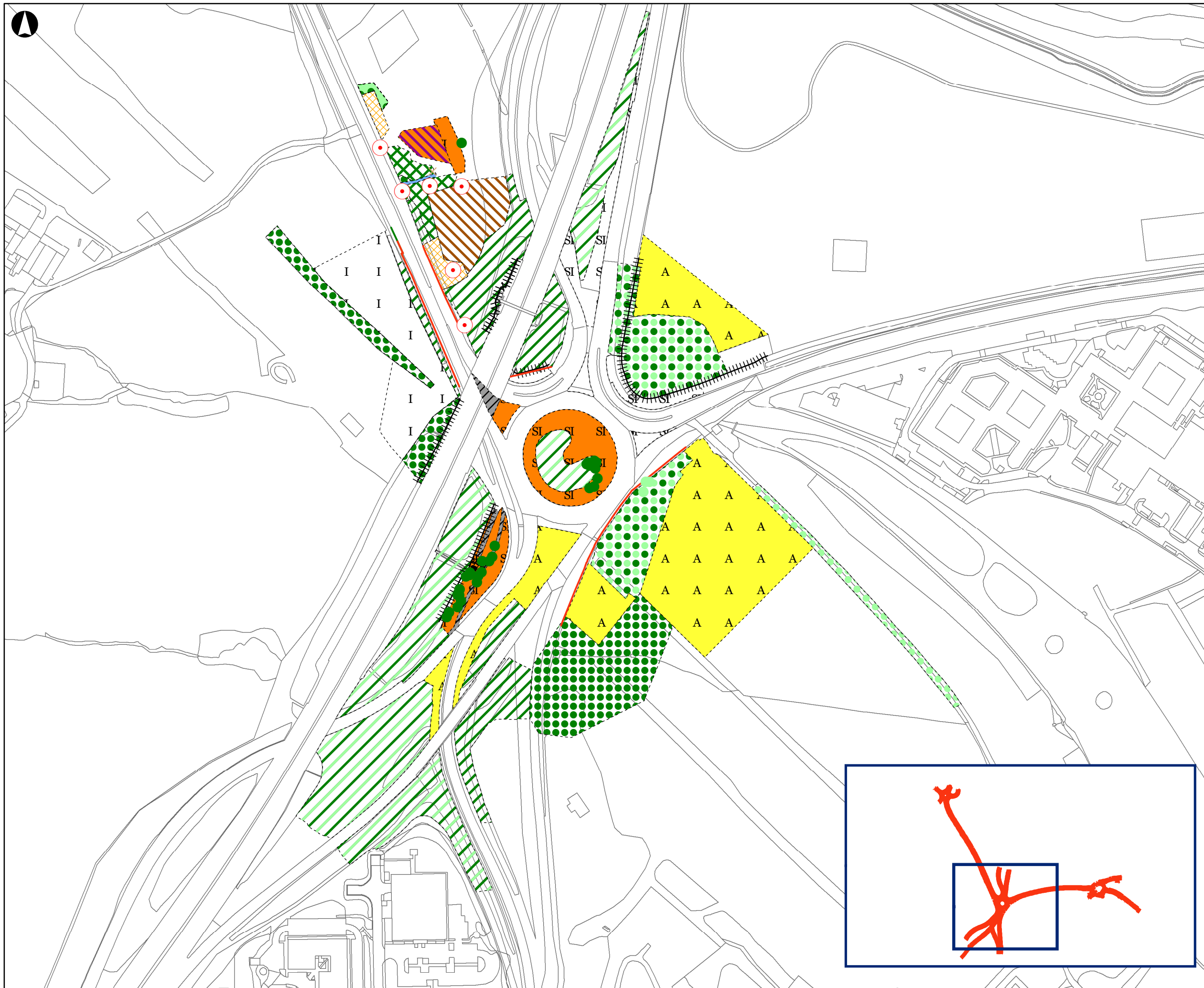
**Extended Phase 1 Habitat Survey:  
Pont Ebbw Roundabout**

Scale at A3

**1:2,000**

Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
Drawing No <b>002</b>	Issue <b>P0</b>





- Legend**
- Scattered broad-leaved trees
  - Scattered coniferous trees
  - × Japanese knotweed
  - Target note
  - Broad-leaved tree line
  - Running water
  - Species-poor intact hedge
  - Species poor defunct hedge with fence
  - Fence
  - Wall
  - Wall with fence
  - Dry ditch
  - Broad-leaved plantation
  - Mixed woodland
  - Mixed plantation
  - Dense scrub
  - Scattered scrub
  - Scattered broad-leaved trees
  - Scattered coniferous trees
  - Scattered mixed trees
  - Semi-improved neutral grassland
  - Improved grassland
  - Marshy grassland
  - Poor semi-improved grassland
  - Tall ruderal
  - Running water
  - Amenity grassland
  - Introduced shrub
  - Buildings
  - Tarmac

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P0	2015-03-18	FG	MM	PW
Issue	Date	By	Chkd	Appd

Metres

0 40 80 160

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Job Title  
**M4 Junction 28**

**Extended Phase 1 Habitat Survey:  
Junction 28 Tredegar Roundabout**

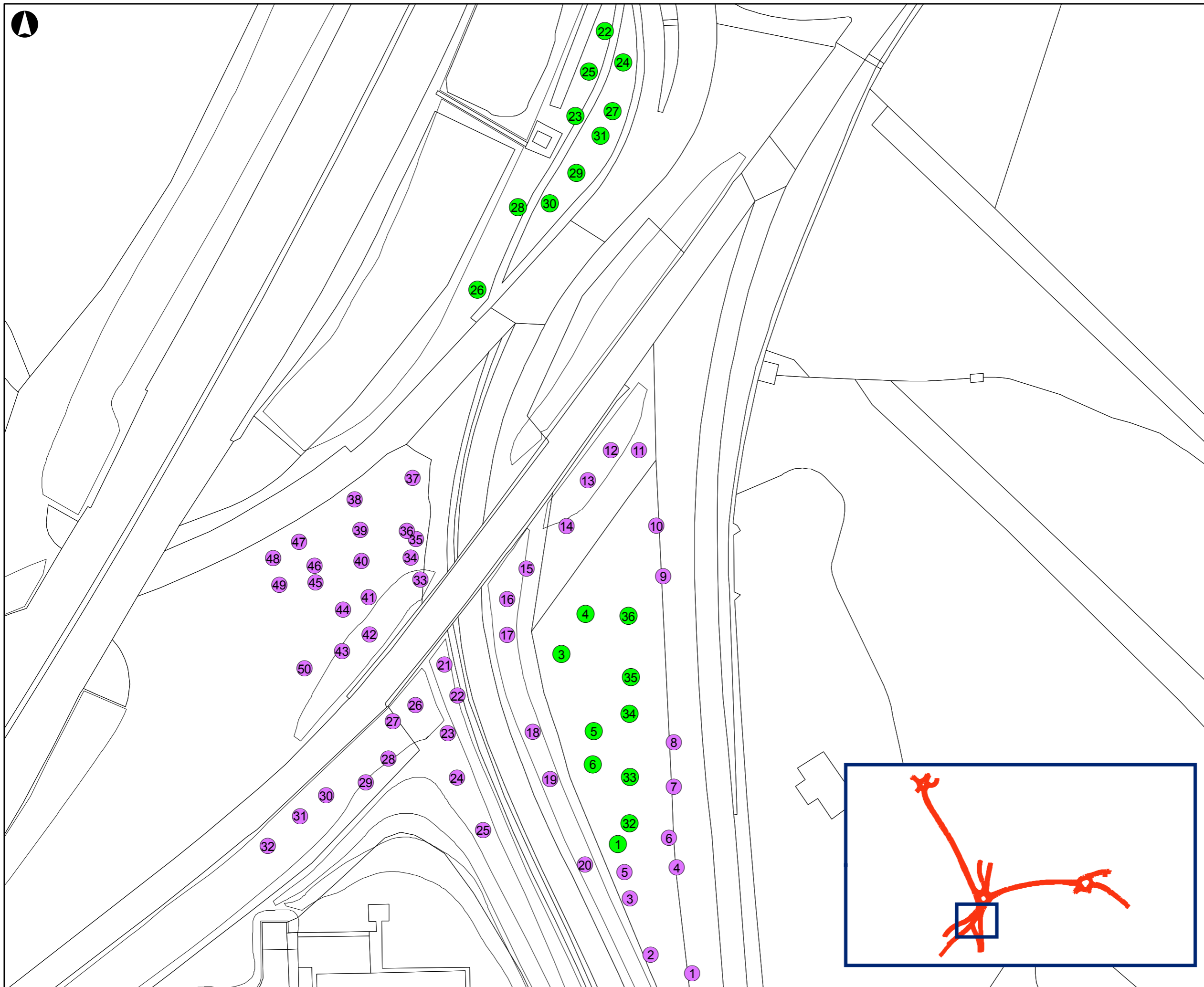
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Job No <b>240226-00</b>	Drawing Status <b>Preliminary</b>
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Drawing No <b>003</b>	Issue <b>P0</b>
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## **D2 Dormouse and Reptile Survey Locations**

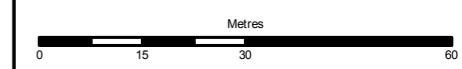
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- Legend**
- Dormice Tube Locations
  - Reptile Mat Locations

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Ordnance Survey 0100031673

F1	2016-11-21	FG	MM	PW
Issue	Date	By	Chkd	Appd



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**Llywodraeth Cymru  
Welsh Government**

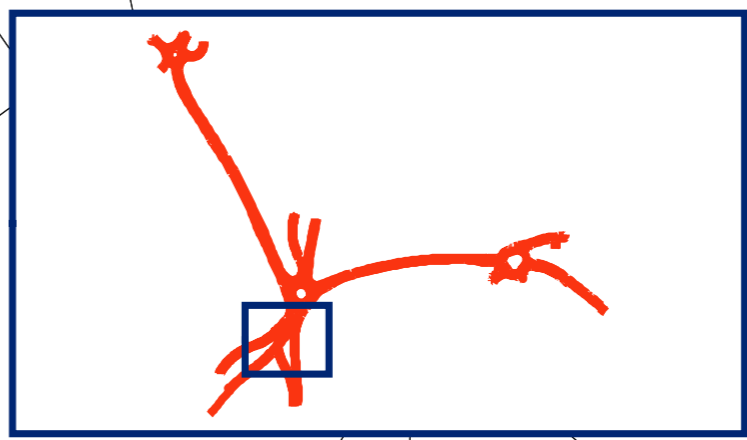
Job Title  
**M4 Junction 28**

**Reptile Mat & Dormouse  
Tube Locations**

Scale at A3  
**1:1,100**

Job No <b>240226-00</b>	Drawing Status <b>For Issue</b>
----------------------------	------------------------------------

Drawing No <b>004</b>	Issue <b>F1</b>
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## **Appendix E**

### **Noise and Vibration Appendices**

## E1 Glossary of noise and vibration terminology

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### Decibel

The ratio of sound pressures, which we can hear, is a ratio of 10<sup>6</sup> (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L<sub>p</sub>) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

### dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as LA10, LA90, and LAeq for the 'A' weighted equivalent continuous noise level.

### Equivalent continuous sound level

Another index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

### Statistical noise levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L10, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L90, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L1, the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted LA10, dBLA90 etc. The reference time period (T), is normally included, e.g. dBLA10, 5min or dBLA90, 8hr.

### Maximum noise level

This is generally expressed as the maximum A-weighted noise level (LA<sub>max</sub>) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures.

### Frequency

The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes, the

octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

### Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level ( $L_p$ ) is 10 times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of  $2 \times 10^{-5}$ Pa (the threshold of hearing).

Thus  $L_p$  (dB) =  $10 \log (P1/Pref)^2$  where Pref, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e.  $2 \times 10^{-5}$  Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB(A) or more and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

### Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing structure borne noise or human comfort issues respectively. Vibration amplitude may be quantified as a peak value, or as a root mean squared (rms) value.

Vibration amplitude can be expressed as an engineering unit value e.g. 1 mms<sup>-1</sup> or as a ratio on a logarithmic scale in decibels:

Vibration velocity level, dB =  $20 \log (V/V_{ref})$

(where the preferred reference level,  $V_{ref}$ , for vibration velocity =  $10^{-9}$  ms<sup>-1</sup>).

The decibel approach has advantages for manipulation and comparison of data.

## Typical noise levels

Some typical noise levels are given below:

Noise level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m

80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing



## E2 Baseline noise survey results

### Measurement procedure

#### Site location

The surveys were undertaken to determine the existing noise climate around the proposed improvement scheme and the surrounding residential areas. Noise measurements were taken by Ray Houghton and Neil Allso of Arup on Tuesday 12th January 2016.

The proposed M4 Junction 28 improvement scheme lies to the northwest of Newport on Forge Road (A467), which leads from Duffryn village to Rogerstone village.

#### Measurement locations

The measurement locations were chosen to provide typical ambient noise levels at representative noise sensitive receptors around the proposed improvement scheme. The six measurement positions are shown in Figure C2.1.



Figure E2.1: Measurement Locations

The six measurement locations comprised the following:

Location 1 – on the pavement next to Court Crest Road and Forge Lane, approximately 3m from carriageway edge and 30m from Forge Road roundabout to the east.

Location 2 – on the pavement next to Forge Road and Forge Lane, approximately 4m from main carriage way edge of the (A467) and 5m from Forge Lane to the west.

Location 3 – on a patch of grass at the T-junction of Forge Lane and Court Crest Road approximately 5m from Forge Lane and approximately 65m from the main carriageway edge of Forge Road (A467).

Location 4 – on the pavement next to Churchmead Road approximately 50m north of Forge Road (A467) roundabout.

Location 5 – on a patch of grass between the River Ebbw and Forge Mews road and approximately 25m from the main carriageway edge of Forge Road (A467).

Location 6 – on a patch of grass next to Bassaleg School main footpath accessed from Court Crest Road, approximately 220m from Forge Road roundabout to the east.

## Attended survey period

Attended noise surveys were carried out to establish the baseline noise levels at the measurement locations at the following times:

Daytime (interpeak) between 11:50 and 15:33 on Tuesday 12th January 2016.

## Survey methodology

The measurements were made with the measurement microphone mounted using a tripod 1.2m – 1.5m above ground level under acoustically free field conditions (i.e. at least 3.5m from any acoustically reflecting surface other than the ground).

The measurement locations were chosen to provide typical ambient noise levels at representative noise sensitive receptors around the site of the proposed Scheme.

The weather conditions during the survey were within the limits specified in BS7445-1:2003. It was noted that roads were slightly damp but this was judged not to affect the tyre/road noise relative dry conditions. Wind conditions were moderate for the majority of the time, skies overcast and very light rain was noted during some of the survey times during the day. The maximum wind speed recorded gusted no greater than 4.9m/s and was generally from the northwest.

Measurements were made in broad accordance with the procedure set out in the document “Calculation of Road Traffic Noise” (UK Department of Transport and Welsh Office), ie at each location, measurements were made in three consecutive hours between 10:00 hours and 17:00 hours.

For the attended noise surveys, the sound level meter was set to record noise levels over 15 minute periods. For each noise measurement, the noise climate, wind speed and direction, and the measured noise levels were all recorded and

noted. The meter was set to automatically store the LAeq, LAmin, LAmax, LA10 and LA90 indices. Measurements were made with a fast (0.125s) time constant.

## Measurement equipment

Measurements were carried out using equipment as detailed in Table C2.1. The sound level meters and microphones are Type 1, conforming to BS EN 61672-1: 2003. The calibration of the sound level meters, pre-amplifier and microphone chains were checked before and after use, to confirm that there was no significant drift in meter response at the calibrator frequency and level. All Arup's sound level meters are regularly calibrated and this calibration is traceable to international standards.

Measurement Equipment	Manufacturer	Type Number	Serial Number
Precision grade noise logging sound level meter (kit-A)	Norsonic	NOR 140	1403425
½" diameter pre-polarised condenser microphone	Norsonic	NOR 1225	98510
Pre-amplifier	Norsonic	NOR 1209	12578
Type 1 sound pressure calibrator	Norsonic	Nor 1251	33849
Precision grade noise logging sound level meter (kit C)	Norsonic	NOR 140	1403429
½" diameter pre-polarised condenser microphone	Norsonic	NOR 1225	98521
Pre-amplifier	Norsonic	NOR 1209	12625
Type 1 sound pressure calibrator	Rion	NC-74	35173564

**Table E2.1: Measurement equipment used for the survey**

## Measurements results

### Noise survey results summary

Measured noise levels at all locations are summarised in Tables C2.2 below.

Location	Sound level, dB (free field)		
	LA10,15min	LA90,15min	LAeq,15min
1	65	60	64-65
2	82	69	78-80
3	63	56	60-62
4	61	57	60-61
5	65	59	63
6	54	49	52-57

**Table E2.2: Summary of measured daytime noise levels**

## Full survey results at all locations

### Survey locations

Location 1 - was at the northernmost end to Forge Lane on the grass verge alongside court crescent. The roundabout (A467) was north east and was in full view from this location. To the south of the location was a housing estate that ran along the length of Forge Lane. From the site the ground fell slowly North East towards the roundabout and slowly to the south down Forge Lane. The noise climate at this location is dominated by the traffic flows on the (A467)

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	12:36	12:51	5	6	2.3	NW	63.6	75.9	56.8	65.4	60.3	Location 1 is dominated by traffic noise arising from vehicles travelling on the (A467) and traffic negotiating the roundabout. During measurement period it was noted that the traffic was running @ approx. 34 cars per minute.
12.01.16	13:59	14:14	4.5	5	2.3	NW	64.4	81.4	55.6	65.9	60.0	Traffic negotiating the (A467) roundabout, is the dominant noise source at this location. During measurement period it was noted that the traffic was running @ approx. 34 cars per minute, apart from few car pass-bys on Forge Lane. No other noise sources were audible at this time.
12.01.16	14:53	15:08	5	5	3.1	NW	65.2	77.0	57.8	67.8	61.8	The noise from traffic on Forge Road (A467) roundabout, @ approx 45 cars per minute, dominated with no other noise sources being noted during measurement duration

Table E2.3: Attended measurement results at location 1 (GPS 51o 34” 31’N 03o 02” 36’W)

Location 2 - was on the southernmost point at the end of Forge Lane, on the pavement that ran beside turn circular. The ground rises up the pavement to the west and then slopes gently north up Forge Lane. The noise climate at this location is dominated by the traffic flows on the (A467) and roundabout.

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	11:53	12:08	5	6	2.3	NW	78.4	88.3	61.6	82.5	69.5	Forge Road (A467) very busy traffic running @ approx 32 cars per minute, no other noise source are audible above background at this time
12.01.16	13:00	13:15	5	5	3.9	NW	78.2	88.3	61.1	82.3	69.3	A467 is a fast flowing link road, cars are passing the location at national speed limit for a dual carriageway (ie, 70mph). Location dominated by road traffic noise, and no other noise sources are audible above general back ground levels at this time.
12.01.16	14:15	14:30	5	5	3.4	NW	79.9	93.0	63.3	83.5	70.5	The traffic flow levels on Forge Road (A467) were approx 45 cars per minute, and no other noise sources were noted during measurement duration.

Table E2.4: Attended measurement results at location 2 (GPS 51o 34” 24’N 03o 02” 22’W)

Location 3 - was at the junction of Court Crescent Road and Forge Lane, on a grass verge on the east side of Forge Lane. The site was approx. 65m from the (A467) and 272m from the roundabout. The road rises up to the west (Court Crescent) and slowly up Forge Lane to the north. The noise climate at this location is dominated by the traffic flows on the (A467).

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	12:15	12:30	5	5	3.7	NW	59.5	69.4	51.4	61.6	56.2	No traffic pass-by on Forge Lane were recorded during the measurement duration, location dominated by road traffic noise on the (A467), and no other noise sources audible.
12.01.16	13:43	13:58	4.5	4.5	4.9	NW	60.8	72.2	52.8	62.5	58.1	Road traffic noise (A467) to the east of the location is the dominating noise source. No other noise sources were noted during the measurement duration.
12.01.16	14:32	14:47	4.5	4.5	3.2	NW	61.6	69.0	42.4	63.5	58.8	No other roads in the surrounding area are audible, apart from (A467). Noise climate dominated by fast flowing traffic.

Table E2.5: Attended measurement results at location 3 (GPS 51° 34' 22" N 03° 02' 32" W)

Location 4 - was opposite to No.8 Churchmead Road, on the north west side of the (A467). To the east was a steep embank running up to the edge of the (A467) with a large thick hedge running along the peak of the bank, which obscured the direct line of sight to the elevated carriageway. The ground sloped down gently northwards and up to the south west. This location was set in a modern Cul-de-sac housing estate which was dominated by the traffic noise arising from both local roads and the more distant A467.

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	12:15	12:30	5	5	2.4	NW	61.0	83.8	54.0	62.0	56.6	Traffic noise from the (A467) is audible above general background level with contribution from vehicle pass-bys on Churhmead Road.
12.01.16	13:35	13:50	5	5	3.3	NW	59.5	73.4	55.2	61.1	57.2	The Traffic on the (A467) is audible, but noise climate has contribution from general housing estate road traffic movement noise.
12.01.16	14:50	15:08	4	4	2.8	NW	60.0	81.9	54.5	63.5	56.6	Traffic on the (A467) is still audible, but not dominant due to local traffic contribution.

Table E2.6: Attended measurement results at location 4 (GPS 51o 34'' 38'N 03o 02'' 34'W)



Location 5 - was located opposite to No.1 Forge Mews on a hard standing, on the east side of the (A467). As the fast flowing water of the River Ebbw negotiated it way down the weir it became a contributing noise source to this location, but was not a dominant one. The dominating noise source was the (A467) and was visible to the south, past the footbridge.

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	11:50	12:05	6	6	3.1	NW	62.8	71.1	55.4	65.1	58.9	Location 5 is dominated by road traffic noise arising from vehicles travelling on the (A467) with a contribution from water at the nearby weir. During the measurement period it was noted that the traffic was running @ approx. 43 cars per minute.
12.01.16	13:10	13:25	5	5	2	NW	62.8	73.0	56.3	64.9	59.3	Fast flowing water over the weir is contributing noise source at this location although traffic travelling on the (A467) is still the dominating noise source. During the measurement period it was noted that the traffic was running @ approx. 27 cars per minute.
12.01.16	14:25	14:40	5	5	2	NW	62.9	72.4	55.4	65.1	56.6	No other roads in the surrounding area are audible, apart from (A467). Location is dominated by noise from fast flowing traffic. During measurement period it was noted that the traffic was running @ approx. 27 cars per minute

Table E2.7: Attended measurement results at location 5 (GPS 51o 34” 40’N 03o 02” 33’W)

Location 6 was located in a field to the south of the main Bassaleg School grounds at approx. 220 metres from the A467 and at the same elevation to the school car park and inline to the main school building. The view of the A467 was obscured by houses and large trees. The ground sloped gently eastwards towards the housing estate on Court Crescent, and rose sharply towards trees to the south. Traffic on the (467) was barely audible above the general noise from the school.

Date	Time		Temperature, °C		Wind		Noise Level, dB (A)					Comments
	Start	Finish	Start	Finish	Speed (ms-1)	Direction	Leq	Lmax	Lmin	L10	L90	
12.01.16	12:40	13:05	5	5	3.5	NW	56.1	82.0	47.8	55.7	50.2	From this location the A467 is just audible above background level. Vehicles using Court Crest Road contribute to the overall noise climate. School children in the playground are clearly audible above other noise sources.
12.01.16	14:00	14:16	5	5	3	NW	52.3	64.9	47.1	54.4	49.3	The (A467) is not audible above background level. Vehicles using Court Crest Road, and school children in grounds are contributing to the overall noise levels.
12.01.16	15:15	15:33	5	5	2.5	NW	57.3	69.5	51.1	59.7	53.5	This location is dominated by school related traffic on Court Crest Road and children leaving school. The A467 is not audible at this time.

Table E2.8: Attended measurement results at location 6 (GPS 51o 34' 29"N 03o 02' 45"W)

## E3 Figures: Operational Noise

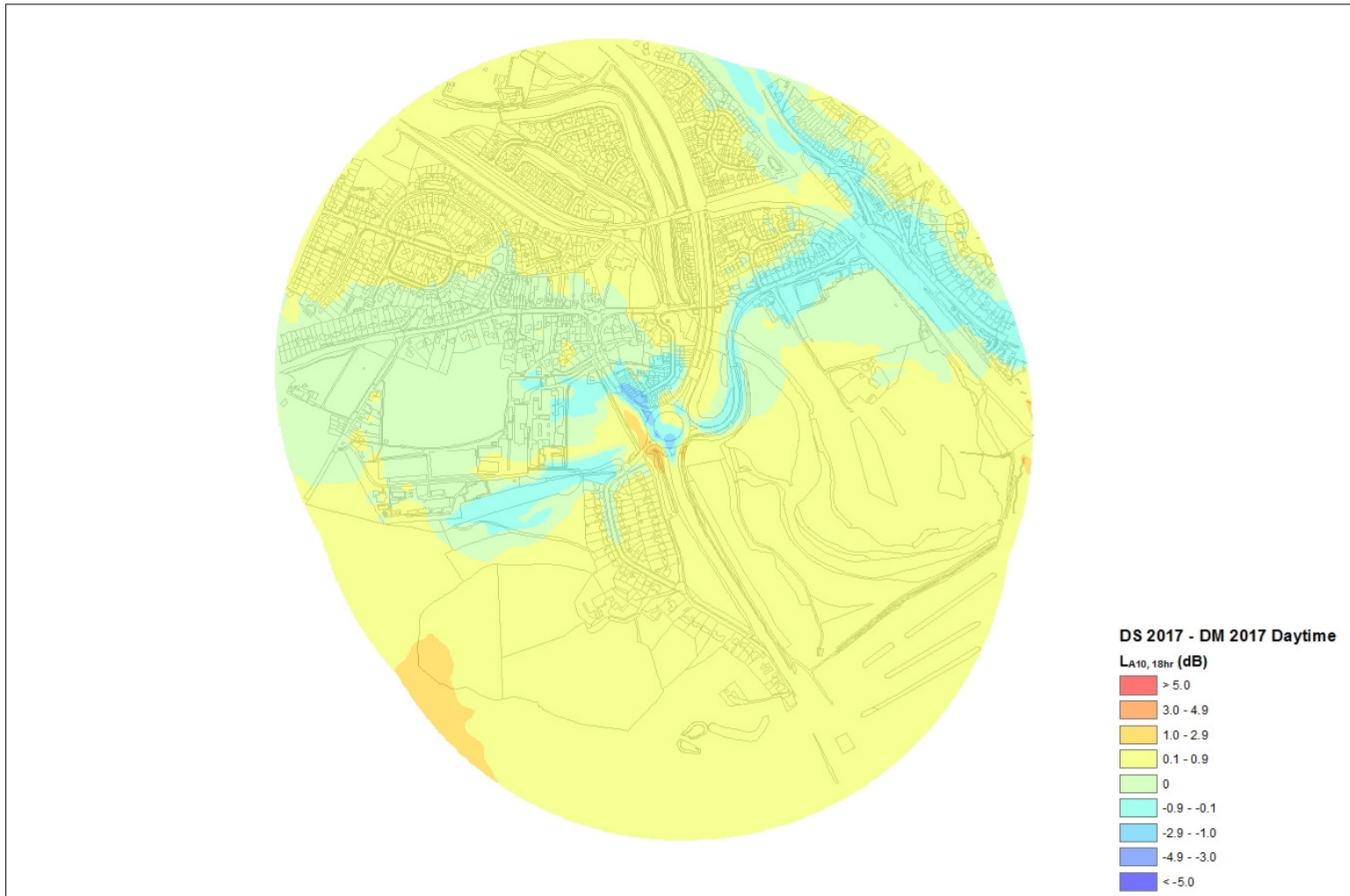


Figure E3.1: Daytime noise changes – unmitigated - Do-Something scenario in the 2017 baseline year against the Do-Minimum scenario in the 2017 baseline year (short term)

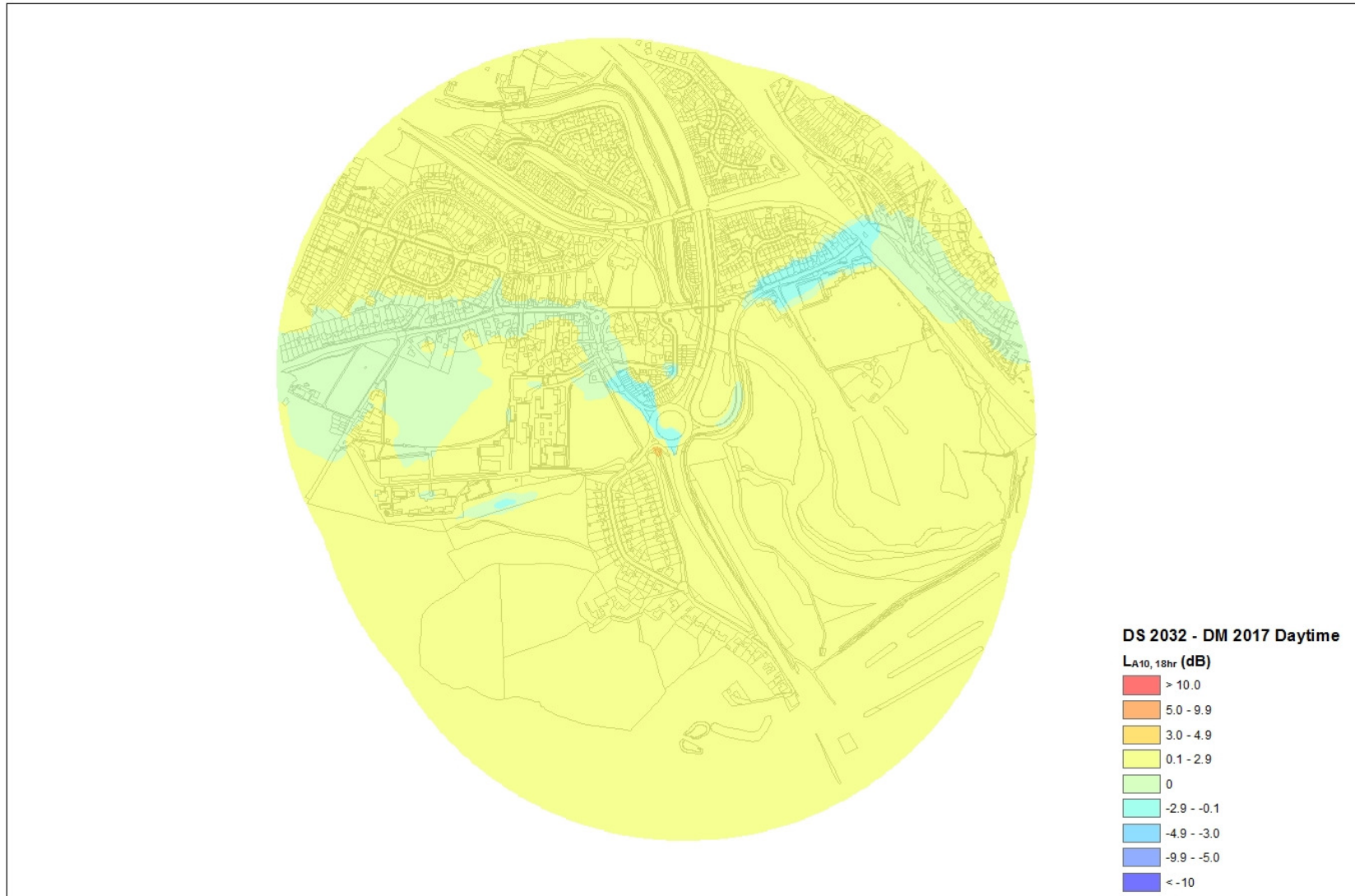


Figure E3.2: Daytime noise changes – unmitigated - Do-Something scenario in the 2032 design year against Do-Minimum scenario in the 2017 baseline year (long term)

