Welsh Government

# M4 Corridor around Newport

## Environmental Statement, Volume 1

## Chapter 4: Scheme Development and Alternatives Considered

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# 4 Alternatives Considered

## 4.1 Introduction

**4.1.1** This chapter of the Environmental Statement (ES) outlines the main alternatives considered during the development of the Scheme. In addition, it sets out the main reasons for the selection of the key elements of the Scheme, including the following.

- Selection of a motorway option (compared to non-motorway solutions).
- Selection of the broad route corridor to the south of Newport (compared to alternative route options).
- Selection of the design options included within the draft Statutory Orders (compared to alternative design solutions at locations along the route).

## 4.2 Legal Context

**4.2.1** The 2011 EIA Directive requires the following to be included within an ES.

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

**4.2.2** As set out in Chapter 1 of this ES, Directive 2011/92/EU has been amended by Directive 2014/52/EU. Although the transitional measures in place mean that the provisions of Directive 2011/92/EU remain applicable for the Scheme, the requirements of Directive 2014/52/EU have been taken into account within this ES, where practicable.

**4.2.3** Directive 2014/52/EU amends Article 5, 3 as follows.

*'A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment'. (Article 5, 3(d) Directive 2011/92/EU)*

**4.2.4** 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 development of the Scheme and the justification behind any design changes.

## 4.3 Alternatives to a New Motorway and Alternative Route Options

**4.3.1** The transport related problems on the M4 around Newport are well established and proposed measures aiming to address the problems have been developed and assessed over a period of more than 25 years. The identification, appraisal, sifting and selection of potential alternative solutions and alternative route corridors has been wide ranging up to the Welsh Government's decision to adopt its preferred strategy in a Plan for the M4 Corridor around Newport and publish a

modified Preferred Route for a new section of motorway to the south of Newport (July 2014). Since that time, the focus has been on design development.

**4.3.2** The following sections set out the key stages of decision making. Key milestones in the development of the Plan are shown in Figure 4.1.

## 1989 - 1990 South Wales Area Traffic Study

**4.3.3** In March 1989, the then Secretary of State for Wales commissioned the South Wales Area Traffic Study (SWATS) to review traffic patterns over part of the trunk road network in South Wales in order to identify problem areas and propose possible solutions. The SWATS Report (Welsh Office, 1990) identified the need for substantial improvements to the M4, in particular the section between Magor and Castleton.

## 1992 - 1995 Selection of M4 Relief Road Preferred Route

**4.3.4** As a consequence of the SWATS findings, a proposal for a relief road around Newport (which became known as the 'M4 Relief Road', and later, the 'New M4 Project') was included in the Welsh Trunk Road Forward Programme in 1991. Consequently, a wide variety of options were considered, including corridors passing to the north and south of Newport, as well as online widening options. Corridors to the north of Newport were discounted because they offered significantly fewer benefits, including relief of traffic on the M4, than the southern corridors. Public consultation in 1993 on various options confirmed the existing problems on the M4 and identified a new motorway to the south of Newport as the preferred option.

**4.3.5** A report was published at the request of the then Countryside Council for Wales (CCW) to provide a detailed explanation of the approach to the assessment of the northern route options and the reasons for discarding them (Welsh Office, 1993a). A further review was carried out following CCW concerns about the southern corridor options which crossed the Gwent Levels Sites of Special Scientific Interest (Welsh Office, 1993b, 1995). It was concluded that even with reduced design standards, the northern corridors would not be acceptable. Such alternative alignments that sought to reduce landscape impacts had greater impacts on the built environment and the requirement for a crossing of the River Usk north west of the existing M4 Junction 24 was regarded as a major severance feature. Hence, various corridors to the north of Newport were discounted.

**4.3.6** Following consultation, the Preferred Route for the 'M4 Relief Road', to the south of Newport, was announced by the then Secretary of State for Wales, William Hague, on 12 July 1995. A TR111 Notice was published on the same day, protecting the corridor for planning purposes.

## 1997 Modification to Preferred Route

**4.3.7** The 1995 Preferred Route was subsequently modified in 1997 to allow for development of an employment site at Duffryn. A new TR111 Notice was published on 1 April 1997 superseding the earlier Notice.

## 1997 - 1999 Common Appraisal Framework Study

**4.3.8** As well as pursuing the new road proposal, a more broad-based study of possible solutions was undertaken between 1997 and 1999. A Common Appraisal Framework (CAF) study commenced in 1997, considering public transport enhancements, traffic demand/management measures and construction of an 'M4 Relief Road'. The outcome of the CAF study was that none of the alternatives investigated would relieve the M4 to the same degree as the proposed 'M4 Relief Road' (Welsh Office, 1999).

## 2004 - 2006 Re-examination of Route Corridors

**4.3.9** In 2004, the then Minister for Economic Development and Transport reported on the outcome of his review of transport programmes, which was undertaken to ensure a strategic fit with 'Wales: A Better Country' (Welsh Assembly Government, 2003) and the Wales Spatial Plan (Welsh Assembly Government, 2008a as updated). One of the conclusions of the review was that additional capacity was still required on the M4 motorway in South Wales, in order to reduce congestion, improve resilience and remove an obstacle to greater prosperity along the whole corridor through to Swansea and West Wales. In addition to widening the motorway north of Cardiff, the Minister announced proposals to develop a new section of motorway south of Newport between Magor and Castleton.

**4.3.10** Following Ministerial Review in 2004, the 'New M4 Project' was the subject of a thorough re-examination in order to consider fit with policies at that time and to take account of physical and legislative changes. Three key activities were undertaken as follows.

- Re-examination of Route Corridors, including a workshop considering, in particular, the implications and consequences of legislative changes and physical developments within the original project study area (Transport Wales, 2006a).
- Preferred Route Review (Transport Wales, 2006b).
- Junction Strategy Review (Transport Wales, 2006c).

**4.3.11** The Preferred Route Review specifically took into account the fact that the Countryside and Rights of Way Act (2000) had strengthened the protection of Sites of Special Scientific Interest and specific reference was made to the duties of the then National Assembly for Wales under Section 28G of the Wildlife and Countryside Act (1981), as amended. Other matters that were taken into account included the fact that the River Usk had been formally designated as a Special Area of Conservation in December 2004.

**4.3.12** The conclusion of the Preferred Route Review was that the route corridor passing to the south of Newport remained the most appropriate alignment for the 'New M4 Project' in preference to any other route. Following the review, a modified TR111 Notice was published on 19 April 2006 to protect a revised Preferred Route corridor (see Figure 4.2). One of the key drivers for the recommendation that led to the modification of the route was to reduce the impact on and severance of the Gwent Levels Sites of Special Scientific Interest. To that end the alignment of the Preferred Route corridor was moved further north by up to 400 metres which also enabled some 1.5 km of the earlier protected route to be

taken out of the Sites of Special Scientific Interest entirely (Transport Wales, 2006b). A series of public exhibitions were held in April and May 2006 to explain the changes to the public and other stakeholders with an interest in transport in South Wales.

## 2008 Welsh Transport Planning and Appraisal Guidance

**4.3.13** In 2008, the Welsh Government adopted the Welsh Transport Planning and Appraisal Guidance (WelTAG). WelTAG sets out a methodology and process for assessing proposed strategies, plans and schemes. It aims to provide decision makers with information about significant economic, environmental and social impacts from proposals. It enables decision makers to judge the merits of proposals and helps reasoned decisions to be made using a consistent approach. It also provides an audit trail of decision making.

**4.3.14** The WelTAG process starts with the planning stage, which establishes the conditions in the area, its transport problems and opportunities and generates objectives for the steps that follow. These are referred to as Transport Planning Objectives. This is followed by the identification of possible solutions, which are tested first informally against the objectives set (referred to as 'sifting') and then in more detail, leading in due course to the appraisal stage.

**4.3.15** The appraisal stage has two components - Stage 1 and Stage 2 appraisal. The WelTAG guidance (Welsh Assembly Government, 2008b) sets out that for strategies, plans or programmes Stage 1 appraisal should be carried out, whilst for schemes both Stages 1 and 2 are required. Stage 2 requires more detailed consideration and is a much more resource intensive process.

**4.3.16** During the appraisal process, proposals should be considered against both the established Transport Planning Objectives and the Welsh Impact Areas, which focus on the three areas of sustainability that underlie policy in Wales: the economy, the environment (including legal requirements and the desire to protect and enhance the condition of the built and natural environment) and society. WelTAG states that a proposal which performs poorly against Welsh Impact Areas is unlikely to gain support from the Welsh Government. The Transport Planning Objectives and Welsh Impact Areas therefore underpin the appraisal process by allowing testing of whether or not a proposal is likely to succeed in addressing the identified problems or achieving the identified objectives.

**4.3.17** Between 2009 and 2010 various WelTAG appraisals of the ‘New M4 Project’ were undertaken (Welsh Assembly Government, 2009 a, b, c, 2010a). These led to the identification of objectives (Transport Planning Objectives) for the M4 Corridor around Newport and various potential solutions (alternatives) were appraised. Although the outcome was that a new section of motorway to the south of Newport was recommended for further appraisal, because of the matters referred to below a Stage 2 scheme appraisal did not take place until later.

## 2010 National Transport Plan

**4.3.18** A written statement in July 2009, by the then Deputy First Minister, announced that the ‘New M4 Project’ was not affordable. The statement, however, accepted ‘*the need to urgently address safety and capacity issues on the existing route’ through the introduction of ‘a range of measures’*.

**4.3.19** The National Transport Plan was published in March 2010 (Welsh Assembly Government, 2010b) and excluded the 'New M4 Project' on the above basis. However, it was accepted that there was a need urgently to address the transport problems on the M4 and a commitment to this effect was included in the published document.

## 2010 - 2012 M4 Corridor Enhancement Measures (M4 CEM)

**4.3.20** In response to the written statement in July 2009 by the then Deputy First Minister that announced that the 'New M4 Project' was not affordable, the M4 Corridor Enhancement Measures (CEM) Programme was initiated by the Welsh Government, which aimed to create a package of measures to deal with resilience, safety and reliability issues within the M4 corridor between Magor and Castleton.

**4.3.21** Under the M4 CEM Programme, potential measures were initially identified in consultation with members of the public, key stakeholders and local councillors through separate workshop events held in April and July 2011 and a drop in exhibition held in January and February 2011. Over 100 possible measures were considered, including the following.

- Network improvements.
- Network management.
- Demand management.
- Alternative modes.
- Smarter sustainable choices.

**4.3.22** These included corridor efficiency measures, widening of the existing M4 between Junctions 24 and 29, a new dual carriageway road to the south of Newport, bus priority on the M4, reduced public transport fares, a new lagoon barrage link, hard shoulder running on the existing M4 and improvements to existing roads including the A48 Southern Distributor Road (SDR) and A4810 Steelworks Access Road (SAR), as well as other alternatives. Alternatives considered but discarded were set out in the M4 CEM Alternatives Considered Workbook in November 2011 (Welsh Government, 2011).

**4.3.23** Measures were appraised informally using WelTAG criteria at a high level, as recommended by WelTAG guidance and taking into account comments received during stakeholder workshops. These were developed into four strategies, each focusing on different potential solutions. These would deliver additional highway capacity on a phased basis. Some of the measures considered avoided crossing the Gwent Levels Sites of Special Scientific Interest. The main components of each of the four alternative strategies considered appropriate for further appraisal were the following.

