Welsh Government

M4 Corridor around Newport

Environmental Statement Volume 3

Appendix 3.1: Buildability Report

M4CaN-CJV-GEN-ZG_GEN-RP-WM-0013

At Issue | March 2016

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Contents

1 Introduction

1.1 Introduction

1.1.1 The Buildability Report describes the proposed approach for the construction of the Scheme based on the outline design developed for the preparation of the draft Statutory Orders. Information set out in in this document has been used to inform the Environmental Impact Assessment process and is reported in the Environmental Statement. This report has also been used to assess the land required for the Scheme to inform the draft Compulsory Purchase Order. The relationship between these documents is illustrated in Figure 1.1.

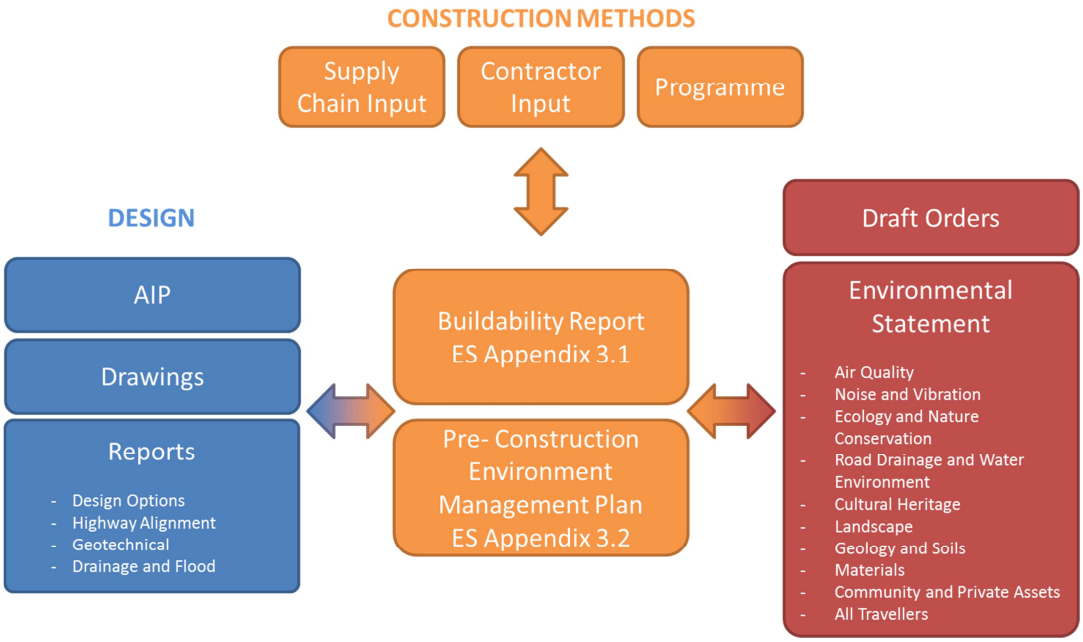


Figure 1.1 – Relationship of Design, Construction and Environmental Documents

1.1.2 Early Contractor Involvement (ECI) has been implemented during the development of the outline design, which has allowed an iterative approach to design to be followed. The design has been developed alongside the environmental mitigation strategy and uses current best practice design and construction methods.

1.1.3 Details of the environmental mitigation strategy, in terms of environmental measures to be implemented during construction, are set out in the Pre-Construction Environmental Management Plan (Appendix 3.2).

1.2 Scope of the Buildability Report

1.2.1 The Buildability Report identifies the construction methodology, technology, materials and methods that are likely to be used. The construction methods detailed in this report are based on available information at outline design and may be refined, where appropriate, during the detailed design stage following

further investigations and on completion of detailed programming, design and construction methodology.

1.2.2 The scope of the Buildability Report includes, but not limited to:

- Phasing of the construction of M4 junction 29 and junction 23, including draft Traffic Management layouts.
- Earthworks mass haul and deposition schedule, including details of imported materials in respect of location of quarries etc. and methods of transport to the site.
- Treatment of contaminated material.
- River Usk and Ebbw Crossings.
- Location of temporary compounds and layouts.
- On site batching plants and their locations.
- Arrangements for working close to the railway including Network Rail requirements and agreed possessions.
- Complementary measures on the existing M4 motorway.

1.3 Structure of the Report

1.3.1 The report presents an overview of how the Scheme would be constructed, the phases of construction, the likely programme and the key impacts associated with the construction works. The report focuses on the construction of the new section of motorway but also considers the complementary measures on the existing M4 motorway.

1.3.2 The key subjects are described in Table 1.1.

Table 1.1 – Section References for Key Subjects

Key Subject	Section Reference
Logistics including : • Construction Traffic Access • Source of Materials	Section 3
Water Management	Section 4
Demolition	Section 5
Utilities and Interfaces with Network Rail and Associated British Ports	Section 6
Earthworks including : • Mass Haul • Treatment of Contaminated Material	Section 7
Roadworks and Surfacing	Section 8
Construction and Traffic Management at the existing Junctions 29 and 23 of the M4	Section 9

Key Subject	Section Reference
Construction on the Gwent Levels	Section 10
River Usk Crossing	Section 11
Construction of Other Structures	Section 12
Complementary Measures	Section 13
Temporary Land Requirements including: Location of Temporary Compounds and On Site Batching Plants	Section 14

1.3.3 This report should be read in conjunction with the Pre-Construction Environmental Management Plan (CEMP, Appendix 3.2) that contains, but not limited to, the detailed aspects of environmental requirements, constraints and control measures that would be applied during the construction of the new section of motorway.

1.4 Construction Strategy

1.4.1 The approach to the construction works is based on the following strategy.

- To consider health and safety throughout the design and construction of the new section of the motorway in accordance with Health and Safety at Work etc. Act 1974 and the Construction (Design and Management) Regulations 2015 (CDM 2015). Measures to protect the work force and the travelling public would be implemented at all occasions.
- At each stage of construction, measures to protect the environment would be implemented.
- To meet the requirement of all relevant legislation, codes of practice and latest standards.
- To minimise the impact of the required works on road users and local communities, particularly concerning traffic management, noise, vibration and pollution control and other major works, careful management of activities to be undertaken. Major earthworks operations would be segregated from the public wherever practicable.
- To provide the most sustainable delivery of the new section of motorway by minimising the import and export of the materials to achieve an overall earthwork balance.
- Use on-site production of construction elements where possible.

1.5 Construction Programme

1.5.1 Subject to the successful completion of the statutory procedures, it is anticipated that the main construction activities would begin in early 2018 following a short mobilisation period.

1.5.2 It is anticipated that the construction of the new section of motorway would be completed within approximately four years with a completion date of autumn

2021. Following on from the construction phase, there would be a five-year landscape aftercare period through to autumn 2026.

1.5.3 Work associated with the reclassification of the existing M4 between Castleton and Magor would commence on completion of the new section of motorway under a separate construction contract. These works are expected to be completed within two years. However, programmed dates and construction periods may be subject to change depending on factors such as the actual start date, weather conditions and engineering conditions experienced on site. Table 1.2 provides an overview of the construction programme.

1.6 Phasing

1.6.1 The phasing of the key construction activities for the new section of motorway is set out in Table 1.2 below

Table 1.2 - Construction Phasing

Duration	Activities	Location
Diversion/Protection of Utilities/ Traffic Management		
Q1 to Q3 year 2018 (Usk) Q1 to Q2 year 2018 (Ebbw)	Construct all statutory diversions and temporary access (and haul road and demolition works for River Usk Crossing) from both sides of the River Ebbw and River Usk bridges before piling can commence.	River Ebbw Underbridge. River Usk Crossing.
Q1 to Q2 year 2018	Build access from the Southern Distributor Road (SDR) to the Docks Way Link Road to allow ground treatment to commence and to form the working platforms for the precast piles (east embankment of River Ebbw to west embankment of the River Usk Crossing).	Docks Way Link Road. East embankment of River Ebbw to west embankment of the River Usk Crossing.
Enabling Work		
Q1 to Q4 year 2018	Enabling work including reen protection (temporary reen crossings), advanced service diversion/protection measures, site clearance and fencing etc., create access routes (Magor Interchange). More detail on these works are described in the Ecology and Nature Conservation Chapter (Chapter 10) of the Environmental Statement and Appendix 3.2 (Pre-CEMP).	Castleton Interchange, Wentlooge/Caldicot Levels, Magor Interchange.
Q2 to Q4 year 2018	Construct Llandevenny temporary bailey bridge (South Wales to London Mainline), and/or gain approval to use existing A4810 rail bridge to facilitate bulk earthworks operations.	Magor Interchange.
Major Earthworks		
Q1 year 2018 to Q2 year 2019	Build west embankment to install the launching platform at the west side of the western abutment – enables the structural steelwork to be launched.	River Usk Crossing.
Q1 year 2018 to Q2 year 2019	Build east embankment to install the launching platform at the east side of the eastern abutment – enables the structural steelwork to be launched.	River Usk Crossing.
Q2 year 2018 to Q4 year 2019	Bulk excavation of new eastbound M4 link and Pound Hill Borrow Pit.	Castleton Interchange.
Structures		
Q3 year 2018 to Q4 year 2019	Construct new Magor East B4245 structures, embankments, gyratory and open to traffic.	Magor Interchange
Major Earthworks		
Q4 year 2018 to Q4 year 2020	Build embankment in reinforced earth once precast piles are sufficiently advanced.	East embankment of River Ebbw to west embankment of the River Usk Crossing
Enabling Works		
Q2 year 2018 to Q4 year 2018	Construct temporary bailey bridge over South Wales to London Mainline (Duffryn).	Wentlooge/Gwent Levels.
Embankment Construction		

Duration	Activities	Location
Q3 year 2018 to Q1 year 2019	Construct working platform band drains and surcharged stage 1 bulk fill to embankments between Church Lane and South Wales to London Mainline (Duffryn).	Wentlooge/Gwent Levels.
Q3 year 2018 to Q3 year 2019	Construct working platform band drains and surcharged stage 1 bulk fill to embankment between Usk East and Glan Llyn Junction.	Caldicot/Gwent Levels.
Structures		
Q4 year 2018 to QI year 2020	Construct permanent Duffryn Railway Underbridge.	Wentlooge/Gwent Levels.
Q4 year 2018 to Q4 year 2019	Construct permanent Llandevenny Railway Underbridge.	Magor Interchange
Major Earthworks		
Q4 year 2018 to Q1 year 2019	Bulk excavation of new link road north of existing M4/M48 and deposit along the Caldicot Levels.	Magor Interchange
Embankment Construction		
Q4 year 2018 to Q4 year 2019	Construct working platforms band drains and surcharged stage 1 bulk fill to embankments between Glan Llyn Junction and South Wales to London Mainline (Llandevenny).	Caldicot/Gwent Levels
Q4 year 2018 to Q4 year 2019	Construct working platforms and install pre-cast concrete piles throughout.	Wentlooge/Gwent Levels
Structures		
Q4 year 2018 (Ebbw North Slip Road). Q4 year 2019 (Main Line). Q1 year 2020 (South Slip Road)	Install the launching platform at the east side of the River Ebbw Underbridge – requires the east embankment to be sufficiently built.This would be undertaken in three stages: • North Slip Road – stage 1. • Main Line – stage 2; • South Slip Road, stage 3.	River Ebbw Underbridge
Settlement		
Q1 year 2019 to Q1 year 2020	Settlement period – Church Lane to South Wales to London Mainline (Duffryn).	Wentlooge/Gwent Levels
Roadworks		
Q4 year 2019 to Q2 year 2020	Construct eastbound M4 Link Road.	Castleton Interchange
Embankment Construction		
Q4 year 2018 to Q2 year 2019	Construct working platforms band drains and surcharged stage 1 bulk fill to embankments between South Wales to London Mainline (Duffryn) and River Ebbw.	Wentlooge/Gwent Levels
Major Earthworks		
Q2 year 2019 to	Bulk excavate embankment north of Llandevenny railway to St Brides underpass and deposit	Magor Interchange

Duration	Activities	Location
Q3 year 2019	along the Caldicot Levels.	
Structures		
Q4 year 2018 to Q3 year 2019	Construct new B4245 side road and bridge.	Magor Interchange
Q2 year 2019 to Q3 year 2020	Extend existing structures along existing M4/M48 in advance of work to the reclassified M4.	
Q2 to Q4 year 2020	Once the launching of the structural steelwork is complete on the west side of the River Usk Crossing, the reinforced earth walls (near the River Usk) and the Docks Way Link Road roundabout can be completed.	West embankment of the River Usk Crossing
Q2 year 2019 to Q1 year 2021	Construct the pylon to install the stay cables.	River Usk Crossing
Q3 to Q4 year 2018	Construct E7 pier head in order to install a launching platform between E7 to E8.	River Usk Crossing
Q3 year 2018 to Q3 year 2020	Construct new M4 westbound flyover and embankment slip road.	Magor Interchange
Settlement		
Q3 year 2018 to Q4 year 2019	Settlement period.	Docks Link Road
Q3 year 2019 to Q3 year 2020	Settlement period – Usk to Glan Llyn Junction.	Caldicot/Gwent Levels
Roadworks		
Q2 year 2019 to Q2 year 2021	Construct key side roads at Church Lane, Lighthouse Road, Nash Road, Glan Llyn and North Row. (Bridge piers after 12 month settlement).	Wentlooge/Gwent Levels; Caldicot/Gwent Levels
Structures		
Q2 to Q4 year 2020	Construction of the reinforced earth walls (near the River Ebbw) and the Docks Way Junction structures once the launching of the structure steelwork on the east side of the River Ebbw Underbridge is completed.	East embankment of River Ebbw
Q4 year 2019 to Q3 year 2020	Construct the transverse beam on both pylons and launch western and eastern structural steelwork (back spans).	River Usk Crossing
Q1 year 2020 to Q1 year 2021	Construct new Overbridge Link A and eastbound A48M to M4 link.	Castleton Interchange
Settlement		
Q2 year 2019 to Q2 year 2020	Settlement period – South Wales to London Mainline (Duffryn) to Ebbw Bridge.	Wentlooge/Gwent Levels
Q1 to Q4 year 2020	Settlement period – Glan Lyn Junction and South Wales to London Mainline (Llandevenny).	Caldicot/Gwent Levels
Major Earthworks		

Duration	Activities	Location
Q4 year 2019 to Q1 year 2020	Bulk fill to new westbound embankments.	Castleton Interchange
Roadworks		
Q4 year 2019 to Q4 year 2020	Carriageway refurbishment to existing M4 between Junction 23A to tie-in past Junction 23.	Magor Interchange
Q3 year 2020 to Q2 year 2021	Construct road pavement on completion of the embankments and the Docks Way Junction structure.	Docks Link Road
Structures		
Q1 to Q3 year 2020	Complete western and eastern structural steelwork (back spans) to allow installation of structural steelwork for the cable stayed bridge main span. .	River Usk Crossing
Roadworks		
Q1 to Q3 year 2020	Construct westbound M4 link and westbound link to A48M roads.	Castleton Interchange
Removal of Surcharge Material		
Q1 to Q4 year 2020	Excavate surcharge material, road box material and fill to piled embankment east of South Wales to London Mainline (Duffryn) and Ebbw Bridge West, and west of South Wales to London Mainline (Llandevenny).	Wentlooge/Gwent Levels Caldicot/Gwent Levels
Roadworks		
Q2 year 2020 to Q1 year 2021	Main line road construction.	Wentlooge/Gwent Levels
Traffic Management		
Q3 year 2020	Main Traffic Management switch running new eastbound and westbound.	Castleton Interchange
Major Earthworks		
Q3 year 2020 to Q3 year 2021	Bulk excavation of existing M4 and construct new section of motorway tie-in.	Castleton Interchange
Removal of Surcharge Material		
Q3 year 2020 to Q1 year 2021	Bulk excavation of surcharged material from Caldicot Levels and fill piled embankments and South Wales to London Mainline (Llandevenny).	Magor Interchange
Q1 year 2021	Excavate surcharge and fill reclassified M4 link and Magor East Junction embankments.	Caldicot/Gwent Levels
Roadworks		
Q3 year 2020 to Q3 year 2021	Main line road construction.	Caldicot/Gwent Levels
Q2 to Q3 year 2021	Roadworks to new Magor East Gyratory though link and tie-in existing M4 to new section of motorway.	Magor Interchange

1.7 Working Hours

1.7.1 The normal working hours would be 07.00 to 19.00 hours (Monday to Friday), and 07.00 to 17.00 hours on Saturdays. The majority of construction activities would be undertaken within this period. In certain circumstances, specific works may have to be undertaken outside the normal working hours.. Night working would also be required in some cases. This would include work to be carried out with enhanced safety requirements and, in some cases, to minimise disruption to daytime road users. These works would include the demolition of the existing overbridges at the A48(M) and Pound Hill, the installation of the decks on the underbridges and overbridges at the Castleton Interchange and the construction of the pylon upper legs on the River Usk Crossing.

1.7.2 On a few occasions, weekend closures of the highway would be required where 24 hour working is needed for some essential and complex operations.

1.7.3 Any working outside the normal hours would be agreed with the local Environmental Health Officer and local residents would be informed.

2 Construction Activities

2.1 Main Construction Considerations

2.1.1 The general sequence of works during construction of the new section of motorway would depend on the location and engineering needs. However, the general activities would include:

- enabling works, including but not limited to pre-construction ecological mitigation, pre-construction archaeological investigation provision of access points, temporary fencing and fencing to protect sensitive sites, construction sites installations;
- remediation of contaminated land or groundwater where required;
- construction of haul roads;
- site clearance and water management works;
- demolition works;
- temporary highway diversions and traffic management;
- diversion/protection of utilities;
- earthworks;
- pavement, road works and surfacing;
- street furniture, including lighting columns, road signs and safety barrier;
- accommodation works; and
- landscaping.

2.1.2 In addition to the above, the construction methodology includes activities that would occur at specific locations of the new section of motorway, such as at the Gwent Levels, the River Usk Crossing and the Castleton and Magor Junctions. These activities are set out below and are described in more detail in Sections 9 to 12 of this report.

The Gwent Levels

2.1.3 Activities in this location would include:

- early reen protection works;
- ground treatment;
- major earthworks and embankment construction (including addition of surcharge material);
- settlement period;
- removal of surcharge material (refer to Ground Treatment section of this section below);
- drainage and reen management; and
- construction of reens, culverts and retaining walls.

Castleton and Magor Interchanges

2.1.4 Activities at the Castleton and Magor Interchanges would include:

- pre-earthworks drainage and topsoil strip;
- demolition works (including the possible use of blasting);
- water management works;
- major earthworks (including blasting); and
- construction of junctions and tie in with the existing M4.

River Usk Crossing

2.1.5 Construction of the River Usk Crossing would be divided into three main structures: Approach Viaduct West, Approach Viaduct East and the Cable Stayed Bridge. These structures would be constructed concurrently. The sequence of activities is listed below:

Approach Viaducts East and West

- Installation of bored piles.
- Construction of foundations.
- Construction of the abutments, piers and pier heads.
- Installation of steelwork.
- Installation of concrete precast slabs and construction of the stiches and upstands.

Cable Stayed Bridge

- Demolition of existing buildings.
- Piling works for east and west pylons.
- Construction of foundations for the back span piers and pylons.
- Construction of piers (east and west sides would be constructed concurrently).
- Construction of the pylons.
- Launching of the steelwork for the back spans and construction of the upper pylon.
- Construction of the bridge deck.

2.2 Enabling/Pre-construction Works

2.2.1 The enabling works would be planned and executed in preparation for the main construction activities. The enabling activities can be summarized but not limited to the activities below:

- alternative ecological habitat creation and translocation;
- archaeological and heritage surveys;
- Unexploded Ordnance (UXO) surveys

- structures and property condition surveys (at identified locations where the construction works might affect the existing structures);
- noise and dust baseline monitoring and monitoring during the works;
- vegetation/tree clearance;
- enabling works including access points and temporary fencing;
- obtaining relevant permits and licences;
- isolation/diversion of utilities.

Alternative Ecological Habitat Creation and Translocation

2.2.2 The creation of alternative ecological habitats and ecological translocation works would be executed according to the Environmental Masterplans (EMPs), Construction Environmental Management Plan (CEMP), the requirements of the Protected Species Licences and the Environmental Statement (ES), which would detail the measures that would be undertaken to ensure compliance with environmental legislation and best practice. Adequate time would be given to allow the alternative habitats to become established before species are translocated.

Archaeological and Heritage Surveys

2.2.3 Archaeological and heritage surveys would be completed in accordance with the ES and the Cultural Heritage Management Plan (CHMP). The appropriate protection and investigation of archaeological remains would be provided in advance of and during construction works in accordance with the CHMP and CEMP.

Unexploded Ordnance (UXO) Surveys

2.2.4 A risk assessment and desktop study of unexploded ordnance (UXO) would be completed in advance of the construction works to identify whether a more detailed assessment is necessary or not. Appropriate measures to mitigate the risk would be adopted on a case by case basis. The factors affecting risk assessment are based upon the history and previous usage of a site and its surroundings. The guidelines of the Construction Industry Research and Information Association (CIRIA) would be taken into account during the risk assessment and mitigation planning when required. A UXO Mitigation Strategy would be prepared and then implemented during construction.

Condition Surveys

2.2.5 Condition surveys would be carried out to establish the condition of existing buildings and structures adjacent or in close proximity to the works site before commencing any construction or site formation works. If entry for pre-construction survey is not possible then the exterior face of the property or structure would be surveyed and the records for the attempt to contact relevant owners for permission to conduct pre-construction surveys would be kept.

Baseline Noise and Dust Monitoring

2.2.6 Baseline noise and dust monitoring would be undertaken to confirm previously recorded noise levels.

Pre-construction Ecological Surveys

2.2.7 Pre-construction ecological surveys would be undertaken prior to construction. The scope of these surveys would be agreed with NRW, and would be expected to include (but not necessarily be limited to) the following species:

- Great crested newts;
- badgers;
- bat roosts;
- water voles;
- otters; and
- dormice..

Vegetation/Tree Clearance

2.2.8 Tree clearance and protection fencing would be planned with the Ecological Clerk of Works in accordance with industry standards and guidelines. Tree clearance works would be undertaken outside of the breeding bird season.

Temporary Fencing/Access Points

2.2.9 Temporary boundary fencing would be installed around the perimeter of the whole site to prevent unauthorised access. Areas out of bounds to construction activities (e.g. soil storage areas, ecologically sensitive areas or archaeological sites) would also be fenced off or suitably demarcated to ensure plant and machinery cannot enter.

2.2.10 Wherever possible, site access points would be installed to reduce the need to run construction traffic through residential areas. Accesses would consist of hardstanding and wheel wash facilities would be provided where necessary.

Accommodation Works

2.2.11 Works would be undertaken to accommodate landowners affected by the new section of motorway. This would include new field access points where the existing entrances and fencing are affected to delineate new or adjusted boundaries as agreed with the landowners.

Obtaining Relevant Permits/Licences

2.2.12 All necessary 3rd party permissions and approvals would be obtained before commencing any site works. These include (but not necessarily limited to):

- protected species licences;
- marine licence for works on the River Ebbw and River Usk crossings;
- mobile plant licences;
- abstraction licences;
- water discharge permit;
- flood defence consent;
- land drainage consent; and

- notification of demolition works

2.3 Site Clearance

2.3.1 The site clearance operation would vary greatly throughout site using bespoke plant such as stump grinders appropriate to the activity with appropriate mitigation planned and detailed within the activity specific Method Statement. Clearance operations would be adapted to suit the specific site conditions and appropriate protection measures would be implemented. The works would be undertaken by specialists experienced in working in ecologically sensitive areas, where consideration and awareness of the environmental impacts of their operations would be the key. Where appropriate, site clearance activities would be carried out in accordance with protected species licence Method Statements (e.g. those for dormice or great crested newts).

2.3.2 The control of invasive weeds such as Japanese Knotweed and Himalayan Balsam would be carried out in accordance with best practice guidance (i.e. Managing Japanese Knotweed on development sites). Ecological mitigation and site clearance would be carried out under the supervision of the Ecological Clerk of Works.

3 Logistics

3.1 Construction Traffic Management

Haul Roads

3.1.1 The key objective of the construction traffic management strategy would be to avoid the use of the existing M4 and local road network where possible. There would be instances where this is unavoidable, for example early in the construction programme for the transport of materials and plant until construction access points have been established; during tie-in works with the existing highways and junction remodelling at Castleton and Magor; and during pavement laying operations.

3.1.2 The early establishment of haul roads is essential to delivering the programmed earthworks as they provide a direct route between each section of work along the route. Three types of haul road would be used during the construction of the new section of motorway, all of which would be within the construction boundary i.e. with the limits of the permanent and temporary land take. These haul roads would include:

- earthworks haul road;
- structures haul road; and
- combined haul road.

Earthworks Haul Road

3.1.3 The majority of haul movements would use the earthworks haul road. It would extend along the route of the new section of motorway within the permanent land take and would use the working platform installed as part of the ground treatment works (see Ground Treatment section). The haul road would be kept to one side of the carriageway footprint using the working platform, whilst works are undertaken on the other half of the carriageway. On completion of the works, the haul road would be moved to the other side of the carriageway to allow the remaining ground treatment and embankment construction works to be undertaken. There would be two haul roads on the first completed side of the surcharged embankment: one would be stoned and used by road going vehicles only. The other would be used for earthworks traffic and would run upon the surcharge material. Whilst the haul roads are located upon one side of the completed embankment, works to the ground treatment and earthwork embankment would take place on the other carriageway (see Annex 3). Measures to control dust are set out in the Pre-CEMP (Appendix 3.2). After the 12 month settlement period on this section of the constructed embankment, the carriageway and initial pavement layers would be installed to seal the earthworks material. This would allow the site haul road to be switched to this carriageway whilst the remaining embankment is constructed.