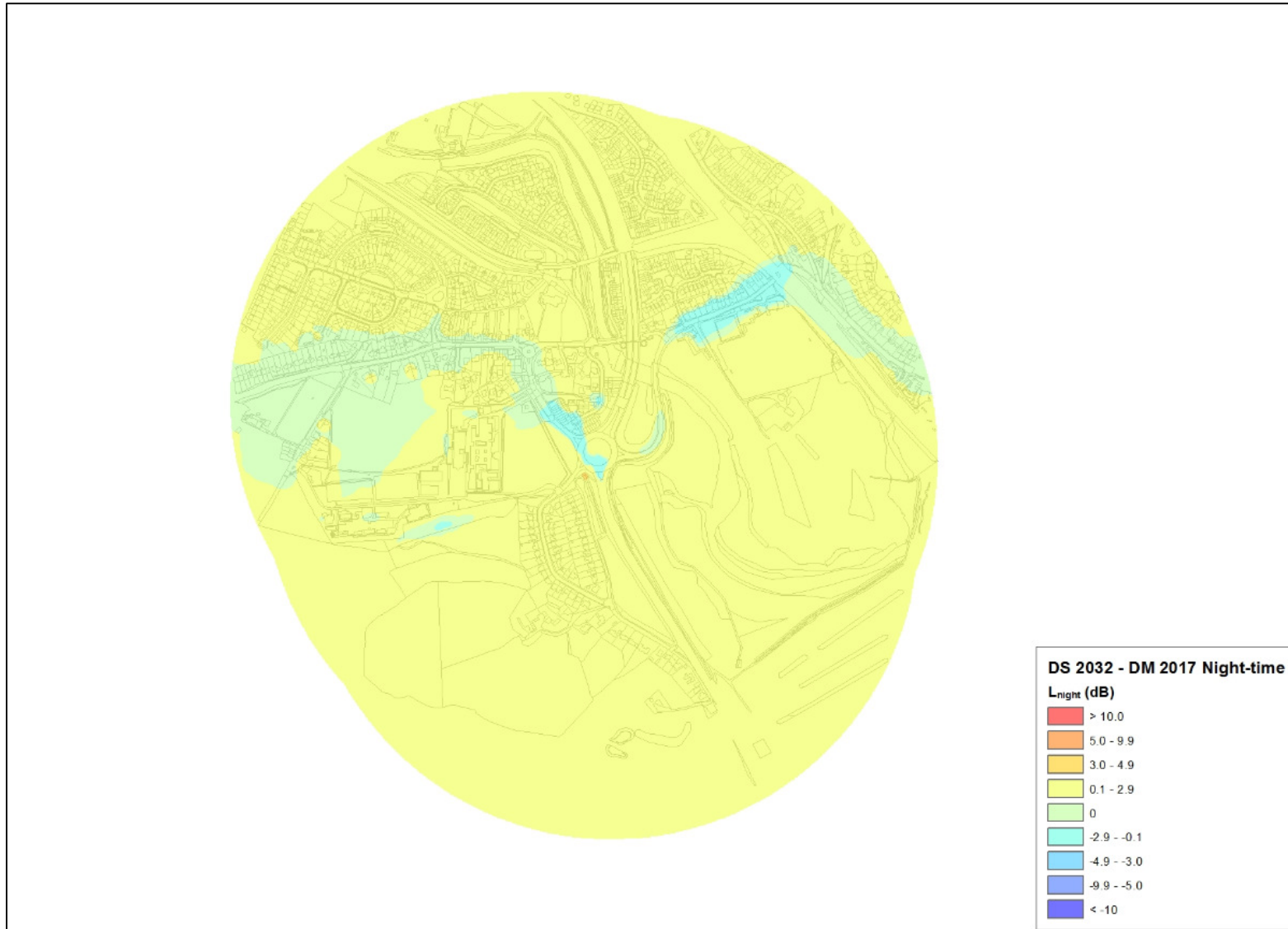


Figure E3.3: Night-time noise changes – unmitigated - Do-Something scenario in the 2032 design year compared with the Do-Minimum scenario in the 2017 baseline year

## E4 Construction Works Plant Machinery Assumptions

Phase		Estimated total phase duration	Noisy Construction Activity	Plant	Sound Power (dBA)	Reference (Defra / BS 5228)	Number	% On time
1	SITE CLEARANCE	2 months	Grubbing	Excavator	114.0	D3.29	1	60%
			Tree felling	Chainsaw	114.0	D2.14	1	15%
			Transporting material	Truck	109.0	C.5.17	2-4	70
2	EARTHWORKS	4 months	Earthworks	Excavator	107.0	D3.88	3	90%
			Earthworks	Dumper Truck (small)	101.0	D3.98	4	90%
			Transporting material	Tipper Lorry	113.0	C8.20	2	90%
3	SURFACING	4 months	Road Surfacing	Paving machine	103.7	C5.30,31,3	1	80%
			Transporting material	8 wheel lorry	--	--	2-10	--
			Road Surfacing	Roller - Static	108.0	C.5.19	2	80%
			Road Surfacing	Dumper truck (small)	101.0	D3.98	4	80%

**Table E.4.1: Junction 28 – Generic junction works assumptions for construction noise assessment: Pont Ebbw, Tredegar House and Bassaleg junction improvements**

## E5 Study and Calculation Area

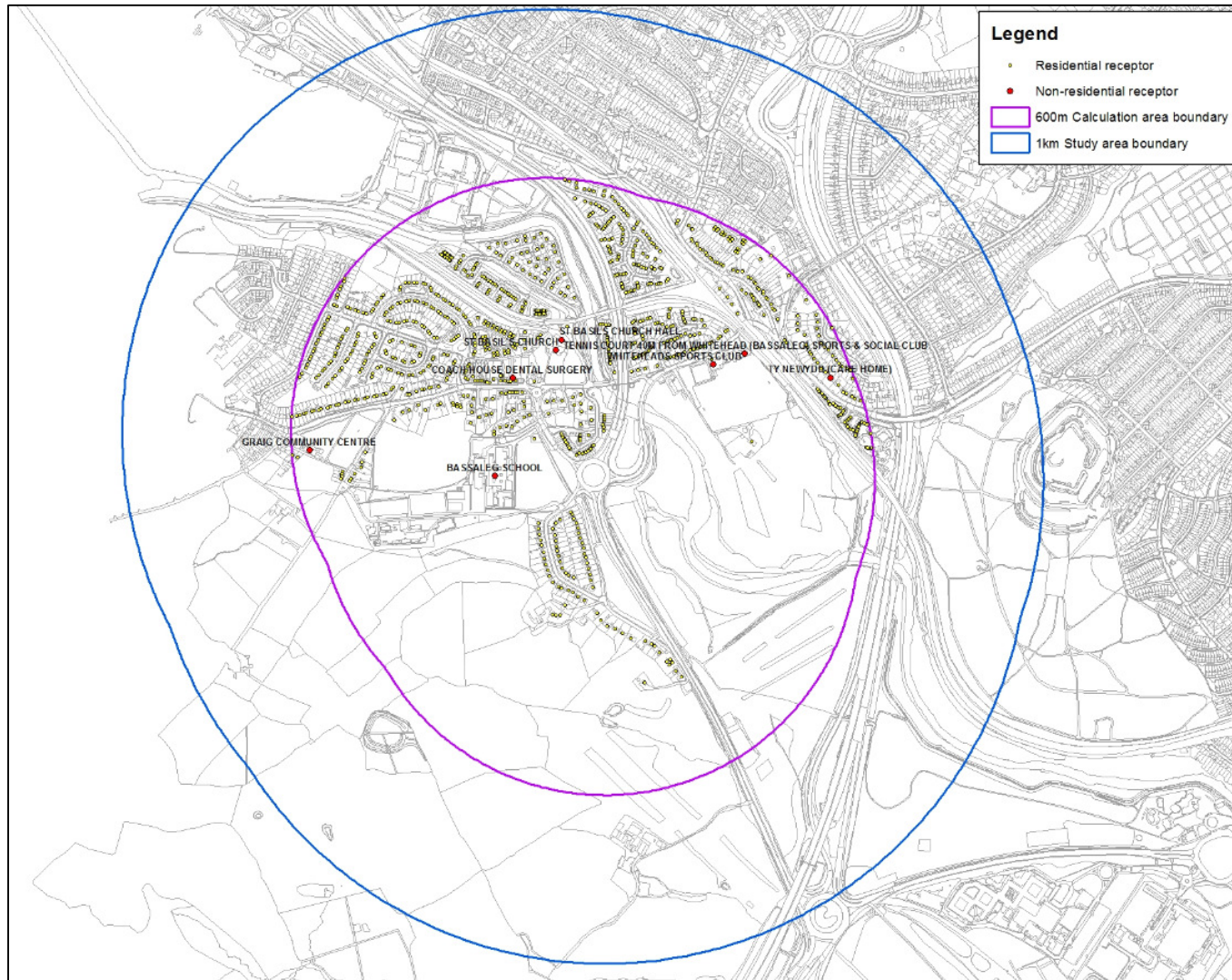


Figure E5.1 Study and calculation area and sensitive receptors defined for the DMRB HD 213/11 noise and vibration assessment





## E6 Noise Levels Predicted at Dwellings Closest to the Proposed Scheme

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
1	No.33 Churchmead	SE	0	69.8	68.2	68.9	68.2	68.9
1	No.33 Churchmead	SE	1	73.4	73.3	74	73.3	74
2	No.32 Churchmead	SE	0	70.9	69.2	69.8	69.2	69.8
2	No.32 Churchmead	SE	1	74.1	74	74.6	74	74.6
3	No.31 Churchmead	SE	0	71.5	70.6	71.3	70.6	71.3
3	No.31 Churchmead	SE	1	74.1	74.2	74.8	74.2	74.8
4	No. 30 Churchmead	SE	0	70.7	70.1	70.7	70.1	70.7
4	No. 30 Churchmead	SE	1	73.3	73.5	74.2	73.5	74.2
5	No. 29 Chuchmead	SE	0	69.9	69.3	70	69.3	70
5	No. 29 Chuchmead	SE	1	72.5	72.7	73.3	72.7	73.3
6	No. 28 Churchmead	SE	0	69.4	69.5	70.1	69.5	70.1
6	No. 28 Churchmead	SE	1	72	72.2	72.8	72.2	72.8
7	No.27 Churchmead	SE	0	69.9	69.5	70.1	69.5	70.1
7	No.27 Churchmead	SE	1	71.9	72	72.6	72	72.6
8	No.26 Churchmead	SE	0	69.7	69	69.5	69	69.5
8	No.26 Churchmead	SE	1	71.8	71.6	72.1	71.6	72.1
9	No.25 Churchmead	SE	0	65.9	64.7	65.1	64.7	65.1
9	No.25 Churchmead	SE	1	68.1	67.2	67.6	67.2	67.6
10	No.24 Churchmead	SE	0	68	66.7	67.2	66.7	67.2
10	No.24 Churchmead	SE	1	70.1	69.3	69.8	69.3	69.8
11	No.23 Churchmead	SE	0	68.7	67.3	67.7	67.3	67.7
11	No.23 Churchmead	SE	1	70.9	69.9	70.4	69.9	70.4
12	No.1 Forge Lane	NE	0	64.5	64.7	65.2	64.7	65.2
12	No.1 Forge Lane	NE	1	67.1	67.2	67.7	67.2	67.7
13	No.2 Forge Lane	NE	0	64.4	64.6	65.1	64.6	65.1
13	No.2 Forge Lane	NE	1	67	67.2	67.8	67.2	67.8

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
14	No.3 Forge Lane	NE	0	64.3	64.5	65	64.4	65
14	No.3 Forge Lane	NE	1	67	67.1	67.7	67	67.6
15	No.4 Forge Lane	NE	0	63.5	63.8	64.4	63.8	64.4
15	No.4 Forge Lane	NE	1	66.5	66.6	67.2	66.5	67.1
16	No.5 Forge Lane	NE	0	63.5	63.8	64.4	63.5	64
16	No.5 Forge Lane	NE	1	66.4	66.5	67.1	66.1	66.7
17	No.6 Forge Lane	NE	0	63.4	63.8	64.4	62.8	63.4
17	No.6 Forge Lane	NE	1	65.9	66.2	66.8	65.1	65.7
18	No.7 Forge Lane	NE	0	63.9	64.2	64.8	62.7	63.3
18	No.7 Forge Lane	NE	1	66.3	66.5	67.1	64.9	65.5
19	No.8 Forge Lane	NE	0	64.5	64.8	65.4	62.9	63.5
19	No.8 Forge Lane	NE	1	66.9	67.2	67.8	65.1	65.7
20	No.9 Forge Lane	NE	0	65.1	65.4	66	62.9	63.5
20	No.9 Forge Lane	NE	1	67.4	67.7	68.3	65.1	65.7
21	No.10 Forge Lane	NE	0	65.1	65.4	66	62.9	63.5
21	No.10 Forge Lane	NE	1	67.4	67.7	68.3	65	65.6
22	No.11 Forge Lane	NE	0	65.3	65.6	66.2	63.2	63.8
22	No.11 Forge Lane	NE	1	67.6	67.9	68.5	65.3	65.9
23	No.12 Forge Lane	NE	0	65.5	65.9	66.5	63.6	64.2
23	No.12 Forge Lane	NE	1	67.7	68	68.6	65.8	66.4
24	No.13 Forge Lane	NE	0	65.4	65.7	66.3	64	64.6
24	No.13 Forge Lane	NE	1	67.7	68.1	68.7	66.3	66.9
25	No.14 Forge Lane	NE	0	65.7	63.6	66.6	64.6	65.2
25	No.14 Forge Lane	NE	1	67.6	65.5	68.6	66.7	67.3
26	No.15 Forge Lane	NE	0	66.2	66.6	67.1	65.4	66
26	No.15 Forge Lane	NE	1	67.7	68.1	68.7	67	67.6
27	No.16 Forge Lane	NE	0	65.1	65.5	66.1	64.6	65.2
27	No.16 Forge Lane	NE	1	66.7	67.1	67.7	66.2	66.8

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
28	No.16 Forge Lane	SE	0	63.8	64.1	64.7	64.1	64.7
28	No.16 Forge Lane	SE	1	65.4	65.7	66.3	65.7	66.3
29	No.17 Forge Lane	NE	0	63.2	63.5	64.1	63.1	63.7
29	No.17 Forge Lane	NE	1	64.7	65	65.6	64.7	65.2
30	No.19 Forge Lane	NE	0	63.3	63.7	64.2	63.7	64.2
30	No.19 Forge Lane	NE	1	64.5	64.8	65.4	64.8	65.4
31	No.20 Forge Lane	NE	0	65.2	65.6	66.2	65.6	66.2
31	No.20 Forge Lane	NE	1	66.5	66.8	67.4	66.8	67.4
32	No.21 Forge Lane	NE	0	66	66.3	66.9	66.3	66.9
32	No.21 Forge Lane	NE	1	67.1	67.5	68.1	67.5	68.1
33	No.22 Forge Lane	NE	0	66.3	66.7	67.3	66.7	67.3
33	No.22 Forge Lane	NE	1	67.8	68.1	68.7	68.1	68.7
34	No.22 Forge Lane	NE	0	67.4	67.7	68.3	67.7	68.3
34	No.22 Forge Lane	NE	1	68.6	69	69.5	69	69.5
35	No.23 Forge Lane	NE	0	69.3	69.6	70.2	69.6	70.2
35	No.23 Forge Lane	NE	1	71.2	71.5	72.1	71.5	72.1
36	No.24 Forge Lane	NE	0	70.8	71.1	71.7	71.1	71.7
36	No.24 Forge Lane	NE	1	73	73.3	73.9	73.3	73.9
37	No.25 Forge Lane	NE	0	72.1	72.4	73	72.4	73
37	No.25 Forge Lane	NE	1	74	74.4	75	74.4	75
38	No.26 Forge Lane	NE	0	71.9	72.2	72.8	72.2	72.8
38	No.26 Forge Lane	NE	1	74.4	74.7	75.3	74.7	75.3
39	No.27 Forge Lane	N	0	66.9	67.3	67.9	67.3	67.9
39	No.27 Forge Lane	N	1	71.3	71.6	72.2	71.6	72.2
40	No.27 Forge Lane	NE	0	71.4	71.7	72.3	71.7	72.3
40	No.27 Forge Lane	NE	1	77.5	77.8	78.4	77.8	78.4
41	No.29 Forge Lane	NE	0	71.4	71.7	72.3	71.7	72.3
41	No.29 Forge Lane	NE	1	77.5	77.8	78.4	77.8	78.4

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
42	No.30 Forge Lane	NE	0	71.3	71.6	72.2	71.6	72.2
42	No.30 Forge Lane	NE	1	77.4	77.7	78.3	77.7	78.3
43	No.31 Forge Lane	NE	0	72.4	72.7	73.3	72.7	73.3
43	No.31 Forge Lane	NE	1	78.6	78.9	79.5	78.9	79.5
44	No.32 Forge Lane	NE	0	61.1	61.4	62	61.4	62
44	No.32 Forge Lane	NE	1	62.3	62.6	63.2	62.6	63.2
45	No.14 Court Crescent	NE	0	62.5	62.7	63.1	62.7	63.1
45	No.14 Court Crescent	NE	1	63.9	64.2	64.6	64.2	64.6
46	No.16 Court Crescent	NE	0	59.6	59.8	60.2	59.8	60.2
46	No.16 Court Crescent	NE	1	61.2	61.4	61.8	61.4	61.7
47	No.20 Court Crescent	NE	0	57.1	57.3	57.6	57.3	57.6
47	No.20 Court Crescent	NE	1	58.8	59	59.3	59	59.3
48	No.24 Court Crescent	NE	0	58.3	58.3	58.5	58.3	58.5
48	No.24 Court Crescent	NE	1	59.9	60	60.1	60	60.1
49	No.28 Court Crescent	E	0	56.7	56.7	56.8	56.7	56.8
49	No.28 Court Crescent	E	1	58.5	58.5	58.6	58.5	58.6
50	No.30 Court Crescent	E	0	56.9	57	57.2	57	57.2
50	No.30 Court Crescent	E	1	58.8	58.7	59	58.7	59
51	No.1 Court Crescent	NW	0	58	57.7	58.1	57.7	58.1
51	No.1 Court Crescent	NW	1	60.2	59.8	60.1	59.8	60.1
52	No.3 Court Crescent	W	0	56.1	56.1	56.1	56.1	56.1
52	No.3 Court Crescent	W	1	58	58	58	58	58
53	No.6 Court Crescent	W	0	56.6	56.6	56.6	56.6	56.6
53	No.6 Court Crescent	W	1	58.8	58.8	58.8	58.8	58.8
54	No.3 Court Crescent	E	0	53.5	53.8	54.4	53.8	54.3
54	No.3 Court Crescent	E	1	55	55.3	55.9	55.2	55.8
55	No.6 Court Crescent	E	0	54.5	54.8	55.4	54.5	55.1
55	No.6 Court Crescent	E	1	55.9	56.2	56.8	55.9	56.4

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
56	No.10 Court Crescent	W	0	55.4	55.4	55.4	55.4	55.4
56	No.10 Court Crescent	W	1	58	58	58	58	58
57	No.10 Court Crescent	E	0	55.6	56	56.6	55	55.6
57	No.10 Court Crescent	E	1	57.3	57.6	58.2	56.7	57.3
58	No.13 Court Crescent	SW	0	55.7	55.7	55.7	55.7	55.7
58	No.13 Court Crescent	SW	1	57.8	57.8	57.9	57.8	57.9
59	No.13 Court Crescent	NE	0	55	55.4	56	55.3	55.9
59	No.13 Court Crescent	NE	1	57.4	57.7	58.3	57.5	58.1
60	No.22 Churchmead	SE	0	65.1	63.8	64.1	63.8	64.1
60	No.22 Churchmead	SE	1	67.3	66.1	66.4	66.1	66.4
61	No.22 Churchmead	SW	0	68.4	66.7	66.8	66.7	66.8
61	No.22 Churchmead	SW	1	70.9	69.3	69.5	69.3	69.5
62	No.21 Churchmead	SW	0	67.5	66	66.1	66	66.1
62	No.21 Churchmead	SW	1	70.1	68.7	68.8	68.7	68.8
63	No.20 Churchmead	SW	0	67.5	66	66.1	66	66.1
63	No.20 Churchmead	SW	1	70.1	68.7	68.8	68.7	68.8
64	No.8 Churchmead	E	0	66	65.4	66	65.4	66
64	No.8 Churchmead	E	1	68.2	67.7	68.4	67.7	68.4
65	No.35 Churchmead	E	0	72.8	72.9	73.6	72.9	73.6
65	No.35 Churchmead	E	1	76.5	76.7	77.4	76.7	77.4
66	No.37 Churchmead	E	0	69.3	69.4	70.1	69.4	70.1
66	No.37 Churchmead	E	1	73.3	73.5	74.1	73.5	74.1
67	No.38 Churchmead	E	0	71.7	71.9	72.5	71.9	72.5
67	No.38 Churchmead	E	1	74.8	75	75.7	75	75.7
68	No.41 Churchmead	E	0	72.5	72.7	73.4	72.7	73.4
68	No.41 Churchmead	E	1	74.5	74.6	75.3	74.6	75.3
69	No.2 Forge Mews	E	0	74.3	74.5	75.2	74.5	75.2
69	No.2 Forge Mews	E	1	76.3	76.5	77.2	76.5	77.2

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
70	No.5 Forge Mews	E	0	74	74.2	74.9	74.2	74.9
70	No.5 Forge Mews	E	1	76.1	76.3	76.9	76.3	76.9
71	No.7 Forge Mews	E	0	73.9	74.1	74.8	74.1	74.8
71	No.7 Forge Mews	E	1	76	76.2	76.8	76.2	76.8
72	No.9 Forge Mews	E	0	73.8	74	74.7	74	74.7
72	No.9 Forge Mews	E	1	75.9	76.1	76.7	76.1	76.7
73	No.11 Forge Mews	E	0	73.8	74	74.6	74	74.6
73	No.11 Forge Mews	E	1	75.8	76	76.6	76	76.6
74	No.13 Forge Mews	S	0	72	72.2	72.8	72.2	72.8
74	No.13 Forge Mews	S	1	74	74.2	74.9	74.2	74.9
75	No.13 Forge Mews	N	0	72.5	72.7	73.4	72.7	73.4
75	No.13 Forge Mews	N	1	74.6	74.8	75.4	74.8	75.4
76	River View Cottage	S	0	73.4	73.6	74.3	73.6	74.3
76	River View Cottage	S	1	75.4	75.6	76.3	75.6	76.3
77	No.38 Park View	S	0	68.7	68.9	69.5	68.9	69.5
77	No.38 Park View	S	1	71.8	72	72.6	72	72.6
78	No.36 Park View	S	0	65.8	65.9	66.5	65.9	66.5
78	No.36 Park View	S	1	67.9	68	68.5	68	68.5
79	No.34 Park View	S	0	65.2	65.2	65.7	65.2	65.7
79	No.34 Park View	S	1	67	67	67.5	67	67.5
80	No.32 Park View	S	0	67.4	67.2	67.3	67.2	67.3
80	No.32 Park View	S	1	68.6	68.3	68.4	68.3	68.4
81	No.7 Park View Gardens	S	0	66	66.2	66.9	66.2	66.9
81	No.7 Park View Gardens	S	1	68.6	68.8	69.4	68.8	69.4
82	No.7 Park View Gardens	N	0	69.5	69.7	70.4	69.7	70.4

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
82	No.7 Park View Gardens	N	1	73.1	73.3	74	73.3	74
83	No.4 Park View Gardens	SE	0	60.2	60.4	61	60.4	61
83	No.4 Park View Gardens	SE	1	61.8	62	62.6		
84	No.4 Park View Gardens	NW	0	64.1	64.3	65	64.3	65
84	No.4 Park View Gardens	NW	1	66.2	66.4	67.1		
85	No.2 Park View Gardens	SE	0	58.8	58.8	59.4	58.8	59.4
85	No.2 Park View Gardens	SE	1	60.3	60.4	60.9		
86	No.2 Park View Gardens	NW	0	62.3	62.5	63.2	62.5	63.2
86	No.2 Park View Gardens	NW	1	64.2	64.4	65		
87	No.28 Park View	SE	0	63.6	63.3	63.4	63.3	63.4
87	No.28 Park View	SE	1	65.5	65.2	65.2		
88	No.22 Park View	SE	0	63.4	63.1	63.1	63.1	63.1
88	No.22 Park View	SE	1	65.3	65	65		
89	No.14 Park View	S	0	66.3	65.9	65.8	65.9	65.8
89	No.14 Park View	S	1	67.9	67.5	67.4		
90	No.10 Park View	SE	0	63.9	63.5	63.4	63.5	63.4
90	No.10 Park View	SE	1	66	65.5	65.5		
91	No.4 Park View	SE	0	65	64.6	64.5	64.6	64.5
91	No.4 Park View	SE	1	67.1	66.7	66.6		

Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
92	No.55 Park View Gardens	S	0	55.6	55.8	56.4	55.8	56.4
92	No.55 Park View Gardens	S	1	56.9	57.1	57.7	57.1	57.7
93	No.51 Park View Gardens	SE	0	52.7	52.8	53.3	52.8	53.3
93	No.51 Park View Gardens	SE	1	54.2	54.3	54.9	54.3	54.9
94	No.46 Park View Gardens	SE	0	51.1	50.9	51.1	50.9	51.1
94	No.46 Park View Gardens	SE	1	53	52.8	53	52.8	53
95	No.46 Park View Gardens	NW	0	48.1	48.3	49	48.3	49
95	No.46 Park View Gardens	NW	1	49.5	49.7	50.3	49.7	50.3
96	No.51 Park View Gardens	NW	0	53.3	53.4	54.1	53.4	54.1
96	No.51 Park View Gardens	NW	1	54.5	54.7	55.4	54.7	55.4
97	No.55 Park View Gardens	NW	0	55.8	56	56.7	56	56.7
97	No.55 Park View Gardens	NW	1	57.2	57.4	58.1	57.4	58.1
98	No.8 Park View Gardens	NW	0	68.9	69.1	69.7	69.1	69.7
98	No.8 Park View Gardens	NW	1	73.1	73.3	73.9	73.3	73.9



Receiver ID	Receiver Address	Facade	Floor	Noise Level, dB LA10,18hr (façade corrected)				
				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
99	No.14 Park View Gardens	W	0	69.7	69.9	70.6	69.9	70.6
99	No.14 Park View Gardens	W	1	73.1	73.3	74	73.3	74
100	No.17 Park View Gardens	NW	0	68.3	68.5	69.2	68.5	69.2
100	No.17 Park View Gardens	NW	1	71.7	71.9	72.5	71.9	72.5
101	No.23 Park View Gardens	N	0	55.2	55.3	56	55.3	56
101	No.23 Park View Gardens	N	1	56.8	57	57.6	57	57.6
102	No.38 Park View Gardens	W	0	50.1	50.4	51	50.4	51
102	No.38 Park View Gardens	W	1	51.8	52.1	52.7	52.1	52.7
103	Bassaleg School	E	0	55.3	55.6	56.1	55.6	56.1
103	Bassaleg School	E	1	57.2	57.3	57.8	57.3	57.8
104	No.19 Churchmead	SW	0	66.5	64.9	65	64.9	65
104	No.19 Churchmead	SW	1	69	67.7	67.8	67.7	67.8
105	No.18 Churchmead	SW	0	66.9	65.7	65.8	65.7	65.8
105	No.18 Churchmead	SW	1	69.6	68.6	68.6	68.6	68.6
106	No.17 Churchmead	SW	0	65.3	64.2	64.2	64.2	64.2
106	No.17 Churchmead	SW	1	67.8	66.9	66.9	66.9	66.9
107	No.16 Churchmead	SW	0	66.1	65.3	65.4	65.3	65.4
107	No.16 Churchmead	SW	1	68.7	68	68.1	68	68.1
108	No.15 Churchmead	SW	0	65.9	65.3	65.4	65.3	65.4
108	No.15 Churchmead	SW	1	68.5	68	68.1	68	68.1
109	No.14 Churchmead	SW	0	65.7	65.2	65.3	65.2	65.3

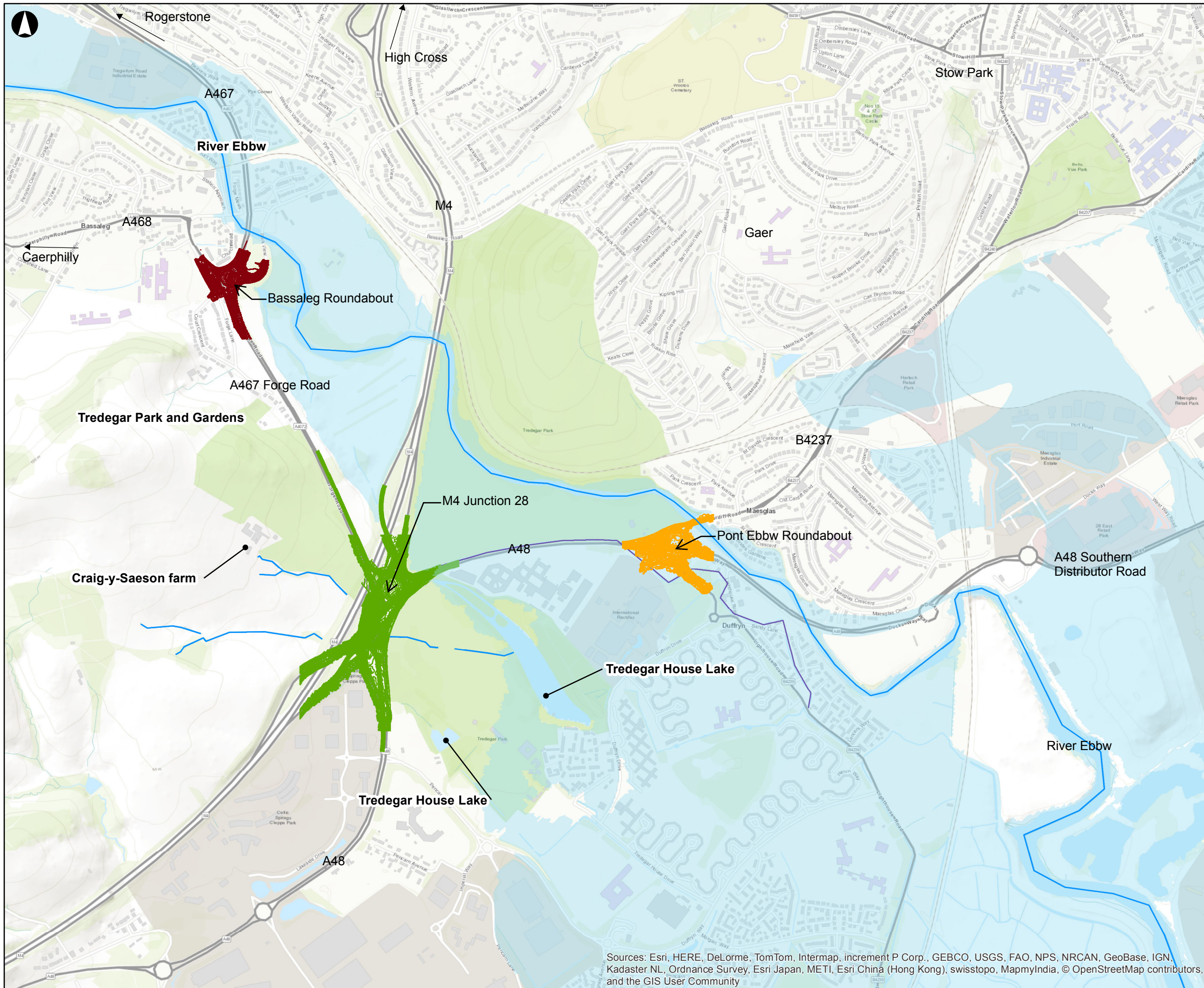
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				2017 DM (Baseline)	2017 DS (without Mitigation)	2032 DS (without Mitigation)	2017 DS (with Mitigation)	2032 DS (with Mitigation)
109	No.14 Churchmead	SW	1	68.3	67.9	67.9	67.9	67.9
110	No.13 Churchmead	SW	0	64.9	64.6	64.5	64.6	64.5
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## **Appendix F**

### **Water Environment**

# F1 Surface Water Plan

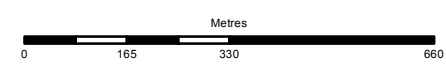
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- Legend**
- Bassaleg Junction
  - Pont Ebbw Junction
  - Flood Risk
  - Tredegar Junction
  - Dock feeder
  - Watercourses

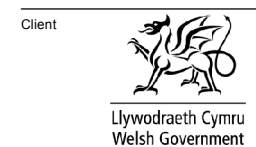
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P2	30-11-16	SW	AM	SH
Revision	Date	By	Chkd	Appd



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Client  
**M4 - J28 Improvements**

Drawing Title  
**Surface Water Plan**

Scale at A3  
**1:12,180**

Job No  
**240226-40**

Drawing Status  
**Issue**

Drawing No  
**001**

Revision  
**P2**

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

## F2 Flood Risk Statement

---

Welsh Government

**M4 Junction 28 Improvement  
Works**

**Flood Risk Statement**

M4J28-ARP-HDR-SWG-RP-CD-000001

P04 | 22 December 2015

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 240226

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# Document Verification

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<b>Job title</b>		M4 Junction 28 Improvement Works		<b>Job number</b>	
				240226	
<b>Document title</b>		Flood Risk Statement		<b>File reference</b>	
<b>Document ref</b>		M4J28-ARP-HDR-SWG-RP-CD-000001			
<b>Revision</b>	<b>Date</b>	<b>Filename</b>	FRS-001.docx		
Draft 1	23 Jan 2015	<b>Description</b>	First draft		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	Kambiz Ayoubkhani	Gary Davies
		Signature			
I0	28 Jan 2015	<b>Filename</b>	FRS-001.docx		
		<b>Description</b>	Issued for Information		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	Kambiz Ayoubkhani	Gary Davies
		Signature	<i>S. M. Williams</i>		
I1	3 Mar 2015	<b>Filename</b>	FRS-001.docx		
		<b>Description</b>	Revised following comments from PB		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	Kambiz Ayoubkhani	Gary Davies
		Signature			
I2	11 Mar 2015	<b>Filename</b>	FRS-001 I2.docx		
		<b>Description</b>	Issued following Further PB Comments		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	Kambiz Ayoubkhani	Gary Davies
		Signature			

Issue Document Verification with Document





# Document Verification

<b>Job title</b>		M4 Junction 28 Improvement Works		<b>Job number</b>	
				240226	
<b>Document title</b>		Flood Risk Statement		<b>File reference</b>	
<b>Document ref</b>		M4J28-ARP-HDR-SWG-RP-CD-000001			
<b>Revision</b>	<b>Date</b>	<b>Filename</b>	M4J28-ARP-HDR-SWG-RP-CD-000001.docx		
P03	23 Apr 2015	<b>Description</b>	Uploaded to ProjectWise with reference number in accordance with file numbering protocol. Copy sent to NRW.		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	K. Ayoubkhani	Gary Davies
		Signature			
P04	22 Dec 2015	<b>Filename</b>	M4J28-ARP-HDR-SWG-RP-CD-000001.docx		
		<b>Description</b>	Amended following receipt of further correspondence from NRW.		
			Prepared by	Checked by	Approved by
		Name	Sion Williams	Gary Davies	Gary Davies
Signature	pp 	X  <small>12/22/2015</small> Gary Davies Signed by: Gary Davies	X  <small>12/22/2015</small> Gary Davies Signed by: Gary Davies		
		<b>Filename</b>			
		<b>Description</b>			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		<b>Filename</b>			
		<b>Description</b>			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document



## Contents

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<b>3</b>	<b>Conclusion</b>	<b>4</b>

## Figures

**No table of figures entries found.**

## Appendices

### Appendix A

NRW Correspondence

# 1 Introduction

---

The Welsh Government have commissioned Costain with Arup as their design consultants to develop the Key Stage 3 design of improvement measures to the interchange of Junction 28 of the M4 near Newport, South Wales. The purpose of the scheme is to increase the flow capacity of the interchange. It is proposed to realign the existing M4 J28 interchange and construct throughabouts at the nearby Pont Ebbw and Bassaleg roundabout located to the south and north of J28 respectively. The extent of works for each junction is shown on Figures 1 to 3.

- Figure 1: M4 J28 Interchange
- Figure 2: Pont Ebbw Roundabout
- Figure 3: Bassaleg Roundabout

This note has been prepared to outline the risk of fluvial or tidal/coastal flooding as a result of the proposed works and the preliminary discussions with Natural Resources Wales (NRW). Copy of the correspondence has been included in Appendix A. It will also describe the management of surface water runoff as a result of the proposed works for each of the junctions.

## 2 Proposed Works and Flood Risk

---

### 2.1 Fluvial and Tidal Flood Risk

#### 2.1.1 M4 J28 Interchange

The proposed works at the M4 J28 interchange is likely to involve some earthworks on the existing interchange. No new structures or modification to existing structures is required. The extent of works is shown on Figure 1.

A preliminary review of the current Technical Advice Note 15 (TAN15) Development Advice Map (DAM) illustrated on Figure 4 and the Environment Agency (EA) online maps illustrated on Figure 5 show that the majority of works is located within Zone A. This is considered to be at little or no risk of fluvial or tidal/coastal flooding.

Preliminary discussion with NRW have confirmed that a Flood Consequences Assessment is not required as the extent of works is outside the floodplain or involve at-grade works within the existing carriageway.

#### 2.1.2 Pont Ebbw Roundabout

The proposed works at Pont Ebbw Roundabout is likely to involve some earthworks, as well as a construction of a throughabout across the existing roundabout. This is likely to involve an earthworks cutting through the middle of the existing roundabout. The extent of works is shown on Figure 2.

A preliminary review of the current Technical Advice Note 15 (TAN15) Development Advice Map (DAM) illustrated on Figure 6 and the EA online maps illustrated on Figure 7 show that the majority of works is located within Zone C1 and C2. These are considered to be areas of the floodplain which are developed and served by significant infrastructure, including flood defences and areas of the floodplain without significant flood defence infrastructure respectively.

As the proposed works are generally at-grade or involve earthworks cuttings, NRW have confirmed that no Flood Consequences Assessment is required as they don't envisage any adverse effects as a result of the proposed works. It is advised that no surplus material is deposited within the proposed Pont Ebbw Roundabout area. Any surplus material arising from the works associated with Pont Ebbw roundabout shall be deposited (if deemed suitable for re-use) outside the flood extents (at either of the proposed works at Bassaleg Roundabout and M4 J28 Interchange) or removed from site.

#### 2.1.3 Bassaleg Roundabout

Similar to the Pont Ebbw proposals the works is likely to involve some earthworks, as well as a construction of a throughabout across the existing roundabout which will also involve an earthworks cutting through the middle of the existing roundabout. The extent of works is shown on Figure 3.

A preliminary review of the current Technical Advice Note 15 (TAN15) Development Advice Map (DAM) illustrated on Figure 8 and the EA online maps

illustrated on Figure 9 show that the majority of works is located within Zone A. This is considered to be at little or no risk of fluvial or tidal/coastal flooding.

Discussions with NRW have confirmed that a Flood Consequences Assessment is not required as the extent of works is outside the floodplain or involve at-grade works within the existing carriageway.

## **2.2 Surface Water Runoff**

### **2.2.1 M4 J28 Interchange and Bassaleg Roundabout**

A preliminary assessment of the impermeable and permeable areas has been undertaken on both junctions. The preliminary assessments concluded that there would be a net increase in the impermeable area as a result of the proposed works. This is likely to generate an increase in post development storm water flows when compared to the pre development storm water flows.

To reduce the risk of flooding, Sustainable Drainage Systems (SuDS) are proposed at both junctions. These will restrict the rate of storm water runoff generated from the proposed hardstandings to either replicate pre development storm flows or to agreed runoff rates with the relevant statutory authorities. Such systems are likely to take the form of infiltration or attenuation basins and/or oversized tanks/pipes. As a result this would reduce the risk of any adverse effects to downstream watercourses/drainage infrastructure.

The above information will need to be reviewed upon receipt of further information on existing drainage, proposed junction arrangement and consultation with the relevant statutory authority.

### **2.2.2 Pont Ebbw Roundabout**

The existing storm network which transmits storm flows generated from the Pont Ebbw roundabout discharges unrestricted storm flows into the River Ebbw. The network discharges storm flows into the River Ebbw approximately 400m upstream of where the River Ebbw is under tidal influence. It is proposed to use the existing outfall location in the permanent case post development.

A preliminary assessment of the impermeable and permeable areas has also been undertaken on the proposed Pont Ebbw Roundabout. The preliminary assessment also concluded that there would be a net increase in the impermeable area as a result of the proposed works. However, the net increase in impermeable area due to the proposed works is negligible when compared to the size of the overall catchment of the River Ebbw.

The net increase in impermeable area is likely to be generate an increase in post development storm water flows when compared to the pre development storm water flows. However, in considering the above and that the proposed works are located either within Flood Zones C1 or C2, it is proposed to discharge storm flows generated from the proposed development into the River Ebbw unrestricted, as it's considered that the potential for any adverse impacts are considered very low. NRW has agreed that this is acceptable.

The above information will need to be reviewed upon receipt of further information on existing drainage, proposed junction arrangement and further consultation with the relevant statutory authority.

### **3 Conclusion**

---

As the majority of the works which lie within the floodplain (as defined by TAN15 DAM and EA online flood maps) are considered by NRW not to have an adverse effects to the existing flood situation, no further assessment is required to be undertaken.

It is however advised that any surplus material is deposited on-site (if deemed suitable material for re-use) outside the flood outlines as part of the Bassaleg Roundabout and M4 J28 Interchange works, or alternative disposed off-site.

## Figures

---

Figure 1 – Tredegar Park Roundabout: Extent of Works

Figure 2 – Pont Ebbw Roundabout: Extent of Works

Figure 3 – Bassaleg Roundabout: Extent of Works

Figure 4 – Tredegar Park Roundabout: TAN15 Development Advice Map

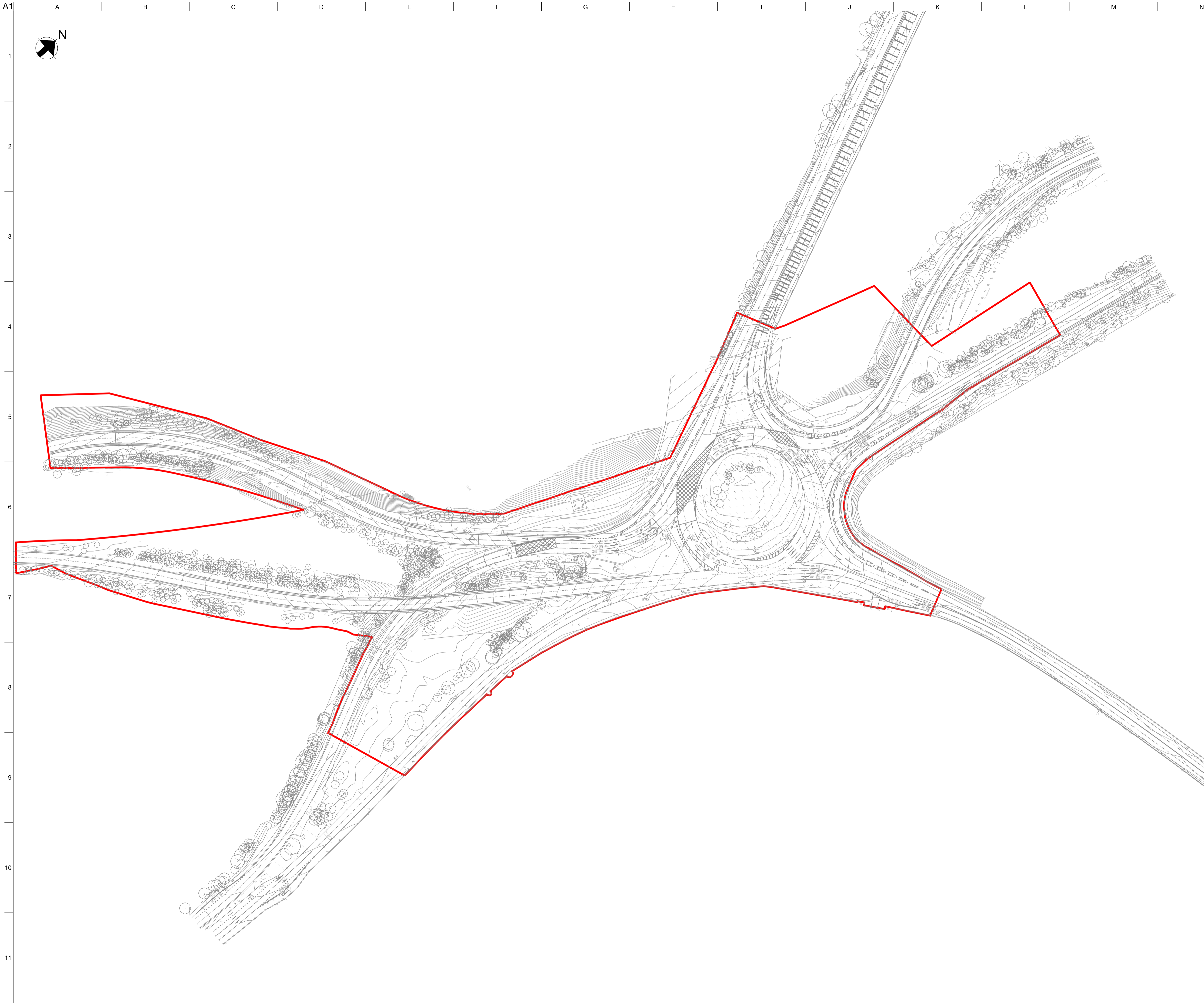
Figure 5 – Tredegar Park Roundabout: Environment Agency Online Flood Map

Figure 6 – Pont Ebbw Roundabout: TAN15 Development Advice Map

Figure 7 – Pont Ebbw Roundabout: Environment Agency Online Flood Map

Figure 8 – Bassaleg Roundabout: TAN15 Development Advice Map

Figure 9 - Bassaleg Roundabout: Environment Agency Online Flood Map



**Legend**

Indicative extent of works

**Notes**

1. The details shown on this drawing were used to inform preliminary discussions with NRW.
2. The details shown may vary in subsequent design stages.

IO	26/01/15	RL	SW	GD
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Issue	Date	By	Chkd	Appd

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Client  
**Welsh Government**

Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Tredegar Park Roundabout  
Extent of Works**

Scale at A1  
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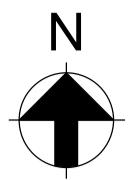
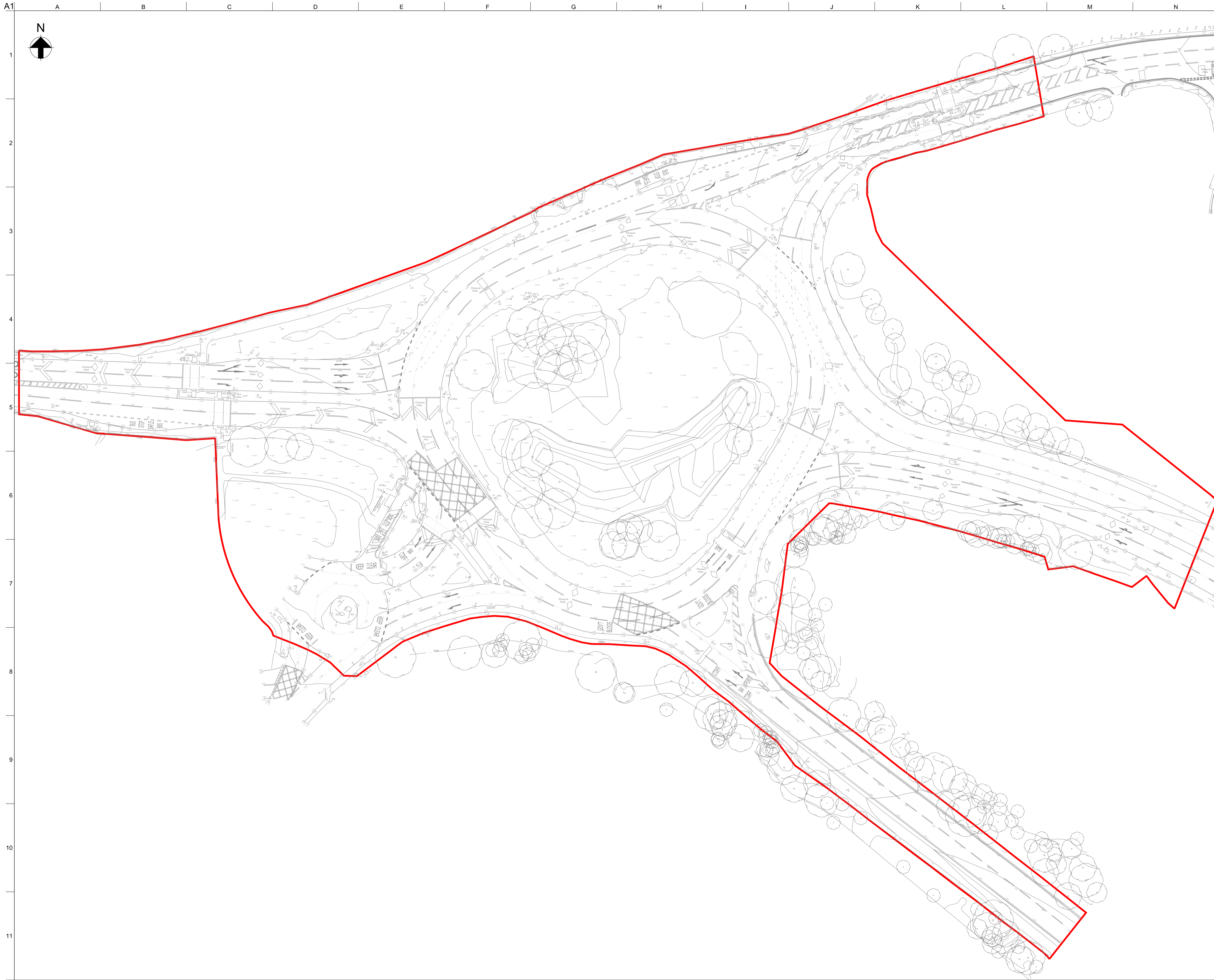
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Drawing Status

**For Information**

Job No	Drawing No	Issue
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**Legend**  
 — Indicative extent of works

**Notes**  
 1. The details shown on this drawing were used to inform preliminary discussions with NRW.  
 2. The details shown may vary in subsequent design stages.

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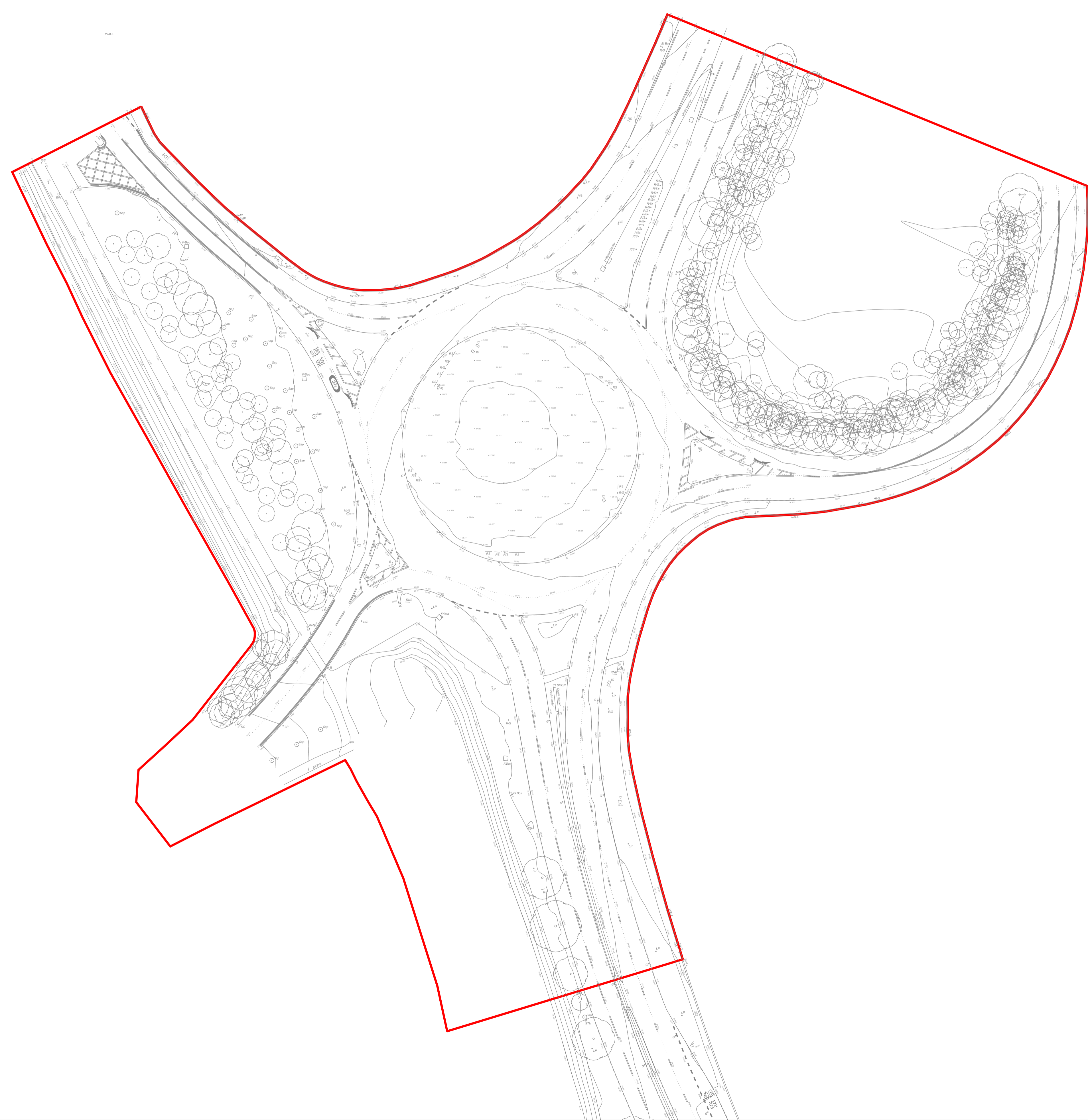
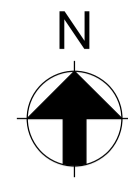
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 Extent of Works**

Scale at A1 1:500

Discipline

Drawing Status  
**For Information**

Job No	Drawing No	Issue
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**Legend**

— Indicative extent of works

**Notes**

1. The details shown on this drawing were used to inform preliminary discussions with NRW.
2. The details shown may vary in subsequent design stages.

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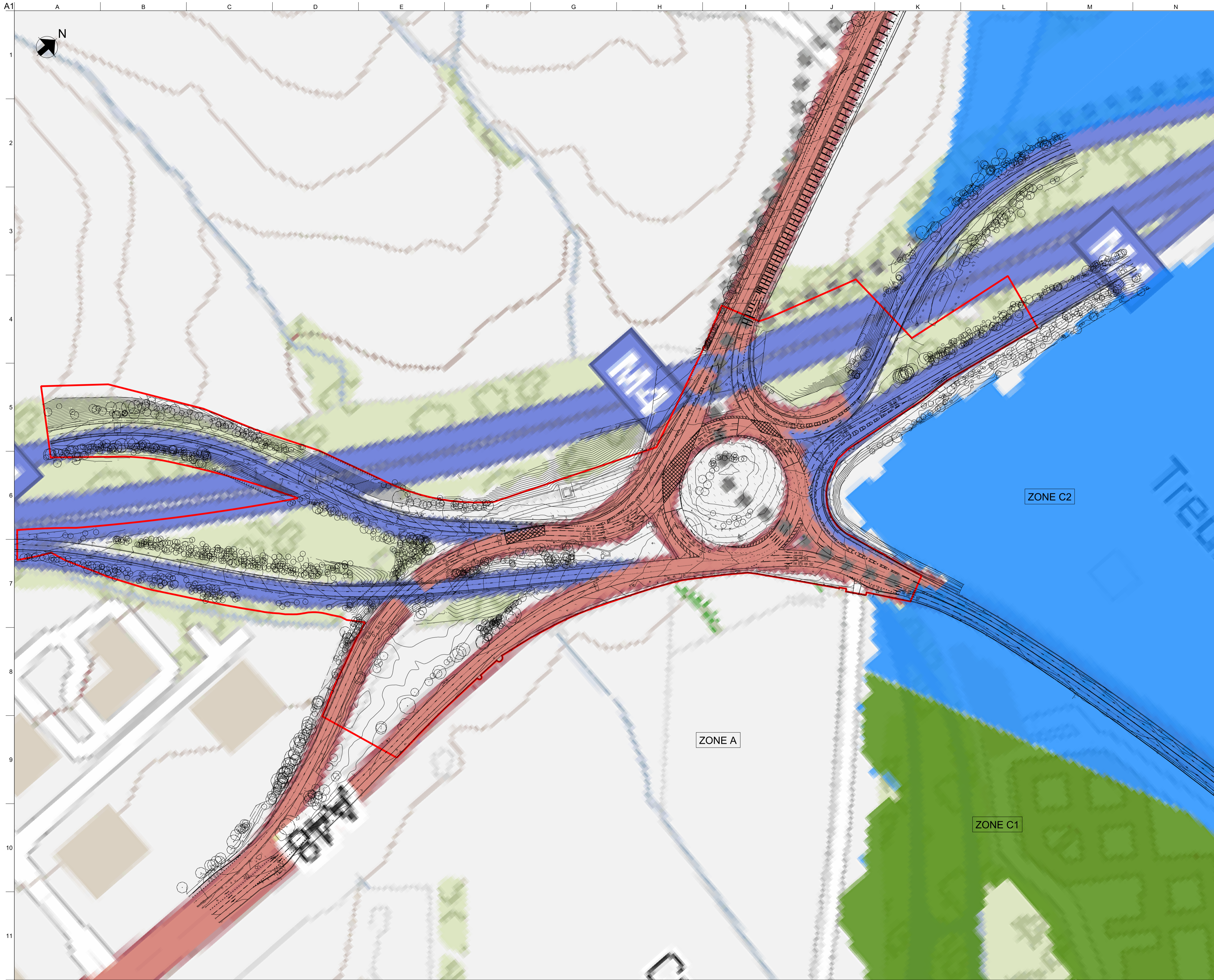
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Drawing Title  
**Bassaleg Roundabout  
Extent of Works**

Scale at A1 1:500  
Discipline

**For Information**

Job No	Drawing No	Issue
<b>240226</b>	<b>Figure 3</b>	<b>10</b>



- Legend**
- Indicative extent of works
  - Zone C1: Served by significant infrastructure including flood defences
  - Zone C2: Without significant flood defence infrastructure
  - Zone A: Considers to be little or no risk of fluvial or coastal / tidal flooding

- Notes**
1. The details shown on this drawing was used to inform preliminary discussions with NRW.
  2. The details shown may vary in subsequent design stages.
  3. Flood outline shown based on WG TAN15 DAM.
  4. Zones C1 and C2 based on EA's extreme flood outline  $\geq 0.1\%$  (River, tidal or coastal).

IO	26/01/15	RL	SW	GD
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Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Tredegar Park Roundabout  
Technical Advice Note 15  
Development Advice Map**

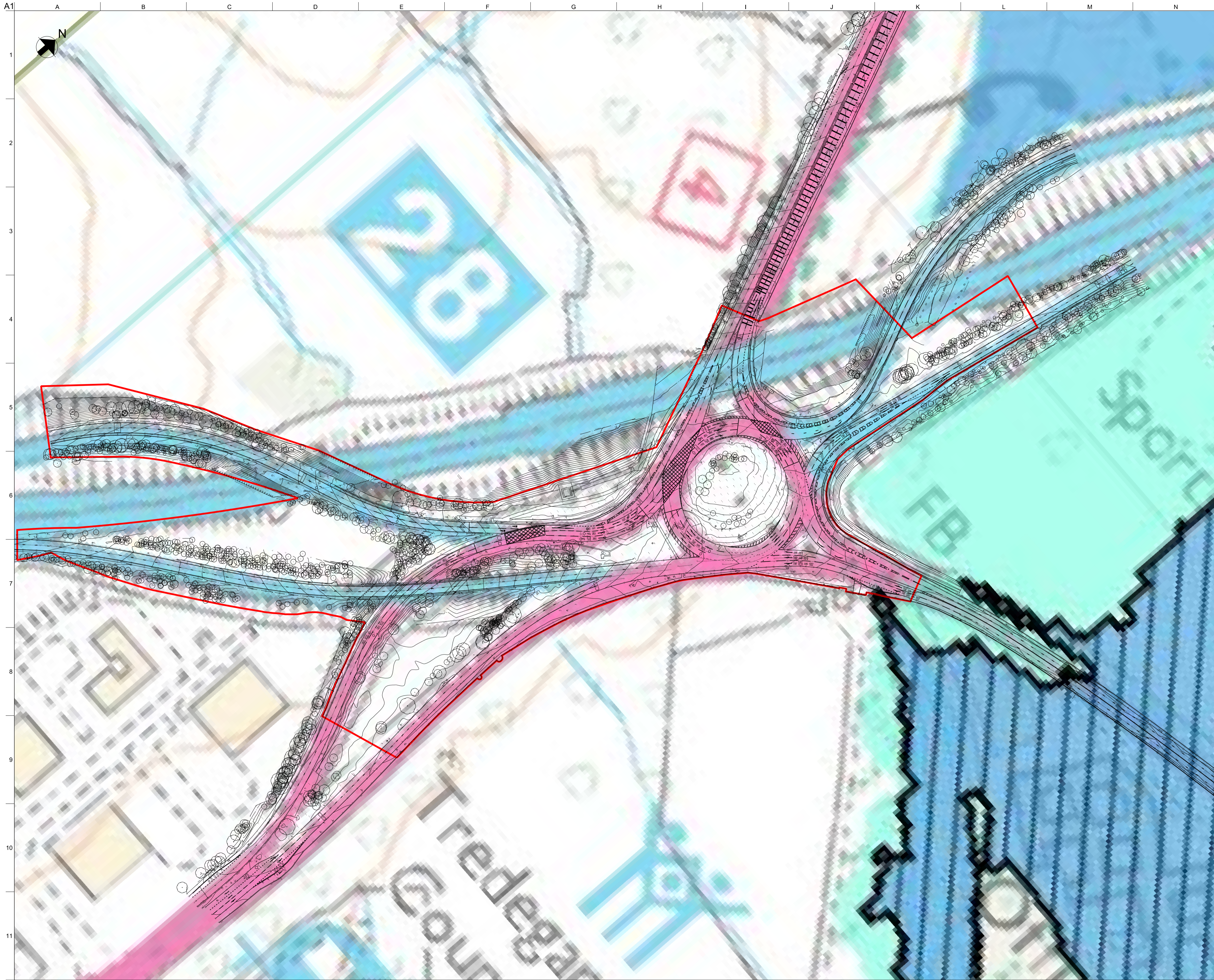
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Discipline

Drawing Status

**For Information**

Job No	Drawing No	Issue
<b>240226</b>	<b>Figure 4</b>	<b>10</b>



**Legend**

- Indicative extent of works
- Flood Zone 3
- Flood Zone 2
- Areas benefiting from flood defences

**Notes**

1. The details shown on this drawing was used to inform preliminary discussions with NRW.
2. The details shown may vary in subsequent design stages.
3. Flood outline shown based on EA online flood maps.

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Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Tredegar Park Roundabout  
Environment Agency  
Online Maps**

Scale at A1 1:1250  
Discipline

Drawing Status

**For Information**

Job No <b>240226</b>	Drawing No <b>Figure 5</b>	Issue <b>10</b>
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- Legend**
- Indicative extent of works
  - Zone C1: Served by significant infrastructure including flood defences
  - Zone C2: Without significant flood defence infrastructure

- Notes**
1. The details shown on this drawing was used to inform preliminary discussions with NRW.
  2. The details shown may vary in subsequent design stages.
  3. Flood outline shown based on WG TAN15 DAM.
  4. Zones C1 and C2 based on EA's extreme flood outline  $\geq 0.1\%$  (River, tidal or coastal).

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Issue	Date	By	Chkd	Appd

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Job Title  
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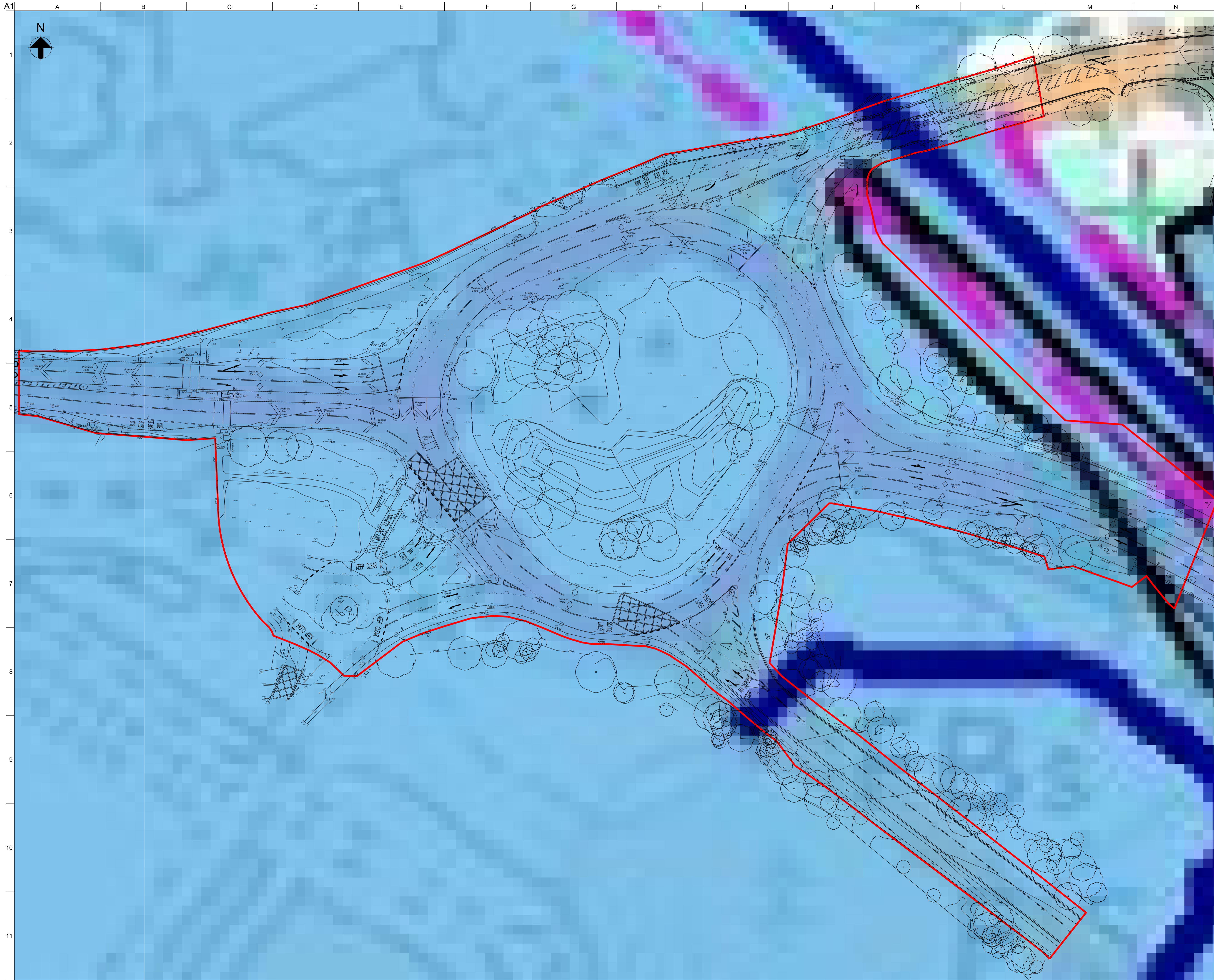
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Technical Advice Note 15  
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Scale at A1 1:500  
Discipline

Drawing Status  
**For Information**

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- Legend**
- Indicative extent of works
  - Flood Zone 3

- Notes**
1. The details shown on this drawing was used to inform preliminary discussions with NRW.
  2. The details shown may vary in subsequent design stages.
  3. Flood outline shown based on EA online flood maps.

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Issued for Information				
Issue	Date	By	Chkd	Appd

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Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Pont Ebbw Roundabout  
Environment Agency  
Online Maps**

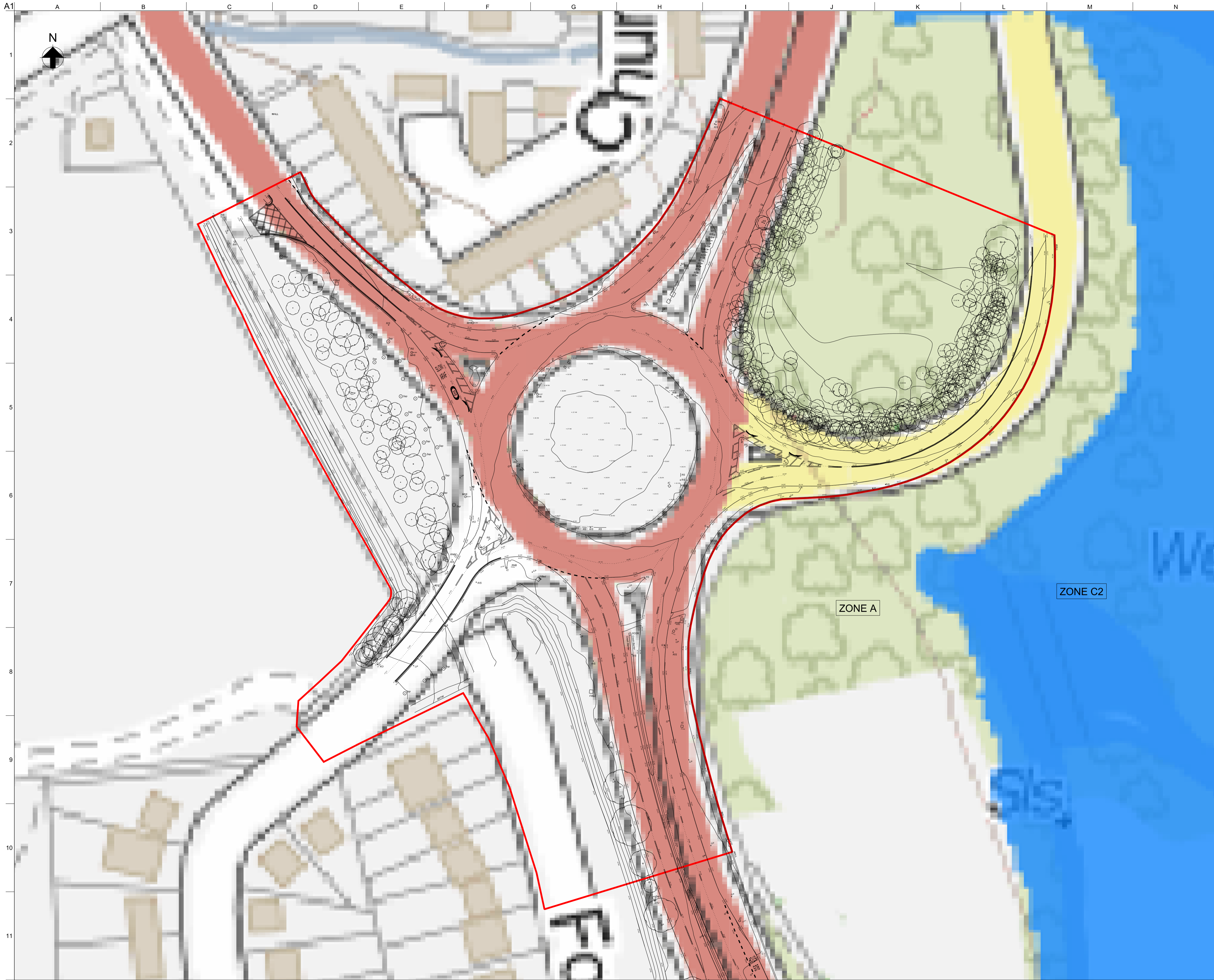
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Discipline

Drawing Status

**For Information**

Job No	Drawing No	Issue
<b>240226</b>	<b>Figure 7</b>	<b>10</b>



- Legend**
- Indicative extent of works
  - Zone C1: Served by significant infrastructure including flood defences
  - Zone C2: Without significant flood defence infrastructure

- Notes**
1. The details shown on this drawing was used to inform preliminary discussions with NRW.
  2. The details shown may vary in subsequent design stages.
  3. Flood outline shown based on WG TAN15 DAM.
  4. Zones C1 and C2 based on EA's extreme flood outline  $\geq 0.1\%$  (River, tidal or coastal).

IO	26/01/15	RL	SW	GD
Issued for Information				
Issue	Date	By	Chkd	Appd

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Client  
**Welsh Government**

Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Bassaleg Roundabout  
Technical Advice Note 15  
Development Advice Map**

Scale at A1 1:500  
Discipline

Drawing Status

<b>For Information</b>		
Job No <b>240226</b>	Drawing No <b>Figure 8</b>	Issue <b>10</b>



**Legend**

	Indicative extent of works
	Flood Zone 3
	Flood Zone 2

- Notes**
1. The details shown on this drawing was used to inform preliminary discussions with NRW.
  2. The details shown may vary in subsequent design stages.
  3. Flood outline shown based on EA online flood maps.

IO	26/01/15	RL	SW	GD
Issued for Information				
Issue	Date	By	Chkd	Appd

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Client  
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Job Title  
**M4 Junction 28 Improvements**

Drawing Title  
**Bassaleg Roundabout  
Environment Agency  
Online Maps**

Scale at A1 1:500  
Discipline

**For Information**

Job No <b>240226</b>	Drawing No <b>Figure 9</b>	Issue <b>10</b>
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## **Appendix A**

### NRW Correspondence

**From:** Purnell, Gary <Gary.Purnell@cyfoethnaturiolcymru.gov.uk>  
**Sent:** 12 October 2015 08:26  
**To:** Sion Williams  
**Cc:** Gary Davies; Nutt, Christopher  
**Subject:** RE: M4 Junction 28 Improvements: Pont Ebbw Storm Drainage Principles

Good Morning Sion

Based on your justification, especially with respect to the location of the discharge point within close proximity to the tidal limits of the River Ebbw, I confirm that the proposed runoff from the scheme can remain unrestricted.

Regards  
Gary

Gary Purnell  
Technical Specialist, Flood Risk Analysis, South East Area  
Arbenigwr Technegol, Dadansoddiad Risg Llifogydd , Ardal De Dwyrain

Natural Resources Wales, Rivers House, St Mellons Business Park, Cardiff, CF3 0EY  
Cyfoeth Naturiol Cymru, Plas yr Afon, Parc Business Llanelwys, Caerdydd, CF3 0EY

**Tel/Ffôn:** 03000 653116  
**Internal Tel/Ffôn mewnol:** 3116

**E-mail/E-bost:** [gary.purnell@naturalresourceswales.gov.uk](mailto:gary.purnell@naturalresourceswales.gov.uk)  
[gary.purnell@cyfoethnaturiolcymru.gov.uk](mailto:gary.purnell@cyfoethnaturiolcymru.gov.uk)

---

**From:** Sion Williams [mailto:sion.williams@arup.com]  
**Sent:** 09 October 2015 12:21  
**To:** Purnell, Gary  
**Cc:** Gary Davies; Nutt, Christopher  
**Subject:** RE: M4 Junction 28 Improvements: Pont Ebbw Storm Drainage Principles

Hi Gary,

We always encourage the use of SuDS on every scheme to try and reduce its impact on the environment. However, in this instance, we consider it to be unnecessary due to the reasons and impacts outlined below. The impacts outlined, have developed during various reviews of the proposed storm strategy with the design team.

**Reasons for Justification:**

- Existing storm network discharges unrestricted storm flows into the River Ebbw.
- The net increase in impermeable area due to the proposed works is negligible when compared to the size of the overall catchment of the River Ebbw and only contributes to an increase of 25% of the existing contributing area (existing approximately 10,800m<sup>2</sup>).
- The River Ebbw is still under tidal influence approximately 400m downstream of existing outfall. Therefore the potential for adverse impacts is considered very low.

- The proposed works are located either within Flood Zones C1 or C2. Therefore during periods of fluvial flooding, the attenuation pond and the drainage network would be inundated and surcharged i.e. serving no purpose during these events.

### **Impacts of installing SuDS:**

- Safety concerns regarding:
  - locating a substantial sized basin adjacent to the existing and propose carriageways
  - may attract children to explore/play in the basin especially considering the location of the nearby school
- Difficulties in locating a maintenance bay adjacent to the basin

I would be grateful if you could consider the above and confirm if we can proceed on the basis of discharging unrestricted storm flows into the River Ebbw as a result of the proposed works?

Regards,

Siôn

Siôn Williams

Engineer | Infrastructure Engineer

Arup

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---

**From:** Purnell, Gary [<mailto:Gary.Purnell@cyfoethnaturiolcymru.gov.uk>]

**Sent:** 24 September 2015 11:17

**To:** Sion Williams

**Cc:** Gary Davies; Nutt, Christopher

**Subject:** RE: M4 Junction 28 Improvements: Pont Ebbw Storm Drainage Principles [Filed 24 Sep 2015 11:37]

Hi Sion

Chris Nutt is the person who deals with this part of the catchment even though I cover all the SE Area. I've copied Chris to this email for information.

I recommend that the existing runoff rate from the carriageway via the existing outfall is maintained and, if there is a proposed increase in flow, justification for doing so must be provided.

Regards

Gary

Gary Purnell

Technical Specialist, Flood Risk Analysis, South East Area

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---

**From:** Sion Williams [<mailto:sion.williams@arup.com>]  
**Sent:** 22 September 2015 16:03  
**To:** Purnell, Gary  
**Cc:** Gary Davies  
**Subject:** M4 Junction 28 Improvements: Pont Ebbw Storm Drainage Principles

Hi Gary,

Further to Kambiz's email below, we have also been developing the storm water drainage strategy for the proposed highway works. The proposals for the Pont Ebbw roundabout are to construct a through-about and widen the existing approaches to the existing roundabout (see attached drawing but note that this has not been in the Public Domain, therefore would appreciate your discretion). This has resulted in a net increase in impermeable area of approximately 25% (i.e. an increase from approximately 10,800m<sup>2</sup> to 14,400m<sup>2</sup>).

Details of the existing storm drainage network have been received from Newport County Council. This is based on as-built information received following the construction of the Southern Distributor Road. The details provided illustrate that the existing storm water runoff generated from the existing road network is discharged via a petrol interceptor into the River Ebbw unrestricted. Since this is the case and considering that the River Ebbw is under tidal influence just downstream of the existing and proposed outfall locations at this point, we were exploring whether the proposed storm flows generated upon completion of the works require restricting to replicate the existing storm flows?

Alternatively, I would be grateful if you could provide me with a contact within NRW who I would be able to contact to discuss further? I spoke to Carl briefly earlier last week when in discussion on The Mill project and he mentioned a colleague of yours who looks after this area however I have forgot his surname (Chris?).

Regards,

Siôn

Siôn Williams  
Engineer | Infrastructure Engineer

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**From:** Purnell, Gary [<mailto:Gary.Purnell@cyfoethnaturiolcymru.gov.uk>]  
**Sent:** 23 January 2015 15:09  
**To:** Kambiz Ayoubkhani  
**Cc:** Llewellyn, Carl  
**Subject:** RE: Improvements to M4 Junction 28,

Good Afternoon Kambiz

Referring to the drawings submitted I confirm that no FCA will be required for the following reasons.

Drg No. 101 – Proposed works at grade and within existing carriageway.

Drg No. 102 – Works are proposed outside our current flood outlines.

Drg No. 103 – Proposed works are cutting into existing ground profiles. Therefore don't envisage any adverse affects taking these locations into consideration and the reduction of ground levels.

Regards

Gary

Gary Purnell

Technical Specialist, Flood Risk Analysis, South East Area

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**PLEASE NOTE: My new contact number with immediate effect is below**

**Tel/Ffôn: 03000 653116**

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**From:** Kambiz Ayoubkhani [<mailto:kambiz.ayoubkhani@arup.com>]

**Sent:** 22 January 2015 12:27

**To:** Purnell, Gary

**Cc:** Llewellyn, Carl

**Subject:** Improvements to M4 Junction 28,

Gary, Carl

On behalf of the Welsh Government we are undertaking design to improve traffic flow through Junction 28 on the M4.

I attach sketches showing the improvement works.

The works consist of widening of some of approach roads and constructing links through existing Pont Ebbw and Bassaleg roundabouts.

Some of the work is within the flood plain C1 and C2.

Can you please confirm if a FCA is required for the improvement works.

Regards

**Kambiz Ayoubkhani**

Associate

**Arup**

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## Appendix G

### Outline CEMP and REAC

# G1 Outline Construction Environmental Management Plan (CEMP)

Table G1.1 provides a guide to the structure and contents of the CEMP which will be developed by the Contractor, in line with ES Chapter 13 Environmental Management, prior to construction.

**Table G1.1 – Draft Outline CEMP: Structure**

1	Introduction
1.1.	CEMP Context
1.2	Roles and Responsibilities
1.2.1	Environmental Coordinator/ Environmental Clerk of Works
1.2.3.	Other Environmental Staff
2.	Stakeholder Liaison
2.1.	Environmental Liaison procedures
2.2.	Environmental Stakeholder Contact Info
2.3	Environmental Liaison KPIs
3.	Pre-construction Environmental Information
3.1.	Designated Sites, Environmental Features and Restrictions
3.2.	Third part abstractions and discharges
3.3.	Licenses and Consents in Place
4.	Management of Environmental Issues
4.1.	Ecological Protection
4.1.1.	Ecological compliance audit
4.1.2.	Biosecurity risk assessment
4.2.	Archaeological and Heritage Protection
4.3.	Control of Nuisance
4.4.	Control of Nuisance Species
4.5.	Soil Management
4.6.	Contaminated Land Management
4.7.	Watercourse protection
4.8.	Waste Management
4.9.	Landscape and Ecology Design and Management
4.11.	Environmental Training
4.12.	Environmental Monitoring

## G2 Draft Register of Environmental Actions and Commitments (REAC)

The REAC is a tool for recording and tracking how the specific mitigation measures and enhancement measures (i.e. the Actions and Commitments) from the NSER will be implemented during construction. The REAC is part of the suite of management plans under the CEMP. Where a commitment requires monitoring, information on the reporting requirements and trigger level for remedial works should be clearly defined within the final REAC.

The draft REAC is provided in Table G1.2. The draft REAC will be updated prior to construction. The REAC should be developed into a table which includes the following headings:

- Clear and specific description of Actions and Commitments (using the Table G1.2 b);
- The objective of the Actions and Commitments;
- How the Action is to be implemented/achieved;
- The source of the Commitment, including references for source documentation;
- Naming of the person responsible for the Action i.e. Principal Contractor or Environmental Manager;
- Achievement criteria and reporting requirements;
- The project stage or date or implementation and/or achievement;
- Details of any monitoring required, what should be monitored and how results should be used to effect/change necessary Actions and Commitments; and
- Date and signature for completion of Actions and Commitments.

**Table G1.2- Draft REAC**

Environmental Topic	Construction Mitigation
Chapter 5: Air Quality	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on-site or off-site and the action taken to resolve the situation in the log book.
	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan, which will include measures to control other emissions.



Environmental Topic	Construction Mitigation
	Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results and make an inspection log available to the local authority, when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
	Damping down at source for operations creating dust.
	Avoid site runoff of water or mud.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
	Cover or seed stockpiles to prevent wind whipping.
	Ensure sand and other aggregates are stored in shielded areas where possible, segregated and dampened down
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
	Implement a Travel Plan than supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques, such as water sprays or local extraction.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use the fine water sprays on such
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as practicable after the event using wet cleaning methods.
	Avoid bonfires and burning of waste materials.

Environmental Topic	Construction Mitigation
Chapter 6: Cultural Heritage	<p>Archaeological watching brief in these specific areas only. It is proposed this would be required where construction works would involve below ground excavations.</p> <p>Mitigation will be undertaken according to a Written Scheme of Investigation (WSI), to be agreed with Glamorgan-Gwent Archaeological Trust (GGAT). The WSI will set out the methodology for the watching brief and the Standards and Guidance that will be followed.</p>
Chapter 7: Landscape Effects	<p>Re-use surplus excavated material won from the site to cover or replace the disused road surfaces and where possible to create attractive and naturally undulating grassed landforms within the central areas of the roundabouts.</p>
	<p>Any disturbed ground within or around the construction sites should be graded and cultivated prior to seeding with appropriate amenity, meadow or suitable biodiverse conservation seed mixes to be agreed with the Local Planning Authority.</p>
	<p>Where possible, within the operational requirements of the new road layout, looking for further opportunities to plant specimen native trees to replace those trees lost as a result of the works.</p>
Chapter 8: Ecology and Nature Conservation	<p>Mitigation over and above plainly established and uncontroversial working methods, will be limited to landscape planting to compensate for the loss of trees and shrubs as a result of the construction works.</p>
	<p>All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs.</p>
	<p>Any works affecting potential bird nesting habitat e.g. clearance of standing vegetation including trees and scrub, should be carried out outside the breeding season (generally accepted as March to August inclusive for most species). If this is not possible, any potentially suitable nesting habitat should be checked for nests by a suitably qualified ecologist immediately prior to its removal. If nests are found further work will need to be delayed until young have fledged and left the nest, and the nest is no longer in use.</p>
	<p>It is currently proposed to clear vegetation in February 2017 prior to the bird breeding season and thereby avoiding costly delays to the construction works caused by the presence of nesting birds. The mitigation strategy would therefore require the vegetation clearance to be undertaken in a two stage process as set out in the Winter Clearance methodology provided in the Dormouse Conservation Handbook (EN, 2006).</p>
	<p>Dormouse mitigation measures are currently being agreed with NRW/NCC and detailed in the Dormouse Licence.</p>

Environmental Topic	Construction Mitigation
	<p>Habitat manipulation in accordance with standard best practice will be undertaken to avoid harm to these legally protected species, the details of which will be provided in the CEMP.</p> <p>Prior to vegetation clearance being undertaken the contractor’s workforce will be given a toolbox talk about reptiles, their legal protection, and what actions should be undertaken if they are encountered during the construction works.</p>
	<p>The CEMP will also outline necessary methods for the removal or treatment of invasive plant species as appropriate.</p>
Chapter 9: Materials	<p>A Site Waste Management Plan will be produced to detail the estimated quantities of waste material and the opportunities for reuse, recycling, recovery or disposal.</p>
	<p>Design to maximize the earthworks balance.</p>
	<p>Minimise import and export of material. Limit disposal and movements. Reuse material as subbase in footpaths, pavement construction.</p>
	<p>To limit the quantities that are disposed of to landfill the materials will be sorted/processed and where necessary treated and the materials disposed of or reused as appropriate for the particular waste stream. The pre-treatment of waste material prior to disposal is a requirement of the waste regulations.</p>
	<p>Construction workers and any future maintenance workers will need to consider health and safety measures for any intrusive works proposed, to protect against contaminants within the soil, including PAHs; likely to be present on account of tarmac, coal and ash within the Made Ground. Hydrocarbon contamination was identified locally near the Bassaleg junction but contamination was not identified within the other areas or the site,</p>
Chapter 10: Construction Noise and Vibration	<p>Localised acoustic screening at the construction area boundary would reduce noise levels to those closest properties to remove significant noise effects. Best practice noise measures in line with BS Standards, Appropriate timing of noisy activities, use of noise sensitive equipment.</p>
	<p>Acoustic screening or appropriate ventilation arrangements to allow the windows at the St David's R.C. Primary School near Pont Ebbw Junction to be closed to control noise ingress during the periods of highest noise levels. Alternatively, the working hours, at least for noisier activities, might be adjusted around the more critical times in the school day to minimise noise impacts to lesson periods in particular. Depending on when the works would be carried out, there may be scope to time the noisier works during school holidays.</p>
	<p>Noise barrier to be positioned near the scheme in front of No 13 and No 14 Forge Lane.</p>
	<p>Practicable construction noise mitigation options would be explored with the contractor.</p>

Environmental Topic	Construction Mitigation
Chapter 11: Road Drainage and the Water Environment	Mitigation should be selected in accordance with existing good practice guidance, such as the Pollution Prevention Guidelines (PPGs), particularly those relating to works in or near water, dealing with spills, refuelling facilities and vehicle washing.
	The risk of contaminants entering the water environment should be minimized by requiring the use of bunded oil storage containers, designated vehicle refuelling points with spill kits and, where appropriate, site runoff detention ponds with petrol interceptors.
	A Spill Response Plan should be prepared.
	The risk of sediment entering the water environment should be minimised by providing a designated area of hand standing (with a sump to collect runoff) for plant/wheel washing, locating stockpiles away from watercourses and using bunds or silt fences to retain sediment in runoff where needed.
	<p>The entire Pont Ebbw site and part of the J28 site are within the floodplain. For J28, the area of the site within the floodplain should, if possible, remain clear of storage and welfare facilities to reduce the likelihood of a flood event causing a pollution incident. This measure would not be possible at the Pont Ebbw site as it is entirely in the floodplain. However additional mitigations should be considered:</p> <ul style="list-style-type: none"> <li>• Works should be timed to avoid periods of the year at the highest risk of flood flows (e.g. avoiding October-March);</li> <li>• Sediments should be stockpiled offsite in an area not at risk of flooding;</li> <li>• Bare surfaces that will remain exposed for a prolonged period should be vegetated; and</li> <li>• An emergency plan to secure or remove sources of contaminants (e.g. fuel/chemical storage) in the event of a forecasted flood flow.</li> </ul>
	All construction work carried out within a flood plain would require a Flood Risk Activity Permit, issued by NRW, prior to the works commencing. The permit would include an assessment of flood risk and water contamination due to the construction works and identification of mitigations to manage these risks.
	Works will be staged to ensure the drainage system is installed early in the construction period, prior to the roadway being laid, allowing for the drainage system to be used to manage runoff of water and sediment during construction.