- Construction of a new dual carriageway road south of Newport.
- Improvements to the A48 SAR.
- On-line widening along the existing M4 around Newport.
- Major public transport improvements.

**4.3.24** These strategies were presented back to key stakeholders at a further workshop in November 2011. Stakeholders identified that no single solution would address the problems and that a multi modal solution was required.

**4.3.25** The Welsh Government took these stakeholder comments on board and developed a combination of measures, which were presented in the M4 CEM Consultation Document in March 2012 (Welsh Government, 2012a). The combination of measures proposed included the following.

- Public transport measures.
- Highway infrastructure measures that could be delivered on a phased basis including either:
  - Highway Option A: additional high quality road to the south of Newport; or
  - Highway Option B: at grade junction improvements to the A48 SDR; or
  - Highway Option C: grade separated junction improvements to the A48 SDR; or
  - Highway Option D: online widening on the M4 between Junctions 24 and 29, including an additional tunnel at Brynglas; and
- Common Measures that could be implemented alongside each of the above measures. These were additional measures being considered to support the strategic public transport and highway capacity measures in addressing travel related problems within the M4 Corridor between Magor and Castleton. They comprised a mix of network improvements, demand management, alternative modes and smarter sustainable choices.

**4.3.26** The M4 CEM public consultation was held between March and July 2012. Highway Option A (a dual carriageway to the south of Newport) attracted the most comments as a preferred or supported option - many cited its possible benefits to transport and the economy. As part of the consultation process, some respondents compared Option A to the previous motorway proposals, calling for the reinstatement of a motorway alternative. Some respondents also stated that they challenged or opposed Option A. Their concerns predominantly included the potential cost of delivery and the potential adverse environmental effects of its construction on the Gwent Levels Sites of Special Scientific Interest.

**4.3.27** Building on the M4 CEM consultation, the Welsh Government undertook further assessment work, which helped inform the assessment of likely impacts of the M4 CEM options. In November and December 2012, the Welsh Government undertook and consulted on the following preliminary documents.

- Health Impact Assessment (Welsh Government, 2012b).
- Equality Impact Assessment (Welsh Government, 2012c).
- Strategic Environmental Assessment (SEA) Environmental Report (Welsh Government, 2012d).
- Strategic Habitats Regulations Assessment Screening Report (Welsh Government, 2012e).
- Strategic Habitats Regulations Statement to Inform Appropriate Assessment (Welsh Government, 2012f).

**4.3.28** Although the November 2012 SEA Environmental Report (Welsh Government, 2012d) was referred to as an SEA Report, it was subsequently recognised that in order to comply with European Directive 2001/42/EC (the SEA Directive) on the assessment of the effects of certain plans and programmes on the environment, and the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (the SEA Regulations), it would be necessary to put forward a preferred strategy. Accordingly, it was accepted that the 2012 SEA Environmental Report was not in fact an Environmental Report within the meaning of the SEA Directive or the SEA Regulations. It was, nevertheless, helpful development work. For example, it set out that the Welsh Government had a duty to conserve and enhance biodiversity.

**4.3.29** All of the M4 CEM options referred to above were appraised in the March 2013 WelTAG Stage 1 (Strategy Level) Appraisal (Welsh Government, 2013a). This document was made available to consultees as part of the M4 Corridor around Newport consultation that took place between September and December 2013.

**4.3.30** In developing the Transport Planning Objectives for this appraisal, the Welsh Government considered and reviewed the problems and objectives identified in earlier work. It was confirmed that the problems remained. The development of the Transport Planning Objectives had been the subject of the M4 CEM stakeholder workshops and public consultation in 2011. Objectives were reworded into plain English and took on board comments raised in the engagement process. Whilst there are subtle differences to the objectives identified in earlier WelTAG appraisals, the only substantive addition was the objective regarding a cultural shift in travel behaviour, in line with the Welsh Government commitment to sustainability and taking into account stakeholder comments.

**4.3.31** The 15 Transport Planning Objectives were set out in the March 2013 M4 CEM WelTAG appraisal.

**4.3.32** The March 2013 WelTAG appraisal set out that Highway Option A (new dual carriageway south of Newport) offered the best value for money, would provide the most relief to the existing M4 around Newport and would provide increased capacity in the highway network around Newport. This option would offer an alternative route for longer distance journeys, especially those using the Severn Crossings, thereby improving the resilience of the highway network. The route aimed to minimise negative impacts on local communities and the environment, whilst seeking to support economic development in Wales. This road could be delivered in phases, both to meet (and respond to) demand and availability of funding. As part of the assessment against the Welsh Impact Areas, an appraisal of Highway Option A was carried out in terms of biodiversity, including the potential impact on the Sites of Special Scientific Interest. Highway Option A was assessed as potentially having a major adverse impact. However, of the four highway options appraised, Option A provided the strongest fit with the Welsh Impact Areas and with the Transport Planning Objectives.

**4.3.33** The assessment indicated that conditions on the M4 would be likely to deteriorate under Option B (at grade junction improvements to the SDR). For example, for Option B, it was forecast that the traffic volumes in 2035 on the M4 east of the Brynglas Tunnels would be greater than if nothing was done other than that which was already committed. West of the tunnels, the traffic volumes were forecast to be similar to the 'Do-Minimum' scenario. Thus no relief was likely to

be provided under Option B. In terms of biodiversity, Option B did not cross the Gwent Levels Sites of Special Scientific Interest and it was assessed as potentially having a minor adverse impact. It was recommended that Option B should not be taken forward for further appraisal.

**4.3.34** Some respondents to the M4 CEM consultation challenged Option C (grade separated junction improvements to the A48 SDR) as a solution or clearly stated that, in their opinion, Option C would not address the problems or achieve the objectives chosen. This view was confirmed by the transport modelling, which indicated very little relief to motorway congestion as a result of Option C. Whilst Option C would be likely to result in benefits, these would not be focused on relief to the M4. By the design year (2035), analysis has shown that the traffic levels through the Brynglas tunnels under Option C would be reduced by only some 4% compared to a 'Do-Minimum' scenario. In terms of biodiversity, Option C did not cross the Gwent Levels Sites of Special Scientific Interest and it was assessed as potentially having a moderate adverse impact. It was recommended that Option C should not be taken forward for further appraisal.

**4.3.35** Option D (online widening of the M4) would not provide long term resilience to the motorway and trunk road network in south east Wales and it would not provide sufficient capacity in the longer term, with severe operational problems continuing to be experienced on some sections, whilst it would have adverse impacts on people and the economy during construction. It would also not contribute towards addressing the Noise Action Planning Priority Areas (NAPPA), and Air Quality Management Area (AQMA) issues alongside the motorway in Newport. In terms of biodiversity, Option D was assessed as potentially having a moderate adverse impact. It was recommended that Option D be discounted. The discounting of this option also reduced the amount of uncertainty and anxiety for some residents and businesses in the Newport area.

**4.3.36** As a result, Options B, C and D identified in the M4 CEM were not considered worthy of further appraisal on the basis of the March 2013 WelTAG appraisal. It was recommended that Option A be the only highway option taken forward for more detailed WelTAG Appraisal, together with Common Measures, and that a Welsh Government Transport Task Force might offer a useful body to continue to develop the public transport measures considered as part of the way forward.

## Changes in Affordability

**4.3.37** Between 2011 and 2013, discussions took place between the Welsh Government and HM Treasury/Department for Transport. The Commission on Devolution in Wales (known as the 'Silk Commission') reviewed the case for devolution of fiscal powers and considered the case for increasing the borrowing powers of the Welsh Government, creating future potential funding opportunities for Welsh Government infrastructure projects. By June 2013, it had become clear that the Welsh Government would be able to use borrowing powers to proceed with improvements to the M4.

**4.3.38** As a result, on 26 June 2013, Edwina Hart AM CStJ MBE, Minister for Economy, Science and Transport, published a written statement on behalf of the Welsh Government, confirming that:

*'As a result of ongoing discussions with the UK Government there has been a significant change in the assessment of the affordability of a major enhancement of the M4.*

*Building on the extensive development and consultation work undertaken on M4 Corridor Enhancement Measures (CEM), we will be consulting formally over the summer with Natural Resources Wales in order to go out to public consultation this September with a finalised draft Plan and Strategic Environmental Assessment (SEA) Report.*

*If implemented, the draft plan would lead to a motorway being built south of Newport.'*

**4.3.39** Accordingly, it was then possible to reconsider motorway options.

## 2013 Preparation of a Draft Plan

**4.3.40** As a result of the changes in affordability referred to above, and in order to develop a preferred strategy for the M4 Corridor around Newport, a further WelTAG Appraisal was undertaken in June 2013 (Welsh Government, 2013b). As a part of this appraisal the Transport Planning Objectives agreed during earlier consultation and engagement exercises were again reviewed. It was considered that the objectives previously considered remained wholly relevant to the M4 around Newport and no changes were made to them.

**4.3.41** The options considered within the June 2013 WelTAG Appraisal were as follows.

- A new section of 3-lane motorway to the south of Newport mainly following the route protected by the TR111 Notice published for the 'New M4 Project' 2006 (referred to as the 'Black Route').
- A new section of dual carriageway to the south of Newport following the route of Option A as recommended by M4 CEM appraisal (referred to as the 'Red Route').
- A new section of 3-lane motorway to the south of Newport along a similar route to the Red Route, albeit with minor differences to reflect the requirements of motorway standards (referred to as the 'Purple Route').
- Public transport measures.
- Complementary Measures that would be implemented alongside each of the above measures, which built on the M4 CEM Common Measures, including the following.
    - Reclassifying the existing M4 between Magor and Castleton (not applicable for the Red Route).
    - An M4/M48/B4245 connection.
    - Providing cycle friendly infrastructure.
    - Providing walking friendly infrastructure.

**4.3.42** The Black, Red and Purple routes are shown on Figure 4.3.

**4.3.43** The only change that prompted the June 2013 WelTAG appraisal was the availability of funding, which enabled a solution to the problems on the M4 to be delivered in a single phase. The problems faced and the potential options for

solving them had otherwise not changed. The previous appraisal work had assessed wide ranging options and considered their performance against similar criteria, and concluded that they were not solutions to the problems on the M4 around Newport. In summary, those appraisals had included consideration of routes to the north of Newport, widening of the M4, the use of the SDR and SAR, public transport (on its own) and other measures and it was considered that there was no need for these options to be reconsidered in the June 2013 WelTAG appraisal. Had the additional funding been applied to those other potential options, it would not have materially improved their performance against the relevant criteria as those other potential options had not previously been ruled out on grounds of cost.

**4.3.44** The June 2013 WelTAG appraisal contained a comparative performance of options. In summary, the appraisal showed that a dual carriageway on the Red Route did not perform as strongly as the motorway options, scoring less well than the motorway options against the Transport Planning Objectives. It also performed poorly on the Welsh Impact Area of environment. The Red Route option had significantly reduced capacity compared with the two motorway scenarios. By 2035, the Red Route would be expected to be operating at or near capacity. Provided that funding could be made available to deliver it as a single project, then a motorway solution would offer greater value for money and better meet the objectives than the Red Route.