3.1.4 The earthworks haul road would have a running surface of 10 metres width to allow the safe passing of vehicles, outside of which would be temporary bunded areas to control surface runoff. These bunded areas are described in more detail in the Water Management Section. For the majority of its length, the earthworks haul road would only be used by earthworks plant and vehicles. However, the

section between Nash Road and the River Usk Crossing (eastern works access) would be stabilised to allow its use by road vehicles.

3.1.5 In addition to the earthworks haul road, there would also be a dedicated earthworks haul road located at the eastern end of the new section of motorway to the boundary of Ifton Quarry. It would be used to haul rock from the quarry that would be used for drainage blankets and starter layers. The rock head is high across these fields and it is envisaged the road would sit directly upon the exposed rock once the topsoil has been stripped and stored. This haul road route was used in the mid-1990s for the construction of the approaches to the Second Severn Crossing, with previous mitigation measures (for example, pipe crossings, gated crossings and concrete protection slabs) still in place.

Structures Haul Road

3.1.6 The structures haul road would be used for delivering materials and plant for constructing structures (such as overbridges, underbridges and culverts). It would be up to 7 metres wide and formed of aggregate material. An alternative approach may be adopted for the section of new motorway to the east and west of Lighthouse Road and Nash Road, where early access is required to begin the culvert installation and the piling works for structures. Subject to agreement with NRW, this alternative approach would involve the construction of a stabilised haul road where a predetermined quantity of cement and lime would be mixed with topsoil to a depth of approximately 500 mm and then rolled and covered with approximately 200 mm of stone. The stone would protect the stabilised layer so that heavy plant (such as piling rigs) could access the works much sooner. The stabilised haul road would be located along the centre line of the proposed new section of motorway and be incorporated within the working platform for the ground treatment (see Ground Treatment section).

Combined Haul Roads

3.1.7 The combined haul road would be used by earthworks and structures traffic. It would be up to 10 metres wide and constructed of quarried material. It would be used at pinch points along the new section of motorway at areas where there would be construction of structures, culverts and piled embankments and where haul roads are required to cross temporary bridges (for example, the Duffryn and Llandevenny Overbridges). The combined haul road would be maintained to a standard to allow it to be used by both earthworks and road vehicles such as concrete truck mixers and material deliveries.

Construction Traffic Access

Abnormal Loads

3.1.8 Some deliveries would be categorised as abnormal loads. These are likely to be associated with major earth moving plant, cranes and the steel and pre-cast concrete bridge beam elements. Temporary holding areas would be required to control the deliveries of abnormal loads to the works areas. The proposed holding areas are summarised below and shown on Annex 4.

- Wilcrick (Magor) – following the relocation of the existing Wilcrick Depot early in the construction programme, the depot would be demolished. The remaining upper yard would be used to accommodate abnormal loads, in

particular controlling the delivery of steel bridge beams for the eastern side of the River Usk Crossing. From the depot, abnormal loads would travel along the B4245 to access the works areas at Magor. To access the works areas at the River Usk Crossing, Nash /Meadows Road and Glan Llyn the abnormal loads would use the B4245 and Queens Way.

- A449 Newbridge on Usk (South of Usk) – the existing southbound layby on the A449 near Newbridge on Usk would be used for bridge beam storage for the western side of the River Usk Crossing, the River Ebbw Underbridge and other structures west of the Ebbw, including Castleton Interchange. Abnormal loads would travel on the A449 to the M4, leaving the motorway at Junction 28 and onto the A48 to access the works areas.
- Docks Way – an access would be constructed from the existing Newport SDR onto the new Docks Way. This would provide a holding area within the compound area for a number of beam deliveries for the western side of the River Usk Crossing and the River Ebbw Underbridge.

Equipment Delivery Points

3.1.9 The main earthworks, piling and ground improvement plant would be delivered to the Imperial Park, Glan Llyn and the Newport Road compounds (see Annex 4). The earth moving equipment delivered to Imperial Park would initially serve the borrow pit at Berryhill Farm from south of the A48 at Castleton to the Duffryn Rail Crossing until the temporary rail crossing has been constructed over the South Wales to London Mainline, after which it would serve the western approaches to the western abutment of the River Ebbw Underbridge.

3.1.10 The earth moving plant delivered to Glan Llyn compound would serve the eastern approaches to the River Usk Crossing to the south of the Llandevenny Rail Crossing. The Newport Road compound would provide plant access to Ifton Quarry to the north side of the Llandevenny Rail Crossing.

3.1.11 The initial plant delivery access to the River Usk and River Ebbw crossings would be via the A4810 /Dock Way for the eastern abutment of the Ebbw and western approach to the River Usk Crossing via the ABP main gate for the western pylon, and via Corporation Road for the eastern pylon and eastern approach spans.

3.1.12 Site equipment would also be delivered to other work areas via dedicated work access points. These would be considered to be remote satellite sites until a main access has been established to link the sections east and west of the Rivers Ebbw and Usk respectively.

3.1.13 Access would be required off the A48 for works north of the existing M4 until such time the new bridge is constructed across the A48. This bridge would provide north south access off the A48 without the need to cross the existing highway.

3.1.14 Wheel wash facilities would be provided at the main egress points from the works area onto the existing road network where necessary. These would be self-contained facilities using a water recycling feature. The units would be regularly cleaned and maintained, and sediment would be separated and removed.

General Site Access

3.1.15 The main site accesses are identified in Annex 4.

3.1.16 Initial construction works would require the creation of general site access points, which would provide access to the remote areas of the site. This would allow the initial enabling works to commence, such as utility diversions and protection works, construction temporary reen/ditch crossings. It is anticipated that these access points would be used for initial material deliveries until the main haul roads have been established, after which they would be used as access points for smaller site vehicles and vans for staff.

Temporary Bridges

3.1.17 To ensure stakeholders are not unnecessarily inconvenienced and road users not subject to unnecessary delays during the earthmoving phase of the works at busy crossing points and physical barriers along the route of the new section of motorway, temporary bridges would be used to provide the temporary construction access. A total of four bridges would be required to accommodate the earthworks mass haul operation. These would span roads and railways and are described in section 12 and summarised below.

Road Bridges

3.1.18 The existing underbridge at St Brides Road is not wide enough for two Articulated Dump Trucks (ADTs) to pass each other safely. To ensure haul road capacity is provided to move the required bulk fill material north and south of the existing M4, a temporary two span bridge with central reserve pier would be required at Magor to provide this capacity. This would in effect provide a one way site traffic system under and over the existing M4 which would be clearly signed for construction traffic.

3.1.19 The existing B4245 at Magor is a busy local road. The mass haul earthworks operation would need to cross this road. A signalised plant crossing would create congestion and tailbacks on the B4245 for the duration of the construction of the new Newport Road Overbridge. To remove the risk of congestion, a single span overbridge would be installed which would be wide enough to accommodate two loaded ADTs passing each other. Once the new Newport Road Overbridge is complete and open to traffic, the temporary overbridge spanning the B4245 would be removed and the earthworks mass haul would pass beneath the new overbridge.

Rail Bridges

3.1.20 Two temporary bridges would be constructed early in the works to span the South Wales to London Mainline at Duffryn and at Llandevenny. These would be single span structures sat upon reinforced earth embankments / abutments. At both locations access is required to either side of the railway line to build the temporary abutments. Three of the four abutments are likely to require piling.

3.1.21 Granular material would be required to create the temporary abutments and approach ramps for these bridges. This material would be delivered to the works areas in road wagons from local quarries.

3.1.22 It is expected the abutments for the reinforced earth abutments and approach ramps would be constructed within the ‘Green Zone’, an area outside of the operational influence of the railway line.

3.1.23 An overnight rail possession would be required for the installation of each of the bridges. It is expected the temporary bridges would be assembled on the ground ahead of the possession and lifted into to position with a suitably sized crane.

3.1.24 The bridges would remain in position until such time the permanent structure is installed and can be used by construction plant. The temporary bridges would be removed during overnight rail possessions. The granular material used within the earth abutments and approach ramps would be re-used as backfill for the structures (refer to Chapter 12).

Temporary Road Diversions

3.1.25 A number of road diversions would be required throughout the duration of the construction phase. These diversions would vary in duration from a few hours for a total motorway closure to a number of months for a strategic side road closure.

3.1.26 Advance warning of motorway closures along the M4 would be posted along the M4, A465, A470 and other strategic trunk roads in Wales. Over the border in England, the works would be notified via the Highways England matrix signs along the M4, M5, M40, M6, M1 and M25.

3.1.27 To construct the new M4 Junction 23 at Magor, a number of side roads would require long term closure and diversion. St Brides Road would be shut for the duration of the construction phase. This is to accommodate utility protection works within St Brides Road, existing structure extension works north and south of the existing underbridge and to provide construction traffic routes to and from Ifton Quarry beneath the existing M4.

3.1.28 Whilst St Brides Road is closed, other existing traffic routes north - south of the existing M4 between Junction 23 and 23A would require temporary closure for durations between 12 months to a number of weeks. A 12 month road closure would be required for the construction the new Knollbury Lane Overbridge to span the new M48 link to the new M48 Roundabout. A shorter duration of road closure would be required for the installation of the bridge beams to the new Rockfield Lane and Bencroft Lane Underbridges. It is expected that these could be constructed before there is a need to construct the new Knollbury Lane Overbridge so as to avoid further disruption to the local travelling public. The local north – south side road routes may require localised upgrading with the provision of temporary passing places in the lanes.

Side Roads

3.1.29 Temporary road diversion construction works have been avoided where the existing side roads are bisected by the new M4; i.e. Lighthouse Road, Meadows Road, North Row and Barelands Street. At these locations new over or under bridges would be provided. The existing side roads would remain open to traffic until the new permanent overbridges are complete. The new local road links would be provided off line, to one side of the existing side road, allowing the new side road alignment and overbridge to be constructed first. There is one exception to this, Church Lane Overbridge, described below. The overbridge construction in this area cannot commence until the motorway carriageway embankments have been formed and the surcharge material left to settle for 12 months. Further detail is set out below. Once the new bridges have been constructed and opened, there would be localised areas within the earthworks

along the alignment of the existing side road that would require ground treatment and 12 months surcharge. This area may require treatment with precast driven piles to complete the construction with in the programme.

Church Lane

3.1.30 A new roundabout would be constructed on the Duffryn Link joining together the connecting arms to the existing road network. A short link of around 30 m of temporary road would be constructed to accommodate the new earthworks embankment for the overbridge. This link would provide access from Church Lane onto the new connecting arms of the roundabout until such time as the new bridge and approach embankments are complete and the road is open to traffic. This temporary diversion is expected to be open for around 12 months.

3.1.31 Church Lane Overbridge would be built offline. Its northern approach embankment obstructs the current junction of Church Lane with the adjacent roundabout. Traffic would need to be diverted along Church Lane, with localised realignment, and back onto the existing network via the new roundabout and link road. The new roundabout would be constructed in phases to maintain vehicular access to Quinn Radiators commercial premises. A Stop/Go controlled plant crossing of the existing Church Lane would be operated to control site / public traffic interface until the new road alignment is brought into operation. The redundant carriageway across the new section of motorway would then be removed to enable earthworks to be infilled.

Reen Crossings

3.1.32 A number of reens would be crossed by the new section of motorway. During construction, temporary crossings would be required over the reens until such time as the permanent structure is installed. The temporary crossings would be in the form of pipes placed in the channel and back filled with clean stone to prevent contamination of the reen. The temporary crossing would have provision to prevent construction material entering the reen during the works.

Major Reen Crossings

3.1.33 At areas where temporary reen crossings are expected to be in place for the duration of the works, (e.g Mill Reen), a semi-permanent type of temporary crossing is likely to be constructed. This crossing would be of a more robust construction to the other temporary crossings as it would be heavily trafficked and likely to be used to transport aggregate from Ifton Quarry.

Plant Crossings

3.1.34 Plant crossings are required where the proposed new section of motorway would cross the existing side roads at grade until the new over / underbridges have been built. These crossings may be constructed early within the construction period on a half and half basis under temporary traffic signals. The plant crossing would consist of an *in situ* reinforced concrete protection slab constructed to existing road levels. Due to the ground conditions present along the Gwent Levels, some of these slabs may require to be piled. The temporary plant crossing and service protection slabs would extend over existing services within the verges. All plant crossings would be manned with a crossing operator and a labourer to ensure the crossing is free of debris prior to letting queuing vehicles pass once the construction plant has used the crossing.

3.1.35 The crossings would be manned whilst construction works are ongoing. The plant crossings and connected roads would be regularly swept when in operation

Manned Signalised Crossings

3.1.36 Crossings of major roads would be controlled with temporary traffic signals. These would be either mains operated connected to a local power source or battery operated, depending upon whether existing power supplies exist. The crossing operator would hold construction traffic either side of the main road and then allow it to cross. This avoids causing unnecessary congestion of the side road traffic when the traffic lights are at red.

3.1.37 Traffic flows on the main crossing points may impose restricted working hours during the earthworks seasons. This would be discussed with the relevant local highway authority. The crossing points likely to be traffic sensitive are:

- Lighthouse Road B4239;
- Nash / Meadows Road; and
- Caldicot Road B4245.

Non-Motorised User (NMU) Crossings

3.1.38 Temporary NMU crossings of the works would be avoided where possible and a temporary diversion would be provided instead. Where NMU diversion routes are not possible, then gated and clearly defined routes would be provided across the site. Signage would be provided for both NMUs and plant operators. These NMU routes would be regularly monitored and checked throughout each shift.

3.2 Source of Materials

Capping and Sub-base Material

3.2.1 The pavement design for the scheme is not 100% reliant upon using capping material. Capping and sub-base material is expected to be supplied from local quarries with a small volume expected to be generated from borrow areas at Magor. At the Wentlooge Levels this is expected to be delivered by road from Machen to the works access areas shown on Annex 4. The slag and sludge material on TATA land south of the A4810 has the potential to be reclaimed and blended with a cementitious product and various other locally sourced material such as Pulverised Fuel Ash (PFA), crusher dust from material processing on site, local quarries and Cement Kiln Dust (CKD) (a by-product from cement production). It is expected that the blends of the material above could produce high value sub-base and CBM pavement layers.

Granular Fill to Structures

3.2.2 Graded aggregates are likely to be sourced from local quarries. This would be delivered by road from the quarry, then distributed to the works location via the internal site haul roads to structures west of the River Ebbw. Material required east of the River Usk Crossing to ch 24,400 is expected to be delivered via a direct haul from Ifton Quarry and via road from local quarries. Some material may be sourced from the borrow areas planned at Magor and Undy.

3.2.3 Material obtained from these areas would need to be processed to the specification grading requirements. This would be hauled to the processing areas and stockpiled for re-use at a later date within the construction programme.

3.2.4 Methods of importing material to the construction works by other modes of transport such as rail and sea have been investigated. These modes of transport may be adopted for the works between the East Abutment of the River Ebbw Crossing to the West Abutment of the River Usk Crossing including the new Docks Way Link. Should rail transport be used, this material would be hauled from Machen or Tytherington Quarries. These modes of transport may reduce impact upon the local road network, the internal road network within ABP and the day to day operation of the small businesses that operate from the port.

3.2.5 These modes of delivery rely heavily upon the viability of the material rehandling system to load and unload the required quantities for the works and external factors such as timetabled line space on the South Wales to London Mainline for rail deliveries, and berth space, tides and weather conditions for deliveries by ship. Deliveries using these modes of transport are generally reliant upon quick turnaround times at the point of discharge. Delivery times could be at out of normal working hours depending upon line space and tides.

3.2.6 Subject to the results of materials testing, treated sludge from TATA's lagoons would also be used as general fill material in the core of the motorway embankment.

Precast Concrete Units

3.2.7 Precast bridge deck elements would be constructed on site at two dedicated precast facilities at either side of the River Usk Crossing. It is expected that these components would be delivered a short distance from the precast yard to the point of placement on the bridge deck. These units would be delivered to the works area via a tractor and trailer vehicle configuration and lifted on to the deck area with a crane for installation to its final position.

3.2.8 Due to the volume of precast driven piles required for embankments greater than 5 m in height, a precast pile manufacturing facility with its own dedicated concrete batching plant would be established at the main compound at Imperial Park.

3.2.9 It is anticipated that culvert headwalls and pollution control chambers could be made of precast concrete. These would be manufactured off site and delivered to where they are required using articulated road haulage to the nearest work access point along the route.

Reinforcement Steel

3.2.10 Reinforcement for all *in-situ* works would be delivered to the required works areas by articulated road wagon from the nearest works access point along the length of the route.

3.2.11 Pile cages would be manufactured off site and delivered to the works area by articulated road wagons. These would be delivered to the works area on a 'just in time' basis. It is anticipated that with the series of similar structures to be constructed in similar ground conditions, the pile cages are likely to be of a similar standard design allowing components to be shared across structures.

Bridge Beams

3.2.12 Bridge beams required for the new section of motorway would comprise of either pre-stressed concrete beams or manufactured steel plate girders. It is anticipated that these would be manufactured off site and delivered to site on a 'just in time' basis.

3.2.13 All beam deliveries would be made, where possible, during off peak hours. These would initially arrive at the abnormal loads holding areas to be located at the site of the disused Wilcrick depot. All abnormal loads would report here and be called in on a 'just in time' basis at the position of unloading. The load would move under the supervision of an abnormal load escort to the point of unloading.

3.2.14 Localised temporary works may be required to the centres of the roundabouts for bridge beams being delivered to the east of the River Usk from the Wilcrick Abnormal Loads holding area along the A4810 to the A48 Docks Link Junction. The localised works would require the temporary hardening / creation of a 'throughabout' that could be opened up for beam delivery. Load movements along this route would be controlled by the traffic management teams in the form of escorts and rolling blocks. This would be undertaken off peak where possible and co-ordinated with the local authority, Gwent Police, bridge and structure owners such as Network Rail and ESDAL (the Electronic Service Delivery for Abnormal Loads).

Drainage Materials

3.2.15 It is anticipated that this material would be locally sourced and produced from either on site processing at cut areas in rock or could be supplied from local quarries. Drainage aggregate material deliveries to the western side of the new section of motorway are likely to be delivered by road from local quarries. Rail haulage has been investigated into Newport Docks and Llanwern sidings to supplement road haulage with direct haul to the works area. When Ifton Quarry is established, it is expected that all single sized drainage material required east of the River Usk Crossing could be produced at the quarry and delivered either directly by dump truck or road wagon to where it is required.

3.2.16 It is anticipated that all precast manhole and drainage components would be manufactured off site and delivered to site on a 'just in time' basis on articulated road wagons.

3.2.17 Pipes required on the project are likely to be either precast concrete or twin wall plastic pipe. These products would be manufactured off site and delivered to the works location on a 'just in time' basis.

4 Water Management

4.1.1 For the majority of its length, the new section of motorway crosses the Gwent Levels, which has a very high water table and contains a large number of interconnecting watercourses (reens and field ditches) feeding into the Severn Estuary. This area is designated as a series of Sites of Special Scientific Interest due to the ecosystem developed and supported by the reen drainage system.

4.1.2 The water management strategy during construction and operation of the new section of motorway is described below. The strategy takes into account the sensitivity of the reen system and it would be supported by mitigation measures and a monitoring programme (see Chapter 16 of the ES and Appendix 3.2). Further information on the key constraints and sequencing of construction works on the Gwent Levels is described in Section 10 of this report.

4.2 Construction of Culverts

4.2.1 A number of existing reens crossed by the new section of motorway would be maintained as part of the design. The connectivity of the existing reen network would be maintained by installing culverts and constructing replacement reens and field ditches that intercept channels being severed by the embankments of the new section of motorway.

4.2.2 Most culverts would be constructed offline with the reens permanently diverted after installation. Temporary crossings of the existing reens/ditches would be constructed to provide continuity of the haul road and access to works areas along the proposed new section of motorway. Temporary pipes would be installed within the existing reens and ditches early in the construction programme to maintain connectivity of the watercourses and to provide temporary plant crossings. The number of pipes installed would vary according to the reen channel dimensions and the discharge rate (see Annex 1).

4.2.3 The permanent culvert installation would take place once the haul road is constructed. The culverts would be constructed on a half and half basis (i.e. constructing half of the culvert, switching the haul road to the other side of the carriageway then construct the other half of the culvert) to maintain the haul route access through the site.

4.2.4 Typically, the permanent culverts would be founded on driven piles. In areas of precast driven piles, the permanent box culvert would be installed after the piling is installed. For areas of band drain and surcharge embankment construction it is preferable to install the permanent culverts prior to the surcharging period (i.e. low height embankments), for the following reasons.

- It avoids the return mobilisation of non-earthworks plant.
- It reduces the extent of temporary works required for installation.
- It enables the permanent solution to be implemented.

4.2.5 The other option would be to install the box culvert after the surcharging period is completed. This would require enhanced temporary works as the embankment fill would increase the relative depth of the box culvert and would also elongate the construction programme. This option would only be considered where driven

pile foundations are not available until after the surcharging period has completed.

4.3 Construction Phase Water Treatment Areas

4.3.1 It is intended to use the location of the permanent water treatment areas (WTAs) as temporary lagoons for water management during construction.

4.3.2 The temporary lagoons would be formed by approximately 1 metre high impermeable perimeter bunds on top of the existing ground surface. The bunds would contain construction runoff to prevent infiltration into the adjoining SSSI. The size and layout of the lagoons would be designed to achieve the required degree of settlement and water quality as well as the capacity to accommodate storm events. Weirs would be installed to form a series of settlement lagoons with the objective of increasing the water quality as it progresses towards the discharge point. A water sampling regime would be implemented to confirm that the settled water achieves the required turbidity parameters and can be discharged into the reen network.

4.3.3 Towards the end of construction, the temporary lagoons would be cleaned out of sediments and the permanent WTAs would be constructed. The construction sequence for the permanent WTAs is set out below.

- Secure the WTA with permanent or temporary fencing.
- Complete the bund around the attenuation pond (if not done completely during the temporary state).
- Clean out the sediment and excavate the pollution control lagoon, attenuation lagoon. The excavated material would be deposited directly within the borrow pits as part of their restoration.
- Install and secure the liner as specified to prevent the seepage of wastewater to the environment.
- Install the carrier pipe from the motorway and to the outlet reen.
- Install the permanent security fence.

4.4 Capture of Runoff from Works Footprint

4.4.1 During construction, surface water runoff from the proposed works footprint would be managed by capture and settlement before being released to the existing reen system. The sequence of activities to install water management measures is described below and includes temporary measures for the construction period and the permanent measures.

- Construct replacement reen/field ditch (where required) to maintain connectivity of the existing Levels network.
- Construct impermeable bunds at the edge of the construction boundary to form temporary lateral lagoons.
- Form temporary collection ditches on top of the earthworks embankment.
- Seed the sides of embankments to minimise soil erosion during the surcharging process.

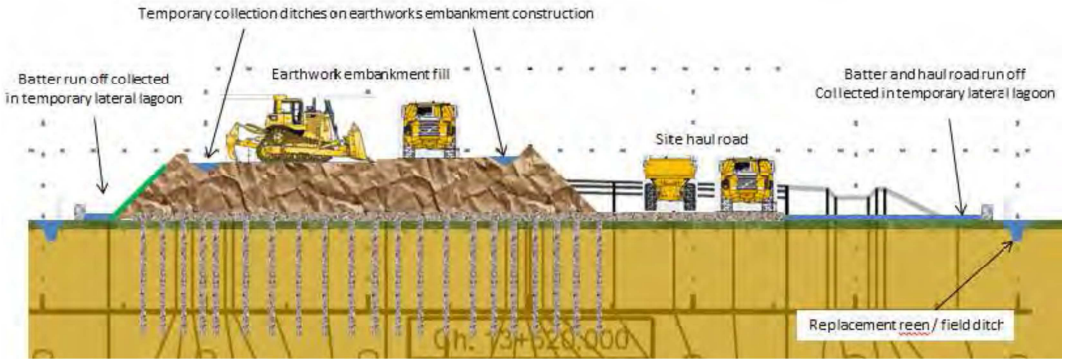


Figure 4.1: Temporary Measures during Construction

4.4.2 The transition to the permanent water management is described below and shown in Figure 4.2.

- Remove surcharge material when consolidation period is completed.
- Construct carriageway foundation and place initial layer of carriageway surfacing.
- Construct the permanent grass lined channel.
- Empty the temporary lateral lagoon and remove the bund.
- Install the permanent highway boundary fence line.
- Form the maintenance access between the highway boundary fence and the replacement reen/field ditch.
- Construct the permanent WTAs once the carriageway initial surfacing is installed on both carriageways.

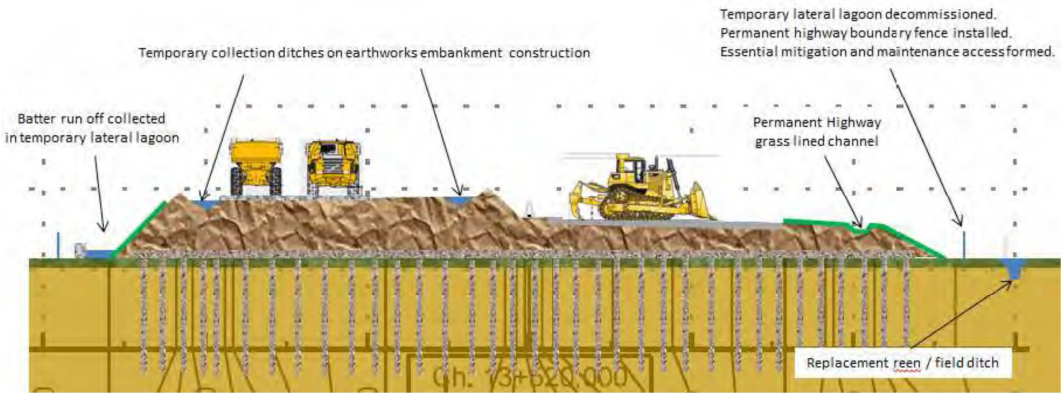


Figure 4.2: Transition to Permanent Water Management Measures

Temporary Collection Ditches

4.4.3 Bunds and collection ditches would be formed on the edge of the earthworks embankment during construction. These would channel water from the top of the embankment via a slope drain to the WTA.

Temporary Lateral Lagoons

4.4.4 Runoff from the sides of the embankments would be captured in an impermeable bunded area located along the corridor of construction between the main line

embankment and the permanent parallel field ditch/replacement reen. The impermeable bund would be approximately 1 metre above ground level and would contain runoff until controlled discharge points. The adjacent channel would remain vegetated (i.e. the topsoil would not be stripped) for the following purposes.

- To protect the underlying organic material.
- To reduce the amount of unsuitable material generated;
- To slow the flow of water towards the outfall point. The grass would also act as a filter.
- To facilitate the deposition of sediment and the retention of oily residues and organic matter, which would be broken down in the top layer of soil and vegetation.

4.4.5 Due to the minimal longitudinal falls across the Levels, the bunded areas would act as lateral settlement lagoons. Silt fences and settlement weirs would be installed at reens to prevent runoff from entering the reens prior to settlement. Runoff would migrate to natural low areas within the bunded areas and would be pumped to the nearest WTA.

5 Demolition

5.1.1 The proposed highway network would require the demolition of both buildings and structures. The demolition works would be undertaken by a specialist demolition contractor in accordance with approved method statements and relevant legislation including the Demolition Building Act 1984, Town & Country Planning (Permitted Development Rights) Order 1995, Planning (Listed Building and Conservation Areas) Act 1990 (where relevant), Health & Safety at Work etc. Act 1974, Management of Health & Safety at Work Regulations 1992 and Construction (Design and Management) Regulations 2015.

5.1.2 Pre-demolition asbestos surveys would be undertaken as required. Demolition audits would be undertaken to identify any materials that could be recovered for re-use or recycling. Where appropriate, pre-demolition bat roost surveys would also be carried out of those buildings/structures identified as requiring such assessment.

5.1.3 To minimise the impacts of demolition the following measures would be taken into consideration:

- water spraying of structures/use of water as a dust suppressant prior and during demolition;
- use enclosed chutes and covered skips;
- protection measures for the Gwent Levels Sites of Special Scientific Interest (SSSIs); and
- re-use of materials.

5.1.4 The buildings and structures to be demolished and their impact on the sequence of construction activities are listed below.

Table 5.1: Buildings and Structures to be Demolished at Castleton

Ref	Name of Structure	Impact on sequence	Principal Activities
SBR 0200	Park Farm Footbridge	Open new footbridge prior to demolition of existing footbridge. Demolition to be carried out during full overnight weekend closure of the M4. To be demolished prior to completing new eastbound slip road.	Removal of surfacing from the deck of the bridge to expose the concrete deck. Installation of road protection. Break structure of bridge using demolition excavators with hammer attachments. Reduce reinforced bridge structure onto crash deck below. Demolition plant would be supported by ancillary and support plant including dust suppression equipment. Piers would be demolished to ground level and reduced to rubble. Rubble and demolition
SBR 0250	Castleton 1C Overbridge	Open new A48(M) eastbound slip road prior to demolition of existing overbridge. Demolition to be carried out during full overnight weekend road closure (westbound traffic only). Eastbound traffic would be sent on the newly constructed slips to Newport.	

Ref	Name of Structure	Impact on sequence	Principal Activities
			arisings removed from the surface of the road.
SBR 3040	Pound Hill Overbridge	Maintain bridge as long as possible to use as earthworks haul road. Demolition to be carried out during full overnight weekend closure of M4. Required to be demolished prior to completing new eastbound slip road.	Explosives would be used to demolish the deck of Pound Hill Bridge to ground level (due to the height of the bridge and that the works have to be completed within a short road closure period). Prior to blowdown, the following activities would be undertaken: - explosive engineering preparatory work; - pre-weakening of structure; - drilling charge holes; - stakeholder liaison; - protection of existing road surface. Once the bridge has been completed, the demolition arisings would be cleared.

Table 5.2: Buildings and Structures to be Demolished at Magor

Ref	Name of Structure	Impact on sequence	Principal Activities
SBR 2335	Bencroft Lane New Underbridge	Open new M48 eastbound connection prior to demolition of existing underbridge. Demolition to be carried out during full side road closure. Required to demolish structure prior to completing landscaping works in the area.	As for SBR0250.
	Wilcrick Maintenance Depot	The existing Wilcrick Maintenance Depot would be demolished as soon as the new depot at Glan Llyn has been commissioned and used by the maintenance team.	

5.1.5 Twelve residential properties would be demolished as part of the construction of the new section of motorway as follows:

- The Conifers, Coedkernew, Newport;

- White Cottage, Newport Road, Coedkernew, Newport;
- San Remo, Coedkernew, Newport;
- The Glen, Coedkernew, Newport;
- Quarry Cottage, Coedkernew, Newport;
- Myrtle House, Pound Hill, Coedkernew, Newport;
- Berryhill Cottage, Coedkernew, Newport;
- Berryhill Farm, Coedkernew, Newport;
- Barecroft House, Barecroft Common, Magor;
- Woodland House, Newport Road, Magor;
- Undy Farm, Undy; and
- Dunline, Knollbury, Magor.

5.1.6 Existing commercial properties would require demolition in the following locations:

- buildings located at Newport Docks owned/operated by Associated British Ports to allow for construction of the River Usk Crossing;
- buildings owned/operated by Marshalls Mono Ltd; and
- building located at Tata Steelworks operated by Harsco Metals to allow for construction of the new maintenance depot.

6 Utilities, Network Rail and Associated British Ports

6.1 Utilities

6.1.1 The construction of the new section of motorway would involve a number of Statutory Undertaker utility diversions and also a number of private diversions.

6.1.2 Service diversions would range from small localised re-routing to major overhead and underground service diversions and all would require individual solutions. Typical constraints for the construction of service routes include traffic management, reduced working space, land take and height restrictions. Given the location of the new section of motorway, the additional constraints of working within (or close to) a SSSI and adjacent to areas of contaminated land would also apply.

6.1.3 Discussions have been held with the Statutory Undertakers and private stakeholders to gain an understanding of the existing service routes and requirements, which has been used to inform service diversions or other mitigation.

6.1.4 The list of proposed service diversions is shown in Table 6.1.

6.1.5 Throughout the duration of construction there would be a risk that unchartered services may be encountered which have not been identified on any location plans. This would be dealt with through a series of mitigation measures which would include site surveys with cable detecting equipment, trial holes and the issuing of Permits to Dig.

6.1.6 The strategy is to avoid service routes, where possible, protect existing services if they cannot be avoided and, if neither option is achievable, then diversions would be the last resort.

Identification of Major Utilities

BT Fibres (along A48)

6.1.7 Fibre optic cables have been identified within the footprint of the existing A48 which are affected by the proposed structures at Castleton Junction. These fibre optics supply a number of regulatory authorities and are critical to their day to day operations.

6.1.8 Diversion of these fibre optic cables would need to be undertaken in advance of the foundation construction in this area for the structures spanning the A48 (for example, the Castleton Interchange Overbridge). The diversion routes would be developed with BT Openreach within the construction site and A48 footprints.

National Grid (site wide)

6.1.9 The new section of motorway has been designed to avoid diversions of National Grid assets and clearances from finished road levels have been checked for compliance with National Grid specifications.

Trunk Sewers (site wide)

6.1.10 The new section of motorway conflicts with Dwr Cymru Welsh Water (DCWW) sewer assets in seven locations, with the sizes of the sewers affected varying between 100 mm and 1,830 mm diameter. By adjusting the pier locations on the River Usk Crossing bridge, two diversions have been avoided and the remaining conflicts are under review. Existing routes that cross the new section of motorway would be protected with a reinforced concrete slab, the design of which would be agreed with DCWW.

Air Products

6.1.11 Air Products own and operate the existing oxygen, nitrogen and hydrogen mains, which fall under the Control of Major Accident Hazards (COMAH) Regulations. These pipelines are in close proximity to the alignment of the new section of motorway at two locations.

- At the tie-in with the A4810 where a protection slab already covers the pipelines would need to be checked for loadings and then extended.
- South of Solutia the pipelines are above ground and are currently affected by the temporary works requirements. The methods for the lifting of the steel pier head beam over the PCB cell using a crane within the available space have been reviewed and an optimum crane position has been identified.

6.1.12 Discussions with Air Products are ongoing to develop protection measures, and the Major Accident Prevention Policy (as defined by COMAH Regulation 7) developed for the new section of motorway would incorporate any Air Products requirements as part of our Safe System of Work and implemented into our Method Statement.

Solutia

6.1.13 An existing effluent pipe crosses the route of the proposed new section of motorway at Chainage 11880 and must remain operational at all times. Any release of contents from a damaged pipe would be considered to be a Major Accident to the Environment as defined under COMAH. To that end a Major Accident Prevention Policy would be prepared in conjunction with Solutia to also incorporate their emergency procedures.

6.1.14 Discussions are ongoing with Solutia regarding an agreed protection slab that would avoid the need for any diversion and mitigate the risk of damage to this effluent pipe.

Magor Brewery

6.1.15 There is an existing raw water feed and an effluent pipe, into and out of the Brewery, which cross the route of the new section of motorway. These feeds are critical to the daily operation of the brewery and cannot be interrupted without consultation with the Brewery.

6.1.16 At these locations, a series of options to cross the pipelines would be developed. This would consist of protecting existing lines *in-situ* with a designed reinforced concrete protection slab prior to commencing earthworks in the area. A spare sleeve may be installed through an earthworks embankment should there be any

need to replace the pipe in future. If necessary, temporary protection would be used for crossing of the haul road. This would be determined during the detailed design of the protection measures.

High Pressure Gas Main

6.1.17 Wales and West Utilities own and operate three high pressure mains in the vicinity of the new section of motorway. The design of the new section of motorway avoids the need for diversion of two of these mains by utilising protection slabs designed in agreement with Wales and West Utilities. The third main crosses the proposed Meadow Road side road diversion. Wales and West Utilities have indicated that no diversion would be necessary.

Table 6.1 List of Required Diversion Works

Statutory Undertaker	Location	Comments
BRITISH TELECOM		
A48 underbridge North	Ch3700	affected by footprint of proposed bridge - requires diversion before work commences
A48 Underbridge South	Ch3700	affected by footprint of proposed bridge - requires diversion before work commences
Pound Hill	Ch3400	Pound Hill bridge to be removed
Church Lane	Ch4650	clash with proposed Church Lane Underbridge - requires diversion before bridge construction
Dyffryn Link / Percoed Lane	Ch4600-5800	new duct route required to avoid M4 alignment
Lighthouse Rad Overbridge	Ch7500	divert after construction of proposed Lighthouse Road Overbridge - protection at tie ins
New Dairy Farm	Ch8100	protection under main carriageway
Eastern Dry dock Area Corporation Road	Ch10700	re-route supplies to existing buildings
Cold Harbour Road	Ch11100	protection required
Nash Road Junction	Ch12400	protection to existing cable required -divert after construction of Nash Road Overbridge
Tatton Farm Caldicot Levels	Ch13100	localised diversion to farm
North Row Overbridge	Ch18000	protection to existing cable required - divert after construction of North Row Overbridge
Bareland Street Underbridge	Ch19800	divert into new Bareland Street Underbridge
B4245 Magor Junction	Ch20900	diversion after construction of Newport Road Overbridge
St Brides Road Underbridge	Ch21300	slew existing cables into St Brides Road
Knollbury Lane Overbridge	Ch22300	temporary diversion and divert after construction on Knollbury Lane Overbridge
B4245 Rogiet Tie-in	Ch23600	protection of services
Various disconnections to properties		
VIRGIN MEDIA		
A48 Castleton	Ch3700	affected by footprint of proposed bridge - requires diversion before work commences
Lighthouse Road	Ch7400	divert after construction of proposed Lighthouse Road Overbridge - protection at tie ins
DCWW Potable Water		
4" diameter Asbestos Cement pipe laid in 1930	outside White Cottage on A48	protection prior to diversion - sits under proposed new embankment
4"diameter Asbestos Cement pipe laid in	Ch3900 - 4300	protection prior to diversion including spare sleeves - sits under proposed

Statutory Undertaker	Location	Comments
1930		new embankment
250mm diameter HPPE pipe laid in 1998	Ch4700 – 5700 Duffryn link	sits under new proposed M4 alignment
180mm diameter MDPE laid in 1991	Ch7500 Lighthouse Rd	divert after construction of proposed Lighthouse Road Overbridge - protection at tie ins
12" diameter cast iron pipe laid 1954	Ch12400 -12500 - Nash Road	protection required to construct new section of motorway and divert after completion of Nash Road Overbridge
A4810 existing roundabout - link from M4 tie in	Ch14350 – A4810	possible protection whilst tie in to roundabout
3" asbestos cement pipe laid 1930	Ch19600-19900	protection required to allow mainline fill, divert after construction of Bareland Steet Underbridge
450mm diameter ductile iron pipe laid 1978 - feed to Brewery	Ch20200-20300	divert early to allow construction of approach to Llandevenny rail bridge
180mm diameter MDPE pipe laid 1993	Ch20700-20900	divert after construction of Newport Road Overbridge
6" diameter asbestos cement laid 1930	Ch20900	divert after construction of Newport Road Overbridge
6" diameter asbestos cement laid 193 - feed to Police Station	Ch20800	abandon mains - cut and cap required
St Brides Road - 200mm diameter ductile iron pipe laid 2001	Ch21200-21300	protection required during extension of St Brides Underbridge and earthworks haul road
St Brides Road - 250mm diameter ductile iron pipe laid 1978	Ch21200-21300	protection required during extension of St Brides Underbridge and earthworks haul road
St Brides Road south - 200mm diameter ductile irn pipe laid 2001	Ch21200-21300	diversion to incorporate extension of St Brides Underbridge
Knollbury Lane overbridge - 4" diameter UPVC pipe laid 1960	Ch22050	temporary diversion required whilst bridge extended then permanent diversion
3" diameter asbestos cement pipe laid 1930	Ch21850-21950	feed on north side to Beeches Farm caravan park - diversion required
200mm diameter ductile iron pipe laid 1999	Ch23700	diversion required for construction of M4 eastbound slip road underbridge
200mm diameter ductile iron pipe laid 1999	Ch23700	protection required during construction of Caldicot Road Underbridge
DCWW Sewers		
Western Valley Trunk Sewers - 2 no. - 1350mm and 40" diameters	Ch5750	early installation of culverts to facilitate fill operations - divert at a later date, protect existing
400mm diameter Rising main and 825mm diameter concrete sewer	Ch12400	early installation of culverts to facilitate fill operations - divert at a later date, protect existing
10" diameter Rising main	Ch20200	protect existing and install sleeves early to allow embankment

Statutory Undertaker	Location	Comments
		construction
90mm diameter MDPE Rising main	Ch19800	protect existing before diverting into Bareland Street Underbridge
150mm diameter UPVC	Ch20850	protect existing at plant crossing, divert after construction of Newport Road Overbridge
4" diameter cast iron pipe	Ch21300	early diversion required
Wales & West Utilities (High Pressure Gas Mains)		
900mm diameter steel pipe	Ch3650	protection required via culvert over main
300mm diameter steel main	Ch12400 Meadows Road	protection only required at north tie in for construction of new Nash Road Overbridge
Wales and West Utilities (Intermediate Pressure Gas and Lower Pressure Gas		
18" diameter steel Intermediate pressure main	Ch11050	protect during piling and crane operations no diversion
18" diameter steel Intermediate pressure main	Ch10950	protect during piling and crane operations no diversion
18" diameter steel Intermediate pressure main	Ch12400	protect existing mains through new section of motorway, divert after construction of Nash Road Overbridge
450mm diameter low pressure	Ch12400	protect existing at northern tie in only of Nash Road Overbridge
B4245, Newport Road Gas Governor, Magor	Ch20850	protect existing and divert existing after construction of Newport Road Overbridge
B4245, Newport Road, Magor 6" steel pipe medium pressure	Ch20850	lay new pipe after Newport Road Overbridge, run in parallel then divert through new gas governor
B4245, Newport Road, Magor 63mm PE pipe steel medium pressure	Ch20850	lay new pipe after Newport Road Overbridge, run in parallel then divert through new gas governor
WPD 132kV Diversions		
132Kv pylon conflicts with new section of motorway and Lighthouse Overbridge	Ch7290-7700	early diversion required to release bridge construction
new WPD feed to Biomass Plant	Ch8200	protection would be required even if only overhead protection
132kv pylon clashes with River Usk Crossing pier (E11) on east approach viaduct	Ch10900-11550	underground diversion required between new pylons
132kv pylon clashes with River Usk Crossing pier (E12) in PCB cell	Ch10900-11550	underground diversion required between new pylons
insufficient clearance	Ch12000	towers to be extended
insufficient clearance	Ch12300	towers to be extended
tower clashes with new section of motorway	Ch12650	new tower on line on north side of proposed road
critical feed to Severn Tunnel	Ch12700	protection only at bottom of pylon during construction of new section of

Statutory Undertaker	Location	Comments
		motorway
North Row	Ch17780	protection only at bottom of pylon during construction of North Row south approach to bridge
insufficient clearance	Ch19600	new towers to raise line levels to achieve clearance
WPD <132kV Diversions		
11kV overhead terminates at pole and then underground	Ch1950	protection only for plant travelling around pole
LV supply to gantry	Ch3040	disconnect
LV supply over Pound Hill bridge to motorway responder unit	Ch3350	diversion before demolition of Pound Hill bridge
11kV overhead line and sub station	Ch3650-3900	early diversion required to allow fill on new section of motorway
numerous 11kV underground and overhead through Duffryn link	Ch4650-5550	divert prior to ground treatment works, protection of cables crossing new section of motorway
11kV overhead and underground lines on Lighthouse Road	Ch7400	temporary diversion required to construct Lighthouse Road Overbridge, divert into new bridge after construction
Corperation Road - River Usk Crossing bridge east back span piers	Ch10950-11260	protection required during construction of piers
Meadows Road - underground and overhead 11kV	Ch12400-12500	protection and then divert into proposed Nash Road Overbridge
11kV overhead	Ch12900	divert to underground (around pond) and protect under new section of motorway
11kV overhead cable crosses mainline route	Ch18080	divert underground and protect under new section of motorway
magor sub station	Ch20110	diversion required prior to embankment fill and temporary Llandevenny rail bridge
11kV overhead line	Ch20111	diversion required prior to embankment fill
11kV underground	Ch20200 Greenmoor Lane	located at commencement of fill area - protection required
Wilcrick Depot	Ch20800	relocate sub station and terminate supplies
LV underground cable along bottom batter existing M4	Ch21100-21500	protection where needed and diversion required prior to earthworks
St Brides Road - underground 11kV and LV	Ch21200	protection of existing for haul road, diversion for bridge extension
Knollbury Lane - 11kV overhead and underground & LV	Ch21800-22220	divert through existing Knollbury Lane to allow extension of new bridge
underground LV	Ch22750	relocate LV feed to motorway communication system
11kV and LV underground	Ch23600	divert prior to construction of M4 eastbound onslip bridge

Statutory Undertaker	Location	Comments
11kV underground cable	Ch23800	protect existing, additional sleeves required
National Grid		
North Row (4YX115)	Ch17700	protection required around tower during North Row construction
Imperial Park - St Brides U/G Cable X-	Ch6100	protection only - dependant on installed depth
National grid Circuit 275kV	Ch5800-5900	Clearance under National Grid Review
National Grid Circuit 275kV (XM006 - 007 OHL)	Ch7850	Clearance under National Grid Review
National Grid Circuit 400kV (4YX100 - 101 OHL)	Ch13200	Clearance under National Grid Review
national Grid Circuit 400kV (4YX114 - 115 OHL)	Ch17700-18400	Clearance under National Grid Review
national Grid Cuircuit 33kV - Whitsun S/S	Ch15100-15200	Clearance under National Grid Review
Solutia / Eastman		
100mm diameter buried oxygen main	Ch11000-11150	protection existing pipeline during works on Corperation Road
Above ground hydrogen and oxygen pipelines	Ch11200	protection required during crane lift operation
fire protection system	Ch11400	diversion required
18" diameter underground cast iron effluent outfall pipe	Ch11900	protection required to outfall pipe crossing new section of motorway
Air Products		
A4810 junction	Ch14800	protection slab required
above ground pipe racks	Ch11200	protection required during crane lift operation
TATA Steel		
350mm diameter effluent pipe, 600mm above ground, 70 psi	Ch16400	early in programme divert below ground and protect to allow haul road and construction of embankment
Traffic Wales		
relocate communication system at Castleton	Ch3350	diversion required at Pound Hill
relocate communication system at Magor	Ch20900	diversion required at Newport Road
Magor Brewery		
600mm diameter effluent outfall pie	Ch20200	concrete protection to allow embankment fill material
ABP		
1400mm diametr storm water outfall	Ch8500-8650	diversion required to avoid conflict with pile installation
LV supply to lighting columns	Ch8650-9020	disconnect supplies and remove
Storm water pipe run size unknown South side of new Docks Junction	Ch8780	located in north side of road - abandon
Storm water pipe run size unknown South	Ch8780	located in south side of road - re locate around bottom of new roundabout

Statutory Undertaker	Location	Comments
side of new Docks Junction		
11kV and LV cables south side Docks junction for Tom Lewis S/S	Ch8780	located in south side of road - localised diversion around bottom of new roundabout
BT supply to Assett	Ch9000	abandon
water supply to Assett	Ch9000	abandon
various supplies in existing footpath - storm, 11kV, LV	Ch9010	diversion required
150mm diameter ductile iron pipe laid 1971 – water	Ch9050	diversion required
BT supply to Assett	Ch9050	diversion required
storm water drainage and gullies	Ch9100	abandon
300mm diameter storm water drain	Ch9160	diversion required as clashes with west abutment
Docks Junction to Newport SDR - 1200mm diameter outfall	Ch9000	protection required
Jewson timber yard storm water drainage runs and petrol interceptor PI10	Ch9310	protection required
LV supplies	Ch9340	protection required
Supplies following rail line	Ch9360	protection only if required
storm water outfall to petrol interceptor	Ch9420-9600	divert due to clashes with River Usk Crossing piers
LV supply to lighting columns	Ch9450	abandon
storm water outfall to petrol interceptor	Ch9500-9600	divert due to clashes with River Usk Crossing piers
180mm diameter MDPE pipe laid 1996 – water	Ch9520	protection required during construction of piers
LV cables	Ch9520	protection required during construction of piers
BT underground and overhead cables	Ch9520	divert due to clashes with River Usk Crossing piers
storm water pipe & petrol interceptor - PI 10	Ch9600	relocate
LV cables	Ch9600	divert due to clashes with River Usk Crossing piers
fibre/CCTV/IT cable	Ch9600	divert due to clashes with River Usk Crossing piers
fibre/CCTV/IT cable and LV cables - east side of north dock	Ch9670	divert due to clashes with River Usk Crossing piers
6" diameter steel pipe laid 1912 - water	Ch9670	divert due to clashes with River Usk Crossing piers
125mm diameter MDPE pipe laid 1996 – water	Ch9700-9900	protection under lay down areas
power and water disconnections to various buildings to be demolished	Ch9700-9900	disconnect and remove
11kv feed to workshop	Ch9810	disconnect and remove

Statutory Undertaker	Location	Comments
storm water pipes and petrol interceptor PI 05	Ch9810	abandon and remove
storm water SE corner of west pylon	Ch9100	abandon and remove
storm water outfalls	Ch9910	protection during West pylon construction

Advanced Utility Diversions

6.1.18 A number of utility diversion would need to be completed within the first six months of the construction programme before further works such as earthworks, fill and commencement of structural foundations, could be undertaken.

6.1.19 A number of private diversions also need to be completed early in the construction programme.

6.2 Network Rail Interface

Requirements

6.2.1 As part of the new section of motorway there is a requirement to construct two underbridges over the South Wales to London Mainline at Duffryn (Coedkernew) and Llandevenny (Magor).

6.2.2 The design of both structures would take into account the proposed electrification of this line which is due for completion in 2017.

6.2.3 In addition there would be construction works in very close proximity to Network Rail's Uskmouth line which feeds Uskmouth power station, and although not a heavily used route, is still subject to constraints.

Interface with Overhead Line Electrification (OLE)

6.2.4 The electrification of the South Wales to London Mainline is due to be completed before construction works on new section of motorway commence. Constraints would be imposed whilst working close to 'live' lines, including waterproofing all structures above the rail. Discussions are ongoing with Network Rail.

Possessions

6.2.5 Working adjacent to the railway line would be managed by 'possession planning', whereby sections of the railway track would be closed to allow construction activities to be undertaken safely whilst minimising disruption to the train network.

6.2.6 There are two types of possessions that are granted on this line by Network Rail - Rules of Route and Disruptive Possessions.

6.2.7 Under Rules of Route possessions two tracks out of the available four tracks are blocked and generally this can be up to eight hours over night mid-week. Rules of Route possessions also allow for a full four track closure in the early hours of Sunday morning between the first and last trains and would give an approximate working window of five hours. However, any local events could reduce the available window.

6.2.8 Disruptive Possessions are generally only permitted at Easter and Christmas and give a full 52 hour working window. These possessions can be granted at other times if there is no alternative. However, disruption to freight traffic and passengers would need to be reviewed before possessions are sought at other times.

Constraints

6.2.9 Network Rail have indicated that Disruptive Possessions would not be granted simultaneously at Duffryn and Llandevenny Bridges as passengers would incur additional journey times needing to travel via road from Cardiff to Bristol and the resulting journey time is considered to be too long. To that end Cardiff to Newport is considered to be one Disruptive Possession and Newport to Bristol is another Possession.

6.2.10 It has also been noted that any closure request would need to be viewed in the wider context to consider passengers travelling from Paddington to South Wales to ensure there are no additional clashes resulting in passengers having to travel by road in more than one location.

Safe Systems of Work

6.2.11 In addition to the approvals of risk assessment and method statements, specific information about any nightly task involving a possession would be detailed in a works package for the Controller of Site Safety (CoSS) as required by Network Rail.

Temporary Works

6.2.12 Prior to any works commencing on site, a detailed risk assessment/method statement would be produced together with a Work Package Plan which would be submitted and approved by Network Rail. This would also include all relevant lift plans.

Temporary Overbridges

6.2.13 The electrification of the South Wales to London Mainline is programmed to have been completed when construction of the new section of motorway commences and allowance has been made for the heights of any twin track cantilevers close to overbridges.

6.2.14 The temporary overbridges would need to be encapsulated to a height of 1.85 m on the parapets to ensure nothing drops onto the tracks and, as the structures are over live cable routes, they would need to be waterproofed.

Duffryn Railway Underbridge

6.2.15 A temporary bridge over the South Wales to London Mainline railway at Duffryn is required for the transportation of fill material required between Duffryn and River Usk west abutment. Once in place this would avoid the requirement to use the local road network for construction traffic access via Lighthouse Road.

6.2.16 Two adjacent temporary bridges would be 45 m long and provide sufficient clearance to the underside of the temporary bridge from the running rail for planned installation of overhead electrical equipment. They would also provide the minimum lineside widths stipulated by Network Rail (i.e. the area either side of the railway immediately off the track ballast shoulder, which normally provides a safe area for workers and their equipment to stand when trains approach). Each temporary bridge would be 6 m wide, each bridge carrying one way flow of construction vehicles.

Llandevenny Rail Underbridge

6.2.17 A temporary bridge over the South Wales to London Mainline railway at Llandevenny is required for the transportation of fill material from Ifton Quarry and Magor Junction onto the Caldicot Levels, minimising the requirement for road haulage and the detrimental effect to the public and the local highway network.

6.2.18 The temporary bridge would be a 31 m long double lanes two ways structure. Signal sighting lines to the railway signal gantry under the structure dictate the deck level rather than the minimum clearance to the planned overhead electrical equipment. Three metre minimum lineside widths would be maintained to avoid potential obstruction or areas of limited clearance for Network Rail personnel. The railway is on a bench cut into the existing hillside therefore the abutment embankments would steepen the face of the existing batters to the railway as well as raise the level of the ground forming approach ramps.

Piling Adjacent to Railway Lines

6.2.19 All piling works would follow Network Rail Guidance NR/L3/INI/CP0063 for Piling Adjacent to the Running Line both for the permanent works and, where required, for temporary works.

6.2.20 The design of both underbridges is such that abutment walls would sit upon a row of bored piles which would be installed at a minimum 5 m from the closest running rail. Discussions are ongoing with Network Rail where installation of the piles would impinge within 3 m of the twin track cantilevers to confirm any additional requirements.

6.2.21 Track monitoring would need to be undertaken for an agreed period of time before work commences, during construction and an agreed period of time after installation of piles.

Formwork Used Adjacent to Railway Lines

6.2.22 Formwork would be designed and checked independently. After installation of the piles and pile cap, a temporary running platform would be constructed so that formwork can move along the length of the bridge at the side of the track.

6.2.23 It would be necessary to prevent any objects falling within the 3 m zone of the track so the formwork would consist of a permanent, moveable back shutter, behind which all steel fixing operations can be undertaken. This would then allow the installation of reinforcement behind a protective barrier to the rail.

Temporary Track Crossings

6.2.24 Due to the restrictive height of the existing rail bridge on Corporation Road when crossing Uskmouth railway line, and following discussions with local stakeholders to understand traffic movements in this area, an alternative access would be required. A temporary crossing point would be required to act as the main access point during the construction period. The design of the crossing would be subject to the approval of the Official Rail Regulator. The crossing would be primarily for road vehicles but pedestrians could use it as well.

6.2.25 All design would be sufficient to withstand proposed loads and full design and certification would be sent to Network Rail. Any agreed crossing point on

Uskmouth railway line would be gated and manned by Network Rail operatives who can liaise directly with the shunter.

6.2.26 It is likely that the tracks would need to be monitored prior to installation of the crossing point to gain a baseline, during and after the crossing point has ceased operation.

6.3 Associated British Ports (ABP)

Introduction

6.3.1 The new section of motorway has been discussed with Associated British Ports (ABP) a number of times since original conception.

6.3.2 Following award of the Scheme to the Costain Vinci Joint Venture (CVJV) dialogue with Associated British Ports has been established to gain information in terms of service locations and general activities. It became apparent with the amount knowledge transfer available that a dedicated Liaison Manager was required to coordinate all contact between CVJV and the ABP.

6.3.3 Numerous meetings have been held, both at the ABP's Offices in Newport and Cardiff and at the CVJV offices, at which both the CVJV, Welsh Government and ABP positions have been tabled so that all have a better understanding of the impacts from the new section of motorway. The main focus of the meetings has been the route alignment and the dock clearance heights.

6.3.4 Current and planned land use has been discussed with ABP and considered to minimise compound and working area impact on port activity as far as possible.

6.3.5 Internal port access roads and vehicles movements have also been discussed at length with ABP and considered to maintain free traffic on all critical routes both in the permanent operational and temporary construction conditions.

6.3.6 The dedicated Liaison Manager has also held meetings with business's operating within the Port to ensure the impact of our construction methodology is minimised as far as possible.

Site Interfaces within ABP area

Access to West compound of River Usk Crossing

6.3.7 The western construction compound would be located within land currently owned by ABP. It would be divided into four areas:

- Area 1: located west of West Way road, which would include offices, welfare facilities, batching plant, precast yard, deck launching platforms (for west approach viaduct and Ebbw bridge) and the west abutment (WA), the east abutment of the Ebbw bridge and the Dock Way Junction
- Area 2: located between West Way Road and the railway, which would be needed for the construction of piers W8 and W7
- Area 3: located between the railway and the dock cut, which would be needed for the construction of piers W6, W5 and W4

- Area 4: located on the east side of the dock cut, which would be needed for the construction of piers W3, W2, W1 and the west pylon, as well as for the erection of the west back span

6.3.8 All of the above areas would be securely fenced and made secure.

6.3.9 The sketch below illustrates these 4 areas. For the exact extents of the proposed site installation areas see the Compulsory Purchase Order plans.

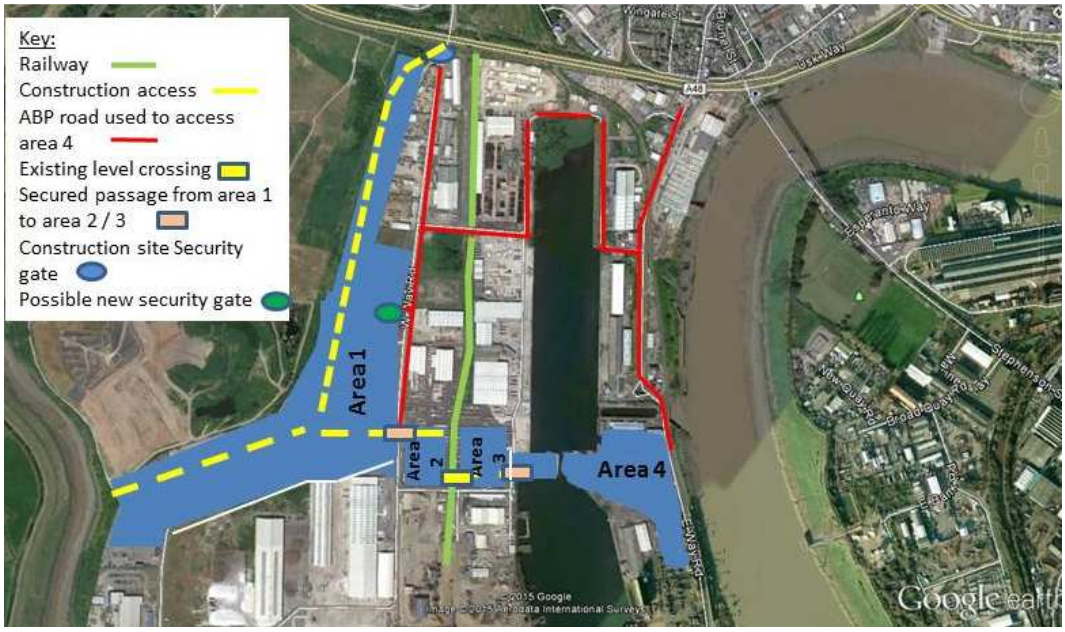


Figure 6.1 : West areas – indicative sketch

6.3.10 Proposed access arrangements to these areas are set out below. Further discussions with ABP are required during construction to manage this interface and minimise disruption to the Port operation with regard to operational security arrangements.

6.3.11 An independent access would be created to enter the Area 1. The access would be located before ABP's west security gate in order to minimise the construction traffic at current ABP gates. For this purpose, it is anticipated that the west security gate would need to be temporarily relocated a few metres south of its current location.

6.3.12 Area 1 would include offices, welfare facilities, precast yard a batching plant and, the launching area of the steel deck. This area would also give access to the east side of the Ebbw bridge.

6.3.13 To minimise disruption to ABP activities, access to Area 2 would be possible from Area 1 by crossing West Way via a secure gate system. In a similar manner access to Area 3 would be from Area 2 via the existing level crossing.

6.3.14 A north/south access for ABP traffic would be maintained through Area 3 during the construction works, if required.

6.3.15 To access Area 4, there are two options available:

- This can be done by exiting Area 1 onto West Way Road and using the ABP road (in red on Figure 6.1). An ABP security gate could be put in place if required to exit Area 1 and enter into the ABP site
- Access to Area 4 can also be achieved through the existing ABP East Gate.

6.3.16 Areas 1 to 3 would be "outside" ABP security and fenced to the same level of security that ABP facilities currently have. Area 4 would be "inside" ABP security and would be secured in the same way as currently.

Traffic entering the River Usk west compounds

6.3.17 The anticipated total number of deliveries to site by HGVs during the whole construction period is estimated to be in the range of 20,000 vehicles.

6.3.18 On the west side, the figures are the numbers of vehicles entering either through the new dedicated gate (80%) (before ABP's West Gate as described above) or through the ABP East Gate (20%).

6.3.19 During the busiest months, there would be up to 1,500 lorry deliveries per month coming to and exiting from the West Compound area.

6.3.20 In addition to HGVs, light vehicles would enter the site as well (mainly staff and operatives vehicles coming to and from work on site).

6.3.21 The total estimated number of these vehicles entering and exiting the site during the construction period is in the range of 92,000 vehicles.

Vehicle movements on ABP internal road

6.3.22 There would be also some vehicle movements on the west side between Area 1 (located at the west of the docks) and Area 4 (located at the east of the docks) which would be via the internal ABP road network. The anticipated total number of movements during the construction period is approximately 20,000 vehicles.

6.3.23 The pouring of the pylon pile cap at the West Pylon would necessitate 12 to 15 concrete truck mixer movements per hour during 3 days, 24 hours per day.

Rail interface within ABP dock area

6.3.24 Within the ABP dock area there is an existing rail system which is used for incoming and outgoing goods to the port as well as deliveries to local stakeholders. There are two lines; one on the east of the port and one on the west and both lines link to the national network but are not owned by Network Rail.

6.3.25 The line on the east side of the port is used every day of the week, 365 days of the year with up to eight train movements per day, which can increase in winter months. Although there is a timetable of running it is varied due to changing circumstances and can be more frequent at night and weekends to fit in with freight schedules on the mainline.

6.3.26 There are existing sidings to the north of the dock where trains can be held before moving into the port.

6.3.27 The line on the west side of the port is not heavily used. The interface with the new section of motorway would be more prominent on the west side railway line

as this would be crossed numerous times by general construction traffic throughout the construction period and during the construction of the approach span to the River Usk Bridge. The interface with the rail on the side of the River Usk is less onerous and would only be during the construction of the River Usk Crossing.

6.3.28 It is not envisaged that temporary works during construction of the West Pylon of the River Usk Crossing would impact upon the rail network within ABP. However, any cranes within the vicinity may have the capability of over sailing the rail during any lifting operations and therefore, all lift plans would be submitted to ABP to keep them informed and, where necessary, slew restrictors would be fitted.

6.3.29 Where the existing rail on the west side of the port cuts through the works, it is envisaged that there may be a requirement for an additional railway crossing point. The existing crossing point on the south of the proposed new section of motorway would be utilised but during the works there may be a need for an additional crossing point on the north within the construction temporary landtake.

Existing buildings

6.3.30 Construction of the proposed River Usk crossing would require the demolition or modification of buildings located on the footprint of the proposed new structure and / or the temporary areas required during construction.Figure 6.2 below identifies the location of these buildings.

Figure 6.2 - Buildings to be demolished or modified within ABP dock area

7 Earthworks

7.1 Introduction

7.1.1 This section outlines the methodology for the earthworks operations. The location of the works and the type of earthworks required are summarised below.

7.2 Earthworks Strategy

7.2.1 The earthwork strategy has been designed to achieve the following objectives.

- Achieve a materials balance between cut and fill (i.e. the material excavated and the material placed) and minimising the generation of material that has to be disposed off site.
- Import the minimum amount of earthworks material from offsite by maximising the use of site-won material, including the reuse of contaminated soils provided they are suitable for use.
- Avoid the need to remove topsoil or break the upper soil layer across the Gwent Levels; reducing the volume of unsuitable material generated.
- Avoid double handling material and aim to deliver the material from where it is excavated to where it is to be placed in a single operation, eliminating the need for temporary stockpiling of material (other than topsoil, unsuitable material and hard material stockpiles) and minimising the number and distance of dump truck movements for the transport of materials on site.
- Where practicable, process excavated material on-site at source (using crushing / screening, stabilisation and modification) for incorporation within the works.
- Use temporary stockpiles of topsoil and early permanent earthworks to provide barriers between the works and sensitive receptors where practical.
- Provide edge protection and appropriate Health and Safety precautions around excavations at the end of each working period with physical barriers where required.
- Minimise the number and distance of vehicle movements on public roads for the transport of materials.
- Minimise disruption to stakeholders and the travelling public.

7.2.2 The use of borrow pits and re-profiled areas at the Castleton and Magor Interchanges provides an early source of local, acceptable general fill required for the embankment construction. Locally sourced material reduces the need to haul material along the existing road network. Once the borrow areas have reached their expected extraction volumes, they provide a deposition area for material deemed unacceptable for highway construction. This material would be generated from piling arisings and water treatment area construction along the length of the new section of motorway.

Earthworks Volumes

7.2.3 The earthworks for the new section of motorway have been segregated into zones east and west of the River Usk Crossing. The zones and associated earthwork volumes are set out below.

Zone 1 – Castleton to Duffryn

7.2.4 This section of the works would involve circa 1,123,000 m³ of cut material placed locally at the Castleton Interchange supplemented with 210, 000 m³ material generated from a borrow pit at Berryhill Farm. There would be approximately 54,000 m³ of imported granular material for the ground improvement layers and temporary works associated with the construction of temporary bridges.

Zone 2 – Duffryn to Docks Junction

7.2.5 This section requires an import of 275,000 m³ of granular material for ground improvement layers for the highway embankment across the Gwent Levels, the proposed Docks Way Link and launching platforms associated with the River Usk and Ebbw Crossings and Docks Way link. Circa 516,000 m³ would be imported into Newport docks via road. There is the potential for contamination in this area as a result of its former land use. This is discussed in more detail in Appendix 11.1 Contaminated land Assessment Report.

Zone 3 – River Usk Crossing

7.2.6 Material generated within this section would be in the form of pile arisings and pile cap excavation from the pier and abutment construction works. The volumes expected to be generated here would be circa 60,000 m³. Materials that are considered suitable would be accommodated in the works and any unsuitable material would either be treated or disposed of off-site to an appropriate waste management facility. Contaminated materials would be handled and managed in line with the Remediation Strategy Report.

Zone 4 – River Usk to Llandevenny

7.2.7 This section has the most potential for contamination associated with its industrial legacy. It is expected that the treatment of a volume in the region of 770,000 m³ - 800,000 m³ of Steelwork lagoon sludge by product would be necessary. The new section of motorway would be constructed upon an embankment along the full length of this section, with a combination of imported granular fill, of approximately 437,000 m³ for the ground improvement layers and approximately 776,000 m³ of site won fill and borrow from zone 5 at Magor. The embankment fill would also include treated lagoon materials.

Zone 5 – Llandevenny to Junction 23 Magor Tie-In

7.2.8 This section would provide suitable rock fill for use in ground improvement layers and general embankment fill. The majority of this section would be within cuttings which would fill areas at the tie-ins with the M4 at Junction 23a and the M48 at Junction 23.

7.3 Common Earthwork Activities

7.3.1 The main earthworks activities include:

- pre-earthworks drainage;
- stripping;
- bulk earthworks;
- breaking, ripping or blasting of rock;
- haulage of excavated materials;
- remediation of contaminated material;
- temporary storage of excavated materials; and
- placing and compacting excavating material.

7.3.2 These operations may be supplemented with additional works at some locations depending on conditions encountered, for example, reprocessing of excavated material and dealing with additional drainage installations.

7.3.3 The key earthwork activities are described in further detail below.

Pre-Earthworks Drainage and Topsoil Stripping

7.3.4 Wherever possible, topsoil would be left in place to minimise the amount of unprotected ground exposed to runoff. Where topsoil is removed, it would take place as late as possible prior to other works in the area.

7.3.5 Topsoil and subsoil would be stripped from the Castleton and Magor Interchanges in accordance with best practice guidance in line with a Soil Management Strategy and stored separately in designated storage areas where it would be maintained appropriately to avoid losses. The storage areas would be located close to where the material was removed. Further information on the topsoil storage areas is provided in Section 6.

7.3.6 Due to the geology and environmental sensitivity of the area, topsoil would not be stripped from the Gwent Levels other than as necessary.

7.3.7 Pre-earthworks drainage would be installed to divert surface water runoff from earthworks areas before works to remove topsoil begins. Silt fencing would be installed around the margins of topsoil stockpiles to minimise the risk of sediment laden runoff reaching sensitive watercourses.

7.3.8 In the work areas at the Castleton and Magor Interchanges, cut off ditches would be constructed, where required, on the uphill side of the works area. These ditches would intercept overland flow from adjacent land areas to reduce the flow over exposed ground and thereby reduce the amount of silt-laden runoff generated. The cut off ditches would drain under gravity to existing field ditches. At each outfall to a field ditch, straw bales wrapped in geotextile would be staked across the channel to act as a primary filter and reduce suspended sediment that may have been disturbed in the newly cut ditches.

7.3.9 Baffles would be created within the cut off ditches to break up the flow distances and promote the settlement of fines. The baffles would be constructed from clean stone within geotextile bags and would be placed where there is a

significant fall in the ditch gradient and/or long ditch sections leading to a single outfall.

Bulk Earthworks

General

7.3.10 The bulk of all excavation works would primarily be at both ends of the new section of motorway at the tie-in points with the existing M4. The geology differs considerably across the length of the new section of motorway from clays and mudstones at Castleton, soft alluvial soils across the Levels to limestone, sandstones and conglomerate at Magor. Topsoil and subsoil would mainly be removed in the Castleton and Magor sections, leaving the topsoil in place across the Gwent Levels other than as necessary. The topsoil would be stripped with tracked excavators and dozers and transported to temporary stockpile deposition areas. Bulk excavation works would be undertaken using suitably sized tracked excavators ranging between 3 tonnes to 80 tonnes depending upon the scale of the task being undertaken. In areas of hard dig, ripping may be required utilising a dozer mounted ripping tooth to loosen the material prior to excavating and removal with a tracked excavator.

Castleton

Castleton (North of Existing M4)

7.3.11 The excavation works at this location would be from behind the temporary traffic management protection established to the rear of the running lane of traffic. The earthworks would be cut from the top of the slope down to the finished designed levels. The plant likely to be used to excavate this material would be of a size similar to a 21 tonne excavator and zero tail swing excavators. The excavated material would be hauled to the deposition areas to the south of the existing M4 typically using 40 tonne Articulated Dump Trucks (ADTs). Access to the south of the existing M4 at Castleton would be via the existing Pound Hill Overbridge and then via the Castleton Link B Overbridge, which would span the A48.

7.3.12 Approximately 247,000 m^3 of excavated material from the excavations North-East of existing M4 would be hauled to Docks Way with road wagons on the existing road network.

Castleton (New Section of Motorway)

7.3.13 Once the main cut to the north of the existing M4 has been excavated, the road works completed and the slip road opened to motorway traffic, the next major cut area at Castleton would be to form the main carriageway excavation from ch 2,550 – ch 3,650. The existing level of the motorway at the far eastern end of the junction would be reduced by up to 11 m to finished road level. It is envisaged that this material would be removed beneath the new westbound slip roads using tracked excavators and dozers. The material would be loaded and hauled to the deposition areas south of the M4 using a maximum sized 40 tonne ADT to transport it.

Magor

Magor (Llandevenny to M4)

7.3.14 Hard dig is expected to be encountered at Magor, north of the South Wales to London Mainline to the tie-ins with the M4 and M48. In this area it is expected that, once the topsoil and subsoil has been removed, the rock head would be exposed. The top 1 m or so of the exposed rock could potentially be removed using large tracked excavators and dozer mounted ripping teeth. This material would be processed for re-use within the works.

Magor (M48 Link)

7.3.15 The M48 Link would be constructed partially in cut and fill. The cut areas would be in limestone. It is envisaged that this material would be visible approximately 400 mm below ground level. The cutting areas would be approximately 6 m deep. It is envisaged that this material could be removed through either open cut with dozers fitted with ripping teeth and large excavators fitted with a toothed bucket. If the material is deemed too hard for open cut methods, then controlled blasting may be deployed (see later in this section for further details). Depending upon how the material reacts to blasting, it may need further processing to meet the highway specification. This material could be processed within the cutting area and either re-used within the works as drainage layers or other graded aggregate products. Throughout the excavation and fill work on the M48 Link, an access would remain open at all times for the mass haul earthworks operation direct from Ifton Quarry and for traffic on the existing M4. This would be supplemented with a temporary bridge over the M4 at Magor for one direction flow of vehicles to accommodate the volume of earthmoving traffic required to cross the existing M4 as the existing underbridges would not be wide enough to accommodate 2 ADTs passing each other. A number of bridges would be constructed and extended along the length of this section which would provide corridors for utility diversions, provisions for embankments to be widened allowing the next phases of the works to continue. Access would be provided within the earthworks sequence to accommodate these activities.

Controlled Blasting

7.3.16 In deep cut areas where rock and hard dig is expected to be encountered, controlled blasting using explosives and sophisticated electronic detonators would be adopted to loosen the material prior to excavation and removal from the works area. Modern blasting techniques minimise the noise and vibration traditionally associated with this form of excavation. The works would involve drilling holes through the rock to set the charges. These would be drilled to ensure the rock is blasted to provide a clean cut in the finished face of the rock cut. It is expected that the works associated with blasting would continue on one side of the proposed highway alignment whilst the site haul road would be segregated and clearly positioned the other side. A local exclusion zone within the works would be established when the controlled charges is detonated. This would involve temporarily closing the haul road for a few moments until the area is deemed safe. The blasted material would require processing (see below).

7.3.17 Once one carriageway has been blasted to the desired level, the haul road would switch to the side previously carved out in the rock and the process would continue until the remainder of the cutting is complete.

Processing of Material

7.3.18 Material excavated at some locations along the length of the proposed new section of motorway may require processing to enable it to be either used within the works as a material specified or to be stabilised to prevent the spread of potential contamination into the SSSI reen network. The remediation of contaminated material is described later in this section.

7.3.19 The material excavated in the areas of hard dig would require processing. These would predominantly be within the Llandevenny to Junction 23 Magor tie in part of the new section of motorway within the highway cutting areas and proposed borrow pit locations.

7.3.20 As the highway cutting areas are formed in areas of hard dig, the initial material removed via ripping and large excavator would be hauled to an area away from sensitive local receptors and processed so it can be re-used within the works. The processing area would be screened and may require dust suppression during dry conditions.

7.3.21 Where controlled blasting would be carried out in the deep rock cuttings, it is expected that the material would be processed at source, fed into the crusher with an excavator at one end and then loaded into trucks the other end with a loading shovel or tracked excavator for re-use elsewhere in the works. As the controlled blasting works proceed along the alignment of the cut area, the processing would follow, reducing the need to double handle material before it is placed into the crusher in a continuous operation to maintain supply to the worksite. Again, dust suppression would be deployed in dry conditions. The dust material generated in the crushing and screening process would be hauled to a stockpile area at the contaminated materials processing areas for reuse within the treatment and stabilisation of the TATA sludge lagoons.

7.3.22 The exception would be in the area that adjoins proposed new housing in Magor . The unprocessed material extracted from this location would be hauled to a processing area away from residential areas and then distributed to where it is required in ADTs.

7.3.23 A number of existing bridge structures on the existing road network and disused buildings are to be demolished as part of the works (for example, Pound Hill Overbridge). The demolition of existing bridges would occur in overnight weekend road closures. It is expected the bridges would be demolished via mechanical means, with the steel and concrete stockpiled separately close to the works and off the existing road network. This material would be processed and reused within the works. The metallic items would be removed off site in bulk skips and recycled for future re-use.

7.3.24 A similar approach would be adopted for existing buildings to be demolished to make way for the new section of motorway. The buildings would be stripped of potential contamination and asbestos where applicable prior to demolition. Concrete and rubble generated during the demolition works would be processed and reused.

Dewatering

7.3.25 It is possible that groundwater would be encountered at the borrow pits near Berryhill Farm. To maximise the use of the suitable material that lies within the

borrow pits, a method of dewatering may be required. This would be in the form of well pointing to ensure the excavation is kept dry for extraction and refill to final profile. The groundwater extracted would pass through a settlement pond prior to discharge into the nearby reen network. This water could also be used for damping down the haul roads in dry conditions or, depending upon its quality and chemical properties, could be tankered by lorry or tractor bowser and re-used in the batching of concrete at either the precast driven pile manufacture facility or the concrete batching plants located at either side of the River Usk Crossing.

Remediation

7.3.26 A Remediation Strategy Report would set out the control measures that would be in place to manage contamination that has been identified already, and also procedures to identify and to follow if unexpected or previously unidentified contamination is encountered during construction. The Remediation Strategy Report would set out 'suitable for reuse' criteria to determine whether contaminated soils can be placed within the core of the motorway embankment or require treatment prior to reuse. It would also sets out the requirements for verifying that the remediation has been undertaken as agreed through the collection of appropriate 'Lines of Evidence' and Verification Reporting.

7.3.27 An Outline Remediation Strategy Report is included within the Environmental Statement Chapter 11 at Appendix 11.2 which would be updated prior to construction as detailed designs are finalised and it would be agreed with Natural Resources Wales (NRW), Monmouthshire County Council (MCC) and Newport City Council (NCC). The detailed Remediation Strategy would be implemented within the framework of the CEMP.

TATA Steel Sludge Lagoons

7.3.28 The section of new motorway would pass through the disused TATA site south of the A4810. This area is a legacy from 60 years of steel manufacture at Llanwern.

7.3.29 The proposed highway alignment for the new section of motorway bisects the disused sludge lagoons which contain by-product generated from the steel manufacture process, including slag which includes heavy metals contamination.

7.3.30 The sludge is contained within lagoons formed with granular Basic Oxygen Slag (BOS) slag walls and located on the Gwent Levels. A series of ditches, known as "clean and dirty" ditches, are used to manage the run off and leachate from the lagoons. The water within the ditches is treated with the current TATA pollution control measures. These ditches would be replicated to the north of the new section of motorway to allow continuity of the ditch network and runoff treatment.

7.3.31 It is expected that the material would be excavated and processed in an area to the east of Air Products as identified within Section 6. It is expected that there would be four plants located in this area, each one treating an estimated volume of 2,500 – 3,000 m³ per day.

7.3.32 The treated material would take the form of either a pelletised granular product or a monolith. The pelletised material could be mass produced and stockpiled similar to a processed aggregate for re-use within the works at later date. It is expected that the treated material would be re-used within the footprint of the new section of motorway for general embankment fill or pavement foundation layers subject to material testing. The stabilisation and solidification process to

treat the sludge lagoon material is an effective, practical and durable technique for remediation and avoids the need to dispose of contaminated materials off-site. The key features of the process are noted below.

- Stabilisation – Chemical fixation of soluble species, formation of less soluble compounds.
- Solidification – Contaminants are physically encapsulated within a solid, low permeability and physically robust matrix

Solutia Chemical Works including PCB Cell

7.3.33 An engineered cell containing Poly Chlorinated Biphenyls (PCBs) exists between the Uskmouth Railway and the Solutia Chemical Works. The River Usk Crossing eastern approach span piers have been designed to avoid the footprint and oversail the cell to avoid disturbing this contaminated area.

7.3.34 Material excavated from the piles either side of the cell would be tested for potential PCBs. Any soils contaminated with PCBs would be carefully handled and stockpiled prior to treatment and re-use or off-site disposal in line with the Remediation Strategy Report.

Unknown and Undefined Land Contamination

7.3.35 Although substantial ground investigations and research have identified known areas of contamination and potential contamination, there is still a low risk that previously unidentified areas of contamination could be encountered during construction. As such a 'discovery strategy' would be adopted to manage such finds as set out in the Remediation Strategy Report. This would include keeping NRW, MCC and NCC informed of any findings and agreeing actions to be taken if gross contamination is identified.

Ground Treatment

7.3.36 Ground conditions across the Gwent Levels comprise soft, organic soils and a very high groundwater table. Ground treatment is required to facilitate the construction of the new section of motorway. This is illustrated in Annex 1.

7.3.37 Prior to undertaking the ground treatment, a working platform would be created by laying out a geotextile/geogrid on the existing ground. This method would avoid breaking the soil layers, reduce the volume of unsuitable material that would be generated and reduce the risk of saturating the working platform from the underlying groundwater. Imported stone would be added to a depth of between 500 mm and 1,000 mm depending on the proposed height of embankment and the envisaged construction traffic use. The working platform would serve both temporary (construction) and permanent requirements, support site construction plant required to install the ground treatment techniques and be used as the initial haul road through the new section of motorway during the mass haul activities. The granular nature of the working platform would act as drainage blanket and would relieve water transferred through the band drains where required.

7.3.38 Construction of embankments over such soft soils can lead to settlement over a long period of time, resulting in potential instability of the embankment. The

following ground treatment is required across the Levels to manage this settlement.

Band Drains and Surcharging

7.3.39 To speed up the process of settlement and to ensure a consistent rate of settlement is achieved, vertical band drains would be installed prior to the construction of the embankments. The band drains would allow water within the soil (i.e. pore water) to drain more quickly and reduce the build up of pore water pressure. In combination with the installation of the band drains, additional material (up to 1 metre in height) would be added to the embankment in a process called 'surcharging', whereby the additional load would achieve settlement in a shorter period. The surcharge material would be removed after approximately 12 months once consolidation of the embankment has been achieved. Testing would be undertaken to confirm that settlement has been achieved. This technique of ground treatment (i.e. to accelerate the settlement process) would be applied to embankments up to 5 metres in height. Band drains would not be installed through contaminated soils.

Pre-cast Piles

7.3.40 Where higher embankments are required (i.e. above 5 metres) ground treatment would comprise the installation of precast piles to support the embankment fill material. The precast concrete driven piles would be founded upon gravels and mudstone below the organic soil layers and the arisings would be stored in stockpiles located at either end of the new section of motorway (i.e. the unsuitable material storage areas) and eventually used to restore the borrow pits. Piled embankments would also be used on the approaches to structures to minimise differential rates of settlement.

7.3.41 Where piles are to be installed within potentially contaminated areas, piling risk assessments would be undertaken and, if necessary, the piling installation would be modified to prevent the spread of any contamination.

Soil Mixing

7.3.42 Transition zones between the piled embankments and the surcharged embankments may be subject to a soil improvement technique whereby cement is mixed into the soil.

Culvert Construction

7.3.43 The reen network on the Gwent Levels provides an important ecological resource as the key feature of the SSSI and is also a flood control mechanism. Constructing the culverts early in the construction programme would maintain connectivity of the reen and ditch network and reduce potential disruption to ecology and reduce the risk of flooding in the area. Ground treatment measures in the form of precast driven piling would be required beneath these new culverts to prevent them settling and sinking into the soft organic layers below. The proposed culverts would range from 900 mm to 1.8 m diameter concrete pipes, to 1.8 m x 1.8 m to 4.0 m x 4.0 m precast concrete box culverts units. These culverts would be installed in a half and half basis per culvert crossing with a temporary piped crossing installed within the existing channel to one side of the works. This would ensure the haul route is maintained for construction plant

traffic. Annex 1 illustrates the sequence of installing a typical piled box culvert. The environmental control measures to minimise the impact to the SSSI are set out in the Pre-CEMP (Appendix 3.2) and the SSSI Mitigation Strategy (Appendix 10.35).

7.4 Plant and Machinery

7.4.1 The selection of plant and machinery to be used for earthworks activities would take into account noise levels, fuel consumption, CO_2 emissions, safety and suitability to undertaken the task.

7.4.2 A summary of typical plant and machinery that would be required to undertake the earthworks operations is provided below:

Table 5.1 Plant and Machinery

Item of Plant	Typical Work Activities
Tracked Excavators ranging from 3T to 80T	Excavation of material, trenches, surcharge material and loading haulage.
25, 35 and 40 tonnes articulated dump trucks	Transport of excavated material from area to area on site haul roads.
Compaction Plant	Compaction of material placed in accordance with the Specification for Highways Works
Large bulldozers (including ripping teeth)	Placing excavated material and imported material to form new highway, works at areas with headroom constraints, ripping hard material
6 or 8 wheeled tipper lorries	Transport of excavated material and imported material on the public highway.
Pneumatic or hydraulic breakers	Breaking out rock, redundant concrete or road construction.
Crushers and screeners	Processing rock material generated within the site
Pumps and well pointing	Dewatering of borrow pits where required.
Water Bowsers	Dust suppression in dry conditions
Road Brushes	Ensuring construction plant crossings are kept clean and free of debris
Fuel bowsers	Re-fuelling of small plant/equipment, e.g. generators and large slow moving excavators.

8 Roadworks and Surfacing

8.1 Permanent Drainage

Carriageway Drainage

8.1.1 For the majority of its length, the proposed route of the new section of motorway is located within the Caldicot and Wentlooge Levels, which comprise soft ground with a very high water table. It is proposed, therefore, to intercept the run-off from the motorway into grass lined ditches in the verge. These would lead surface water overland from the drained carriageway to the water treatment areas. Each water treatment area includes a sediment trap, oil interceptor, pollution bypass lagoon, permanently wet flood attenuation and dilution lagoon and a reed bed. Once the water had reached quality parameters as agreed with NRW, it would be discharged to the reen network.

8.1.2 The grass lined ditches would be dry during dry weather, enhancing their pollutant removal capability, but during a rainfall event the water would flow into them from the carriageway and move slowly to the outfall point. The flow of water would be retarded and filtered by the grass. Sediment would be deposited and oily residues and organic matter retained and broken down in the top layer of soil and vegetation.

8.1.3 The grass lined ditches would follow the gradient of the motorway, typically 1 in 7,000 through the Levels. It is anticipated that the grass lined ditches would be lined with a geo-synthetic clay liner below 50 mm of topsoil. This would eliminate the risk of surface water runoff containing possible pollutants seeping into the underlying ground.

8.1.4 When the carriageway is super elevated in the central reserve of the motorway, the introduction of concrete barriers and maintenance restrictions would exclude the use of grass lined ditches. In these locations, concrete channels would be utilised.

8.1.5 Desilting catchpits would be constructed within the width of the grass lined ditches or the median channel. From the catchpits, the water would flow into water treatment areas and attenuation areas.

8.1.6 Where highway alignment dictates steeper falls or the carriageway drains to the median, conventional concrete surface water channels would be used. Fin drains would be installed along the edge of carriageway between the edge of the pavement and the safety barriers.

8.1.7 The standard kerb and gully drainage would be installed in River Usk Crossing, other bridge structures and where appropriated on the junctions. Discharges to the River Usk and River Ebbw would be provided with oil interceptors and pollution retention basin would also be provided for the River Usk.

8.2 Road Pavements

Sub-base

8.2.1 Sub-base construction would consist of the placement and compaction of bound and unbound material to specified depths in accordance with the Specification of Highway works (SHW). It is currently proposed that the sub-base type would be produced on site to reduce the volume of imported material required, which would be subject to materials testing. The material would be tipped at the desired location, spread in layers to the specified thickness and compacted. Samples would be taken to ensure the desired compaction is achieved.

Cement Bound Granular Material

8.2.2 Cement Bound Granular Mixture (CBGM) is a mixture of base aggregate material and/or granular soils combined with measured amount of portland cement and water to form a durable paving layer, hardening after compaction and curing. Curing takes a mandatory seven days but tends to reach required strength in two days.

8.2.3 The CBGM material would be mixed in batch plants according to the mix design requirements till a homogenous mixture is produced.

8.2.4 The plant mix material would be delivered to site by dump trucks directly to the point where they are to be placed. The mix material would be protected from weather both during transit from the batching plant to the laying site and while awaiting tipping.

8.2.5 The material would be placed using one or two tandem finishers (pavers). The longitudinal joint for CBGM would be avoided by using tandem finishers along the width of the motorway so far as reasonable practicable.

8.2.6 Compacting would start immediately after the placing of the CBGM. A double drum vibratory roller would be used. Compaction would be continued untll the surface of the layer is closed and the required density of the compacted base is achieved. The maximum period between the mixing of the material and completion of compaction would be two hours.

8.2.7 The CBGM layer would be cured by applying misting water to the surface several times a day. Construction traffic on the completed base would be kept a minimum and contamination of the layer from mud and dirt carried by the truck tyres would be prevented. When mixing the CBGM, a stationary batch plant would be used.

Road Pavements Bitumous Bound Materials

8.2.8 Flexible pavement would be laid in three layers – base, binder and surface course. Where possible, the bituminous material required for these layers would be supplied by mixing plants local to the construction works for direct delivery to the required site location.

8.2.9 Dump trucks or trailers would be used for delivery of the hot-mix material from the plant to the site location. These trucks would need to be previously cleaned and insulated against excessive heat loss during transportation and would be covered with a canvas to protect the material from weather.

8.2.10 Placement of a bituminous mixture would be done only when the underlying layer is dry and weather conditions are convenient. The bituminous mixture is placed by an asphalt paver that spreads the mixture in a uniform layer of the required thickness, elevation and cross-section that is ready for compaction. The asphalt pavers are fitted with electronic screed control.

8.2.11 The compaction of the bituminous layer would start immediately after the spreading and finishing operations have been completed. Rolling would be carried out by steel wheel rollers.

8.2.12 The typical plant required for pavement construction operations are detailed in Table 8.1.

Table 8.1: Typical Plant for Pavement Construction

Plant	Use
Asphalt paver	Placing bound and unbound materials
20T tipper lorries	Transporting material to paving machine from batching plant.
Compaction plant of various sizes with edge cutter.	Compacting material place in accordance specifications
Asphalt planner	Removing redundant road construction
Pneumatic or hydraulic breakers	Breaking out and cutting back joints in the surfacing.
Bond coat lorry	Apply bond coat between surfacing layers

8.3 Other Operations

Road Restraint Systems

8.3.1 Both temporary and permanent barriers would be required throughout the route of the new section of motorway. Temporary barriers would be used to segregate the works area from the public whilst providing adequate deflection to protect the work force.

8.3.2 The permanent restraint system would comprise a variety of methods. A conventional beam system with either driven or concrete foundation “z” post would be used where the verge width provides allowable safe working width. Posts would be driven using a purpose built driving rig in the embankments. Where rock is present, the restraint system would have excavated concrete foundations using a tracked excavator with a breaker attachment.

8.3.3 All materials required to install the road restraint system would be imported and stored on the constructed highway near the works area to reduce the need for double handling materials.

Road Lighting, CCTV Masts

8.3.4 The cable ducts, lighting poles and CCTV masts would be installed in accordance with the final design. The lighting poles would be manufactured and transported

to the site and would be erected with the help of mobile cranes and mobile elevating work platforms.

ITS and Motorway Communications

8.3.5 The intelligent transport systems and motorway communication elements such as gantries, ducting and chambers would be a part of the finishing activities of the construction of the motorway.

8.3.6 The installation of the gantries would have several stages including preparation of the foundations, manufacturing and transportation, installation. The gantries would be manufactured and constructed as much as possible off-site to minimize the disruption on site due to gantry construction. Foundations would be constructed in advance of the erection of the gantries. The gantries would be erected at site with the help of mobile cranes, telehandlers and mobile elevating work platforms.

Kerbs Installation, Road Markings and Road Signs

8.3.7 Other highway construction operations include kerb installation, road markings and road signs. Kerbs would be a mixture of pre cast concrete kerbs and combined drainage kerbs. The kerbs would placed on a bed of concrete, which would run directly out of the back of the mixer lorry. A telehandler with a vacuum lifter would be used to position the kerbs to eliminate the need for manual handling.

8.3.8 Road markings would be installed directly from a lorry, which reduces the interface between the hot thermoplastic markings and the operator undertaking the installation.

8.3.9 Road signs vary in size but generally have a large concrete base to resist the overturn moment produced by wind loading on the sign face. The posts would vary from standard round steel posts to collapsible fibreglass or aluminium posts. The posts and sign faces would be installed using a crane lorry.

9 Castleton and Magor interchanges

9.1 Overview

9.1.1 The construction methodology for Castleton and Magor Interchanges has been designed to achieve the following objectives:

- Maintain existing traffic movements where possible.
- Avoid a major 900mm diameter High Pressure (HP) Gas main diversion across the existing M4 (Castleton).
- Programme bulk earthworks movements from the north side of the existing M4 to be predominately off road, avoiding disruption to existing M4 traffic and optimising haulage to point of deposition.
- Generate excavated material within the new section of motorway to provide sufficient fill to achieve an earthworks balance west/east of the River Usk.
- Construct major bridges predominately off-line to reduce interruptions to the existing traffic network.
- Minimise the impact on M4 traffic with only three primary Traffic Management switches whilst maintaining three lanes in each direction throughout the construction programme reducing driver confusion and risk of incidents.
- Minimise temporary surfacing required to limited areas only (for example, crossovers).
- Reduce impact and land take from adjoining A48 residential properties.

9.2 Castleton Interchange

9.2.1 Castleton Interchange at Junction 29 of the M4 is the western extent of the proposed works where the new M4 alignment would tie into the existing M4 and the existing A48(M) connecting the route between Newport and Cardiff. It includes three key features:

- Overbridge link A supports the slip roads from the A48(M) eastbound to the proposed new M4 eastbound as well as the existing M4 eastbound
- Overbridge link B supports the slip road from the proposed new M4 westbound to the A48(M) westbound.
- Overbridge link C supports the proposed deviated west bound of the existing M4 to be merged into the proposed new M4 west bound.

Key Constraints, Stakeholders and Strategy

9.2.2 Effects of the works at the Castleton Interchange on key stakeholders in and around the area and mitigation potentially impose constraints on the delivery of the works. These interfaces require co-ordination and management to address the needs of the stakeholders whilst de-risking any impact on the programme. The key stakeholders, potential constraints and the proposed strategy for works at Castleton Interchange are set out in Table 9.1.

Table 9.1 - Key Constraints, Stakeholders and Strategy

Stakeholder	Key Constraints	Proposed Strategy
M4 Road Users	Traffic management for construction of Castleton Interchange	Phasing of works that maintains the existing traffic movements and lanes during construction. Minimise necessary overnight and inter-peak M4 road/lane closures with suitable diversion routes. Providing clear and safe roadworks according to legal requirements and best practice.
Other Road Users	Works over A48 and impact on surrounding road network due to construction works on M4	Minimise time during which the A48 is reduced to one lane in each direction for construction of three new bridges. Ensure that the A48 runs two lanes in both directions during M4 weekend closures. Maintaining the M4 existing traffic flow to minimise additional users on the other roads. Minimise construction traffic on public roads.
Local Residents	Working close to residential, for example,. properties along the A48 including a care home	Develop a site specific plan for mitigating the impact on local residents with regards to noise, vibration and dust pollution. Implement appropriate restrictions on works that may affect local residents, for example, noise and vibration limits on piling works.
South Wales Trunk Road Agent (SWTRA) / Welsh Transport Technology Consultancy (WTTC)	Traffic Management on the existing M4 and A48(M) Maintenance and Emergency Access	Liaise with SWTRA and WTTC throughout the project, e.g. traffic liaison meetings, to inform them of the works programme, planned overnight works, Traffic Management maintenance and to align requirements to minimise interruption to existing road network and agree maintenance provisions. Liaise with Welsh Government and key stakeholders for the management of the partial and full trunk road embargos during holiday periods as set by Economy Science and Transport (EST) Department.
Local Authorities	Construction in local authority areas	Work closely with Newport City Council and Cardiff City Council to carry out the construction works, in particular with regards to traffic orders and diversion routes.
Emergency Services	Emergency arrangements for traffic management and construction	Work closely with emergency services, for example, traffic liaison meetings, to facilitate emergency access and diversions throughout traffic management arrangements and plan emergency measures for the actual construction works.

Stakeholder	Key Constraints	Proposed Strategy
Statutory Undertakers	Working in close proximity of existing services	Refer to section 6
Statutory Consultees	Protected species and sensitive habitats (including watercourses).	Ensure that all licences and consents are in place before construction commences and comply with the requirements of any method statements therein.

Phased Delivery

9.2.3 The construction of the Castleton Interchange follows the three main traffic management phases. Phasing of the works is further defined into sub-phases and the key construction elements. These elements are described below showing the key features.

9.2.4 The table below provides an overview of the key elements currently proposed to be delivered in each phase. The envisaged construction sequence is shown below.

Table 9.2 – Castleton Phased Delivery

Phase	Key elements delivered
Preparatory	Use elements of the traffic management Phase 1 to gain access to the preparatory work areas. Establish the site compound, storage and assembly areas. Carry out the statutory utilities diversions and protection measures. Establish the site accesses, including alterations to 3rd party access where required. Carry out the vegetation and site clearance works in accordance with the requirements of the dormouse licence (including dormouse translocation, as necessary).
1.1	Establish the traffic management Phase 1 to gain construction access to the M4 verges and reduce A48 to single lane for the bridge works. Close Pound Hill Bridge to public and Install the haul route, including the signalised plant crossing on the A48. Commence the bulk excavation at the north of the M4 hauling material to the south via the Pound Hill Bridge and the plant crossing of the A48. Commence the bulk fill between the M4 and the A48. Construct Stage 1 of the bulk fill south of the A48 to facilitate the construction of the east abutments of the two A48 Underbridges. Construct the west abutment and piers of the Overbridge Link B. Construct the Gas Main Culvert. Construct the west abutments and piers of the two A48 Underbridges.
1.2	Continue the bulk excavation at the north of the M4 hauling material to the south via the Pound Hill Bridge and the plant crossing of the A48. Continue the bulk fill between the M4 and the A48. Construct the east abutments and piers of the two A48 Underbridges. Construct the east abutment and piers of the Overbridge Link B.

Phase	Key elements delivered
1.3	Continue the bulk excavation at the north of the M4 hauling material to the south via the Pound Hill Bridge and the plant crossing of the A48. Continue the bulk fill between the M4 and the A48. Construct Stage 2 of the bulk fill south of the A48 to establish a ramp for haul road use. Construct the new Park Farm Footbridge. Transport to site the prefabricated steel deck of the Overbridge Link B from the bridge assembly area, by use of self-propelled modular transporters (SPMT), and complete the concrete deck in-situ with suitable surfacing for haul road use. Switch the site traffic, especially earthworks plant, to use the Overbridge Link B removing the need of the plant crossing on the A48.
1.4	Continue the bulk excavation at the north of the M4 hauling material to the south via the Pound Hill Bridge and the Overbridge Link B. Continue the bulk fill between the M4 and the A48. Construct the piers and west abutment of the Overbridge Link C. Transport to site the prefabricated steel deck of the two A48 Underbridges from the bridge assembly area, by use of self-propelled modular transporters (SPMT), and installing westbound bridge deck before eastbound. Complete concrete decks of the two A48 Underbridges in-situ with suitable surfacing for haul road use.
1.5	Continue the bulk excavation at the north of the M4 hauling material to the south via Pound Hill Bridge and the plant crossing of the A48. Continue bulk fill between the M4 and the A48. Demolish the existing Pound Hill Bridge and Park Farm Footbridge; excavate remaining material around the abutments. Transport to site the prefabricated steel deck of the Overbridge Link C from the bridge assembly area, by use of self-propelled modular transporters (SPMT). Construct main section of the M4 eastbound diverge slip.
1.6	Continue the bulk fill between the M4 and the A48, including the Castleton East assembly area once the deck of Overbridge Link C is completed. Construct the east abutment of the Overbridge Link C. Transport to site the prefabricated steel deck of the Overbridge Link C from the bridge assembly area, by use of crane. Complete concrete decks of the Overbridge Link C in-situ. Construct remaining sections and tie-ins of the M4 eastbound diverge slip.
2.1	Switch to the traffic management Phase 2 to move the M4 eastbound traffic to the new M4 eastbound diverge slip to gain construction access for the Overbridge Link A and M4 westbound works. Complete bulk fill between the M4 and the A48. Construct north abutment and pier of Overbridge Link A. Construct main section of the M4 westbound link to A48(M), including tie-ins to M4 westbound diverge and merge slips. Install crossovers on M4 between eastbound and westbound carriageways to facilitate the traffic management in the next phase.

Phase	Key elements delivered
2.2	Switch the M4 westbound traffic to the eastbound carriageway with the A48(M) westbound traffic using the new M4 westbound link to A48(M). Construct the south abutment and the central pier of the Overbridge Link A (includes minor traffic switch to provide sufficient access to central pier works). Construct the remaining section of the M4 westbound diverge and merge slips, including tie-in to M4.
3.1	Switch to the traffic management Phase 3 to gain construction access to the bulk earthworks of the M4. Commence the bulk excavation of the M4, including Stage 3 of the bulk fill south of the A48 to final level. A self-propelled modular transporter (SPMT) would transport the Overbridge Link A prefabricated steel deck from the Castleton West bridge assembly area. Complete concrete decks of the Overbridge Link A in-situ. Construct the A48(M) eastbound link, including tie-ins.
3.2	Complete the bulk excavation of the M4, including Stage 3 of the bulk fill south of the A48 to final level. Demolish the existing Castleton 1C Overbridge. Construct the M4 westbound and eastbound carriageways and the M4 eastbound merge slip.
Final	Carry out the final commissioning and demobilisation works, including the reinstatement of areas used for compound, storage and assembly. Remove the traffic management to open the final layout of the Castleton Interchange (Note: This switch could only take place once the road tie-ins of Magor and the whole scheme is complete).

Traffic Management

Main Roads

9.2.5 The tables below provide an overview of the three main traffic management phases and lane/road closures that would be implemented in the Castleton area to construct the new interchange.

9.2.6 The Traffic Safety and Control Officer (TSCO) would liaise with all parties involved, including the South Wales Trunk Road Agency, the Network Operations, the local authorities and the emergency services, to review and agree the final traffic management arrangements and diversion routes. The TSCO would then manage the application process of the required temporary traffic regulation orders prior to the installation on site.

Table 9.3 – Castleton Traffic Management Phases

TM Phase	Details
TM Phase 1	A48 would be reduced to one lane each way to allow construction of the Overbridge Link B and A48 Underbridges. Traffic speed reduced to 40mph. There would be hard shoulder closures with cones along the M4 where access to earthworks work areas is required. Traffic speed reduced to 50mph. There would be a hard shoulder closure with barrier for the construction of the new Park Farm Footbridge. Traffic speed

TM Phase	Details
	reduced to 50mph. There would be hard shoulder closures with barriers for the tie in sections. Traffic speed reduced to 50mph.
TM Phase 2	A48 would be reduced to one lane each way to allow construction of the Overbridge Link B and A48 Underbridges. Traffic speed reduced to 40mph. M4 eastbound traffic diverted on to the new M4 eastbound diverge slip to the north of the existing M4. The merge with the eastbound A48(M) traffic would require temporary widening to extend the five lane running of the traffic to lengthen the merge. Traffic speed reduced to 50mph. The A48(M) westbound slip diverted on to the new M4 westbound merge slip to the south of the existing M4 to allow construction of tie-ins. Traffic speed reduced to 50mph.
TM Phase 3	M4 westbound traffic diverted on to the new M4 westbound merge slip to the south of the existing M4. Construction of the Castleton Interchange Overbridge Link A would require switches of the westbound traffic to the now unused M4 eastbound carriageway for the abutment construction as well as a split of the traffic using east and westbound carriageways for central pier construction. Traffic speed reduced to 50mph.

Table 9.4 – Castleton Road Diversions

Road	Closure Details
M4	Overnight weekend road closures required for: Installation of the new Park Farm Footbridge. Demolition of the existing Park Farm Footbridge. Deck installation of the new Castleton Interchange Overbridge Link A. Demolition of the existing Castleton 1C Overbridge (westbound only). Demolition of the existing Pound Hill Overbridge. Overnight lane/road closures may be required for TM installations and construction of new road tie-ins, gantry erection and surfacing.
A48(M)	Overnight weekend road closures required for: Demolition of the existing Castleton 1C Overbridge (eastbound only). Demolition of the existing Pound Hill Overbridge. Overnight lane/road closures may be required for TM installations and construction of new road tie-ins, gantry erection and surfacing.
A48	Overnight weekend road closures required for: Deck installation of new Castleton Interchange Overbridge Link B. Deck installation of new A48 Underbridge Westbound. Deck installation of new A48 Underbridge Eastbound. Overnight lane/road closures may also be required for TM installations, utility diversions and surfacing.

9.2.7 The drawings in Annex 5 show the proposed diversion routes for the main roads required for the road closures in the table above.

Side Roads

9.2.8 Pound Hill would be closed permanently at the beginning of the works and traffic diverted via an existing bridge to the west that carries Druidstone Road over the M4. The bridge would be used as haul road until the bridge is required to be demolished as part of the sequence of works at Castleton Interchange.

9.3 Magor Interchange

9.3.1 The Magor Interchange at Junction 23 and 23a of the existing M4 is the eastern extent of the proposed Scheme where the new M4 alignment would tie into the existing M4, M48 and B4245. This interchange aims to reduce traffic through Magor and improve accessibility, including to Severn Tunnel Junction railway station.

Key Constraints, Stakeholders and Strategy

9.3.2 Effects of the works at the Magor Interchange on key stakeholders in and around the area and mitigation potentially impose constraints on the delivery of the works. These interfaces require co-ordination and management to address the needs of the stakeholders whilst de-risking any impact on the programme. The key stakeholders, potential constraints and the proposed strategy for works at Magor Interchange are set out in Table 9.5.

Table 9.5 - Key Constraints, Stakeholders and Strategy

Stakeholder	Key Constraints	Proposed Strategy
M4 Road Users	Traffic management for construction of Magor Interchange	Phasing of works that maintains the existing traffic movements and lanes during construction. Minimise necessary overnight and inter-peak M4 road/lane closures with suitable diversion routes. Providing clear and safe roadworks according to legal requirements and best practice.
Other Road Users	Works close to B4245 and impact on surrounding road network due to construction works on M4	Minimise the time during which the B4245 would be closed to facilitate construction of new structures and road tie-in to new layout Maintain the M4 traffic flow to minimise additional users on the other roads. Minimise construction traffic on public roads.
Local Residents	Working close to residential, e.g. properties in Magor adjacent to the works	Develop site specific plans for mitigating impact on local residents with regards to noise, vibration and dust pollution. Implement appropriate restrictions on works that may affect local residents, for example, noise and vibration limits on piling works.
Wilcrick Maintenance Depot	Re-location of the existing depot to Glan Llyn Junction	Allow the depot to operate without any interruption to the normal operation, with the new depot complete and commissioned before the works require the relocation and demolition of the

Stakeholder	Key Constraints	Proposed Strategy
		existing facilities.
Magor Brewery	Operation of Brewery during construction	A suitable protection measure for the existing raw water feed and an effluent pipe crossing the new M4 route would be agreed with the Brewery to ensure the continued operation.
Magor Services at J23a	Operation of Services during construction	Liaise with Magor Services to minimise impact on the services during the construction of the M4 J23a road tie-in.
Standing Stone	Protection of heritage during construction	Ensure suitable protection measures are in place, in agreement with 'Welsh Government's Historical Environment Service' (CADW) during the construction of Magor East.
South Wales Trunk Road Agent (SWTRA) / Welsh Transport Technology Consultancy (WTTC)	Traffic Management on the existing M4 and M48 Maintenance and Emergency Access	Liaise with SWTRA and WTTC throughout the project, e.g. traffic liaison meetings, to inform them of the works programme, planned overnight works, TM maintenance and to align requirements to minimise interruption to existing road network and agree maintenance provisions. Liaise with Welsh Government and key stakeholders for the management of the partial and full trunk road embargos during holiday periods as set by Economy Science and Transport (EST) Department.
Local Authorities	Construction in local authority areas	Work closely with Newport City Council and Monmouthshire County Council to carry out the construction works, in particular with regards to traffic orders and diversion routes.
Emergency Services	Emergency arrangements for traffic management and construction	Work closely with emergency services, e.g. traffic liaison meetings, to facilitate emergency access and diversions throughout traffic management arrangements and plan emergency measures for the actual construction works.
Statutory Undertakers	Working in close proximity of existing services	Refer to section 6
Statutory Consultees	Protected species and sensitive habitats (including watercourses).	Ensure that all licences and consents are in place before construction and comply with the requirements of any method statements therein.

Phased Delivery

9.3.3 The construction of the Magor Interchange has been split into two sections – Magor West (Jct 23a) and Magor East (Jct 23) – which can be constructed independently from each other until the final layout is opened to the traffic.

9.3.4 The works follow the three traffic management phases. Phasing of the works is further defined into sub-phases and the key construction elements. These elements are described below showing the key features.

Delivery Phases for Magor East

9.3.5 The table below provides an overview of the key elements currently proposed to be delivered in each phase at Magor East. The envisaged construction phased delivery is shown below.

Table 9.6 – Magor East Phased Delivery

Phase	Key elements delivered
Preparation	Use elements of the traffic management Phase 1 to gain access to the preparatory work areas. Establish the Magor East site compound, storage and assembly areas Carry out the statutory utilities diversions and protection measures Establish the site accesses, including alterations to 3rd party access where required Carry out the vegetation and site clearance works in accordance with the requirements of the dormouse licence (including dormouse translocation, as necessary).
1.1	Establish the traffic management Phase 1 to gain construction access to the M4 verges Construct the haul road, including the plant crossings Commence the bulk earthworks Construct the Caldicot Road Underbridge 1, the Llanfihangel Underbridge, the Red Barn Access Bridge and the Bencroft Lane Underbridge 3
1.2	Continue with the bulk earthworks Construct the Rockfield Lane Underbridge Commence the construction of the Magor Interchange Bridge Realignment of the Bencroft Lane under the two new structures Construct the tie-in of the M4 eastbound off-slip Construct the Caldicot Road Roundabout, the north and south sections of the M48 Roundabout, the M4 eastbound on-slip, the M4 westbound off-slip (including tie-in to B4245) and the M4 westbound on-slip
2.1	Establish traffic management Phase 2 (see table 9.8) to open new slip roads to traffic and gain construction access to the M4 central reserve Continue with the bulk earthworks Construct the Bencroft Lane Underbridge 1 Continue the construction of the Magor Interchange Bridge Construct the remaining section of the M48 Roundabout and the M4 eastbound off-slip; open these new sections to traffic once all completed
3.1	Establish traffic management Phase 3 (see table 9.8) to gain construction access to the M4 verges for the completion of the works Continue with the bulk earthworks Continue the construction of the Magor Interchange Bridge Construct the J232 to J23A trunk road link carriageways up to interface point with Magor West section

Phase	Key elements delivered
3.2	Complete the bulk earthworks Complete the construction of the Magor Interchange Bridge Construct the M4 westbound link to the J23 to J23A trunk road link Demolish the Bencroft Lane Existing Underbridge
Final	Carry out final commissioning and demobilisation works, including reinstatement of areas used for compound, storage and assembly Remove the traffic management to open the final layout of the Magor Interchange (Note: This switch could only take place once the road tie-ins of Magor West, Castleton and the whole scheme is complete)

Delivery Phases for Magor West

9.3.6 The table below provides an overview of the key elements currently proposed to be delivered in each phase at Magor West. The envisaged construction phased delivery is shown below.

Table 9.7 – Magor West Phased Delivery

Phase	Key elements delivered
Preparation	Use elements of the traffic management Phase 1 to gain access to the preparatory work areas. Establish the Magor West site compound and storage areas Carry out the statutory utilities diversions and protection measures Establish the site accesses, including alterations to 3rd party access where required Carry out the vegetation and site clearance works in accordance with the requirements of the dormouse licence (including dormouse translocation, as necessary).
1.1	Establish traffic management Phase 1 (see Table 9.8) to gain construction access to the M4 verges Construct haul road, including plant crossings, temporary bridges, temporary road for St Brides diversion route and temporary noise bund/barrier Install the temporary Mill Reen overpumping arrangement to facilitate the culvert extension works Commence the bulk earthworks Construct the Newport Road Overbridge and the Mill Reen Culvert Extension
1.2	Continue the bulk earthworks Commence the construction of the Knollbury Lane Overbridge Construct the new alignment for the B4245 Newport Road including the western tie-in to the existing road and the new roundabout with the A4810. This would include minor traffic switches to maintain the existing traffic movements during construction.
1.3	Switch the haul road under the Newport Road Overbridge and utilise signalised plant crossing on B4245 to remove temporary bridge over B4245 and complete eastern tie-in to existing road. Continue the bulk earthworks Complete the construction of the Knollbury Lane Overbridge Construct the St Brides Road Underbridge

Phase	Key elements delivered
1.4	Switch the B4245 traffic onto the alignment over the Newport Road Overbridge removing plant crossing on B4245. Continue the bulk earthworks Construct the J23 to J23A trunk road link up to the temporary crossover west of the Knollbury Lane Overbridge, including the temporary tie-ins to the existing M4 as required to facilitate the traffic switch at the next phase Remove the temporary bridge over the M4.
2.1	Establish the traffic management Phase 2 (see Table 9.8) to move the M4 eastbound traffic onto the newly constructed J23 to J23A trunk road link. Continue the bulk earthworks Construct the eastbound tie-in between the new and existing M4, including the westbound off-slip and the temporary tie-ins to the existing M4 as required to facilitate the traffic switch at the next phase
3.1	Establish the traffic management Phase 3 to move the M4 westbound traffic onto the existing M4 eastbound carriageway Complete the bulk earthworks Construct the Magor Penhow Underbridge Construct the J23 to J23A trunk road link carriageways up to interface point with Magor East section Construct the new M4 carriageways
Final	Carry out final commissioning and demobilisation works, including reinstatement of areas used for compound and storage and re-opening of the St Brides Road to the public Remove the traffic management to open the final layout of the Magor Interchange (Note: This switch could only take place once the road tie-ins of Magor East, Castleton and the whole scheme is complete)

Traffic Management – Site Specific

Main Roads

9.3.7 The tables below provide an overview of the three main traffic management phases and lane/road closures that would be implemented at the Magor West and Magor East sections to construct the new interchange.

9.3.8 The Traffic Safety and Control Officer (TSCO) would liaise with all parties involved, including the South Wales Trunk Road Agency, the Network Operations, the local authorities and the emergency services, to review and agree the final traffic management arrangements and diversion routes. The TSCO would then manage the application process of the required temporary traffic regulation orders prior to the installation on site.

Table 9.8 – Magor East Traffic Management Phases

TM Phase	Details
TM Phase 1	There would be hard shoulder closures with cones along the M4 and M48 where access to earthworks and structure areas is required. Traffic speed reduced to 50mph. There would be a hard shoulder closure with narrow lanes and barrier on the M4 for the construction of the road tie-ins for the new slip roads. Traffic speed reduced to 50mph. There would be a hard shoulder and lane closure with narrow lanes and barrier on the M48 slip roads for the construction of the road tie-ins for the new slip roads. Traffic speed reduced to 50mph. B4245 would be reduced to narrow lanes with barriers to allow construction of overbridges for the new slip roads. Traffic speed reduced to 30mph.
TM Phase 2	New junction at Magor East partially opened. Similar to Phase 1 with live traffic switched to the verges to allow different access, including access to central reserve on M4 for construction of the central pier of the new Magor Interchange Bridge 1. Traffic speed reduced to 50mph.
TM Phase 3	New junction at Magor East opened except connection to J23 to J23A trunk road link. Similar to Phase 1 with live traffic switched to the central reserve to allow different access, including access to north side of M4 for construction of the north abutment of the new Magor Interchange Bridge 1. Traffic speed reduced to 50mph.

Table 9.9 – Magor West Traffic Management Phases

TM Phase	Details
TM Phase 1	There would be hard shoulder closures with cones along the M4 where access to earthworks and structure areas is required. Traffic speed reduced to 50mph. There would be a hard shoulder closure with narrow lanes and barrier on the M4 for the extensions of the existing structures. Traffic speed reduced to 50mph. B4245 would be reduced to narrow lanes with barriers to allow construction of the road re-alignment for connection to A4810. Traffic speed remains 30mph. A4810 would be reduced to narrow lanes with barriers to allow construction of the new connection to the B4245. Traffic speed reduced to 30mph.
TM Phase 2	Diversion of M4 eastbound traffic to newly constructed J23 to J23A trunk road link to allow modification on existing M4 eastbound carriageway. Remaining works carried out to set up of TM Phase 1. Traffic speed reduced to 50mph.
TM Phase 3	Diversion of M4 westbound traffic to existing M4 eastbound carriageway to allow road tie-in between existing and new M4. Traffic speed reduced to 50mph.

Table 9.10 – Magor Diversions on Main Roads

Road	Closure Details
M4	Overnight weekend road closures required for new Magor Interchange Bridge. Overnight lane/road closures may be required for TM installations and construction of structures and new road tie-ins, gantry erection and surfacing.
M48	Overnight weekend road closures required for new Magor Interchange Bridge. (M4 slip road only) Overnight lane/road closures may be required for TM installations and construction of new road tie-ins and surfacing.
A4810	Overnight lane closures may be required for TM installations, utility diversions and new road tie-ins and surfacing.
B4245	Overnight road closures required for: Deck installation of new Caldicot Road Underbridge 1. Deck installation of new Llanfihangel Underbridge. Overnight lane/road closures may be required for TM installations, utility diversions and new road tie-ins and surfacing.

9.3.9 The drawings in Annex 5 show the proposed diversion routes for the main roads required for the road closures in the table above.

Side Roads

9.3.10 The table below details the closure and diversion requirement for the side roads at Magor due to the construction works. The Annex 5 show the proposed diversion routes for the side roads required for the road closures. During road closures the access to properties and 3rd party assets would be maintained and where required suitable turning areas would be installed.

Table 9.11 – Magor Diversions on Side Roads

Road	Closure and Diversion Details
St Brides Road	Anticipated to be closed for public use for a duration of the project for utilities protection, haul road and bridge structure works at north and south of the existing M4. The diversion route would be via St Brides Road, B4245, A4810 and a temporary road by Magor services. A temporary road is proposed behind Magor services to reduce the length of the diversion route.
Mill Reen Culvert	Anticipated to be closed for public use for a duration of nine months for culvert structure works at north of the existing M4. Footpath diversion route would be via Knollbury Lane Overbridge.
Knollbury Lane	Anticipated to be closed for public use for a duration of 12 months for utilities diversions and bridge structure works at north of the existing M4. The diversion route would be via Vinegar Hill, B4245, The Elms and Rockfield Lane Underbridge. Rockfield Lane would not be closed at the same time to allow use as diversion route. St Brides Road would be closed at same time (see St Brides Road above). A signalised plant crossing would be in place prior to the construction of the new bridge structure to manage the crossing with the haul road.

Road	Closure and Diversion Details
Rockfield Lane	Anticipated to be closed for public use for a duration of 12 months to use as earthworks haul road and bridge structure works at north of the existing M4. The diversion route would be via The Elms, B4245, Vinegar Hill and Knollbury Lane Overbridge. Knollbury Lane would not be closed at the same time to allow use as diversion route. St Brides Road would be closed at same time (see Knollbury Lane above). A signalised plant crossing would be in place prior to the construction of the new bridge structure to manage the crossing with the haul road.
Bencroft Lane	Anticipated to be closed for public use for day/night closures for the realignment of road. The diversion route would be via B4245, The Elms and Rockfield Lane. Rockfield Lane would not be closed at the same time to allow use as diversion route. St Brides Road would be closed at same time (see Rockfield Lane above). A signalised plant crossing would be in place prior to the construction of the new bridge structures to manage the crossing with the haul road.

10 Gwent Levels

10.1 Overview

10.1.1 The new section of motorway would be constructed on low height embankments across the Gwent Levels. The majority of this area is classified as SSSI (Site of Special Scientific Interest) due to the ecosystem developed and supported by the reen drainage network.

10.1.2 The low height embankments are designed as “floating construction” (built upon existing soft ground, rather than excavating to remove soft ground) with vertical (band) drains and a working platform layer below the embankment to dissipate ground pore water pressure. This technique accelerates predicted ground settlement whilst minimising the production of unsuitable material for disposal. Where higher embankments are required to take the new section of motorway over existing side roads and the South Wales to London Mainline railway, driven piles would be installed to support the embankment fill.

10.2 Key Constraints

10.2.1 The key constraints associated with works on the Gwent Levels include:

- Works within areas designated as SSSI.
- Prevention of detrimental effect to existing reens and water management networks.
- Protection of existing flora and fauna.
- Existing “poor” ground conditions for construction.
- Minimising impact on local landowners, businesses and residents.
- Network Rail restrictions at Duffryn and Llandevenny.
- Land affected by contamination particularly at TATA steelwork lagoons area and land to the west of Newport Docks.
- Location of suitable embankment fill material.
- Existing overhead power lines and limited vertical clearance precludes the installation of band drains to accelerate ground consolidation.
- Existing traffic maintenance depot facility at Wilcrick obstructing the proposed works

10.3 Construction Strategy

General Construction Sequence

- Lay working platform on proposed M4 footprint (working predominantly west to east across Wentlooge Levels and east to west across Caldicot Levels) using imported material.
- Install construction phase site water management system including temporary pipes for plant crossings of existing reens and field ditches.

- Construct haul road access at the following locations to enable works to key areas of the proposed alignment (Duffryn mainline railway, River Ebbw, River Usk, TATA lagoons, Llandevenny mainline railway etc.)
- Construct temporary haul road bridges and approach ramps over the South Wales mainline railway at Duffryn and Llandevenny.
- Install permanent culverts. Where possible reen and ditch connectivity would be maintained using temporary pipes and permanent replacement ditches to avoid overpumping.
- Remove temporary pipe plant crossings upon commissioning of the permanent culvert, remove unsuitable material from the redundant water course bed and instate structural fill
- Install band drains to alleviate pore water pressure (low height embankments) or driven piles for proposed higher embankments.
- In areas with existing overhead power lines, driven piles would be utilised to support the proposed embankment, installed with low headroom piling rigs to operate within safe vertical clearance restrictions.
- Place low height embankment fill and surcharge. Monitor settlement during predicted consolidation period
- Structure design and construction methodology implemented at Duffryn and Llandevenny railway crossings to minimise the quantity of Network Rail possessions required.
- Once consolidation obtained on low height embankments, remove surcharge and utilised material to complete fill to higher embankment.
- Implement environmental control measures set out in the Pre-CEMP throughout the construction sequence.

Side Road Interfaces

10.3.1 Crossings of side roads are formed with structures built to the side of the existing highway, while maintaining public traffic on its existing alignment. Plant crossings would be formed (signal or manually controlled, dependant on traffic volumes) to manage the interface between the public highway and transit of construction vehicles along the new section of motorway, during the construction of the permanent grade separated bridges crossing the M4.

10.3.2 Once the side road bridge structure is completed along with the approach roadworks, the side road would be diverted onto its permanent alignment. Temporary traffic management would be required to undertake the roadwork tie in to existing highway. This would be conducted maintaining single alternate flow traffic on the public highway past the works using temporary traffic signals.

10.3.3 The redundant carriageway of the side road across the new section of motorway is then removed.

Wentlooge Levels

10.3.4 Earthworks fill material would be generated from the Castleton Junction works area and transported along the footprint of the works. The South Wales to London Mainline railway at Duffryn and the River Ebbw provide a natural obstruction to this movement of materials. To construct these two permanent structures a stabilised haul road would be constructed within the works footprint

from Duffryn Railway to River Ebbw structures, accessed at Lighthouse Road. To enable the placement of earthworks material generated from Castleton and offsite quarries, a temporary haul road bridge would be installed at Duffryn Railway to gain access from Castleton towards River Ebbw, minimising the use of public highways around Newport.

10.3.5 The permanent Duffryn Railway Bridge would be constructed sequentially north to south. This enables placement of the initial deck beams and the deck slab at the northern end during construction of the remaining abutment walls thus permitting the haul route to be diverted over this section of completed deck slab whilst the remaining structure is constructed. The temporary haul road bridge and associated reinforced earth approach embankments would then be decommissioned and removed, releasing this fill for use elsewhere on the Gwent Levels.

Dock Link Junction area

10.3.6 The River Ebbw Bridge superstructure would be constructed utilising a beam and permanent formwork bridge launch methodology from east to west. Access for the east abutment, pier and beams would be through the Usk Bridge worksite from West Way Road into the west River Usk Crossing compounds and temporary construction areas. Fill for both the River Usk Bridge west abutment and River Ebbw east abutment reinforced earth embankments (used as bridge launch ramps) would need to be transported using road-going vehicles.

10.3.7 Once access is available over both the South Wales to London Mainline at Duffryn and the River Ebbw, remaining bulk materials in the Newport Docks area could be transported using site plant, reducing construction traffic on the public highways.

10.3.8 A dedicated site access would be formed from West Way Road, before ABP's west security gate, and fenced to be outside of ABP security restrictions. This would be the initial access for the Usk Bridge west side works and River Ebbw Underbridge eastern abutment pier and superstructure works.

10.3.9 Docks Way Junction embankment would be constructed at the interface with Southern Distributor Road to provide access directly from the main highway network and segregated the work access from the ABP access.

10.3.10 The River Ebbw Underbridge would be constructed using an east to west bridge launch methodology for superstructure construction. To achieve the required programme of works, fill including reinforced embankment material between the River Usk and the River Ebbw, would need to be imported via road haulage.

Caldicot Levels

10.3.11 Earthworks fill material is generated from the borrow pits and excavation areas at Magor Junction and local quarries. It is transported along the works footprint from east to west utilising 40T ADTs. The South Wales to London Mainline railway at Llandevenny provides an obstruction to this movement of materials. To enable earliest transit of mass earthworks material west of Llandevenny railway, a temporary haul road bridge would be installed to enable access to towards the River Usk.

10.3.12 The new section of motorway crosses TATA Steelworks land used as reed beds and sludge lagoons for storage of sludges from their steelmaking operations. Accommodation works need to be undertaken to retain the integrity of their waste and water management system (for example and not limited to, the relocation of the reed beds and peripheral ditches network to allow the construction of the new section of motorway). The accommodation works related to the reed beds relocation would be commissioned before the earthworks were undertaken within this location, thus removing a further obstruction to the transit of bulk materials east to west along the new section of motorway.

10.3.13 Road access is available to the required locations on the Caldicot Levels via the A4810. Access from the A4810 at Meadows Road would be utilised until the temporary access bridge is established over the South Wales to London Mainline railway at Llandevenny and TATA steelwork accommodation works have been commissioned. This would then provide continuity of the site haul road from the Magor area.

11 River Usk Crossing

11.1 Overall description

11.1.1 The proposed River Usk crossing would be a 2.1km long elevated structure including a high level cable stayed crossing. It would extend from chainage 9+224 on the west side to chainage 11+376 on the east side and would carry the proposed M4 3 lane dual carriageway over the River Usk and Newport Docks area.

Figure 11.1 - Artist Impression of the River Usk Crossing

11.1.2 The River Usk Crossing can be divided into three main structures:

- the west approach viaduct, 512m long, spanning the Newport docks area;
- the cable-stayed bridge, 752m long, crossing the River Usk; and
- the east approach viaduct, 888m long.

11.1.3 The viaducts and cable-stayed bridge would be supported on concrete piled foundations and constructed with reinforced concrete piers and with a steel and concrete composite deck.

11.1.4 There would be a reinforced earth embankment located to the west of the west abutment (WA).

11.2 Site installation / logistic and temporary land take

Site installation

11.2.1 Two site compounds would be established, one on the west side of the River Usk within ABP, which is described in section 6, and one on the east side of the river whose extent is shown in Figure 11.2.

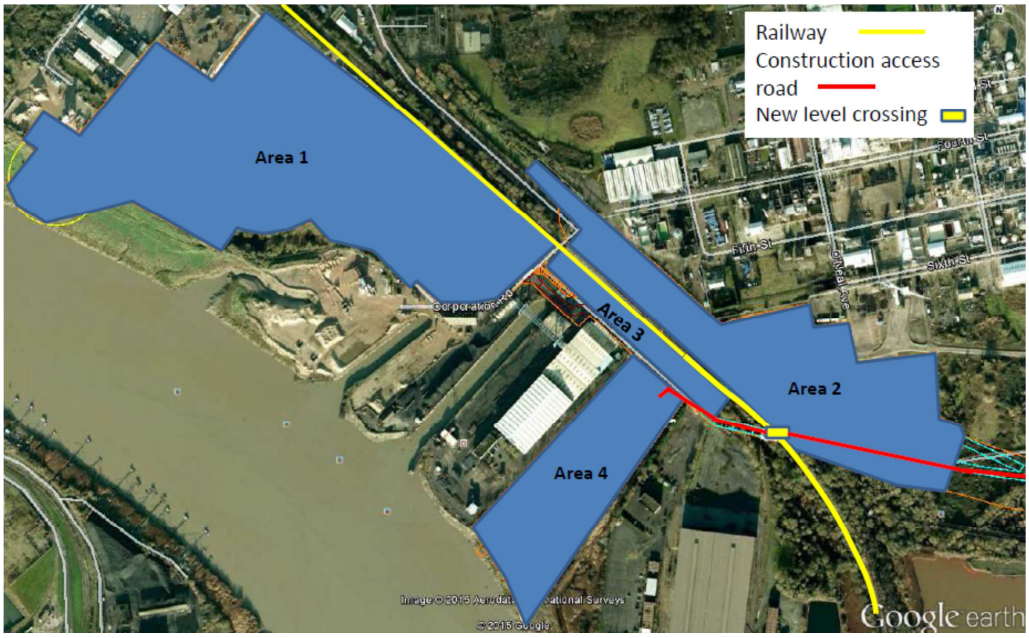


Figure 11.2 – Compounds to the East of the River Usk

Traffic / construction Vehicles

11.2.2 The main traffic entering these compounds would come from the delivery of the concrete materials, the steel reinforcing bars (rebar), the structural steel beams and the earthwork operations, including removal of the excavated materials that would be taken away and processed for re-use if suitable.

11.2.3 The traffic on the west side of the River Usk (ABP) is described in section 6.

11.2.4 On the east side, the anticipated total number of deliveries by HGVs during the whole construction period is approximately 23,000 deliveries and the total estimated number of light vehicles is 76,000 deliveries.

11.2.5 During the busiest months, there would be up to 1,500 lorry deliveries per month entering and exiting from the east compound areas.

11.3 Construction works and associated methods

11.3.1 The East, West and River Crossing structures would be constructed concurrently with each other.

11.3.2 The works associated with the construction of the proposed structures would include piling, reinforced concrete works, structural steel work, temporary formwork and falsework, heavy lifting operations and in some locations further specialised operations such as sheet pile walls, pre-stressing, and stay cable installation.

Piling works

11.3.3 The preliminary design indicates that 547 bored piles (diameter 1.5m to 2.1m) would be required to support the River Usk crossing structures.

11.3.4 Piling operations would be carried out from a series of prepared piling platforms, designed and installed to support the bearing loads of the piling rig and crane,

and which would incorporate a fine grid geotextile to prevent migration of bentonite drilling fluid downwards into the ground during piling operations.

11.3.5 Bentonite and / or polymer would be used as a pile bore support fluid if and when necessary to provide support to the pile bores through unstable strata (Fluvial Alluvium) until such time that the concrete for the pile is placed.

11.3.6 Temporary casings would be vibrated through the Made Ground and Estuarine Alluvium to the top of the Mercia Mudstone and then the pile would be drilled out using augers and digging buckets as necessary.

11.3.7 Additional controls on preventing the risk of spreading contamination as a result of piling would be implemented subject to the outcome of a piling risk assessment undertaken in line with NRW guidance.

11.3.8 Upon reaching the required depth the pile base would be cleared of any loose material. The sections of reinforcement cage would be installed and the pile would be concreted to the required level.

11.3.9 The temporary casing would be extracted using a hydraulic vibrator suspended from a service crane, and the concrete level would be topped up if required.

11.3.10 On completion of pile head trimming and preparation, the piles would be integrity tested.

11.3.11 To mitigate the potential impact on fish within the River Usk SAC, piles at the East Pylon location are programmed to avoid the highest risk period for underwater noise related impacts on fish migration which is March to June inclusive.

Approach Viaducts

11.3.12 The viaducts are supported on concrete piled foundations and reinforced concrete piers capped by concrete pier-heads which support the composite deck.

Substructures (abutments, pile caps, piers and pier heads)

11.3.13 The concrete reinforced pile caps would be constructed below ground level (except those near the Uskmouth railway line) and buried once constructed. Pile caps would be constructed using standard formwork construction.

11.3.14 The piers would be constructed with purposed made climbing formwork in successive lifts, typically 4.0m high.

11.3.15 A purposed made formwork would also be designed and fabricated for the pier head construction.

Deck

11.3.16 The proposed deck is a composite deck made of a steel structure (twin ladder beams) and full-depth precast concrete panels with in-situ concrete stitches structurally joining the precast concrete panels to form a solid deck.

11.3.17 The steel deck would be mainly erected using the incremental bridge launching technique, which reduces construction impacts by:

- Limiting the ground footprint by assembling the steelwork at a single launching location and pushing the bridge deck sections incrementally along the bridge into their final position. Thus limiting the need for heavy-lifting cranes and disruption to affected businesses and stakeholders along the whole length of the bridge.
- Minimising the need for lengthy possessions on roads as well as ABP and Uskmouth railway lines as most of the deck construction and assembly will be performed away from the roads and railway lines.

11.3.18 The two ladder beam decks (each one consisting of two main girders connected by cross-girders forming a 'ladder shape') would be assembled on temporary launching platforms and then incrementally launched section by section.

11.3.19 The cross girders between the two decks, as well as the southern slip road on the west approach and the connection with the back-spans of the cable-stayed bridge, would be craned into position from the ground as shown below.

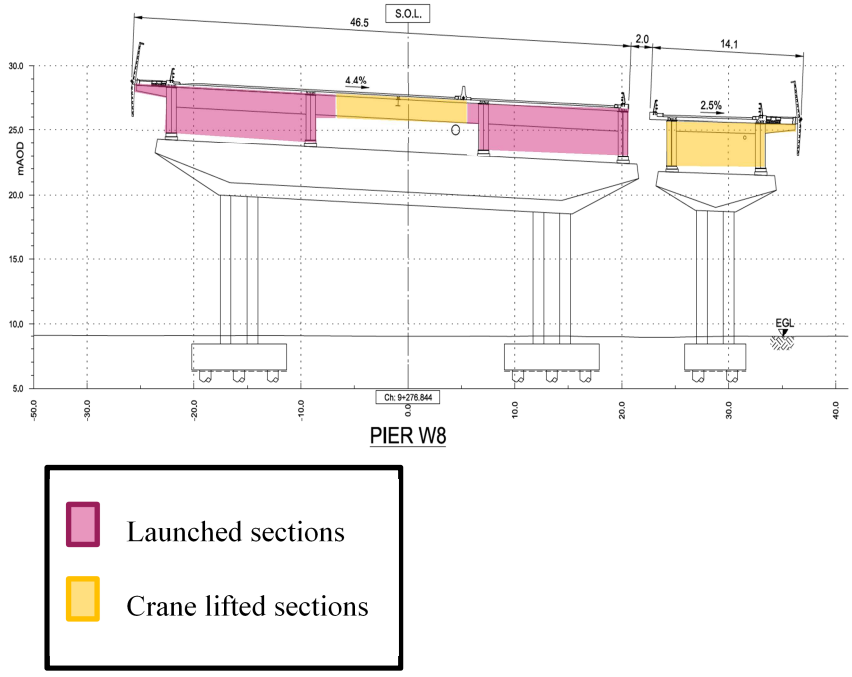


Figure 11.3 – Pier W8 – Launched and Lifted Sections

11.3.20 Precast slabs would be used to form the concrete deck and would be placed onto the top flange of the cross girders with dedicated gantry cranes. Installation of precast slabs would commence after completion of the bridge deck beam launch.

11.3.21 In-situ concrete stitches between precast slabs would be completed in stages, once sufficient slabs are in place.

Cable-stayed bridge (CSB)

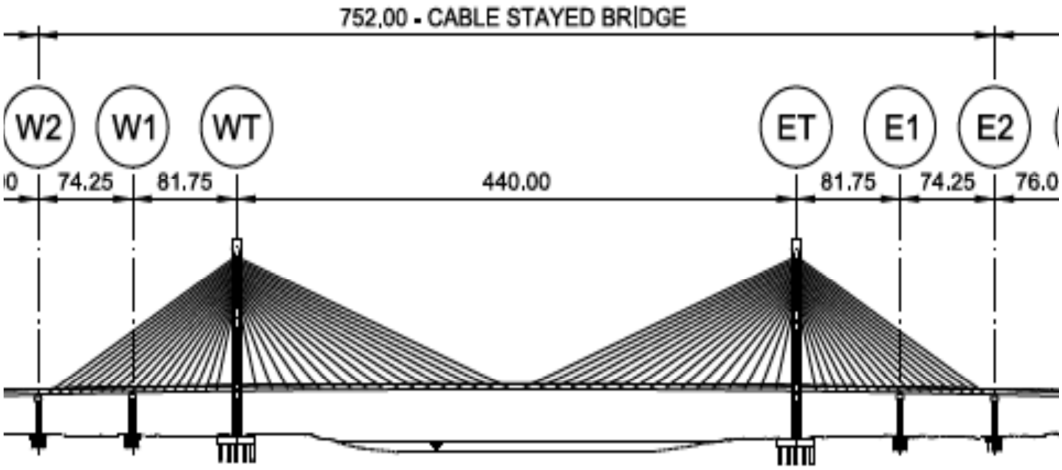


Figure 11.4 – Cable Stay Bridge Longitudinal View

11.3.22 The 752m long cable stayed bridge would be constructed between pier W2 and pier E2. It would comprise three sections: the west back span between West Pylon (WT) and pier W2, the main span between WT and East Pylon (ET) and the east back span between ET and pier E2.

11.3.23 The construction of the foundation and piers W2, W1, E2 and E1 would be similar to those for the approach viaducts, although piers W1 and E1 have tie-down cables to counterbalance the asymmetry of the main river span bridge deck.

Foundations for Pylons WT and ET

11.3.24 To reduce the visual impact, the 5m thick pile caps of the pylons would be buried 50cm below existing ground level, leading to an excavation about 6m deep. Cofferdams would be necessary to allow the foundations excavation and the construction of the pylon pile cap in safe working conditions.

11.3.25 The works would include preparation of a piling platform, installation of the cofferdams, piling, excavation within the cofferdams, propping, construction of the reinforced concrete pile cap and scour protection if required. Cofferdams would be constructed using sheet piles and frames to support the sheet pile walls. Sheet piles would be driven through the soft soils under their self weight and limited controled vibration would be used to complete the placing of sheet piles in more competent soils. These operations would take place as prescribed in the pre-CEMP, out of the sensitive periods for fishes.

11.3.26 Excavation would be undertaken with tracked excavators. Only limited dewatering would be needed within the cofferdams to keep the formation dry.

11.3.27 The pile cap reinforcement would predominantly be prefabricated in advance in yards on site and then transported to the pylon location where it would be installed and fixed in-situ.

11.3.28 Pouring approximately 5,250m³ concrete per pile cap would be done in a continuous pour in order to construct the pile cap without any cold joints. It is expected these concrete pours would last around three days per pile cap.

Pylons

11.3.29 The hollow reinforced concrete towers of the cable stayed structure would be of an inclined diamond shape and the top would reach +146.2mAOD.

11.3.30 The two pylons would be erected concurrently, using bespoke self-climbing formworks to build both legs of a pylon independently in 4m high lifts.

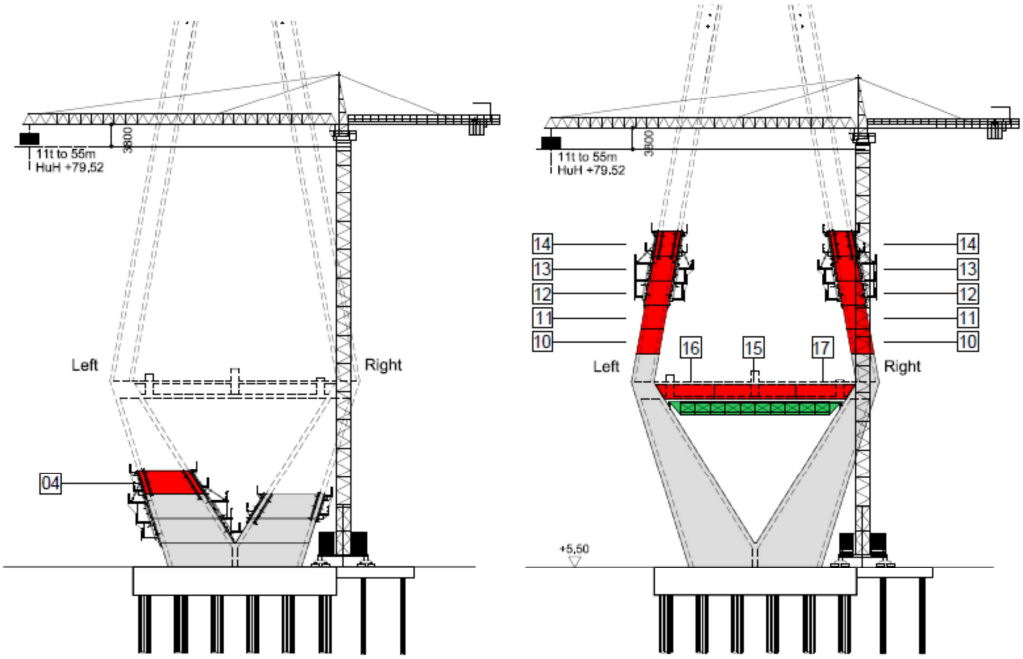


Figure 11.5 –Pylon: Construction Sequence, Lower and Upper Legs

Deck

11.3.31 The east and west back spans would be launched segment by segment from temporary platforms located between piers E1 and E2 and piers W1 and W2 respectively.

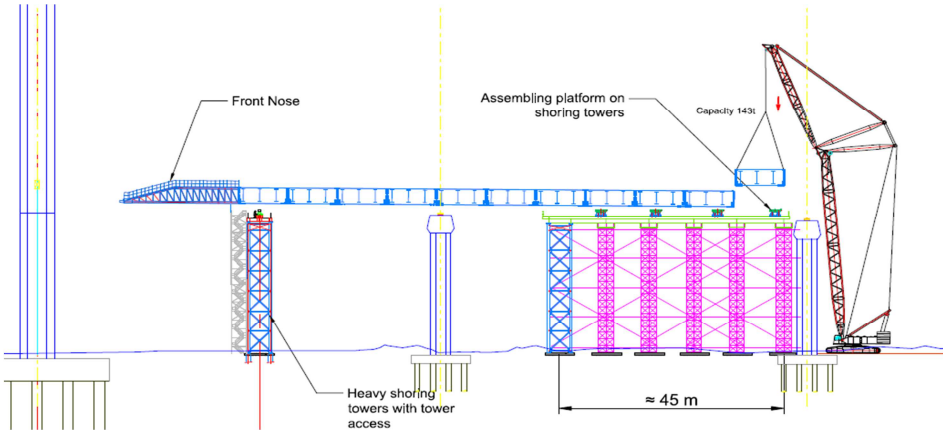


Figure 11.6 – Lifting Back Span Segment on the Temporary Platforms Before Launching

11.3.32 Once the back spans are launched and the pylons are sufficiently constructed to install the stay cables, the erection of the main span can commence.

11.3.33 The main span would be erected segment by segment, using the incremental cantilever technique. Each segment would be approximately 12.375 m long and include three cross girders, requiring 34 segments in total.

11.3.34 The construction cycle to erect the main span segment would also include the following activities:

- installation of stayed cables on the main span and back span segments;
- installation of pre-cast slab above the main span and back span segments;
- pouring concrete ballast on back span segments; and
- pouring concrete stitches between pre-cast slabs.

11.3.35 The segments of the main span (full deck width, 12.375 m long) would be assembled on the ground, in the pre-assembly areas located near W2/W1 and E2/E1, and lifted onto the deck between piers W2 and W3 or E2 and E3. They would then be skidded on sliding bearings to the main span. A lifting gantry would be used to place the segments next to the previous one so that they can be spliced together, as shown below.

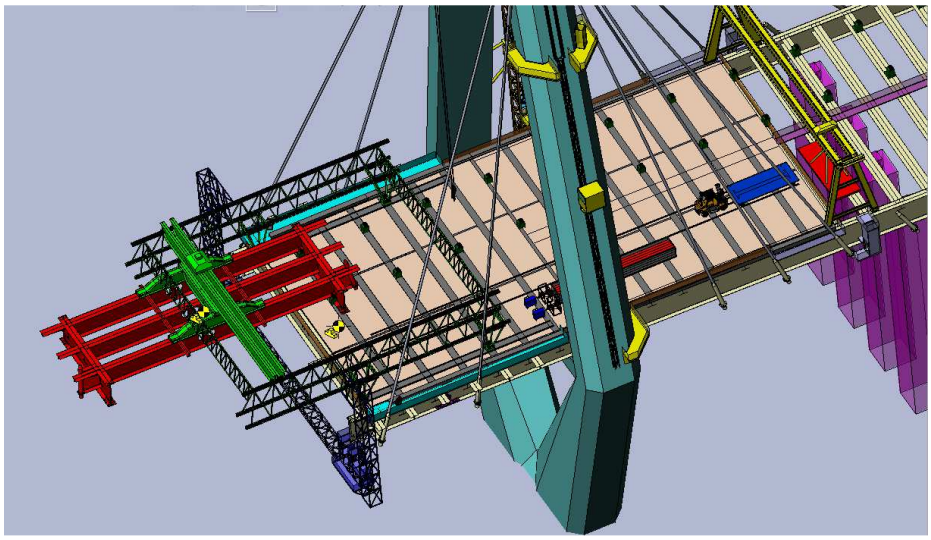
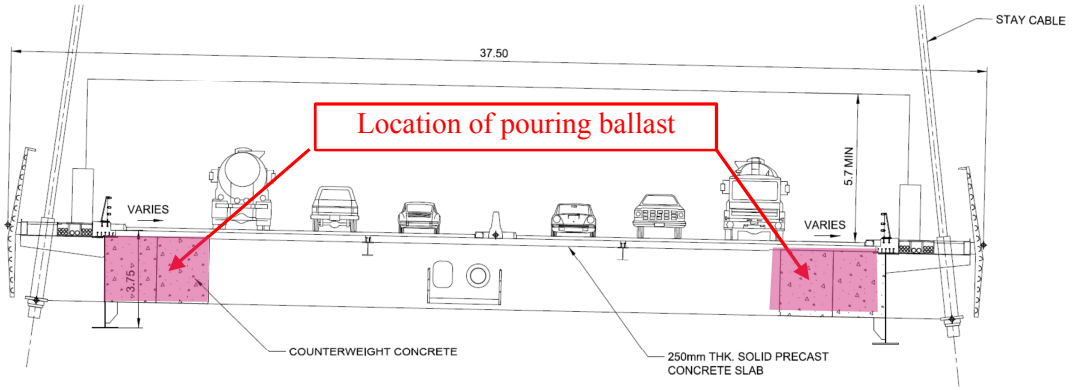


Figure 11.7 – Segment (in red) Picked Up by Lifting Gantry

11.3.36 Precast slabs would then be installed symmetrically on the main and back spans to form the deck and the in-situ concrete ballast (which is needed to counterbalance the asymmetry of the deck due to the short back spans) would be cast on the back span segment. Stitches would be concreted and cured before the stay cable tensioning is completed. Figure 11.8 shows the location of the pouring ballast.



BACK SPAN STAY CABLE SECTION

Figure 11.8 –Location of Pouring Ballast on Back Span Segment

12 Other Structures

12.1.1 The new section of motorway requires the construction of a number of new structures along the 24 km stretch of new motorway and includes a bridge across the River Usk, a series of underbridges and overbridges, four major bridges and culverts.

12.1.2 The works associated with the construction of the proposed structures would include piling, reinforced concrete works, structural steel work and heavy lifting operations.

12.1.3 The proposed structures can be categorised as follows:

- Overbridges and Underbridges (including those for non-motorised users).
- Culverts and Reen Bridges
- Temporary Structures.

12.1.4 The tables below give a description of each structure. Environmental control measures are set out in the Pre-CEMP (Appendix 3.2).

Table 12.1: Details of New Overbridges and Underbridges (including those for non-motorised users)

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-0200	2,000	Park Farm Footbridge	Replacement for existing footbridge (to be constructed and opened to pedestrians prior to demolition of the existing footbridge). The new structure is 49m long single span steel footbridge with a 2m wide path over	• The new bridge would be built adjacent to the existing footbridge and traffic required management would be co-ordinated with other works at Castleton Junction; • close the hard shoulder for construction of the new bridge abutments; • divert services and install sacrificial sheet piles; • construct spread footings and abutments; • establish fabrication yard between A48(M) and the M4 and fabricate the bridge structure into a single element from the three sections delivered to site; • full closure of the M4 for the installation of the completed bridge structure, using a suitable large crane; • should the existing footbridge need to be demolished to allow for construction of the new bridge the footpath would be closed until the new bridge is available for use; • reopen the motorway on completion of the bridge lift; • construct wing walls, install drainage, apply surfacing and waterproofing; • install parapets to wing walls and clad abutment walls to match existing bridge structure; • reopen hard shoulder; and • complete footpath diversion to new bridge
SBR-0245	2,450	Castleton Interchange Overbridge Link A	Proposed overbridge carrying reclassified A48(M) from Cardiff, connecting to the M4 and reclassified M4 north of Newport (eastbound). Structure consists of steel plate girders and cross girders supporting a reinforced concrete deck slab. Structure to be 124.89 m long, 17.6 m wide and a minimum headroom of 5.3 m. Foundations to be reinforced concrete spread footings.	• Coordinate traffic management and diversions to allow for construction; • divert any services in the motorway verge that conflict with new foundation locations; • install sacrificial sheet piles for spread footings to minimise excavation extent;. • construct spread footings, columns and abutments; • install bearings and establish fabrication yard in the area of the service road between the M48 and the M4; • fabricate the ladder beam deck in two sections ready for installation; • under full motorway closure install two sections of

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				prefabricated deck steelwork; • construct bridge deck; • construct wing walls, install drainage and backfill; • apply waterproofing system and install parapets; • install highway kerbing, drainage system, ducting requirements and construct the carriageway including verges; and • Install street lighting.
SBR-0355	3,600	Castleton Interchange Overbridge Link C	Proposed overbridge carrying the westbound slip road from the reclassified M4 onto the new section of motorway and the reclassified A48(M) into Cardiff. Structure consists of steel plate girders and cross girders supporting a reinforced concrete deck slab. Structure to be 237.75 m long, 18.0 m wide and a minimum headroom of 5.3 m. Foundations to be reinforced concrete piles.	• Re-establish the alignment of the gas main and mark up protective zone; • lay down stone mat; • install in-situ concrete bored piles to the west and east abutments and all column foundations; • construct the western abutment wall and intermediate columns; • fix bearings to western abutment and columns; • construct reinforced concrete wing wall to western abutment; • install drainage to rear of abutment and partially backfill; • establish fabrication yard between the M4 and A48 to the east of the eastern abutment of this structure; • fabricate the ladder beam deck in four sections ready for installation; • install all four sections and construct the pile cap and abutment wall for the eastern abutment; • fix bearings on eastern abutment; • construct reinforced earth retaining wall to eastern abutment, sequentially backfilling and installing drainage behind the abutment wall and complete backfill to western abutment; • construct bridge deck and remove formwork; • Apply waterproofing system to main deck. • install parapets, highway kerbing, drainage system, ducting requirements and construct the carriageway including verges; and • install street lighting.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-0360	3,600	Castleton Interchange Overbridge Link B	Proposed overbridge carrying the westbound slip road from the new section of motorway to the reclassified A48(M) into Cardiff. Structure consists of steel plate girders and cross girders supporting a reinforced concrete deck slab. Structure to be 145.75 m long, 14.0 m wide and a minimum headroom of 5.3 m. Foundations to be reinforced concrete piles.	• Re-establish the alignment of the gas main and mark up protective zone; • lay down stone bed to the north and south of the A48 to allow access for the required construction plant; • establish the location of services in the verge of the A48 and Pound Lane, divert or protect; • impose traffic management on the A48, reducing road width to single lane in each direction; • import fill and compact to location of southern abutment up to pilecap formation level; • excavate in location of northern abutment to allow construction, • install in-situ concrete bored piles for abutment and column foundations; • construct pilecaps to abutments and columns. • construct abutments and columns. • place bearings on intermediate columns and abutments; • construct reinforced concrete wing wall to northern abutment, install drainage behind abutment wall and partially backfill; • install drainage behind southern abutment and sequentially construct reinforced earth retaining wall; • establish fabrication yard between the M4 and A48 to the east of the eastern abutment of overbridge link C; • fabricate the ladder beam deck in three sections ready for installation; • closure of the A48 trunk road would be required for the installation of the fabricated deck sections; • construct bridge deck and remove formwork. • apply waterproofing system to main deck and install parapets; • install temporary running surface to allow the bridge to be used to haul materials along the mainline of the motorway; and • when no longer required, remove temporary surface. • Install highway kerbing, drainage system, ducting requirements and construct the carriageway including

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				verges • Install street lighting.
SBR-0370	3,725	A48 Underbridge Westbound	Proposed underbridge carrying westbound carriageway of new section of motorway over the A48. Structure consists of steel plate girders and cross girders supporting a reinforced concrete deck slab. Structure to be 95.0 m long, 20.5 m wide and a minimum headroom of 5.3 m. Foundations to be reinforced concrete piles.	• Re-establish the alignment of the gas main and mark up protective zone; • lay down stone to allow access for the required construction plant; • divert or protect services; • set up traffic management; • import fill and compact at location of southern abutment; • excavate at northern abutment; • install in-situ concrete bored piles for abutment and column foundations; • construct pilecaps and abutments and columns; • construct reinforced concrete wing walls to north and south abutments; • install drainage and partially backfill; • establish fabrication yard between the M4 and A48 to the east of the eastern abutment of overbridge link C; • fabricate the ladder beam deck in two sections; • erect temporary supports for the deck installation; • construct bridge deck and remove formwork; • complete backfill to abutments; • apply waterproofing and install parapets; • install kerbing, drainage, ducting and construct the carriageway including verges; and • install street lighting.
SBR-0375	3,750	A48 Underbridge Eastbound	Proposed underbridge carrying eastbound carriageway of new section of motorway over the A48. Structure consists of steel plate girders and cross girders supporting a reinforced concrete deck slab. Structure to be 84.75 m long, 21.5 m wide and a minimum headroom of 5.3 m. Foundations to be reinforced concrete piles.	• Re-establish the alignment of the gas main and mark up protective zone. • lay down stone to allow access for the required construction plant; • divert or protect services; • set up traffic management; • import fill and compact at location of southern abutment; • excavate at northern abutment; • install in-situ concrete bored piles for abutment and column foundations;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• construct pilecaps, abutments and columns • construct reinforced concrete wing wall to southern abutment, install drainage and partially backfill; • sequentially construct the reinforced earth wing wall to the northern abutment and installing drainage; • establish fabrication yard between the M4 and A48 to the east of the eastern abutment of overbridge link C; • fabricate the ladder beam deck in two sections ready for installation; • erect temporary supports for the deck installation; • construct bridge deck and remove formwork; • apply waterproofing and install parapets; • install kerbing, drainage, ducting and construct the carriageway including verges; and • install street lighting
SBR-0460	4,625	Church Lane Overbridge	Proposed overbridge carrying side road over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a concrete deck slab. Structure spans: 30 m and 29.6 m, carrying a single carriageway 5.0 m wide with overall deck width of 10.0m Carries Church Lane side road over new section of motorway..	• Access along Church Lane (to dwellings and factory) would be maintained by using off line construction. • site access would be from the new section of motorway; • set up traffic management (site traffic crossing); • construct embankments and install mat for the crane and piling rig; • install bored piles; • construct abutments and central walls; • install drainage and profile embankment; • divert traffic temporarily; • install precast beams and permanent formwork; • construct deck slab, parapet edge beams and wing walls; • complete approach earth works; • construct carriageway, install kerbs and verges; • divert services; and • complete road up to bridge and transfer traffic.
SBR-0580	5,775	Percoed NMU Bridge	Proposed structure to carry the Newport/Cardiff cycle way over the proposed new section of motorway. Structure consists of multi-span steel structure supported on bearings on	• Site access to be via the new section of motorway; • construct mainline embankment and approach embankment for bridge and leave for surcharge period; • after surcharge period, install stone mats; • install bored piles for pier foundations and abutments;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			reinforced concrete piers. Length of approach spans would vary between 12 m and 13 m, with a single 48m span over the motorway. Overall length of structure: 188 m.	• construct bankseat abutment walls and piers; • install drainage and partially fill the backfill material; • install bearings and steel superstructure; • complete back filling and wingwalls, apply waterproofing and construct approach earthworks. • divert services onto new bridge structure; and • transfer users onto new structure, including connections into terminated existing cycleway.
SBR-0590	N/A	Percoed Reen NMU Bridge	Proposed structure to carry the Newport/Cardiff cycle way over Percoed Reen. Structure consists of single span steel and timber structure. Bridge would have clear span of 11.6 m.	• Site access via new section of motorway; • install stone mats; • install bored piles for pier foundations and abutments; • construct pile caps and abutments; • Install bearings and install the bridge (delivered from offsite pre-built or part built); • complete backfilling and abutments; and • transfer users onto new structure, including connections into terminated existing cycleway.
SBR-0740	7,350	Lighthouse Road Overbridge	Proposed overbridge carrying side road over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure spans: 28 m and 30 m, carrying a single carriageway 6.3 m wide with overall deck width of 11.0m. Carries Lighthouse Road over the new section of motorway.	• No traffic diversions are required during construction as the bridge would be constructed off line; • site access would be from the new section of motorway; • set up traffic management (site traffic crossing); • divert overhead lines (ahead of works); • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central pier and install drainage; • install precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls; • complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• divert services into new bridge structure; and • complete road and transfer traffic.
SBR-0805	8,025	New Dairy Farm Overbridge	Proposed overbridge carrying access over the new section of motorway to New Dairy Farm. Structure consists two span integral bridge. Structure spans: 32.8m and 32.2 m, carrying a single carriageway 5.0 m wide and a 2.5m wide footpath for the Welsh Coastal path, with an overall deck width of 9.7m.	• Site access would be from the new section of motorway; • set up traffic management (site traffic crossing); • protect BT cables; • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central pier and install drainage; • install precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls; • complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; • divert services into new bridge structure; and • complete road and transfer traffic.
SBR-0850	8,500	River Ebbw Underbridge	Proposed underbridge carrying new section of motorway over the River Ebbw. Structure consists of three separate deck structures carrying the proposed new section of motorway, the westbound merge slip and the eastbound diverge slip. All three spans to be formed of steel plate girders supporting a reinforced concrete deck slab. Structure spans to be 50 m, 78 m and 50 m. There would, however, be variations in the span lengths between the three bridge decks die to the horizontal alignment.	• A temporary access road would be required to provide access from Lighthouse Road to the western foundations; • Access to the eastern foundations would be via the access established for the Usk Crossing • Stone beds would be established on both banks to allow for plant access • The flood bund on the west bank would be realigned to allow construction of the west abutment • Install bored piles for piers and abutments • Construct reinforced concrete piers and abutments • Construct header beam to piers • Construct east and west reinforced earth embankments to the ebbw Bridge abutments • Complete temporary works on top of eastern embankment for fabrication of deck steelwork.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• Install permanent bearings and temporary sliding bearings to allow for bridge deck launch. • Prefabricate deck steelwork on embankment and launch in increments until fully installed. • Install permanent deck soffit formwork and concrete deck slab • Waterproof deck surface • Install parepets, highway kerbing and construct carriageway.
SBR-0875	8,750	Docks Junction Underbridge West	Proposed underbridge. The proposed gyratory system for the Docks Interchange would pass under this bridge, which would carry the new section of motorway. Structure consists of single span deck of pre-stressed concrete beams supporting a reinforced concrete slab. Structure span: 18.4. Deck width: 36.6 m.	• Clear area of existing services, concrete slabs and reduce to formation level. • lay down a stone bed for construction plant; • install bored in-situ concrete piles for support of reinforced concrete column; • reduce ground to formation level and break down piles to correct level, then cast reinforced concrete pile cap; • install precast concrete piles for reinforced earth embankment foundations; • construct reinforced concrete columns for bridge deck support; • construct reinforced earth embankment on either side of the bridge; • construct the reinforced concrete cross head beam on east and west sides of the bridge; • install precast concrete beams; • place permanent formwork on beams and construct reinforced concrete deck slab; • construct edge beam and parapets and install parapets; • install kerbing, drainage system, ducting and construct the carriageway including verges; and • install street lighting.
SBR-0880	8,800	Docks Junction Underbridge East	Proposed underbridge. The proposed gyratory system for the Docks Interchange would pass under this bridge, which would carry the new section of motorway. Structure consists of single span deck of pre-stressed concrete beams supporting a	• Clear area of existing services, concrete slabs and reduce to formation level. • lay down a stone bed for construction plant; • install bored in-situ concrete piles for support of reinforced concrete column;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			reinforced concrete slab. Structure span: 18.4 m. Deck width: 36.6 m.	• reduce ground to formation level and break down piles to correct level, then cast reinforced concrete pile cap; • install precast concrete piles for reinforced earth embankment foundations; • construct reinforced concrete columns for bridge deck support; • construct reinforced earth embankment on either side of the bridge; • construct the reinforced concrete cross head beam on east and west sides of the bridge; • install precast concrete beams; • place permanent formwork on beams and construct reinforced concrete deck slab; • construct edge beam and parapets and install parapets; • install kerbing, drainage system, ducting and construct the carriageway including verges; and • install street lighting.
SBR-1000	10,200	River Usk Crossing	See section 11	
SBR-1210	12,575	Nash Road Overbridge	Proposed overbridge carrying side road (Nash Road) over the new section of motorway. Structure consists of two 31m span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. the bridge carries a single carriageway 6.5 m wide and a 2.5m wide footway on the east side of the structure, with an overall deck width of 11.2m.	• No traffic diversions are required during construction as the bridge is located offline; • site access would be from the new section of motorway; • traffic management set up (site traffic crossing); • divert overhead lines, pylon and underground cables (ahead of works); • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central pier and culvert for crossing Julian's Reen; • install drainage, precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; • divert services into new bridge structure; and • complete road and transfer traffic.
SBR-1465	14,625	Glan Llyn Junction Overbridge West	Proposed overbridge carrying junction gyratory over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure spans: 28 m and 28.9 m, carrying a single carriageway 8 m wide.	• No traffic diversions are required during construction as the bridge is located over the new section of motorway; • site access would be from the new section of motorway; • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central pier; • install drainage, precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls; • complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; and • complete road.
SBR-1470	14,700	Glan Llyn Junction Overbridge East	Proposed overbridge carrying junction gyratory over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure spans: 28 m and 28.9 m, carrying a single carriageway 8 m wide.	• No traffic diversions are required during construction as the bridge is located over the new section of motorway; • site access would be from the new section of motorway; • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central pier; • install drainage, precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; and • complete road.
SBR-1760	17,550	North Row Overbridge	Proposed overbridge carrying side road (North Row) over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure spans: 27.3 m and 27.4 m, carrying a single carriageway 4.8 m wide.	• No traffic diversions are required during construction as the bridge is located offline; • site access would be from the new section of motorway; • traffic management set up on the existing North Row (site traffic crossing); • construct main embankment and leave for surcharge period (12 months); • after surcharge period install mat for crane, piling rig, etc.; • install bored piles for central pier and driven pre-cast piles for approach embankments; • install approach embankments and culverts (pre-cast concrete box sections); • construct abutment walls and central • install drainage, precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls; • complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; • divert services into new bridge structure; and • complete road and transfer traffic.
SBR-1980	19,800	Bareland Street Underbridge	Proposed underbridge carrying the new section of motorway over Bareland Street. An integral concrete structure comprising of pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure to be 37.9 m long, with a clear span of 10.95 m (to accommodate 5.5 m wide carriageway and two 2.5 m wide verges) and a headroom of 7.5 m.	• No diversion is required as the structure would be built offline; • site access would be via the new section of motorway; • set up traffic management where the haul road crosses Bareland Street; • install precast concrete piles and cast the transfer slab in pace; • construct abutment reinforced concrete wall footings and walls; • install precast, pre-stressed concrete beams and permanent formwork;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• construct desk slab and wing walls; • complete connections and waterproofing; • complete backfilling behind abutment walls and wing walls; • install metal parapets, kerbs and construct carriageway over; • complete roadway for Bareland Street; and • divert services.
SBR-2080	20,850	Newport Road Overbridge	Proposed overbridge carrying side road over the new section of motorway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a concrete deck slab. Structure spans: 36 m and 31.7 m, carrying a single carriageway 7.3 m wide with footpath and cycleway widths varying between 2.5 m and 4.1 m along the bridge length.	• Construction can be done off line prior to diversion of the Newport Road; • site access would be from the new section of motorway; • protect existing services (sewer pipe); • excavate ground to founding level; • construct foundations, abutment walls and central pier; • install drainage, precast beams and permanent formwork; • construct deck slab, parapet edge beams and wingwalls; • complete connections, backfilling and waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; • divert services into new bridge structure; and • complete road and transfer traffic.
SBR-2120A	21,225	St Brides Road Underbridge	Proposed extension to existing Magor Penhow Underbridge to carry the new section of motorway over St Brides Road. Existing structure has a clear span of 9.14 m and is approximately 40 m long with a headroom of 4.875m. It is proposed to extend this by 32.7 m on the north side and 20 m on the south side. Headroom would be increased to 5.3 m, in the new sections of the underbridge.	• Site access would be from the link between the reclassified M4 and the new M48 roundabout; • a road diversion would be put in place, for the duration of the works; • divert services, as required; • excavate for strip footings for abutment walls and construct in-situ reinforced concrete footings; • construct in-situ reinforced concrete abutment walls; • install precast concrete beams for bridge deck; • concrete in-situ roof deck slab; • prepare and concrete sections between the existing structure and the two extensions; • construct parapet upstands and wing walls on north and south extensions; • cut existing embankment back and tie in new earthworks;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• waterproof; and • complete backfilling.
SBR-2205	22,025	Knollbury Lane Overbridge 2	Proposed overbridge carrying side road (Knollbury Lane) over the new sectionDual Carriageway. Structure consists of two span integral bridge formed from pre-stressed concrete beams supporting a reinforced concrete deck slab. Structure spans: 18.3 m and 24.8 m, carrying a single carriageway 5.5 m wide. The new structure would abut the existing Knollbury Lane Overbridge 1, which spans the M4 Motorway	• Knollbury Lane would need to be closed during construction and a diversion set up; • site access would be from the link between the reclassified M4 and the new M48 roundabout; • divert services (water, cables); • partially demolish north wing walls of the existing Knollbury Lane Overbridge 1 and install piling mat; • install contiguous bored piles behind north abutment of the existing bridge structure; • excavate ground for abutments and central pier; • construct south pilecap and spread footings for central pier and north abutment; • excavate rock in front of contiguous piled wall; • construct central pier and north abutment; • construct walls and inspection gallery to south abutment; • install drainage and precast beams; • construct deck slab, parapet edge beams and wingwalls; • complete waterproofing; • construct approach earthworks; • install metal parapets, kerbs, carriageway and footways; • divert services into new bridge structure; and • complete road.
SBR-2265	22,700	Rockfield Lane Underbridge 2	Proposed underbridge carrying the new section of Dual Carriageway over Rockfield Lane. Structure consists of concrete box with internal dimensions 9.0 m by 6.81 m, with a length of 41.28 m. To accommodate 5.5 m wide carriageway and two 1.75 m wide verges).	• A road diversion would need to be put in place; • site access would be from the link between the reclassified M4 and the new M48 roundabout; • excavate for the new structure and install precast box sections; • cast in-situ floor section and apply waterproofing to buried elements; • cast wing walls and install drainage; • waterproof roof and complete backfilling; • install metal parapets, kerbs, carriageway and footways; • complete road and path finishes; • complete new track diversion to complete structure.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-2295	22,950	Magor Interchange Bridge	Proposed bridge carrying a westbound free flow link from the M4 motorway to the new J23 to J23A trunk road link. The bridge crosses the westbound merge from the M48 roundabout to the M4 and the eastbound and westbound carriageways of the M4. The bridge superstructure is a five span simply supported steel box bridge. The bridge deck is 12.1m wide and carries a 7.3m wide carriageway.	• Site access would be from the link between the reclassified M4 and the new M48 roundabout, the existing M4 or from the existing M48 to M4 westbound merge slip; • set up traffic management (co-ordination with other works required); • level existing ground and lay stone for construction plant; • construct reinforced concrete piers; • construct abutment walls and wing walls; • install drainage; • install bearings on piers and abutments ready for superstructure; • establish temporary fabrication yard on south side of existing M48 to M4 merge slip; • fabricate box girder beam, lengths of the bridge superstructure, formwork and concrete deck in yard and deliver; • install each fabricated length on to the permanent bearings (requiring overnight motorway closures); • cast in-situ reinforced concrete sections to complete deck slab; • complete backfilling retaining walls, waterproofing; • complete approach embankment; and • install parapets, kerb, drainage and install remaining items. superstructure, formwork and concrete deck in yard and deliver; • install each fabricated length on to the permanent bearings (requiring overnight motorway closures); • cast in-situ reinforced concrete sections to complete deck slab; • complete backfilling retaining walls, waterproofing; • complete approach embankment; and • install parapets, kerb, drainage and install remaining items.
SBR-2340A	-	Bencroft Lane Underbridge 1	Precast concrete box structure with internal width of 7.5m by 5.6m and a minimum clearance of 4.215m with a length of 50.0m.	• Site access would be from the link between the reclassified M4 and the new M48 roundabout, • excavate for the new structure and install precast box

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				sections; • cast in-situ floor section and apply waterproofing to buried elements; • cast wing walls and install drainage; • waterproof roof and complete backfilling; • install metal parapets, kerbs and construct carriageway over. • complete road and verge finishes; and • complete diversion to complete structure
SBR-2360A	-	Caldicot Road Underbridge 1	Extension to existing underbridge 13.9m long with a span of 15m to carry the off slip from the westbound M4, over the B4245 (Caldicot Road).	• Site access from the existing M48/M4 westbound link road; • Set up traffic management on existing M4 and B4245; • retain existing wing walls; • break out the parapet edge beam; • excavate for and construct reinforced concrete spread footings for abutments; • construct in-situ reinforced concrete abutment walls; • install drainage and precast reinforced concrete beams (closure of Caldicot Road); • construct reinforced concrete deck slab together with parapet edge beam; • construct the in-situ reinforced concrete wing walls;. • backfill and complete construction of approach embankments; • apply waterproofing and install parapets and construct highway over the new bridge deck; and • make any alterations to the alignment and layout of Caldicot Road (to be coordinated with other works required on Caldicot Road).
SBR-2360B	-	Bencroft Lane Underbridge 3	Pre-cast concrete box structure with internal dimensions of 7.5m by 5.6m and a minimum clearance of 4.215m and a length of 17.3m	• Site access would be from the existing M48/M4 westbound link road; • excavate for the new structure and install precast box sections; • cast in-situ floor section and apply waterproofing to buried elements; • cast wing walls and install drainage;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• waterproof roof and complete backfilling; • install metal parapets, kerbs and construct carriageway over. • complete road and verge finishes; and • complete diversion to complete structure
SBR-2365A	-	Red Barn Access Bridge	Pre-cast concrete box structure with internal dimensions of 7.5m by 5.3m and a minimum clearance of 4.24m and a length of 15.9m	• Site access would be from the existing M48/M4 westbound link road; • excavate for the new structure and install precast box sections; • cast in-situ floor section and apply waterproofing to buried elements; • cast wing walls and install drainage; • waterproof roof and complete backfilling; • install metal parapets, kerbs and construct carriageway over. • complete road and verge finishes; and • complete diversion to complete structure.
SBR-2365	-	Llanfihangel Underbridge	A 17.2m clear span concrete integral bridge with a length of 14.3m. The bridge carries the new eastbound on slip to the M4 and spans the B4245 (Caldicot Road)	• Site access for construction traffic would be from the existing M48/M4 westbound link • Road; • set up traffic management; • excavate for and construct reinforced concrete spread footings for abutments; • construct in-situ reinforced concrete abutment walls; • install drainage and precast reinforced concrete beams (closure of Caldicot Road); • shutter and cast integral connection between abutment walls and beams • place permanent formwork between beams and construct reinforced concrete deck slab together with parapet edge beam; • construct the in-situ reinforced concrete wing walls; • backfill and complete construction of approach embankments; • apply waterproofing and install metal parapets; and • construct highway over the new bridge deck

Table 12.2: Rail Crossings

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR 0650	650	Duffryn Railway Underbridge	Proposed underbridge carrying new section of motorway over the South Wales to London Mainline. Structure spans four tracks of the railway. Structure consists of pre-stressed concrete beams supporting a concrete deck slab. Structure span to be 29.9m with a minimum headroom of 5.45 m from the rail lines and an overall length of 208m. Foundations to be reinforced concrete piles.	• Site access via new section of motorway. Access from the east would be via an access road from Lighthouse Road until the temporary crossing is available at Duffryn; • the temporary rail crossing would have been established to the east of the site to allow construction traffic to pass over the railway lines; • establish site boundary fence with debris netting to the north and south of the rail lines. • construct stone mats suitable for the required plant on the north and south sides of the rail lines • install bored in-situ concrete piles to north and south of rail lines; • construct cast in-situ concrete abutment walls; • install drainage system and backfill; • install precast pre-stressed concrete beams, cast concrete connections and place permanent formwork and cast concrete deck slab (beams to be installed during possession periods. • Install carrier drain system; • Complete backfill to abutments and construction of wing walls, apply waterproofing system to deck, complete approach earth works. • Install metal parapets and highway kerbing and construct carriageway and verges.
SBR 2000	20,075	Llandevenny Railway Underbridge	Proposed underbridge carrying new section of motorway over the South Wales to London Mainline. Structure spans four tracks of the railway and a realigned non-motorised user route. Structure consists of pre-stressed concrete beams supporting a concrete deck slab. Structure span to be 28.3 m with a minimum headroom of 8.3 m from the rail lines and an overall length of 43.4m. Foundations to be reinforced concrete piles.	• Site access to be via the new section of motorway; • the temporary rail crossing would have been established to the west to allow construction traffic to pass over the railway lines; • establish site boundary fence with debris netting to the north and south of the rail line; • construct stone mat suitable for the required plant on the north and south sides of the rail line; • install concrete piles to north and south of rail lines; • construct concrete abutment walls, install drainage system and partially backfill; • install precast concrete beams and cast concrete connections

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				(beams to be installed during possession periods; • place permanent deck soffit formwork and cast concrete deck slab; • install drainage and complete backfill; • complete construction of wing walls, apply waterproofing system to deck, complete approach earth works; and • install metal parapets and highway kerbing and construct carriageway and verges.

Table 12.3: Details of New Culverts

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-0365	3,675	Castleton Interchange Gas Main Culvert	Structure provides maintenance access to high pressure gas pipe. The superstructure comprises a single span integral portal formed of T3 precast pre-stressed concrete beams acting compositely with a 150 mm thick in-situ reinforced concrete topping with infill between the beams. The structure has a span of 9.3 m with a length of 31 m.	• Establish the alignment of gas main and mark up at protective zone; • excavate for culvert foundations, temporary sheet piling would be required to retain surrounding material and material over the gas main; • construct spread footing foundations for the gas culvert and construct abutment walls up to beam soffit level; • place mass concrete fill between abutment wall and retained material around the gas main; • partially backfill with suitable material behind the abutment walls; • fill to the required level over the gas main; • install precast concrete beams; • erect formwork and construct in-situ deck element and parapet edge beams; • construct wing walls to northern end of the culvert; • complete integral connection between the deck and the abutment wing walls; • apply waterproofing to the deck slab; • complete backfilling around culvert and remove any remaining temporary works piling; • install parapets; • fill areas around culvert to allow construction of other structures in this area; and • install handrail, fencing and highway kerbing and construct the

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				carriageway including verges.
SMN-0510	5,100	Nant-y-Moor Reen Culvert	Structure carries Nant-y-Mor Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section to form an extension to existing culvert structure. Internal dimensions would be 1.8 x 1.8 x 30 m.	• Site access from the new section of motorway; • lay down stone to allow safe access for the piling rig; • establish temporary over-pumping facility; • drive sheet pile cut-off walls and construct haul road; • install temporary sheet piles, excavate along line of existing Nant-y-Moor Reen and backfill with compacted stone; • break out the existing western headwall and make good; • install precast concrete culvert sections and make good connection with existing culvert; • complete waterproofing and remove sheet piles; • remodel the ditch profile to the new culvert structure; • excavate length of compensatory reen to south and construct penstock structures; • remove sheet piles and over-pumping; and • install metal parapets and construct highway carriageway over
SMN-0550	5,500	SDR Reen Culvert	Structure carries realigned SDR Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 54 m.	• Site access from the new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-0680	6,825	Morfa Gronw Reen Culvert	Structure carries realigned Morfa Gronw Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x	• A temporary access road would allow access from Lighthouse Road and would be the point of access until the temporary rail crossing is available at Duffryn; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			72 m.	backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SBR-0735	7,350	Lighthouse Road Highway Drainage North (part of Lighthouse Road Overbridge)	Structure carries channel drainage system below the approach embankment for Lighthouse Road Bridge. Approach embankment for Lighthouse Road would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 2.7 x 1.0 x 47 m.	See Lighthouse Road Overbridge in the Overbridges table above.
SBR-0740	7,350	Lighthouse Road Highway Drainage South (part of Lighthouse Road Overbridge)	Structure carries channel drainage system below the approach embankment for Lighthouse Road Bridge. Approach embankment for Lighthouse Road would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 2.7 x 1.0 x 47 m.	See Lighthouse Road Overbridge in the Overbridges table above.
SMN-0770	7,700	Old Dairy Reen Field Access	Structure carries realigned Old Dairy Reen. A field access track would pass over this culvert. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 10 m.	• A temporary access is required to provide access from Lighthouse Road. This is to be the point of access until the temporary rail crossing is available at Duffryn; • Install temporary pipework in existing reen alignment and backfill with single size stone; • Ensure site water retaining bund restricts site run-off from entering Old Dairy Reen; • Lay down stone to allow safe access to piling rig; • Drive precast piles and sheet piles;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• Lift into place the precast concrete culvert and Waterproof the outside face of the buried elements and backfill; • Wing walls are positioned and backfilling is completed; • Reen diversion is excavated divert flow through new culvert (with agreement of NRW); • Excavate temporary and backfill original reen alignment using suitable material.
SMN-0775	7,750	Old Dairy Reen Culvert	Structure carries realigned Old Dairy Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 62 m.	• A temporary access road would allow access from Lighthouse Road and would be the point of access until the temporary rail crossing is available at Duffryn; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-0800	7,980	Pont-y-Cwcw Culvert	Structure carries realigned Pont-y-Cwcw Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 59 m.	• A temporary access road would allow access from Lighthouse Road and would be the point of access until the temporary rail crossing is available at Duffryn; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-0805	8,050	Pont-y-Cwcw Compensatory Reen Culvert	Structure carries realigned Pont-y-Cwcw Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 59 m.	See New Dairy Farm Overbridge (SBR-0805) in overbridge table above.
SMN-1180	11,950	Picked Lane Culvert	Structure carries realigned unnamed reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 74 m.	• Site access via new section of motorway or directly from Meadows Road; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-1225	12,250	Lake's Reen South Access Culvert	Structure carries realigned Lake's Reen. A field access track would pass over this culvert. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 12 m.	• