

Welsh Government

**A40 Llanddewi Velfrey to Penblewin  
Improvements**

Environmental Statement Chapter 22:

Management of Environmental Effects

A40LVP-RML-EAC-SWI-RP-LE-0005

P04 | S4

12/03/19

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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## 22 Management of Environmental Effects

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### 22.1 Introduction

22.1.1 The Environmental Impact Assessment (EIA) carried out for this project, reported in the topic chapters of this Environmental Statement (ES), identified the following matters that need to be addressed in detailed design, construction and aftercare:

- a) Potentially significant effects associated with the Scheme;
- b) Strategies to avoid, reduce or remedy (mitigate) these adverse environmental effects.

22.1.2 Ensuring that commitments to comply with the law and to provide mitigation are fulfilled during design, construction and operation of this project, is a binding requirement on Welsh Government. A contractor will be appointed who will be responsible for design and construction of the Scheme. Welsh Government will require the contractor to:

- c) Conform with relevant legislation;
- d) Satisfy national policy and standards;
- e) Fulfil project-specific commitments;
- f) Provide mitigation as it is set out in the ES and associated documents and appendices;
- g) Implement a programme of monitoring to demonstrate that mitigation measures are effective.

### Environmental Management

22.1.3 Ensuring compliance with environmental commitments is a process known as Environmental Management which is delivered through the operation of an Environmental Management System (EMS). The EMS is a procedure run by an organisation to ensure that its activities are carried out in a manner that is compliant with legislation and its own environmental policy and commitments.

22.1.4 The requirements of the EMS are applied to a specific construction project through a Construction Environmental Management Plan (CEMP). Of key importance in a CEMP is that there would be specific project objectives and many commitments that apply to that project.

- 22.1.5 The contractor will be expected to ensure that the project is effectively managed, environmental impacts are minimised. Contractors will have an environmental policy and will be required to maintain an Environmental Management System (EMS) in compliance with ISO 14001 and ISO 14004 is recognised.
- 22.1.6 The EMS sets out:
- a) Commitments to continuous improvement, sustainable construction objectives, prevention of pollution and waste, compliance with legislation and requirements of Statutory Environmental Bodies;
  - b) The framework for setting and reviewing objectives and targets;
  - c) A monitoring and review process that audits and reports on compliance;
  - d) The basis for the future operation and maintenance of the completed Scheme.
- 22.1.7 For a construction project these matters are set out in a Construction Environmental Management Plan (CEMP).

## **22.2 The Construction Environmental Management Plan (CEMP)**

- 22.2.1 The Contractor will prepare the CEMP to set out a plan of work which is often brought together into an overall plan for the project that also deals with contractual matters, quality and health and safety. Table 22.1 sets out the stages of development of CEMP. The CEMP would not only address the environmental commitments and mitigation requirements, but also set out plans for procurement, energy use and waste management activities are subject to continual improvement.
- 22.2.2 Understanding the approach to construction of the Scheme is important when preparing the CEMP. The plans for construction would include a construction programme which describes the sequence of activities required to complete the construction contract. Construction activities have been considered in each of the environmental topic chapters of this ES. For this Scheme the approach to construction is set out in Chapter 2, Section 2.3 of this ES.
- 22.2.3 The following would be set out in the CEMP:
- a) targets and commitments to continual improvement, sustainable construction objectives, prevention of pollution and waste,

compliance with legislation and the requirements of Statutory Environmental Bodies;

- b) framework for setting and reviewing objectives and targets;
- c) monitoring and review process that audits and reports on compliance;
- d) guidance for the future operation and maintenance of the Scheme.

22.2.4 A highly important function of the CEMP is alert the Contractor's site personnel, and those of his sub-Contractors and suppliers, to the following:

- a) good practice and statutory guidance;
- b) the need to comply with the EMS;
- c) the significance of actual or potential environmental impacts;
- d) list the mitigation outlined in the ES that the contractor and the maintaining agent are required to implement;
- e) the consequences of construction activity;
- f) the performance benefits of raised environmental awareness of personnel;
- g) personnel roles and responsibilities in meeting the requirements of the EMS including remedial and emergency procedures;
- h) the potential consequences of departure from operating procedures;
- i) environmental hold points at which construction work shall cease until the ECO agrees that work can proceed.

22.2.5 The following list describes how the components of this written document are used by the Contractor's construction team to be as informative and useful as possible:

- a) The main reference document for environmental matters so that continuity of knowledge is maintained between each stage of the project: route selection, preferred route design, detailed design, construction, the maintenance and operation;
- b) Identify the key staff structures and responsibilities associated with the delivery of the project and environmental control and communication and training requirements as necessary;
- c) Record environmental risks and identify how they will be managed during the construction period;
- d) Record how the requirements of environmental legislation, policy, good practice, regulatory authorities, third parties and project objectives are to be met;

- e) Record how commitments, mitigation measures and the environmental design are to be implemented and to gather evidence of completion and the date of achievement;
- f) Provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action will take place.

### Sequence of CEMP development

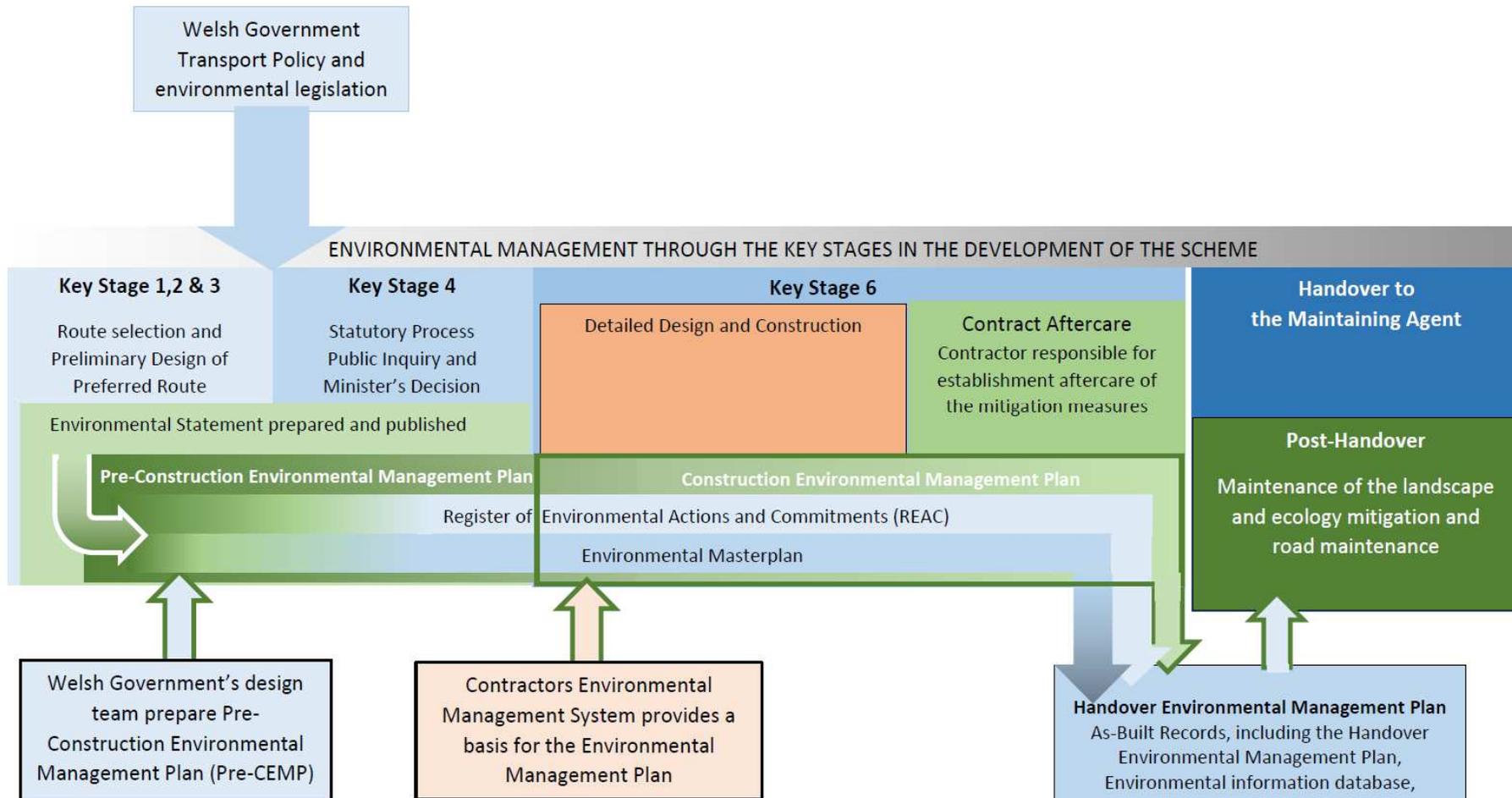
22.2.6 As knowledge about the Scheme continues to grow the CEMP goes through a development sequence which is set out in Table 22.1 and shown diagrammatically in Table 22.2.

Table 22.1 Sequential development of the CEMP

| Key Stage of project | Description                             | Status  | Responsibility               |
|----------------------|---|---|------------------------------|
| Key Stage 0          | Shaping of strategy                     | None  | Welsh Government             |
| Key Stage 1          | Identification and selection of options |   |                              |
| Key Stage 2          |   |   |                              |
| Key Stage 3          | Preliminary design                      | (Pre-CEMP)<br>Pre-construction environmental management plan<br>(refer to Section 22.3 below) | Designer                     |
| Key Stage 4          | Statutory procedures and powers         |   |                              |
| Key Stage 5          | Preparation for construction            | (CEMP)<br>Construction environmental management plan and aftercare management plan            | Contractor (to be appointed) |
| Key Stage 5/6        | Construction and aftercare              |   |                              |
| Key Stage 6          | Handover                                |   |                              |
| Key Stage 7          | Operation and maintenance               | (AMP)<br>Aftercare Management Plan  | Maintaining Agent            |

22.2.7 A pre-contract working draft of the CEMP (Pre-CEMP) has been compiled for handover to the Contractor. A copy is provided in Volume 3 Appendix 2.2. The Contractor will adopt, refine and expand the Pre-CEMP into a ‘live’ construction version so that it will contain all current environmental management plans, method statements, permits, relevant licences, certificates, health & safety plans, the register of environmental commitments, quality assurance procedures, and any other relevant documentation the site environmental team require in order to manage the site effectively.

Table 22.2 Showing how the various stages in the development of the CEMP provide continuity of knowledge through the project from the publication of the Environmental Statement through to the post-completion handover of the completed Scheme for operational maintenance.



## 22.3 Pre-construction CEMP (Pre-CEMP)

22.3.1 A Pre-CEMP has already been prepared as part of this ES to form the framework that the contractor would adopt throughout the construction and aftercare stage. Subsequently the maintenance organisation will make use of the information in operational maintenance of the Scheme.

22.3.2 The Pre-CEMP ensures that the environmental constraints, challenges and risks of construction are identified, assessed, understood, planned for and satisfactorily addressed. A list of the Management Plans which will be provided by the appointed Contractor are listed in Table 22.3. It is anticipated that there will be further management plans and method statements required as the design of the Scheme progresses.

Table 22.3 Annexes within ES Volume 3 Appendix 2.2 Pre-CEMP

| Proposed title                                     | Description   |
|--|---|
| A Regulatory Framework                             | A list of the legal statutory requirements for construction staff working on this Scheme.   |
| B Preliminary List of Permits/Consents             | A list of the statutory consents and permits required before construction can proceed. Some items will be subject to seasonal requirements.   |
| C Invasive Species Management Plan                 | Identifies which invasive species have been identified on site and the procedure for construction works on how to deal with invasive species.   |
| D Outline Pollution Control and Prevention Plan    | Identifies the main risks of pollution during construction and the prevention measures which should be implemented to prevent or reduce the effects.  |
| E Outline Site Waste Management                    | Plan Site Waste Management Plan (“SWMP”), used to plan, implement, monitor and review waste minimisation and management on construction sites. The plan can be based on the Waste and Resources Action Programme’s (“WRAP”) SWMP template;  |
| F Outline Ground and Surface Water Management Plan | Developed in consultation with Natural Resources Wales (NRW). It describes the design of each element of surface water management system required to manage surface water runoff during construction and potential risks to surface waters. It would include, consideration of temporary storage and settlement requirements to manage waterborne sediment, |

| Proposed title                                     | Description  |
|--|--|
|  | water quality criteria to ensure any discharge to receiving watercourses meets regulatory requirements.  |
| G Outline Materials Management Plan (MMP)          | The Scheme's Materials Management Plan ("MMP") would detail how all construction phase materials (material resources and waste) would be managed, developed and implemented by the appointed Contractor and provides a framework which will be used as a basis from which to develop the Scheme's MMP. |
| H Outline Cultural Heritage Management Plan (CHMP) | Informed by the outcome of the EIA, the CHMP should contain detailed method statements for the Scheme construction (from survey, machine excavation, hand-excavation, environmental sampling etc. to office-based activities such as finds processing, database use, reporting etc.).                  |
| I Outline Ecological Management Plan               | This outline plan sets out the measures and procedures for reducing impacts on ecological receptors. It outlines the procedures for preconstruction surveys, vegetation clearance, draining of ponds, translocating of hedges or trees, temporary or permanent measures for protected species.         |

22.3.3 In addition to the management plans listed in Table 22.3, there would be several key documents. These are described in the following sections.

## 22.4 Register of Environmental Actions and Commitments (REAC)

22.4.1 A draft Register of Environmental Actions and Commitments (REAC) was created and provided in ES Volume 3, Appendix 2.3. This is a record of the specific environmental actions and commitments to be implemented and managed through all stages of the Scheme. The draft REAC lists commitments made within the ES (principally taken from the mitigation sections of each chapter).

22.4.2 The draft REAC is critical to the success of an EMP and subsequently the environmental performance of a Scheme. The REAC would be implemented through the CEMP and the Environmental, Landscape and Ecology, Monitoring, Aftercare and Management Plan.

22.4.3 The draft REAC is provided in table format with each column of the

table containing an element of the information required as detailed below:

- Column A & B:** Identification and referencing of the environmental aspect in question (*a reference letter and number*);
- Column C & D:** The primary and secondary environmental topic that is concerned (*e.g. Landscape and Visual & Nature Conservation*);
- Column E:** Brief description of the environmental action or commitment (*e.g. to plant a screen belt of trees*);
- Column F:** The objective or desired outcome of the mitigation/action (*e.g. to screen a view of the road*);
- Column G to M:** The main and secondary source of the commitment and a document reference (*e.g. Environmental Statement/ Chapter X, Section or Table Y, chainage 0.0034*);
- Column N & O:** Which organisation is responsibility for completion and at what stage of the project (*e.g. Contractor, during construction*);
- Column P:** Is the commitment to avoid, mitigate, enhance or a combination of these;
- Column Q:** How is the outcome to be achieved (*the physical work required*);
- Column R:** Sets out the current state of taking the action or fulfilling the commitment, to indicate the status of the necessary actions. This will be updated as the project progresses
- Column S:** Is the location for notes on completion to be added and updated until fulfilment;
- Column T:** A location to provide a cross reference to where evidence is provided of completion of a commitment or action. The evidence could be in meeting minutes, reports, photographs, drawings or site notes.

- 22.4.4 The details of monitoring, success criteria, reporting requirements and trigger level for remedial works would be clearly defined. where it is deemed necessary that mitigation/action must be monitored to determine success.

## 22.5 Environment Masterplan

- 22.5.1 The environmental mitigation measures incorporated within the design of the Scheme are illustrated on the Environmental Masterplan (see drawings in Appendix 2.5 A to F, Volume 3). The masterplan drawings

have been prepared in accordance with DMRB Volume 10. The landscape and environmental design proposals for the proposed new section of highway are described in Chapter 9 Landscape and Visual Effects.

22.5.2 Symbols are used on these plans to represent existing or proposed landscape and environmental features. Each feature is ascribed both an Element and a ‘Function’ to indicate the physical attributes and the purpose. Sometimes, when appropriate, highway and structural elements are given an environmental function that will guide design and maintenance. Elements and Function are described in Tables 22.4 and 22.5.

Table 22.4 Masterplan Elements

| Term used               | Definition  |
|-------------------------|---|
| Landscape Element       | Landscape features found within the highway estate, which can encompass both hard landscape features (i.e. retaining walls, hard surfacing) and elements of the soft estate (i.e. grasslands and woodlands);  |
| Environmental Element   | Non-landscape features of the highway estate that have environmental functions, i.e. noise attenuation measures, water quality controls, protected species, and legislated elements such as injurious weeds and pests                                     |
| Planning Policy Feature | Features pertaining to, or situated in close proximity to, the highway estate that have a specific designation or land use, i.e. Special Area of Conservation (SAC), Scheduled Ancient Monuments (SAM), Snowdonia National Park (SNP) or Listed Building. |

22.5.3 In addition to a range of proposed features, the masterplan shows existing features, for example retained vegetation, watercourses and culverts.

Table 22.5 Masterplan Functions

| Definition: The intended environmental purpose of features within the highway estate |     |                       |     |
|--|-----|-----------------------|-----|
| Visual Screening   | EFA | Heritage              | EFF |
| Landscape Integration  | EFB | Auditory amenity      | EFG |
| Enhancing Built Environment  | EFC | Water quality         | EFH |
| Nature conservation & biodiversity   | EFD | Highway/land boundary | EFJ |
| Visual amenity   | EFE | Access                | EFK |

## 22.6 Roles and responsibilities of those implementing the CEMP

22.6.1 For the environmental team to be effective in the implementation of a Welsh Trunk Road project, some key roles require experienced staff who will need to work across organisational boundaries to ensure continuity of knowledge and a cooperative and productive approach.

### Contractor's Project Manager and Environmental Manager

22.6.2 The Contractor's Project Manager will be responsible for developing the Construction Environmental Management Plan (CEMP) for the project. The Contractor's Environmental Manager will oversee and audit the internal systems and plans to ensure compliance with the environmental management system.

### Environmental Coordinator (ECO)

22.6.3 The ECO will work alongside the Project Manager to ensure that environmental commitments set out in that document are fulfilled. The Environmental Clerk of Works (ECoW), will support the ECO during pre-construction and construction.

22.6.4 The ECO will be an experienced Chartered Member of an appropriate environmental profession. Their role is to ensure that the key environmental documents are properly considered during the development of the detailed design and during construction. The ECO will oversee the Environmental Compliance Process.

22.6.5 The ECO will identify works that are likely to have a significant environmental impact and advise the Contractor how to avoid the impacts. If necessary, the ECO will identify activities that should only proceed once he/she has agreed that adequate measures are in place for environmental protection. As works progress the ECO will review the Contractor's environmental performance against the commitments, objectives and targets/key performance indicators in the CEMP.

22.6.6 To assist in, this the CEMP will be developed to contain procedures for checking, auditing and corrective action. These procedures will continue through the construction and aftercare period.

## Environmental Clerk of Works (ECoW)

- 22.6.7 The ECoW is also an experienced professional with a competency in environmental management, construction and environmental surveys. The ECoW will assist the ECO by overseeing the implementation of environmental mitigation and compliance with environmental management systems and plans.
- 22.6.8 Both the ECO and ECoW will work with the Contractor's Environmental Manager to apply the CEMP through the company's Environmental Management System.

## 22.7 The next stage in the development of the Pre-CEMP

- 22.7.1 Following the publication of this ES, the public will have the opportunity to scrutinise the Scheme. If required, an independent Inspector will hold a Public Inquiry to allow a detailed examination. It is possible that during this stage (Key Stage 4 shown in Table 22.1) further requirements, or mitigation will be introduced. These will be added to the Pre-CEMP in preparation for the construction contract to commence.
- 22.7.2 The next stage in the development of the Pre-CEMP would be in early Key Stage 6, when updates from pre-construction surveys and any modifications to the Scheme will be added. The Pre-CEMP would then be made available for the key stakeholders to comment and would be in place before construction on site commences.
- 22.7.3 During construction, the CEMP would be modified as necessary to take account of changes arising during construction works. These modifications could include changes to the design to reflect site conditions, but also because of:
- a) New legislation or standards;
  - b) Unforeseen site conditions, for example the discovery of ground contamination, a previously unknown protected species, or archaeological discoveries;
  - c) Failings in the environmental performance of the Contractor that require improved procedures, or changes in the design;
- 22.7.4 Towards the end of the construction phase, the CEMP would be refined

to provide the essential environmental information needed by the body responsible for the five years of contract aftercare and the future maintenance and operation of the road and the associated land.

## 22.8 Aftercare, monitoring and management

- 22.8.1 Proposed mitigation is provided for a purpose and is a commitment made in the ES on behalf of Welsh Government to address a particular environmental impact. For example, tree planting might be proposed to reduce the visual impact of a view of traffic. When they are planted, trees will not be an effective screen and will need to grow over several years to perform their function properly. There are three tasks that the Contractor who builds the Scheme will have to carry out to ensure the proposed mitigation performs the required task:
- 22.8.2 **Aftercare:** will be carried out by the Contractor for a period of 5 years, as required under the contract. This is known as the aftercare period. During that time, the Contractor will carry out tasks such as grass cutting, weed control, replacement of dead plants, watering, repair of fences, cleaning out ditches, and repair or replacement of bat boxes or other environmental measures. These tasks will be performed to ensure that the seeding and planting survive and successfully establish as new vegetation. At the end of the aftercare period the Contractor will hand over the now established and healthily growing landscape and environmental mitigation to the Welsh Government's maintenance organisation called South Wales Trunk Road Agent (SWTRA).
- 22.8.3 **Monitoring:** Throughout the aftercare period, and for as long as is necessary to fulfil commitments, the Contractor and then SWTRA will monitor the mitigation measures to:
- a) Ensure that it continues to develop properly to meet commitments and functions (e.g. trees should grow as planned);
  - b) Review if it will achieve the commitment and function in the required time period (e.g. will an area of planting and seeding develop fast enough to satisfy a requirement of a Protected Species Licence);
  - c) Check for adverse or changing conditions that might compromise the effectiveness of mitigation (e.g. has a drain blocked, or has a utility company or neighbouring landowner damaged a fence or trees);
  - d) Advise on maintenance interventions that might be required if a failure to meet commitments is identified in a) to c) above.

- e) Once the mitigation achieves full effectiveness, monitoring will continue to ensure that it continues to perform its proposed function (see Table 22.5)
- f) Monitoring of various kinds ranging from day-to-day observation to sophisticated sampling and analysis is essential to provide information that managers use to make management decisions.

22.8.4 **Management:** once established, the scheme of mitigation will continue to perform its function and satisfy commitments made in the ES until circumstances change. Changing conditions can be predictable or unexpected and they can occur slowly or catastrophically. For example, a hedge will continue to grow but will need trimming regularly to ensure it remains stock proof. In the case of a plantation, it will grow for 15 to 20 years before it will need to be thinned, coppiced or underplanted to ensure it remains an effective visual screen. A fire could destroy a coniferous plantation within hours, while a plant disease could kill only one species in a plantation. Completing both routine annual maintenance guiding long term change and dealing with occasional unexpected incidents is the process of management.

### Aftercare monitoring and handover

22.8.5 During the Contractor's aftercare period, regular monitoring visits will be undertaken to monitor the performance of the mitigation. Reports will be prepared for the Project Manager to provide:

- a) the results of each visit;
- b) the requirements for additional maintenance work; and
- c) indications of how the scheme of mitigation is performing against agreed indicators.

22.8.6 An annual report will bring these together at the end of each year of aftercare. At the end of the aftercare period, a Handover Environmental Design Performance Report (HEDPR) will be prepared. The HEDPR will accompany the Handover Environmental Management Plan to assist SWTRA in taking on the long-term maintenance.

## 22.9 Summary

22.9.1 Environmental Management of the Scheme is a continuous process during design, construction, operation and maintenance which is in line with the requirements of the DMRB and ISO 14001. The Contractor will implement a scheme specific EMS and a CEMP.

- 22.9.2 As identified within this chapter, there are a number of management plans within the CEMP which will be treated as ‘live’ documents. These documents will ensure that design and mitigation measures from the EIA will be implemented on-site by the Contractor. The CEMP will identify those responsible for implementing the various management plans. These management plans will compliment and inform one another as well as require regular updates and revisions. Outline versions of these management plans have been prepared at Key Stage 3 and are provided as Annexes to the Pre-CEMP in ES Volume 3 Appendix 2.2.
- 22.9.3 The objective of the EMS and the CEMP is to mitigate environmental impacts and have a comprehensive management plan in place to reduce any unforeseen environmental impacts.

Welsh Government

**A40 Llanddewi Velfrey to Penblewin  
Improvements**

Environmental Statement Chapter 23:

Conclusions

A40LVP-RML-EAC-SWI-RP-LE-0004

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## 23 Conclusions

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### 23.1 Introduction

- 23.1.1 This Environmental Statement (ES) reports the findings on the Environmental Impact Assessment (EIA) undertaken for the A40 Llanddewi Velfrey to Penblewin Improvements Scheme and was carried out in accordance with current legislation and guidance. It highlighted adverse and beneficial impacts and residual effects associated with the Scheme under several environmental topic headings and described how any adverse effects would be mitigated.
- 23.1.2 A Non-Technical Summary (NTS) of the Environmental Statement (ES) has been produced and the contents are very similar to these conclusions. This is not regarded as duplication because the NTS is a separately bound document which will be read in isolation from the full ES. However, this Conclusion is intended to draw together the conclusions of the various assessments.
- 23.1.3 In accordance with the requirements of the Well-Being of Future Generations (Wales) Act 2015, the proposed Scheme includes incorporated elements that contribute further to ‘improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals. The Environment Act 2016 requires public authorities to maintain and enhance biodiversity to promote the resilience of biodiversity. These improvements go further than mitigation in addressing these two Acts.
- 23.1.4 A list of the proposed enhancements is set out in the summary section of this chapter.

### 23.2 Alternatives considered

- 23.2.1 Alternatives were considered in previous studies for improvements to the A40 between St Clears and Haverfordwest. This ES covers the proposals to address several recognised problems between Llanddewi Velfrey and Penblewin. These problems include limited overtaking opportunities, poor forward visibility, numerous minor accesses, slow-moving agricultural and heavy good vehicles resulting in ‘platooning’, poor journey time reliability, driver frustration, risky manoeuvres and

collisions. During the summer, traffic volumes can increase by over 30%.

- 23.2.2 Due to the amount of traffic passing through Llanddewi Velfrey, pedestrians have difficulty in crossing roads and drivers face conflict with pedestrians and cyclists, particularly along sections where footways are substandard. Severance of the village of Llanddewi Velfrey by traffic, traffic noise and air pollution are of concern to the community.
- 23.2.3 During public consultations, public support was expressed for a northern bypass for Llanddewi Velfrey and improvements between Ffynnon Wood and Penblewin roundabout. A review in 2015 concluded that there is a good case for proceeding with the A40 Llanddewi Velfrey to Penblewin Improvements.
- 23.2.4 In February 2017, the Welsh Government appointed Carillion, with Arup and RML (the ‘Carillion Team’) as their technical and environmental advisors, to develop the design of the proposed A40 Llanddewi Velfrey to Penblewin Improvements up to publication of draft Orders.
- 23.2.5 Carillion entered liquidation in January 2018. The Welsh Government subsequently appointed Arup, supported by RML, to continue the development of the design up to publication of draft Orders and to support the Welsh Government through the Statutory process.

### **23.3 Scheme description**

- 23.3.1 The Scheme was designed to meet the project objectives by providing overtaking opportunities with a ‘2+1’ carriageway (two lanes in one direction to allow overtaking, and one lane in the opposite direction). Overtaking opportunities will alternate so that both eastbound and westbound traffic can overtake. These will provide more than 1km extra overtaking opportunities in both directions. The Scheme is described from west to east, starting at Penblewin in the west and proceeding towards Bethel Chapel in the east, using local place names.
- 23.3.2 At Penblewin Cross a new roundabout would be required to accommodate the Scheme, which would extend eastwards on embankment on a roughly parallel alignment with the existing A40. Trefangor Cottage would be demolished. The existing A40 would

provide local access to properties to the south, while a new local road would be constructed on the north side to carry local traffic to farms, residential properties and fields.

- 23.3.3 At Henllan Lodge, the Scheme would follow the alignment of the existing A40. The junction with a minor county road on the south side and the Private Means of Access (PMA) and bridleway on the north side would be stopped-up, but both would tie-in to the detrunked A40 road and the proposed new single lane side road, respectively. A new bridleway and cycleway would extend east to a new underpass provided under the A40 close to Ffynnon Chapel. The Scheme would follow the existing road embankment through Ffynnon Wood, although the wider carriageway would require some widening of that embankment. The new carriageway would be further from Ffynnon Chapel, allowing space for a new access road to residential properties and fields, which would tie-in to the existing access to Ffynnon.
- 23.3.4 Towards the eastern edge of Ffynnon Wood, the Scheme would draw to the north of the existing A40. There would be a staggered junction giving access to the settlement of Ffynnon Wood to the north and the existing A40 to Llanddewi Velfrey, to the south. A PMA for Pen-troydin-fach Farm would be required and a farm underpass to provide access to fields to the south of the road.
- 23.3.5 Continuing east, the Scheme would traverse the increasingly steep north slope of the Llanddewi Velfrey ridge and would pass to the south of Pen-troydin-fach Farm. Continuing onto embankment, the Scheme would curve to the south around the village. Passing into cutting, the Scheme would cross under a new bridge which would be constructed to carry the Llanfallteg Road.
- 23.3.6 The landform to the east of Llanfallteg Road becomes more rolling with the ridge slope dissected by small valleys. The Scheme crosses these valleys on an embankment. The small watercourses would be culverted under the embankment and an underpass would be required to carry several diverted public footpaths across the Scheme.
- 23.3.7 From here, going eastwards, the Scheme would pass into a cutting, to emerge and meet the line of the existing A40 at Bethel Chapel. Close to the chapel would be a four-arm roundabout, with a new PMA provided on the north side to the chapel and several private properties. On the south side, a road link to Llanddewi Velfrey would be provided.

The Scheme and the existing A40 would tie-in at the top of Fron Hill.

## 23.4 Scheme construction

- 23.4.1 If the Welsh Ministers confirm the Orders, construction could start in Spring 2020 and the Scheme could open in late 2021. The start of construction could be affected by statutory procedures, weather conditions or unforeseen engineering conditions experienced on site. Following the construction phase, there would be 5-years of landscape aftercare.
- 23.4.2 Construction working hours would normally be 07.00 to 19.00 hours (Monday to Friday), and 07.00 to 17.00 hours on Saturdays. In certain circumstances, specific works may have to be undertaken outside these hours with some night working required. Temporary traffic management would be necessary where the Scheme meets existing roads.

## 23.5 Environmental design and mitigation

- 23.5.1 The strategy for landscape and environmental design has the general objective of integrating the road and structures within the setting, by refining the road alignment, earthworks, footpaths and cycleways, planting and boundary treatments, to reflect the character and quality of the historic fabric of the landscape. This includes retaining existing vegetation, avoiding loss or damage to hedges and hedge-banks, individual trees, woodland, water features, public rights of way and field systems.
- 23.5.2 Translocation of vegetation and new planting and seeding with local provenance plant material, will assist in repairing or replacing indigenous landscape features affected by the Scheme. Culverts and underpasses would be provided to maintain connectivity across the Scheme for watercourses, native animal species, farm animals and users of public footpaths.
- 23.5.3 The Scheme is an opportunity to maintain and open routes for pedestrians, cyclists and horse riders. Existing links would be maintained or improved by removing all but local traffic from the existing A40, retaining and diverting public rights of way and by creating new routes.

- 23.5.4 The Scheme has the potential to cause pollution during both the construction and operational phase. Water pollution measures will include balancing ponds and penstocks to reduce the risk of pollution from the road adversely affecting local hydrology. Noise and visual intrusion from the road and traffic would be minimised by using low-noise surfacing, providing screening, using earthworks, planting and boundary treatments in critical locations.
- 23.5.5 The ecological mitigation will include measures to minimise the loss of foraging habitat for wildlife, new areas of ecological mitigation, measures to avoid habitat fragmentation and to maintain connectivity across the landscape for protected species and other wildlife.

## 23.6 Environmental effects

- 23.6.1 The conclusions of the environmental assessments are set out in the following sections.

### Geology and soils

- 23.6.2 The Scheme is located towards the top of the Llanddewi Velfrey ridge and crosses undulating terrain mainly associated with valleys of streams that flow into the Afon Taf or the Afon Marlais. The underlying bedrock of mudstone has some localised superficial deposits of glacial till. Alluvium deposited by watercourses is also present.
- 23.6.3 Bedrock could contain water-bearing strata that provides some local water abstraction. The superficial deposits may also support local water abstraction and supply water courses. No hazards relating to past mineral exploration or general ground hazards were identified.
- 23.6.4 Activities associated with the construction of the embankments, cuttings and structures, and the operation of the Scheme, would have a neutral to slight adverse effect on the underlying geology and geomorphology.
- 23.6.5 The Scheme would affect discrete areas of made ground, possibly associated with the existing road network, agricultural activities or historical infilled quarries or gravel pits, which could be a potential source of contamination. Potential sources of contamination such as sewage works, burial grounds or other infilled quarries are also present in the study area but are remote from the Scheme. Land contamination

would have a neutral to slight adverse effect on construction works in relation to the identified human and environmental receptors. Applying best practice construction management measures would reduce the risks to the environment. Land contamination would have a neutral impact on the operation of the Scheme and therefore no mitigation measures would be considered necessary during the Scheme operation.

## Road drainage and water environment

- 23.6.6 The water environment surrounding the Scheme includes minor streams in the Marlais, Cleddau and Taf catchments, the underlying groundwater and other water dependant features. The road alignment would generally follow a ridgeline, with two areas of cutting below the existing ground level and five stream crossings. No impacts to flood risk are expected and there are no water-related designated areas near to the Scheme.
- 23.6.7 Potential construction effects, including surface water or sediment runoff and accidental spillages, would be mitigated by the implementation of industry best practices, which are described in the Pre-Construction Environmental Management Plan (Pre-CEMP). A temporary lowering of groundwater levels to construct a section of road cutting would have a slight adverse impact on the flow of a minor stream.
- 23.6.8 During operation of the Scheme, slight adverse impacts are anticipated to the flows of four minor streams due to localised changes in groundwater drainage due to the road cuttings. Slight adverse impacts are also expected to the Afon Daulan as a result of a new culvert, and the groundwater beneath the Scheme, due to the infiltration of water from the road drainage. The design of culverts and the road drainage treatment system would mitigate these localised impacts as far as practicable.
- 23.6.9 Overall, it is anticipated that the impacts on the water environment, as a result of the construction and operation of the Scheme, would not result in any significant adverse effect.

## Nature conservation

- 23.6.10 There are five Special Areas of Conservation (SAC) within 10km of the Scheme (Afonydd Cleddau; Yerboston Tops; Pembrokeshire Bat Sites

and Bosherton Lakes; Pembrokeshire Marine; and Carmarthen Bays and Estuaries) and a Special Protection Area (SPA) within 30km (Carmarthen Bay). As a result of the proximity of these sites, an Assessment of Implications on European Sites (AIES) was undertaken and a Statement to Inform and Appropriate Assessment (SIAA) prepared.

23.6.11 Surveys identified that several species of bats, dormice, badger were present or used habitat in areas likely to be affected by the Scheme. Otter and barn owl have also previously been identified in the study area. During construction, protected species licences would be required for bats, dormice and badger (obtained from Natural Resources Wales) prior to the commencement of works. Construction period mitigation measures which would reduce the impact to levels that are not significant would include:

- a) Sensitive timing of works, including vegetation clearance to avoid disturbance to protected species and birds;
- b) Protecting wildlife habitat areas and minimising/avoiding damage to existing vegetation close to the works. Translocation of suitable hedges to receptor sites;
- c) Pre-construction bat, dormouse, otter and badger surveys;
- d) Restrictions on working hours to minimise task lighting at night, in the vicinity of watercourses and key bat flight lines;
- e) Construction pollution and sediment control measures; and
- f) An Invasive Species Management Plan to ensure that plant species such as Japanese Knotweed are not spread outside of the working areas.

23.6.12 The following mitigation measures would be incorporated in the Scheme design to reduce the scale of effects after road opening:

- a) Planting to maintain bat flight lines, mammal fencing and underpasses (including dedicated dormouse underpass) to encourage mammals to cross the road.
- b) Extensive woodland and hedgerow planting throughout the Scheme, including replacement habitat for dormice.
- c) A replacement badger sett for the main sett directly affected by the Scheme.
- d) Control measures to protect watercourses from road-based pollution;
- e) Biodiversity enhancements including the seeding of large areas of wildflowers within seeded grassland within the Scheme.

f) Monitoring of the effectiveness of ecological mitigation.

23.6.13 The impacts during construction on all identified ecological receptors are not considered significant. During operation, the impacts would not be significant.

### Landscape and views

23.6.14 The landscape of the area is rural and agricultural with hedged fields interspersed with woodland. The bypass of Llanddewi Velfrey passes along the north slopes of the Llanddewi Velfrey ridge, while the central section of the Scheme passes through Ffynnon Wood. The western section is on a gently undulating low-lying pastureland. The bypass of Llanddewi Velfrey passes through more steeply undulating land and requires cutting and embankments.

23.6.15 The landscape design for the Scheme includes plantations and hedges that will integrate the cuttings, embankments, bridge and carriageway into the landscape setting, while also providing screening or filtering of the views of traffic on the Scheme.

23.6.16 The effects of major earthworks on the landscape, which changes landform and removes existing hedges, woodland and trees and reduces the sense of tranquillity in a rural area, but these effects will mainly be perceived only north of and close to the Llanddewi Velfrey ridge. This would be a large adverse effect during construction and the winter of Year 1, but by Summer of Year 15 the adverse effects on the landscape would be lessened to moderate adverse. The effect of reducing traffic on the existing A40 would be a slight beneficial effect on landscape character areas.

23.6.17 Dwellings and footpaths on the north facing slopes of the Llanddewi Ridge are predicted to experience a range of visual effects from minor adverse to very large adverse at construction and winter of Year 1, without mitigation. With mitigation that includes new grassland on slopes and verges, as well as planting of hedges, woodland and scrub the significance of effect will reduce noticeably.

23.6.18 Dwellings and footpaths to the south of the Scheme would generally experience beneficial visual effects due to reduced traffic on the existing A40 which would improve views.

## Archaeology and cultural heritage

- 23.6.19 Within the 500m wide Scheme study area there are 123 cultural heritage sites. This assessment has identified that the implementation of the Scheme would result in an adverse effect on a number of heritage assets. This results from physical damage to some assets and a limited impact on the visual setting of some assets that are not physically affected.
- 23.6.20 The Scheme would result in physical damage, a major impact, on 23 non-designated heritage features, including three cottages and a possible leat and 19 other sites identified in the geophysical survey. There would be a moderate impact at two burnt mounds, the site of a cottage near Henllan and the line of the former Turnpike road.
- 23.6.1 Four assets, where the evidence is unclear at present, will receive some form of impact of an uncertain nature. These include a burnt mound and two possible cottage sites. A further cottage site may be protected if landscape designs can be refined in detailed design to avoid the asset.
- 23.6.2 For seven designated assets, there will be negligible impact on setting. These include 2 listed buildings, two Scheduled Ancient Monuments and three non-designated sites. The Llanddewi Velfrey War Memorial, a listed building, will have an improved, minor setting impact.

## Community Assets

- 23.6.3 The Scheme would pass through predominantly rural agricultural land located within the settlements Llanddewi Velfrey, Narberth, Llanfallteg, Whitland and Clynderwen. In the vicinity are places of worship, shops, play areas, village halls, post offices, schools, hospitals and doctor's surgeries. Tourist attractions in the vicinity of the Scheme include Oakwood Theme Park, Bluestone Resort, The Grange, and Folly Farm.
- 23.6.4 There would be no loss of, or direct effects on, community facilities or tourist attractions during construction. There would be indirect effects on Ffynnon Chapel and Bethel Chapel as they are located close to the Scheme. These effects would be temporary and mitigated through liaison and planning of construction activity.
- 23.6.5 The effects from operation would be limited to changes in walking routes and traffic flows on routes that serve local communities and

facilities. Non-motorised access to community facilities would generally be improved due to a reduction of traffic using the existing A40, improving access between the North and South of Llanddewi Velfrey.

- 23.6.6 There would be no loss of community facilities or tourist attractions as a result of the Scheme. Access to doctor's surgeries, hospitals, primary schools, secondary schools, shops, aged people's homes, parks, play areas or visitor attractions would not be directly affected by construction. Access to these local facilities would be via the existing road network, which would be kept open during the construction and operation. The Scheme would improve accessibility to some facilities by improving the flow of traffic along the A40.

### Agricultural assessment

- 23.6.7 The Scheme will involve the permanent loss of approximately 27.4 hectares of agricultural land. None of this is shown to be of the best and most versatile agricultural quality. This is an impact of slight magnitude on a resource of high significance, leading to an overall impact of minor adverse significance.
- 23.6.8 There are seven farms affected. All will experience significant changes in day-to-day operations, but the viability and continued functioning of the holdings is not threatened. Accordingly, in all cases the effect is of moderate adverse quantum on an interest of medium sensitivity, leading to a minor adverse significance.

### Air quality

- 23.6.9 A baseline assessment of current air quality conditions in the vicinity of the Scheme and an assessment of the likely air quality impacts associated with the construction and operation of the Scheme have shown that existing pollutant concentrations in the study area are low and meet air quality objectives. There are no areas where air quality is poor. With appropriate mitigation during construction there is likely to be no significant effect from the dust-generating activities on site.
- 23.6.10 Potential impacts during the operational phase of the Scheme were assessed to be not significant as modelled pollutant concentrations are well below the air quality objectives. However, many receptors would experience a beneficial impact as a result of the Scheme.

## Noise and vibration

- 23.6.11 Noise surveys in the study area were undertaken to establish a baseline for the assessment of noise from the Scheme. The predictions of noise effects include the impacts of moving traffic from the existing A40 to the Scheme.
- 23.6.12 Construction noise levels during the proposed works were assessed as not significant. There are predicted to be significant permanent direct beneficial effects for the community of Llanddewi Velfrey as a result of the Scheme in the short and long term. There would be increases in noise for some properties near the proposed bypass, although these were not assessed to be significant adverse effects.
- 23.6.13 Construction vibration levels during the proposed works were assessed as not significant. This is providing either the distance at which vibratory rollers operate is limited and/or construction vibration monitoring is undertaken along with a further assessment of the risk of impact.
- 23.6.14 No ground borne vibration impacts are forecast during operation because, in accordance with highway construction standards, the surface of the proposed upgraded roads would be smooth with no surface irregularities of enough size to generate significant levels of ground-borne vibration.

## All travellers

- 23.6.15 The Scheme would affect several public rights of way (PRoWs), predominantly used for informal recreation by pedestrians. Some of these PRoWs would be stopped-up on a temporary basis during construction, or permanently, with diversions provided to maintain connectivity. Taking account of these mitigation measures, no significant adverse effects on PROWs or other routes are predicted.
- 23.6.16 During construction, the existing A40, and most local roads crossing the Scheme or linking to it, would remain open except for some overnight or weekend closures. During construction, some trips would take longer or would be less attractive and some travellers might be discouraged. After construction, some PRoWs would be reinstated along their original alignment or their permanently diverted route.

- 23.6.17 One new public bridleway and two new public footpaths would be created as part of the Scheme.
- 23.6.18 A bus service is the only public transport that currently operates in the vicinity of the Scheme, with bus stops located on the existing A40 in the village. Buses would leave the Scheme at the proposed junctions and travel through the village using the proposed junctions. Bus services would be able to function as they do presently and there would be no effects arising from the Scheme.

### Materials

- 23.6.19 A total of around 370 thousand cubic metres of topsoil, superficial deposits and rock would be excavated during construction, all of which would be reused within the Scheme boundaries where suitable for reuse without causing unacceptable impacts on the end users and the environment. The reuse of site won excavated material would minimise the amount of raw material that would otherwise be imported to site and minimise the requirement for offsite disposal at a waste facility thus minimising traffic on public roads.
- 23.6.20 Construction would require the import of around 50 thousand cubic metres of stone and road surfacing materials. Where possible, these would be from local suppliers.
- 23.6.21 During operation, there would not be a significant requirement for the importation or disposal of materials other than those required for routine maintenance operations, such as resurfacing materials. The effects on materials during operation would not be significant. Overall, it is anticipated that the potential impacts on the material resources as a result of the construction and operation of the Scheme would not result in any significant adverse effect on the material resources.

### Population and human health

- 23.6.22 The Scheme has the potential to influence the health of communities as a result of changes to determinants of health. These are environmental, social and economic factors which influence health and wellbeing. A health impact assessment (HIA) was undertaken to meet the requirements of the EIA Regulations (2017) and also the Well-being of Future Generations Act (2015) and the Equalities Act 2010.

- 23.6.23 The Scheme is in a rural area with low population density, and lower than average rates of ethnic and religious diversity. Pembrokeshire has an older population than the Welsh average, with higher proportions of residents in groups aged 50 and over, and smaller proportions of residents in younger age groups. This is reflected in a higher than average proportion of residents who are retired. Unemployment is low, and the workforce is relatively highly skilled, particularly in the local study area where the proportion of working-age residents with a degree-level qualification is above the national average. The largest sector for employment is public administration, education and health, and the agriculture and tourism sectors. These provide a higher proportion of employment than the Welsh average. Deprivation in the local study area is low. Across Pembrokeshire, there are pockets of higher deprivation in urban areas including Pembroke, Pembroke Dock, Milford Haven and Haverfordwest.
- 23.6.24 Health deprivation is also low across the study area, with some pockets of higher deprivation. Life expectancy is above the average for Wales, and mortality rates – including from cancer, respiratory and cardiovascular diseases – are lower than average. There are higher than average levels of alcohol consumption and smoking, but lower than average mortality rates attributable to alcohol and tobacco. The proportion of adults who are overweight or obese is slightly higher than average, although a higher than average proportion of adults meet the recommended level of physical activity. Crime is generally low, except for antisocial behaviour and drugs offences where there are higher rates than the figures for England and Wales.
- 23.6.25 The HIA did not identify any significant adverse health impacts arising from the Scheme during either the construction or operation phases. However, minor beneficial health outcomes were identified due to a reduction in residential noise and air pollutant exposure. Construction-stage employment, investment and training, and operational-phase improvements to the accessibility of services and reduced journey costs are predicted to have socio-economic health and well-being benefits. The impacts on physical fitness and permeability are on balance likely to be neutral.
- 23.6.26 No specific disproportionate impact on individuals or groups based on their gender, race, ethnicity, religion, sexual orientation or sexual preference were identified.

## Climate Change

- 23.6.27 The Scheme has the potential to influence the climate and so an assessment of climate change was completed, to consider three aspects, namely, greenhouses gases, climate change resilience and in-combination climate impacts.
- 23.6.28 A greenhouse gas (GHG) assessment quantifies the potential GHG emissions associated with the construction and operation of the proposed development and identifies mitigation measures to reduce these emissions.
- 23.6.29 A climate change resilience (CCR) assessment evaluates the effectiveness and feasibility of adaptation measures integrated into the proposed development to avoid or reduce hazards and / or increase resilience of the proposed development to climate change impacts.
- 23.6.30 An in-combination climate change impact (ICCI) assessment evaluates the combined effect of the proposed development and potential climate change impacts on the receiving environment during construction and operation.
- 23.6.31 The GHG assessment identified that over the whole life of the scheme there would be an increase in emissions associated with the scheme, with the majority (97.6%) due to vehicles using the road during operation. The increase in user emissions is due to an increase in average speeds and a slight increase in distance travelled due to the alignment of the roads. There are also emissions associated with the construction and operation of the scheme. Over the 60-year appraisal period, the total emissions from the construction, operation and use of the road are expected to increase by 8.4% compared to the Do Minimum scenario.
- 23.6.32 The CCR and ICCI assessments did not identify any significant risks associated with climate change. Potential risks associated with flooding are addressed by mitigation measures in design.

## Cumulative effects

- 23.6.33 Cumulative effects are those impacting on receptors but arising from multiple sources. These could be from the same Scheme (Type i); for example, noise and visual impact from traffic on the Scheme.

Alternatively, there could be cumulative effects arising from two or separate developments, for example the Scheme and a nearby housing development (Type ii). The assessment has shown that a number of potential beneficial and detrimental cumulative impacts would arise during the construction and lifetime of the Scheme.

- 23.6.34 The assessment has shown that for Type (i) effects, those people living near the existing A40 trunk road or using public rights of way in the vicinity would see beneficial changes in relation to noise, air quality and visual change, while others living or using PRowS close to the Scheme, could see adverse changes. Overall, whilst several properties and users of Public-Rights-of-Way close to the new bypass would see a cumulative adverse impact from noise and views of the road and traffic, the overall cumulative impact of this scheme is a significant beneficial effect.
- 23.6.35 Type (ii) effects, the Scheme with other proposed developments, could potentially result in increased urbanisation of the rural setting. A review of planning applications and permissions for ‘other development’ has shown that there are only a small number that could cause Type (ii) cumulative impacts. Of these, a small number could result in cumulative traffic, air quality and noise impacts, if construction on more than one coincides. The impacts would be minor with a low risk of coincidence.

## 23.7 Summary

- 23.7.1 The Scheme would provide an improved carriageway designed and built to current standards with good overtaking opportunities. Side roads and cycleways will provide local access to residential properties, farms and fields with safer and more attractive routes for cyclists, walkers and horse riders.
- 23.7.2 The amount of traffic passing through the Llanddewi Velfrey would be substantially reduced making crossing the road and walking around the village safer.
- 23.7.3 The environmental assessments, reported previously, have determined that there would be some beneficial and adverse impacts on the local environment as a result of the Scheme. Where adverse impacts were identified, these were mitigated where feasible, as part of the design. The mitigation measures were developed in collaboration with the

Statutory Environmental Bodies, landowners and other key stakeholders.

23.7.4 The Scheme was designed following the principles of sustainability and would reuse excavated materials within the Scheme. To minimise pollution risks during construction and after road opening, measures to protect watercourses, including four balancing ponds, were included in the Scheme.

23.7.5 Mitigation measures were designed to reflect the landscape character of the area, to provide some visual screening, ecological mitigation and enhancement. The ES has also considered the effects of the Scheme in combination with other proposed developments in the area and has concluded that there would be no significant cumulative effects.

## 23.8 Enhancements

23.8.1 Table 23.1 is provided to demonstrate the character of enhancements and to allow them to be differentiated from mitigation. The assumption is that all areas of landscape mitigation are required for screening or integration and so the table includes these areas only as habitat.

Table 23.1 Schedule of proposed enhancements

| Proposal  | Form   |                   |
|---|--|-------------------|
| Enhancement of the routes for non-motorised users | Local access road from Penblewin roundabout to Brominau  | 1000m             |
|   | Detrunking of existing A40 to provide local access road from the Penblewin Service Area to The Lodge   | 800m              |
|   | New route from Brominau to Ffynnon Chapel  | 270m              |
|   | New route from The Lodge to the detrunked A40 link to Llanddewi Velfrey (figure does not include existing footpath).                                   | 780m              |
|   | Detrunking of A40 through Llanddewi Velfrey to provide safer route.  | 1,500m            |
|   | New pedestrian and equestrian underpass in Ffynnon Wood to provide safer connection with Llanddewi Velfrey.  |                   |
|   | Total length of new or improved route:   | 4,350m            |
| Biodiversity and habitat enhancements             | An additional area of native woodland and scrub habitat*   | 5.03 hectares     |
|   | Additional species rich grassland*   | 3.75 hectares     |
|   | Additional standing water*   | 200m <sup>2</sup> |
|   | Additional watercourses and ditches  | 3.9km             |
|   | Rock and scree habitat*  | 3.9 hectares      |
|   | Boundary features: hedges, and Pembrokeshire hedge-banks*  | 4km               |
|   | <i>These are referred to in Chapter 8. Items with an asterisk * are Biodiversity Action Plan Habitats in the Trunk Roads Biodiversity Action Plan.</i> |                   |