**4.3.45** Comparing the two motorway options along the alignments of the Black Route and the Purple Route, both performed similarly against the Transport Planning Objectives and the Welsh Impact Areas but the Black Route was selected as the recommended option as it offered the strongest overall case, for the following reasons.

- Whilst costs are similar, the Black Route would be expected to produce higher economic benefits compared to the Purple Route, as it would be a shorter route for traffic, with associated lower journey times and would provide greater relief to the existing motorway.
- The Purple Route is closer than the Black Route to the residential area of Duffryn, including Duffryn High School.
- The Black Route had benefited from planning protection as a result of the publication of the TR 111 in 2006, whereas there were ongoing developments and potential further development sites along the alignment of the Purple Route.
- The Purple Route has an increased delivery risk, mainly associated with crossing the Docks Way landfill site. This would introduce a major risk in the development of the Purple Route alignment and indeed was one of the principal reasons the original ‘M4 Relief Road’ was developed along the line of the Black Route.

**4.3.46** In relation to public transport enhancement, studies relied on in the March 2013 and June 2013 WeITAG appraisals (Welsh Government, 2013 a, b) including the M4 CEM Public Transport Overview Report March 2012, updated in February 2013 (Welsh Government, 2013c) had shown that they would be likely to have only minimal impact in terms of reducing traffic on the M4. Generally, investment in public transport measures is more likely to be aimed at achieving wider benefits than relieving motorway traffic. The impact of appropriate elements of

the potential Cardiff Capital Region Metro (Metro) and rail electrification were considered in the February 2013 update and it was concluded that a reduction of less than 3% of traffic volumes would be expected on the M4 between Magor and Castleton. It was also concluded that in the event of a 100% increase in public transport usage occurring across the Newport area, this was likely to equate to a 5% decrease in traffic flows on the M4 around Newport.

**4.3.47** The June 2013 WelTAG appraisal set out that public transport enhancement would contribute to achieving some Transport Planning Objectives. It considered the initiatives already being progressed (including the electrification of the South Wales Main Line and Valley Lines railways and other public transport proposals) would be a catalyst for increased use of public transport. This was, however, within the context of the March 2013 WelTAG appraisal which outlined that whilst public transport improvements would contribute, they would not on their own be able to address the Transport Planning Objectives.

**4.3.48** It was also recommended in the June 2013 WelTAG that further consideration should be given to the Complementary Measures for the following reasons.

- The provision of a new section of motorway to the south of Newport would provide the opportunity to change the function of the existing M4 around Newport to better integrate it into Newport's road network. This would enable better access to/from the west (west Newport, Cardiff etc.) and from residential areas such as Caerleon/St Julians by potentially re-opening the western approaches to Junction 25.
- Re-classification of the M48/M4 as a trunk road from east of Magor to Tredegar Park/Castleton could create the potential to simplify the proposed interchanges at Magor and Castleton as part of a value engineering exercise.
- Provision of a road link between the M48 and the B4245 would result in benefits to users of the local road network and relief to Junction 23A.
- Provision of additional cycling and walking infrastructure within the M4 Corridor around Newport would encourage healthy lifestyle choices and social interaction as well as assisting in scene setting and place making.

**4.3.49** The conclusion of the June 2013 WelTAG appraisal was that the Welsh Government should progress the preparation of a draft Plan for the M4 Corridor around Newport and, subject to the availability of adequate funding, the following strategic options were considered worthy of further consideration for inclusion in a draft Plan.

- New section of 3-lane motorway between Magor and Castleton to the south of Newport along the line of the Black Route.
- Complementary Measures, including the following.
  - Reclassifying the existing M4 between Magor and Castleton.
  - An M4/M48/B4245 connection.
  - Providing cycle friendly infrastructure.
  - Providing walking friendly infrastructure.

**4.3.50** Following the Ministerial announcement on 26 June 2013 referred to above, an M4 Corridor around Newport SEA Scoping Report (Welsh Government, 2013d)

was prepared. Formal consultation on the SEA Scoping Report was undertaken between 9 July 2013 and 16 August 2013 with Cadw and Natural Resources Wales (NRW), as identified by Regulation 4 and required by Regulation 12(5) of the SEA Regulations. In addition, the Welsh Government chose to consult with Natural England and the Environment Agency due to the potential for cross border effects.

**4.3.51** In order to progress a draft Plan, the Welsh Government then proceeded to prepare the following documents for consultation, after taking into account the results of the scoping exercise.

- The draft Plan Consultation Document (Welsh Government, 2013e).
- The draft Plan - Equality Impact Assessment (Welsh Government, 2013f).
- The draft Plan - Health Impact Assessment (Welsh Government, 2013g).
- Consideration of the draft Plan with regard to the Habitats Regulations (Welsh Government, 2013h).
- Strategic Environmental Assessment (SEA) Environmental Report (Welsh Government, 2013i).
- Consultation Response Form (Welsh Government, 2013j).

**4.3.52** In accordance with the SEA Regulations, the Welsh Government decided upon its preferred strategy, in this case the draft Plan, with the main element being a new section of motorway to the south of Newport following the Black Route as identified in the June 2013 WelTAG Appraisal. The preferred strategy for the draft Plan also included the following Complementary Measures, as were recommended in the June 2013 WelTAG appraisal.

- Re-classify existing M4 between Magor and Castleton.
- M48 - B4245 Link.
- Provide cycle friendly infrastructure.
- Provide walking friendly infrastructure.

**4.3.53** The SEA Directive and SEA Regulations require the selection of 'Reasonable Alternatives' to a preferred strategy. In selecting 'Reasonable Alternatives', the Welsh Government's approach was that an option that could reasonably deliver the relevant objectives (i.e. overall, it performs reasonably against the Transport Planning Objectives and Welsh Impact Areas) would be a reasonable alternative, an approach which was agreed upon by Mr Justice Hickinbottom in his approved judgement on the Judicial Review brought by Friends of the Earth in March 2015 ([2015] EWHC 776 (Admin)).

**4.3.54** As a result of the above development work, two Reasonable Alternatives were selected from all the alternatives previously identified and appraised against the WelTAG criteria of the Welsh Impact Areas and Transport Planning Objectives.

- The Red Route - A new section of dual carriageway to the south of Newport following the Red Route as identified in the June 2013 WelTAG appraisal and which had been recommended for further assessment as Option A by M4 CEM June 2013 WelTAG appraisal.

- The Purple Route - A new section of 3-lane motorway to the south of Newport, along a similar route to the Red Route, albeit with minor differences to the alignment to minimise impact on Newport Docks operation and to reflect the requirements of motorway standards as was also identified in the June 2013 WelTAG appraisal.

**4.3.55** The Red Route was selected as a Reasonable Alternative because it was the only option recommended for further appraisal through the March 2013 M4 CEM WelTAG process (as Option A), which appraised a range of alternatives. It was also the only non-motorway option that had ever been recommended for further appraisal as a result of the March 2013 WelTAG appraisal.

**4.3.56** The Purple Route was selected as a Reasonable Alternative when taking into account the recommendations of the March 2013 M4 CEM and June 2013 M4 Corridor around Newport WelTAG appraisals. The June 2013 WelTAG appraisal demonstrated that the Purple Route performed better than all other alternatives, other than the Black Route, when considered against the Welsh Impact Areas and Transport Planning Objectives.

**4.3.57** As set out above, public transport, taking into account appropriate elements of Metro and rail electrification proposals, was not considered as a Reasonable Alternative because it did not perform sufficiently well against the Transport Planning Objectives and Welsh Impact Areas in the June 2013 M4 around Newport WelTAG appraisal. Nevertheless, the Welsh Government are separately progressing such measures due to their acknowledged city region benefits.

**4.3.58** The assessment also considered the consequences of a Do-Nothing or Do-Minimum scenario, which had been considered throughout the process of identifying a preferred solution for the M4 around Newport. Assessment made reference to the fact that during consideration of options at the draft Plan stage, the WelTAG Stage 1 appraisal report set out details of predicted traffic flows in a Do-Minimum scenario, which included recent network modifications and committed interventions (Welsh Government, 2013b). That report indicated that traffic flows on most road links would increase by 35 to 40% by 2035 (based on data collated in 2012). This would result in the M4 around Newport experiencing flows of above 100% capacity during weekday peak periods.

**4.3.59** The SEA Environmental Report identified adverse effects for the Do-Minimum scenario for most topic areas considered within the SEA, including air quality, climatic factors, noise, population, health and water (Welsh Government, 2013f). No beneficial effects were identified. The Do-Minimum scenario also performed poorly against the objectives.

**4.3.60** Between September and December 2013, the Welsh Government undertook a public consultation on its draft Plan and associated assessments. The public consultation built on previous development work and public consultation, which had helped shape the Welsh Government's draft Plan.

## Alternatives Considered during Consultation on the Draft Plan

**4.3.61** During the draft Plan consultation, some respondents put forward alternative solutions for the Welsh Government's consideration. These were appraised in the Strategic Appraisal of Alternatives Considered During Consultation report

(SAACC) (Welsh Government, 2014g). Suggested alternatives included the following.

- Grade-separated A48 Southern Distributor Road (SDR) and upgraded A4810 Steelworks Access Road (SAR) also known as the 'Blue Route'.
- Alignment of the motorway to the south of Magor.
- Alignment of the motorway to the west of Wilcrick Hill.
- Tunnel under the River Usk.
- Barrage across the River Usk.
- Tunnel widening at Brynglas.
- Motorway to the north of Newport.
- Public Transport.
- The 'Do-Nothing' Strategy.

### The Blue Route

**4.3.62** During consultation on the draft Plan, an alternative route was put forward by third parties, referred to as the Blue Route. The Blue Route was a combination of an upgrade to the A48 Southern Distributor Road (Highway Option C at the M4 CEM stage) and use of the Steelworks Access Road (Figure 4.4).

**4.3.63** Consideration was given to the Blue Route in the Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government 2014g). This report provides additional appraisal, building on that provided at the M4 CEM stage. The report concluded that:

- The Blue Route would provide some local accessibility benefits, particularly around the A48 SDR but could exacerbate problems at Junction 28 in particular unless a free flow junction was created.
- An upgraded A48 SDR and A4810 Steelworks access road would provide a degree of increased network resilience, particularly at times of accidents and delays on the M4.
- The cost of a Blue Route that aims to be attractive to motorway users would be high.
- As part of the development of the Steelworks access road, junctions have been provided/identified for access to Tata Steel and to future development areas. Therefore, an upgrade of this route to ‘expressway; or motorway standard would require a completely new scheme to be developed that would require land and property acquisition to provide the necessary standard, service roads and junctions.
- The optimal way to achieve delivery of a through route and a route that provides for local access is by separating out these functions and displacing the through route in order to achieve an acceptable motorway standard. This could be achieved through the Black Route, allowing the SDR to provide local access.
- Forecasts of future traffic volumes show that operational problems would continue to be experienced around Newport with the Blue Route in place.

- The risks of the Blue Route include greater economic, environmental and social impacts on communities, property and future development land allocations in the in the urban area of Newport.

**4.3.64** Overall, the report concluded that compared to the Black Route, the Blue Route would not provide a long term solution to the identified problems associated with the M4 around Newport. The Blue Route performed poorly compared to the appraisal of the Black Route.

### Alignment of the Motorway to the South of Magor

**4.3.65** During consultation on the draft Plan, an alternative alignment to the Black Route at Magor (to the south rather than the north of Magor) was proposed by third parties. Previous work had considered route alignment options. The Strategic Appraisal of Alternatives Considered During Consultation report (SAACC) (Welsh Government, 2014g) stated that extensive public and stakeholder engagement and consultation informed the decision not to progress a route to the south of Magor. The main reasons not to progress a route to the south of Magor included the following.

- A route to the north of Magor reduced the length of the new section of motorway across the Gwent Levels, including the Sites of Special Scientific Interest.
- A route to the north of Magor would be compatible with allocations of land for commercial, retail and industrial development.
- There would be increased traffic benefits from a route to the north of Magor and increased flexibility of traffic movements between the existing M4, M48 and the new section of motorway.
- Public consultation indicated an overall preference for a route to the north of Magor.

### Alignment of the Motorway to the West of Wilcrick Hill

**4.3.66** During consultation on the draft Plan, an alternative alignment to the Black Route was put forward. This suggested that the Black Route might divert west of Wilcrick Hill, Llanwern. The main reasons not to progress this option included the following.

- The alternative option would have a significant physical impact on the Tata steelworks and the development area at Glan Llyn and would have environmental impacts on receptors at these locations.
- The alternative route would impact on existing businesses in the Llanwern area.
- The route could have a significant impact on businesses and commercial property, leading to the loss of jobs. It could also affect the viability of planned residential and commercial development in the area.
- The alternative route would encroach onto an area of contaminated land.
- The alternative route would offer reduced network resilience as it would merge to the west of Junction 23A.

### Tunnel Under the River Usk

**4.3.67** During consultation on the draft Plan, the Welsh Government considered the potential development of a tunnel under the River Usk and Newport Docks along the approximate alignment of the Black Route. Tunnel options had also been considered in earlier studies. The main reasons not to progress this option included the following.

- A cut and cover/immersed tube tunnel was not considered to be feasible without significant impacts on the River Usk Special Area of Conservation. It would also significantly disrupt Newport Docks, severing the site during construction, and would disrupt the railway lines, the River Ebbw and be incompatible with a docks area junction. This was not therefore considered to be a viable alternative to a bridge crossing.
- A bored tunnel would be feasible but would not be able to deliver a junction on the west side of the River Usk in the docks area.
- A bored tunnel would have significantly greater capital construction costs, maintenance and operation costs than a bridge.
- The potential environmental effects of a tunnel would be dependent on further work but would be likely to include vibration (e.g. effects on migratory fish).
- The engineering risks would be high.

### Barrage Across the River Usk

**4.3.68** During consultation on the draft Plan, the Welsh Government considered the potential development of a barrage across the River Usk and Newport Docks along the alignment of the Black Route. The main reasons not to progress this option included.

- Conflict with existing commercial operations at Newport Docks and along the River Usk, leading to significant compensation requirements or closure of businesses.
- Compared to a bridge crossing, a barrage is likely to have the following environmental impacts.
    - Potential for significant adverse impacts on habitats within the river and therefore on the integrity of the Special Area of Conservation designation.
    - Potential for significant adverse impacts on the water environment.
    - Greater impacts on noise, air quality, cultural and historical assets and soils.

### Tunnel Widening at Brynglas

**4.3.69** As set out above, widening of the existing M4, including widening of the Brynglas tunnels, was considered as part of the Corridor Enhancement Measures (CEM) programme (as Option D). The CEM studies concluded that this option would not provide long term resilience to the motorway and trunk road network.

**4.3.70** During consultation on the draft Plan, a number of respondents suggested online improvements with widening of the tunnels at Brynglas. The Strategic Appraisal of Alternatives Considered During Consultation report considered potential

widening options that could be complementary to planned refurbishment of the Brynglas tunnels (Welsh Government, 2014g).

**4.3.71** The report concluded that widening options that could be complementary to planned refurbishment of the tunnels would provide a limited increase in capacity, with no or very little improvement to network resilience. Neither of the options considered would resolve the issues that discounted CEM Option D. The report concluded that online widening and an additional tunnel at Brynglas should not be progressed.

### Motorway to the North of Newport

**4.3.72** A motorway option to the north of Newport has been considered during the evolution of the Scheme. This included work related to the South Wales Area Traffic Study (SWATS), in addition to work undertaken in relation to the re-examination of route corridors in 2006 and the CEM programme. As set out above, corridors to the north of Newport were discounted because they offered significantly less benefits than the southern corridors, such as relief of traffic on the M4.

**4.3.73** During consultation on the draft Plan, a number of respondents suggested a route to the north of Newport. The Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g) reiterated the findings of previous work on this option, noting that a northern route corridor would be characterised by hills and valleys. The report set out the following reasons that a route to the north of Newport should not be taken forward.

- Initial appraisal indicated that a northern route would perform worse than options to the south as it would be nearly four miles longer, would cause major impacts on the landscape where it crossed the valleys and hillsides and would not attract sufficiently high levels of traffic from the existing M4.
- An alternative option would require extensive property demolition (approximately 70 residential properties) with a considerable impact on Caerleon.
- A northern route corridor would require significant numbers of crossing structures and substantial earthworks due to topography (the corridor is characterised by hills and valleys).
- Significant demolition of properties would be likely to be necessary to create a cutting for the road.
- The proximity to nearby human receptors would lead to impacts during construction and operational impacts in terms of greater noise and air pollution.
- The crossing of the River Usk would be located in an area where there are many receptors, leading to visual impacts.
- Traffic congestion could be redistributed to the west of Newport and Cardiff, with less opportunity to provide accessibility benefits to Newport and its key economic development areas.

### Public Transport

**4.3.74** Public transport enhancement measures have been considered at a number of key stages, including the following.

- The Common Appraisal Framework (CAF) study, which is described above and included consideration of enhanced public transport.
- CEM programme, which included packages that combined public transport, highway and other travel solutions.
- Public Transport Overview.
- M4 Corridor around Newport: draft Plan

**4.3.75** The work at each of the above stages identified that new or improved public transport services would be likely to have only minimal impact with respect to reducing traffic on the M4. However, it was recognised that public transport improvements should continue to be developed and/or promoted due to their acknowledged city region benefits.

**4.3.76** In response to consultation on the draft Plan, some respondents put forward public transport measures or investment in regional public transport services as an alternative solution. Some specifically mentioned the Cardiff Capital Region Metro and/or rail electrification in their responses, and suggested that improved public transport services could reduce the need for a new motorway to the south of Newport.

**4.3.77** The Welsh Government provided a response to the consultation in its Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). The report stated that public transport investment could encourage modal shift by increasing choice and recognised that the Welsh Government has established a task force to consider developing an integrated transport system, known as the Metro. This is likely to include some of the measures included within the CEM programme. In addition, the report noted that the electrification of the South Wales to London Mainline would be a catalyst for increased use of public transport. As such, improvements to public transport should continue to be developed and/or promoted.

**4.3.78** However, studies have shown that new or improved public transport services would only have minimal impact in terms of reducing traffic on the M4. Investment in public transport measures is more likely to be aimed at achieving wider benefits to the region than relieving motorway traffic.

**4.3.79** Overall, the report concluded that public transport enhancement measures were not considered a reasonable alternative to the draft Plan. Potential future public transport enhancement measures are considered to be complementary to a motorway solution. Public transport enhancement measures are being progressed separately by a group set up by the Welsh Government to examine proposals for a Cardiff Capital Region Metro system.

### The 'Do-Nothing' Strategy

**4.3.80** During consultation on the draft Plan, an alternative to the draft Plan was supported by some respondents, suggesting that doing nothing was their preferred strategy. A ‘Do-Nothing’ or ‘Do-Minimum’ scenario had been previously

considered at key stages during the development of the Scheme. A 'Do-minimum' scenario was included in the draft Plan consultation document. This option included only those measures that were already planned or committed.

**4.3.81** The report considered the 'Do-Minimum' option based on WelTAG criteria (Welsh Government, 2014g). This indicated that the 'Do-Minimum' scenario performed poorly against the goals for the M4 Corridor around Newport.

**4.3.82** Overall, a 'Do-Minimum' or 'Do-Nothing' option would have the following difficulties.

- Existing problems relating to congestion and capacity on the M4 around Newport would deteriorate further, with flows predicted to exceed 100% of capacity in the future.
- The existing M4 Corridor around Newport has safety issues in some sections, including alignments that fall below current motorway standards, a lack of hard shoulder, frequent junctions and accidents resulting from stop-start conditions. The 'Do-Minimum' scenario results in a range of issues relating to resilience on the M4 Corridor around Newport due to reduced ability of the transport network to respond to incidents, including accidents and other causes of delays.
- Congestion is considered a barrier to economic growth, affecting business performance and the wider economy. Congestion also results in higher journey times for commuters, reducing the effective travel to work area. Therefore, increasing congestion resulting from capacity and resilience problems mean that it performs poorly against economic criteria and could pose a constraint to the economy of South Wales.
- The option would not address existing noise and air quality concerns along the M4 (including existing Air Quality Management Areas). Higher traffic volumes on the M4 would contribute to poor air quality and to noise.

**4.3.83** Overall, the report concluded that there is a strong need to do something to address identified problems. Doing nothing, other than initiatives already planned or committed, was not considered a reasonable alternative to the draft Plan.

### Conclusion

**4.3.84** The strategic appraisal concluded that none of the suggested alternatives submitted during the consultation on the draft Plan were considered to be 'reasonable alternatives'.

## 2014 Plan for the M4 Corridor around Newport

**4.3.85** Taking into account the results of the public consultation and the assessments, on 16th July 2014, on behalf of the Welsh Government, the Minister announced the decision to adopt the Plan. The Plan included the following.

- A new section of motorway being built between Junctions 23 and 29 south of Newport.
- Complementary measures, to include the following.
    - a. Reclassifying the existing M4 between Magor and Castleton.

- b. An M4/M48/B4245 connection.
- c. Providing cycle friendly infrastructure.
- d. Providing walking friendly infrastructure.

**4.3.86** In accordance with the Post Adoption Procedures set out at Regulation 16 in Part 4 of the SEA Regulations, the Welsh Government published relevant documents including an SEA Post Adoption Statement (Welsh Government, 2014a).

## Summary

**4.3.87** As set out above, a range of alternatives to the Scheme were considered prior to adoption of the Plan. These alternatives can be considered into several groups, as follows.

- The 'Do-Nothing' or 'Do -Minimum' option.
- Improvements to existing infrastructure.
- Alternative route options.
- Other alternatives, including a tunnel under the River Usk and a barrage across the River Usk.

**4.3.88** The main reasons for the selection of the Scheme are summarised in Table 4.1. Further detail is provided in the Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g).

**4.3.89** Section 5 of the SEA Post Adoption Statement describes the reasons for the adoption of the Plan. The SEA Post Adoption Statement cross-referred to the Strategic Appraisal of Alternatives Considered During Consultation report.

## Table 4.1: Summary of Alternatives to a New Motorway and Alternative Route Options

| Alternative | Stages Considered | Main Reasons Alternative Not Considered Further |
|---|---|---|
| Do-Nothing or Do-Minimum Option | Considered throughout the process of identifying a preferred solution for the Scheme, including.<br>• WelTAG Stage 1 appraisal for Corridor Enhancement Measures (Welsh Government, 2013a).<br>• WelTAG Stage 1 appraisal for the M4 Corridor around Newport (Welsh Government, 2013b).<br>• SEA Environmental Report (Welsh Government, 2013i).<br>• Consultation responses to the draft Plan (Welsh Government, 2014g). | The WelTAG Stage 1 appraisal report for the draft Plan indicated that traffic flows on most road links would increase by 35 to 40% by 2035 for the Do-Minimum scenario.<br>The SEA Environmental Report identified adverse effects for the Do-Minimum scenario for most environmental topic areas, including air quality, climatic factors, noise, population, health and water. No beneficial effects were identified.<br>The Strategic Appraisal of Alternatives Considered During Consultation report concluded that doing nothing, other than initiatives already planned or committed, was not considered a reasonable alternative to the draft Plan. The main reasons for this included the following.<br>• Existing problems relating to congestion and capacity on the M4 around Newport would deteriorate further, with flows predicted to exceed 100% of capacity in future.<br>• There would be reduced resilience on the existing M4 due to increased traffic growth. This means that that there would be a reduced ability of the transport network to respond to incidents, including accidents and other causes of delays.<br>• Existing safety issues in some sections would not be addressed.<br>• Economic effects arising from congestion.<br>• Existing air quality and noise issues would not be addressed. Higher traffic volumes would contribute to poor air quality and to noise pollution. |
| **Improvements to Existing Infrastructure** | | |
| Public Transport Enhancements | Considered throughout the process of identifying a preferred solution for the Scheme, including.<br>• Common Appraisal Framework Study (CAF) (Welsh Office, 1999).<br>• WelTAG Stage 1 appraisal for Corridor Enhancement Measures (Welsh Government, 2013a).<br>• Public Transport Overview (Welsh Government, 2013c).<br>• WelTAG Stage 1 appraisal for the M4 Corridor around Newport (Welsh Government, 2013b).<br>• Consultation responses to the draft Plan (Welsh Government, 2014g). | • Minimal impact in terms of reducing traffic on the M4.<br>• Investment in public transport measures is more likely to be aimed at achieving wider benefits to the region than relieving motorway traffic.<br><br>Public transport enhancement measures were not therefore considered to be a reasonable alternative to the draft Plan (Welsh Government, 2014g). Potential future public transport enhancement measures are considered to be complementary to a motorway solution.<br><br>Public transport enhancement measures are being progressed separately due to their acknowledged city region benefits by a group set up by the Welsh Government to examine proposals for a Cardiff Capital Region Metro system. |

| Alternative | Stages Considered | Main Reasons Alternative Not Considered Further |
|---|---|---|
| Corridor Enhancement Measures | • Health Impact Assessment (Welsh Government, 2012b).<br>• Equality Impact Assessment (Welsh Government, 2012c).<br>• Strategic Environmental Assessment (SEA) Environmental Report (Welsh Government, 2012d).<br>• Strategic Habitats Regulations Assessment Screening Report (Welsh Government, 2012e).<br>• Strategic Habitats Regulations Statement to Inform Appropriate Assessment (Welsh Government, 2012f). | Options B, C and D were not taken forward for the following reasons.<br>• Option B: At grade junction improvements to the A48 Newport Southern Distributor Road (SDR). Conditions on the M4 were predicted to deteriorate for this option.<br>• Option C: Grade separated junction improvements to the A48 SDR. Whilst Option C would be likely to result in benefits, these would not be focused on relief to the M4.<br>• Option D: Online widening on the M4 between Junctions 24 and 29, including an additional tunnel at Brynglas. This option would not provide long term resilience to the motorway and trunk road network in south east Wales. It would also not contribute towards addressing the existing noise and air quality issues alongside the motorway in Newport.<br>On this basis, Option A (an additional road to the south of Newport) was the only highway option taken forward. |
| Tunnel Widening at Brynglas | Proposed during consultation on the draft Plan and considered in.<br>• WelTAG Stage 1 appraisal for Corridor Enhancement Measures (Welsh Government, 2013a).<br>• Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • The option attracted most opposition and/or challenge from respondents to the M4 CEM consultation, including strong concerns about its impact on property or land take.<br>• A number of properties would require demolition.<br>• Traffic modelling indicates that the critical link on the motorway would move further west to Junctions 26-27, where flows would exceed capacity before the design year.<br>• Motorway capacity and network resilience issues would only be partially addressed.<br>• Impacts during construction would be large and adverse and result in considerable disruption to local communities.<br>• The option would not address existing noise and air quality concerns, including Air Quality Management Areas. |
| **Alternative Route Options** | | |
| Alternative Routes to the North of Newport | • Welsh Trunk Road Forward Programme.<br>• Re-examination of Route Corridors 2006 (Transport Wales, 2006a).<br>• Corridor Enhancement Measures<br>• Assessment of Discarded Route Options (Welsh Office, 1993a).<br>• Review of Northern Route Adopting Reduced Standards (Welsh Office, 1993b). | • A northern route would perform worse than options to the south as it would be longer, would cause major impacts on the landscape where it crossed the valleys and hillsides and would not attract sufficiently high levels of traffic from the existing M4.<br>• The option would require extensive property demolition (approximately 70 residential properties) with a considerable impact on Caerleon.<br>• A northern route corridor would require significant numbers of crossing structures and substantial earthworks due to topography (the corridor is characterised by hills and valleys).<br>• Significant demolition of properties would be likely to be necessary to create a cutting for the road. |

| Alternative | Stages Considered | Main Reasons Alternative Not Considered Further |
|---|---|---|
| | • Consultation responses to the draft Plan (Welsh Government, 2014g). | • The proximity to nearby human receptors would lead to impacts during construction and operational impacts in terms of greater noise and air pollution.<br>• The crossing of the River Usk would be located in an area where there are many receptors, leading to visual impacts.<br>• Traffic congestion could be redistributed to the west of Newport and Cardiff, with less opportunity to provide accessibility benefits to Newport and its key economic development areas. |
| Red Route<br>Purple Route<br>Black Route | Assessed in:<br>• M4 Corridor around Newport WelTAG Appraisal Report Stage 1 Welsh Government (2013b).<br>• The draft Plan Consultation Document (Welsh Government, 2013e).<br>• The draft Plan - Equality Impact Assessment (Welsh Government, 2013f).<br>• The draft Plan - Health Impact Assessment (Welsh Government, 2013g).<br>• Consideration of the draft Plan with regard to the Habitats Regulations (Welsh Government, 2013h).<br>• Strategic Environmental Assessment (SEA) Environmental Report (Welsh Government, 2013i). | When assessed against the WelTAG criteria, which include economic, environmental and social factors, the Black Route with Complementary Measures performed strongly overall. Key factors in the selection of the Black Route included the following.<br>• The Red Route would have significantly reduced capacity compared to the two motorway scenarios and would attract less traffic. By 2035, the Red Route would be expected to be operating at or near capacity.<br>• The costs for the Purple and Black Routes would be similar. The Black Route would have the strongest performance against economic and social criteria, with the Black Route performing more attractively with less distance travelled and lower journey times.<br>• At the strategic level the Purple and Black Routes would perform similarly against objectives. However, when considered against the WelTAG objectives, the Black Route outperformed the Purple Route. This was principally due to the proximity of the Purple Route to the residential area of Duffryn, including Duffryn Hugh School and potential development areas.<br>• The Black Route has benefited from route protection through the TR111 process. The Purple Route therefore has an increased delivery risk.<br>• The Purple Route would require construction through the historic Docks Way landfill site. In addition, through the Docks and across the River Usk it is likely that the Purple Route would result in greater difficulties in accommodating the operational requirements of businesses reliant on using the Docks and the River Usk for trade. |
| Blue Route | Proposed during consultation on the draft Plan and considered in.<br>• Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • Potential to exacerbate problems at Junction 28 in particular unless a free flow junction was created.<br>• The cost of a Blue Route that aims to be attractive to motorway users would be high.<br>• Would require land and property acquisition to provide the necessary standard, service roads and junctions.<br>• The optimal way to achieve delivery of a through route and a route that provides for local access is by separating out these functions and displacing the through route in order to achieve an acceptable motorway standard. This could be achieved through the Black Route, allowing the SDR to provide local access. |

| Alternative | Stages Considered | Main Reasons Alternative Not Considered Further |
|---|---|---|
| | | • Forecasts of future traffic volumes show that operational problems would continue to be experienced around Newport with the Blue Route in place.<br>• The risks of the Blue Route include greater economic, environmental and social impacts on communities, property and future development land allocations in the in the urban area of Newport. |
| **Alternative Alignments for the Black Route** | | |
| Alignment south of Magor | Proposed during consultation on the draft Plan and considered in.<br>• Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • Increased length of the new section of motorway across the Gwent Levels, including the Sites of Special Scientific Interest.<br>• Potential conflict with allocations of land for commercial, retail and industrial development.<br>• Reduced traffic benefits from a route to the south of Magor and reduced flexibility of traffic movements between the existing M4, M48 and the new section of motorway.<br>• Public consultation indicated an overall preference for a route to the north of Magor. |
| Alignment to the west of Wilcrick Hill | Proposed during consultation on the draft Plan and considered in.<br>• Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • The alternative option would have a significant physical impact on the Tata steelworks and the development area at Glan Llyn and would have environmental impacts on receptors at these locations.<br>• The alternative route would impact on existing businesses in the Llanwern area.<br>• Therefore, the route could have a significant impact on businesses and commercial property, leading to the loss of jobs. It could also affect the viability of planned residential and commercial development in the area.<br>• The alternative route would encroach onto an area of contaminated land.<br>• The alternative route would offer reduced network resilience as it would merge to the west of Junction 23A. |
| **Other Alternatives Proposed** | | |
| Tunnel Under the River Usk | Proposed during consultation on the draft Plan and considered in.<br>• Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • A cut and cover/immersed tube tunnel was not considered to be feasible without significant impacts on the River Usk Special Area of Conservation. It would also significantly disrupt Newport Docks, severing the site during construction, and would disrupt the railway lines, the River Ebbw and be incompatible with a docks area junction. This was not therefore considered to be a viable alternative to a bridge crossing.<br>• A bored tunnel would be feasible but would not be able to deliver a junction on the west side of the River Usk in the docks area.<br>• A bored tunnel would have significantly greater capital construction costs, maintenance and operation costs than a bridge.<br>• The potential environmental effects of a tunnel would be dependent on further work but would be likely to include vibration (e.g. effects on migratory fish).<br>• The engineering risks would be high. |

| Alternative | Stages Considered | Main Reasons Alternative Not Considered Further |
|---|---|---|
| Barrage Across the River Usk | Proposed during consultation on the draft Plan and considered in. Strategic Appraisal of Alternatives Considered During Consultation report (Welsh Government, 2014g). | • Conflict with existing commercial operations at Newport Docks and along the River Usk, leading to significant compensation requirements or closure of businesses.<br>• Compared to a bridge crossing, a barrage is likely to have the following environmental impacts.<br>○ Potential for significant adverse impacts on habitats within the river and therefore on the integrity of the Special Area of Conservation designation.<br>○ Potential for significant adverse impacts on the water environment.<br>○ Greater impacts on noise, air quality, cultural and historical assets and soils. |

# 4.4 Scheme Design Alternatives

**4.4.1** Following the publication of the Plan and its associated assessments, the Welsh Government decided to modify the 2006 Preferred Route in July 2014. The decision making process that led to its modification and subsequent design development up to draft Orders stage is set out below.

## Design Alternatives Considered Prior to Publication of 2014 TR111 Notice

**4.4.2** As described above, on deciding to consult on its draft Plan and then adopt its Plan for the M4 Corridor around Newport (of which the main element is a new section of motorway to the south of Newport), the Welsh Government and its consultants undertook further work to test corridor and design alternatives at a scheme level.

**4.4.3** Building on the identification of the 'Black Route' as the preferred strategy in the Welsh Government's Plan, a Stage 2 DMRB assessment (Welsh Government 2014h, 2014i) and WelTAG Stage 2 appraisal (Welsh Government, 2014j) were undertaken of route options. The route was split into three sections (A to C, travelling west to east) and options were only considered for Section B, where route variations involved the crossing of the Newport Dock. The following options were considered.

- Section A – Black Route from Junction 29 at Castleton to the western end of the Newport Dock. This mainly followed the alignment of the 2006 TR111 route, protected for planning purposes. There was one proposed alignment option in Section A.
- Section B – Black Route crossing of the Newport Dock. There were six alignment options within Section B. These included options for a junction within the Newport Docks area and alternative alignments to cross the River Usk, described below.
- Section C – Black Route from the eastern end of the Newport Dock to Junction 23A at Magor. This mainly followed the alignment of the 2006 TR111 route, protected for planning purposes. There was one proposed alignment option in Section C.

**4.4.4** The alternative options considered for Section B are set out below.

### Dock Alignment Option B1

**4.4.5** Option B1 was based on the Plan's alignment (the Black Route), with a high level clearance over the River Usk and Newport Docks. The horizontal alignment allowed the construction of a bridge that spans the wetted channel of the River Usk. No new motorway junction would be provided in the Docks area.

### Dock Alignment Option B2

**4.4.6** Option B2 was also based on the Plan's alignment (the Black Route), with a high level clearance over the River Usk and Newport Docks. The alignment was the same as Option B1 but with a new motorway junction on to the A48 Southern Distributor Road (SDR).

### Dock Alignment Option B3

**4.4.7** Option B3 was based on the Plan's alignment (the Black Route), with a low level clearance over the River Usk and Newport Docks. The alignment was the same as Option B1 but with a new motorway junction on to the A48 SDR.

### Dock Alignment Option B4

**4.4.8** Option B4 was an alternative option proposed by the Association of British Ports (ABP), routed 600 metres to the north of the Black Route. This option would have a high clearance over the River Usk and Newport Docks. No new motorway junction would be provided. The alignment would require a bridge over the River Usk that would be likely to have piers in the river.

### Dock Alignment Option B5

**4.4.9** Option B5 was a variation on Option B4 with the same alignment routing 600 metres north of the Black Route but with a low level clearance over the River Usk and Newport Docks. The lower elevation would make it feasible to provide a new motorway junction. The alignment would require a bridge over the River Usk that would be likely to have piers in the river.

### Dock Alignment Option B6

**4.4.10** Option B6 was developed as an intermediate option between the Black Route and the ABP proposed alternative. Option B6 would have a low level clearance over the River Usk and Newport Docks and a new junction. It would have an alignment that would allow the construction of a bridge that spans the wetted channel of the River Usk.

### Selection of Preferred Route

**4.4.11** The six alternative options developed (Figure 4.5) all predominantly followed the 2006 TR111 protected route, with deviations in horizontal and vertical alignment in the vicinity of Newport Docks, as well as consideration of the provision of a motorway junction in this same location.

**4.4.12** Following initial assessment, the options were subjected to an initial sift to rationalise the number of options to be subjected to more detailed assessment. It was established that there were several key differentiators between the options in the vicinity of the docks. These related to the following.

- Structures – Route Options B4 and B5 would be restricted in terms of the form of bridge construction for the River Usk crossing and, as a result, were likely to place piers within the wetted channel of the River Usk (which is subject to international nature conservation designations).
- Geotechnics – Route Options B4, B5 and B6 would pass through the middle of the Docks Way landfill site. This would have significant impacts upon the landfill site, requiring large quantities of contaminated material to be moved around the site (for the southern portion of the tip) and also removed from the site to another facility (for the northern part of the tip). Initial assessment indicated that this would potentially use up the spare capacity of the existing facility, requiring a new facility to be sourced for Newport City Council.

- Construction issues – Options B4, B5 and B6 would have construction issues associated with constructing through the Docks Way landfill site. In addition, Options B4 and B5 were likely to require construction within the wetted river channel of the River Usk, which could potentially increase the construction programme for the bridge by up to a year.
- Environmental issues - There was a multi-disciplinary environmental preference for Options B1, B2 and B3 compared to Options B4, B5 and B6. Potential effects on cultural heritage assets, landscape, ecology, geology, hydrogeology, soils, materials, road drainage and the water environment support this conclusion. Options B4 and B5 were likely to require piers to be constructed within the wetted river channel of the River Usk, which is a European designated site for nature conservation (Special Area of Conservation).
- Costs – Route Options B4, B5 and B6 were significantly more expensive than Options B1, B2 and B3, principally as a result of the large costs associated with the excavation and transfer of significant quantities of contaminated material.

**4.4.13** It was clear that Route Options B4, B5 and B6 had a number of significant issues associated with them. Therefore, it was concluded, based on the results of the initial sift of options, that Route Options B4, B5 and B6 should not be progressed any further.

**4.4.14** Further traffic and economic assessment was undertaken for Route Options B1, B2 and B3. Option B1 was the least expensive option, but did not provide a junction connecting to the SDR. Provision of a junction within the area of the Docks was identified as important for Newport City Council and, therefore, Option B1 was rejected.

**4.4.15** Options B2 and B3 both provided the same level of function, with a neutral cost differential between them. However, Option B2 provided high level clearance over the Docks and the River Usk, which could reduce the impact to ABP operations and business operations along the River Usk. The low level clearance provided with Option B3 could adversely affect operations of North Dock and require potential extinguishment of some navigation rights along the River Usk north of the new bridge.

**4.4.16** Based on the findings of the Stage 2 assessment, including WelTAG assessment (Welsh Government, 2014j), Options B2 and B3 were identified for further appraisal, with Option B2 selected due to the allowance for high level clearance over the Docks and the Usk.

### Publication of Modified Preferred Route and TR111 Notice

**4.4.17** Following the design development and selection of a preferred option, the Welsh Government decided to modify the 2006 Preferred Route (TR111) to protect the preferred route for planning purposes. Both the modified TR111 and the Plan were published on 16 July 2014. The key reasons for the modifications were set out in a Statement of Reasons document (Welsh Government, 2014k) and are summarised below.

**4.4.18** The amended route takes into account the decision, as part of the Plan, to reclassify the existing M4 between Magor (Junction 23A) and Castleton (Junction

29) as a trunk road. This has enabled the earlier outline designs of the motorway interchanges at Magor/Rogiet (Junction 23) and Castleton, which were protected for planning purposes, to be reviewed.

**4.4.19** The review of the Magor/Rogiet junction has enabled the provision of a connection between the M4, M48 and the B4245 (see Figure 4.6). This would provide improved access to the Severn Tunnel Junction railway station (and park and ride facilities) and reduce the traffic travelling on the local road network.

**4.4.20** The opportunity has also been taken to review the intermediate junction locations to take into account the ongoing brownfield development at Glan Llyn on the east side of the River Usk and the regeneration proposals for central Newport on the west side of the River Usk.

**4.4.21** The proposed intermediate junction on the east side of the River Usk near Glan Llyn would connect into the upgraded A4810 Steelworks Access Road (SAR). This would provide access to the ongoing housing development, the proposed business park and Llanwern railway station, part of the Cardiff Capital Region Metro proposals.

**4.4.22** The proposed intermediate junction on the west side of the River Usk near the western boundary of Newport Docks would connect into the A48 Newport SDR. This would provide improved access to central Newport and the docks themselves.

**4.4.23** The July 2014 TR111 is shown on Figure 4.6.

## Design Alternatives Considered Prior to Publication of Draft Orders

### New Section of Motorway to the South of Newport

**4.4.24** As described in Chapter 1, the Welsh Government has awarded a Professional Services contract for the next stage of Scheme development and environmental surveys, including publication of draft Statutory Orders and up to any Public Local Inquiry.

**4.4.25** The conceptual or specimen design issued on award of the Professional Services contract was the same as that developed to determine the Preferred Route for which a TR111 was published in July 2014 (Figure 4.6). The main components of the conceptual design included the following.

- Castleton Junction – an all movements free flowing interchange to accommodate the existing M4 and M48 (to Cardiff) and the new section of M4.
- Magor Junction – an all movements interchange comprising a large gyratory to accommodate the slip roads to and from the existing M4 and the B4245 and a new smaller gyratory on the M48 to accommodate the M48 (from Chepstow) together with a new section of dual carriageway and a link between the two gyratories.
- An all movements junction comprising two underbridges at Docks Way from the new section of M4 and a link to the Southern Distributor Road.

- An all movements junction comprising a gyratory with two overbridges at Glan Llyn on the new section of M4 providing a link to the A4810 Steelworks Access Road.

**4.4.26** The main changes to the conceptual design prior to submission of the draft Statutory Orders (leading to the Scheme design for the new section of motorway to the south of Newport set out in Chapter 2) are described below.

Castleton Interchange

**4.4.27** The conceptual design proposed a free flow connection retaining the existing M4 on approximately its existing alignment. The conceptual design was reviewed with a view to reduce the impact on an existing high pressure gas main, reduce the land take and number of structures required and reduce the impact on properties.

**4.4.28** The adopted design would result in a simpler layout, which would be easier for motorists to understand, while retaining the same connections as the conceptual design. It would provide the following benefits.

- Provision of a horizontal and vertical geometry compliant with the requirements of the Design Manual for Roads and Bridges to give desirable visibility through the junction.
- Reduction of the number of major structures from six to four.
- Maintenance of three lanes in both directions during construction.
- Avoidance of the high pressure gas main.
- Facilitates a better cut and fill balance overall with other parts of the Scheme across the Wentlooge Levels.

**4.4.29** However, it is noted the adopted design would result in a greater overall footprint to the north of the existing M4, which results in a greater impact on agricultural land and farming enterprises to the north.

Alignment between Castleton Interchange and Church Lane

**4.4.30** The conceptual design proposed a vertical alignment falling from the Castleton Interchange using a 3% gradient before levelling to keep the alignment above ground to pass over Church Lane. This design would therefore require embankment throughout this section with the requirement for substantial fill material. With this arrangement in place, drainage would have been difficult to achieve, with Church Lane representing a low point.

**4.4.31** The conceptual design was reviewed, taking into account the desire to minimise the footprint, provide a more efficient drainage solution for Church Lane and to reduce traffic disruption for road users during construction.

**4.4.32** In order to take into account the above, the adopted design would increase the gradient from the Castleton Interchange to 4% to lower the vertical alignment of the new section of motorway, allowing Church Lane to pass over the new section of motorway on an overbridge. The overbridge would be constructed offline and so would reduce disruption for road users during construction.

### Green Lane/Percoed Lane

**4.4.33** In the conceptual design, Green Lane would have been diverted to the west of its current alignment to pass beneath the new section of motorway via a new underpass. The cycle route along Percoed Lane would have required a significant diversion onto Green Lane and through the new underpass before returning to Percoed Lane.

**4.4.34** The design was reviewed taking into account the desire to minimise the footprint, reduce the diversions required for non-motorised users and provision of adequate vertical clearance to high voltage overhead power lines.

**4.4.35** The adopted design would divert Percoed Lane over the new section of motorway on an overbridge to the east of its current alignment. Green Lane would be connected into Percoed Lane with shared use of the new overbridge. This arrangement would provide access for non-motorised users across the new section of motorway. This would substantially reduce the diversion on the cycle route compared to the conceptual design and the offline alignment would allow the route to be kept open throughout the construction period. However, the provision of a new overbridge would result in a visual impact.

**4.4.36** The conceptual design provided a perpendicular crossing of Lighthouse Road. This would result in a skewed crossing of the South Wales to London Mainline (approximately 70 degree). The design was reviewed with respect to impacts on the Gwent Levels Sites of Special Scientific Interest, reduce the footprint and consider the impact on residential areas, such as Duffryn.

**4.4.37** An alternative design was considered, which would result in the alignment crossing Green Lane 250 metres to the south west and a reduced skew structure (approximately 45 degrees), aligning the new section of motorway further from the residential area of Duffryn. However, this option would have resulted in alignment located further in to the Gwent Levels Sites of Special Scientific Interest and was not therefore taken forward.

### Lighthouse Road

**4.4.38** The conceptual design was based on using the existing road corridor for Lighthouse Road. This would have utilised a 1.5 metre high embankment in this region of the Gwent Levels, with the overbridge being approximately 8.5 metres above surrounding land. The resulting embankment would have an impact on existing property, farm and field accesses.

**4.4.39** The design has been reviewed taking into account the desire to maintain access to local properties and fields, reduce land take and disruption and simplify the sequencing of construction.

**4.4.40** The adopted design would realign Lighthouse Road to the west of its existing position with a bridge over new section of motorway. The residual carriageway from the existing Lighthouse Road would be retained to serve as an access road for an existing farm to the south of the new section of motorway and for field accesses for the land to the north. This design would enable the road to be kept open during construction with no temporary diversions required. The design would therefore have less impact on adjacent property, farm and field accesses. However, the realigned side road would create a larger highway footprint within the St. Brides Site of Special Scientific Interest and would have a greater impact

on the ditch habitat locally which is one of the special features of the designated site.

Wales Coast Path and New Dairy Farm Overbridge

**4.4.41** The conceptual design envisaged that the Wales Coast Path and the private means of access along Heol Pont-y-Cwcw would be diverted alongside the toe of the embankment of the new section of motorway, to the east, and pass beneath the proposed River Ebbw structure (see below). This would have carried the new section of motorway over the river, before returning westwards alongside the toe of the embankment on to its original alignment.

**4.4.42** The design was reviewed taking into account the desire to reduce the length of the diversion for non-motorised users and the private means of access.

**4.4.43** The adopted design provides an overbridge along the current alignment of Heol Pont-y-Cwcw. The Welsh Coast Path and the private means of access would be rerouted over the overbridge (see below). This would avoid a permanent diversion. However, the realigned side road would create a larger highway footprint within St. Brides Site of Special Scientific Interest and would have a greater impact on the ditch habitat locally which is one of the special features of the designated site.

River Ebbw Underbridge

**4.4.44** The conceptual design for the River Ebbw Underbridge incorporated a bridge crossing of the River Ebbw with a total length of 190 metres. This length was required to cross the River Ebbw, its western flood defence bund, an access track (to enable continuity for flood defence maintenance) and the Sea Wall Reen.

**4.4.45** A value engineering exercise was undertaken to review the design at this location taking into account the following aims.

- Reducing the size of the structure.
- Managing flood risk during construction of the west abutment.
- Reducing impact on the Sites of Special Scientific Interest.
- Maintaining access for Natural Resources Wales.
- Retaining the Wales Coast Path close to its existing course.

**4.4.46** The adopted design would shorten the River Ebbw structure by 21 metres, to 169 metres. This has been achieved by repositioning the west abutment closer to the River Ebbw. Consequently, the access track for flood defence maintenance would be severed and the Sea Wall Reen would be diverted into a separate culvert to the west of the River Ebbw Underbridge. As described above, the Wales Coast Path would be rerouted via Heol Pont-y-Cwcw and the New Dairy Farm Overbridge. Flood defence maintenance access would be maintained up to both the north and south sides of the River Ebbw Bridge. The adopted design would increase the amount of structure located within the Gwent Levels Sites of Special Scientific Interest. In both designs approximately 90 metres of existing reen habitat, one of the special features of the Sites of Special Scientific Interest, would be lost either due to culverting (the adopted design) or beneath the River Ebbw bridge structure (conceptual design).

### Docks Way Junction

**4.4.47** The conceptual design for the Docks Way Junction involved a grade separated roundabout junction at the south east corner of the Docks Way landfill site. It was established that the location of the conceptual junction would mean that the slip roads would affect the River Usk Crossing structure. An alternative design was developed taking into account the desire to reduce the impact on Newport Docks, reduce the number of structure and simplify the construction methodology for the River Usk Crossing.

**4.4.48** The adopted design would reposition the grade separated roundabout approximately 250 metres to the east of the conceptual design location. This design requires one less underbridge and would have less impact on the operational land and premises within Newport Docks. A beneficial consequence of adopting the alternative junction location and design is that it would enable the alignment for the new section of motorway to be straightened over the River Usk Crossing (see below). However, the new location also requires a wider bridge over the River Ebbw to accommodate slip roads with a consequential slight increase in land take from the St Brides Site of Special Scientific Interest on the west bank of the Ebbw. No reen or ditch habitat would be directly affected by this increase.

### River Usk Crossing

**4.4.49** The conceptual design for the River Usk Crossing was based on a skewed structure of 57 degrees, resulting in a main span of 500 metres in order to ensure that the piers were not located within the wetted channel of the river and therefore ensure that there is no effect on the integrity of the SAC.

**4.4.50** The design was reviewed taking into account the desire to simplify the approach to construction, minimise adverse impacts on the River Usk and consider impacts on Newport Docks and Stephenson's Industrial Estate.

**4.4.51** The adopted design would reduce the horizontal skew of the River Usk Crossing structure by 5 degrees. The change straightens the horizontal alignment over the bridge, thereby removing curvature from the main span and the back spans of the bridge. This would result in a simpler construction approach for the River Usk Crossing. The main span would be reduced in length from approximately 500 metres to approximately 440 metres. Two disadvantages of the adopted design were identified. These include the east tower of the structure being located closer to the river edge of the saltmarsh and a greater impact on Stephenson's Industrial Estate.

**4.4.52** In addition to straightening the skew of the bridge, the highway drainage outfall has been redesigned to enable the eastern half of the bridge to drain more directly to the River Usk which alleviates the need for a much larger Water Treatment Area within the Sites of Special Scientific Interest adjacent to Nash Road. Such drainage would be via pollution control measures on the bridge and a Water Treatment Area so as to ensure that there is no impact on the integrity of the SAC.

### Electrical Infrastructure

**4.4.53** The horizontal and vertical alignment of both the conceptual design and the current design come close to a number of high voltage overhead electricity line pylons at three locations: in the vicinity of Green Lane; in the vicinity of Meadows Road; and at North Row.

#### *Green Lane*

**4.4.54** In the vicinity of Green Lane, the proposed new section of motorway would be on embankment to pass over the South Wales to London Mainline. However, a National Grid high voltage overhead electricity pylon line would pass over the new section of motorway in this location, which has required the new motorway embankment to be lowered.

#### *Meadows Road*

**4.4.55** The conceptual design passed to the south of the Solutia industrial area and to the south of the Meadows Road/Nash Road intersection before passing to the north of Whitson substation. This alignment would have affected a Western Power high voltage overhead line pylon. This power line supplies the Severn Tunnel pumping station.

**4.4.56** The alignment at this location was therefore reviewed. The adopted design includes a realignment to the north to avoid the pylon, such that no diversion of the overhead line/replacement of the pylon would be required. This would move the alignment closer to a business trading as International Automotives Components (IAC). This would result in a loss of car parking (see Chapter 15).

#### *North Row*

**4.4.57** The conceptual design would have required the diversion of North Row by approximately 15 metres to the east of its current alignment. Through discussions with National Grid and Western Power, it has been established that the conceptual design for North Row would impact upon a series of overhead high voltage power lines.

**4.4.58** An alternative alignment was developed and subsequently included in the adopted design for this section of new motorway (see Chapter 2), that realigns North Row approximately 350 metres to the west. This revised alignment would tie into the A4810 Steelworks Access Road at the existing roundabout. The North Row diverted alignment would pass over the new section of motorway on an overbridge before tying back into the existing North Row. This alignment would avoid impacts on the overhead lines and pylons. However, it would result in a slight increase in the highway footprint within Redwick & Llandevenny Site of Special Scientific Interest and Whitson Site of Special Scientific Interest and a consequential increase in loss of length of reen habitat of approximately 85 metres.

### Nash Road and Meadows Road

**4.4.59** The conceptual design would have required a diversion for Nash Road to the west of its current alignment, crossing the new section of motorway on an overbridge. However, Nash Road to the north of its intersection with Meadows Road is speed restricted and has traffic calming measures in place opposite

Liswerry High School and Coleg Gwent. It is therefore unsuitable to act as the main through route for traffic.

**4.4.60** The adopted design provides a diversion to the east of Meadows Road. This would connect Nash Road, to the south of the new section of motorway, to Meadows Road to the north of the new section of motorway. In addition, it is proposed to open a new link to connect Nash Road and Meadows Road by extending the existing Nash Mead to form a new junction with Nash Road. This arrangement would result in a better and shorter connection between Nash Road and Meadows Road and require a smaller highway footprint. However, the adopted design requires a small area of land within the Nash & Goldcliff Site of Special Scientific Interest and the loss of approximately a 25 metre length of reen habitat from St. Julians Reen. The length of ditch habitat impacted upon however would be substantially less with the adopted design.

Glan Llyn Junction

**4.4.61** The conceptual design for the Glan Llyn junction provided a grade separated roundabout junction immediately to the east of Monks Ditch with a new dual carriageway link road connecting the new section of motorway to the existing roundabout on the A4810 Steelworks Access Road.

**4.4.62** The location of the junction in the conceptual design resulted in slip roads passing through an area of contaminated land. In addition, there are two sets of overhead power lines crossing the new section of motorway to the east of Monks Ditch. The supporting structures for the overhead line would have been affected by the location of the slip roads in the conceptual design.

**4.4.63** The design of the junction was therefore reviewed taking into account the desire to reduce effects on the existing overhead power lines and reduce the volume of contaminated land to be excavated, whilst minimising the effect on the Sites of Special Scientific Interest.

**4.4.64** The adopted design has relocated the junction approximately 400 metres to the west of the conceptual design location. A new link road would be provided (as in the conceptual design) but the new alignment would require a structure over Monks Ditch. These changes to the design would result in a reduced impact on the existing area of contaminated land and would avoid the conflict with overhead power lines. Although there would be a slightly greater land take from the adjacent Sites of Special Scientific Interest the overall local loss of lengths of reen habitat from Chapel Reen and Monks Ditch together with those of the ditches affected locally would be very similar in extent.

Green Moor Lane

**4.4.65** Green Moor Lane provides vehicle access to land and allotments on the eastern side of the Steelworks Access Road near Magor. There is no through access to Magor. The conceptual design envisaged that Green Moor Lane would be diverted south to cross the proposed new section of motorway underneath the proposed Llandevenny Railway Underbridge. This would have required the proposed railway bridge to be designed for a wider span to accommodate Green Moor Lane. A vehicle height restriction is currently in place on Green Moor Lane, which would have been maintained.

**4.4.66** The alignment for the conceptual design would have been relatively poor, with tight bends either side of the location where Green Moor Lane would pass through the proposed railway bridge. In addition, the realigned Green Moor Lane would have required cars to travel immediately adjacent to a live railway.

**4.4.67** The design was reviewed and an alternative arrangement was proposed. The adopted design provides a diversion of Green Moor Lane but one that is reduced in scale to accommodate only non-motorised users. This would be supplemented by a new vehicular access to the land and allotments on the eastern side of the Steelworks Access Road from Blenheim Close in Magor. In addition, it would allow the span of the Llandevenny Railway Underbridge to be reduced and for improved safety for non-motorised users.

### Water Treatment Areas

**4.4.68** The conceptual design proposed twelve Water Treatment Areas at regular intervals along the route of the new section of motorway between Junctions 29 and Junction 23.

**4.4.69** In the current adopted design, the number, location and size of the Water Treatment Areas have been rationalised, including moving them at the request of Natural Resources Wales where practicable to the north side of the new section of motorway across the Gwent Levels. The advantage of the changes is to reduce the amount of land required within the Gwent Levels Sites of Special Scientific Interest on the south side of the new section of motorway thereby minimising potential impacts on the greater part of the designated sites.

### Magor Interchange

**4.4.70** Unlike the 2006 Preferred Route for the new section of motorway to the south of Newport, in which the Magor Interchange comprised two connected but distinct and geographically distant elements to the west and east of Magor, the conceptual design comprised a single all movements junction to the east of Magor adjacent to Llanfihangel near Rogiet. A large gyratory was located below the level of the existing M4 which incorporated the B4245 on its current alignment and allowed for all movements between the M4, the B4245 and the gyratory. Another smaller, slightly elevated gyratory was located to the east of Bencroft Lane on the M48 to enable connections between the existing M48, the new dual carriageway that would connect to the existing M4 west of J23 and, via a short link, the larger gyratory. Bencroft Lane would have remained open on its existing alignment.

**4.4.71** In the adopted design, the large gyratory has been moved to the location of the small gyratory on the M48 described above and the small gyratory has been discarded. The location and complex design of the single gyratory enables all movements between the existing/new M4, the new dual carriageway, the M48 and the B4245 except for the west bound slip road from the existing M4 and a free flow movement westbound between the existing M4 and the new dual carriageway. The eastbound movement from the new dual carriageway and the existing M4 would pass through the new gyratory via a hamburger arrangement. Bencroft Lane would be realigned around the new gyratory. The main Water Treatment Area for the interchange has been brought within the loop created by the M4 west bound exit slip road. The advantage of the adopted design over the conceptual design is that it facilitates better traffic movement through the

interchange. The main disadvantage of the adopted design, apart from its complex design, is its land take from and direct impact on the Llanfihangel near Rogiet Conservation Area and the visual impact of the free flow link on residences in Magor.

### Highway Drainage

**4.4.72** The conceptual design proposed a grass lining for the impermeable channels either side of the motorway. The grass within the channels would provide an initial pollution treatment to the surface water before it entered the Water Treatment Areas and would also act to slightly reduce the velocity of surface water, reducing entry rates into the Water Treatment Areas. The grass lined channel would have to be cut three times a year to achieve the recommended length as set out in the Design Manual for Roads and Bridges.

**4.4.73** An alternative solution that replaced the grass lined impermeable channel with a rockfill channel was rejected as the benefits of lower maintenance (no grass cutting) and a slight water quality improvement (by entrapping sediments in the rockfill layer) would, on balance, not outweigh the environmental benefits of the grass-lined option.

### Reen Mitigation

**4.4.74** The conceptual design for reen mitigation across the Gwent Levels was to provide new lengths of reen along on both sides of the new section of motorway to mitigate those lengths lost to the footprint of the road. These replacement lengths would connect to the existing reens and ditch network to maintain hydraulic connectivity. During consultation, Natural Resources Wales expressed concern about the length of replacement reen being proposed due to potential maintenance requirements and the possible drying out of land due to the much higher density of drainage channels. Consequently, an alternative solution has been adopted, providing reen connectivity on one side of the mainline.

**4.4.75** The alternative solution incorporated into the current design provides a combination of reens and smaller field ditches that reflects the existing historic landscape. The solution has replacement reens along the north side of the new section of motorway to allow conveyance of rainfall flows in a flooding event, with smaller field ditches to the south of the mainline. Where existing ditches run adjacent to field ditches, the field ditches are omitted.

### Highway Cross Section and Fence Line

**4.4.76** In the conceptual design, the highway fence line was located 3 metres from the toe of the highway embankments in accordance with the standard design set out in the Design Manual for Roads and Bridges. In the current design, that 3 metres offset has been reduced to 1 metre across the Gwent Levels, which decreases the amount of highway land outside of the highway fence line within the Gwent Levels Sites of Special Scientific Interest by approximately 3 hectares.

**4.4.77** Further details of alternatives considered since the contract award in terms of alignment, side roads, junctions, structures, drainage, highway boundary treatments and non-motorised users are provided in the M4 Corridor around Newport Design Options Report (Welsh Government, 2015).

# 4.5 Complementary Measures

## Reclassification of the Existing M4

**4.5.1** The carriageway of the reclassified M4 would be subject to a National Speed Limit generally with an exception of a 60 mph speed limit in some sections of the mainline. Further details are provided in Chapter 2.

**4.5.2** The alignment and geometry is constrained by the following.

- Existing highway boundary.
- Presence of multiple structures.
- Presence of existing gantries and signage.
- Existing pavement extents.
- Location and pavement extents of existing slip roads.

**4.5.3** No design alternatives have been tested. The Welsh Government project brief required that the works to reclassify the existing motorway retained the existing highway boundary. Given the constraint, any alignment adjustments are not practicable.

## Interchanges and Junctions (J23A to J29A)

**4.5.4** Fully compliant merge and diverge road layouts have been tested. In a number of locations, these did not meet the constraints of sitting within the existing highway boundary or provide sufficient capacity to meet general network resilience requirements in terms of space allowance for traffic management or periodic flows in excess of those forecast due to special circumstances.

**4.5.5** Generally the existing road layouts would be retained with minor geometrical enhancements to improve safety that are facilitated by the reclassification. At the following locations, the proposed road layouts would differ from the existing.

- Junction 28, where lane drop and lane gain layouts (with ghost islands) would be used on all diverges and merges to provide additional diverge or merge capacity.
- Junctions 25 and 25A where the existing east facing Junction 25A slip roads would be stopped up, and replaced by west facing slip road accesses to Junction 25. A lane gain layout would be applied to the eastbound merge to provide the additional lane required for climbing St Julians Hill. The westbound diverge to Junction 25 would benefit from widening to provide an additional lane to cater for the traffic of both Junction 25 and 25A.
- The roundabout at Junction 25 would be signalised to provide capacity for the various traffic movements.
- At Junction 24 the existing eastbound diverge would be enhanced with the introduction of a ghost island to separate diverging movements to the side road network. The other slip roads at Junction 24 would be modified to reduce the mainline to two lanes.
- Junction 23A where the existing road layout would be modified to reduce the mainline to two lanes.

**4.5.6** The final road layout for each merge or diverge has been chosen for the following reasons.

- The layout meets the requirements of the Welsh Government with respect to retaining the existing highway boundary.
- The proposed design will require far less intrusive work than for a fully compliant scheme, which will result in: lower costs; less traffic disruption; and a lower overall environmental impact.

## 4.6 Summary

**4.6.1** This section has highlighted the key design iterations considered since the publication of the Plan. The decision making process has been based on a range of considerations, including engineering and environmental considerations. Key factors affecting the selection of the adopted design have included the following.

- The special features of the Gwent Levels Sites of Special Scientific Interest, to minimise the effects of the new section of motorway on them and the desire to minimise land take from these designated sites as far as possible.
- Consultation with stakeholders, such as Natural Resources Wales (for example, in relation to the reen mitigation strategy).
- Existing features, such as existing infrastructure (such as overhead lines and gas mains) and contaminated land.
- Existing land uses, including Newport Docks.
- Connectivity, alignment and drainage of the existing local highway network.
- Maintenance of existing routes used by motorised and non-motorised users, where practicable and the desire to reduce the length of route diversions.
- Maintenance of access to property and land.
- Reduction of disruption, including route closures, during the construction phase.

## 4.7 Conclusion

**4.7.1** This chapter outlines the main alternatives considered during the evolution of the Scheme. In addition, it sets out the main reasons for the selection of the key elements of the Scheme, taking into account environmental effects.

**4.7.2** The process has considered a 'Do-Nothing'/'Do -Minimum' scenario, alternatives to a motorway solution, alternative route options and alternative design solutions. Consideration of 'Do -Nothing' or 'Do-Minimum' options confirmed that there is a strong need to do something to address identified problems for the M4 Corridor around Newport. Doing nothing, other than initiatives already planned or committed, was not considered to offer a reasonable alternative to the draft Plan.

**4.7.3** Taking into account the previous assessment work, the Welsh Government identified a new section of motorway to the south of Newport (known at that time as the Black Route), together with Complementary Measures, as its draft Plan in

2013. The draft Plan identified two reasonable alternatives to this option: the Red Route and the Purple Route.

**4.7.4** The Red Route was a non-motorway (dual carriageway) option. Assessment identified that this option did not perform as strongly as the two motorway options, with significantly reduced capacity and would attract less traffic from the M4. The conclusion was that, provided that funding could be made available to deliver it as a single project, a motorway solution would offer greater value for money and better meet the objectives for the M4 Corridor around Newport.

**4.7.5** The Purple Route offered an alternative route for a new section of motorway. However, assessments concluded that the Black Route performed more strongly than the Purple Route. A range of factors were considered, including distance travelled, journey times, proximity to the residential area of Duffryn and impacts on Newport Docks and the River Usk. Taking into account the constraints identified, consultation responses and the likely effects of the options considered, the Black Route was selected as the preferred route corridor.

**4.7.6** Following adoption of the Plan and modified Preferred Route (TR111), work has continued in relation to design options for the Scheme. A range of factors has been taken into account in order to identify the Scheme that forms the subject of the draft Statutory Orders and described in Chapter 2 of this ES. These factors have included existing constraints and environmental features, together with the findings of consultation undertaken during the Scheme design and EIA process.

**4.7.7** Overall, it is considered that the Scheme represents the most appropriate option to address the existing problems on the M4 Corridor around Newport in terms of environmental, infrastructure, engineering and land based constraints.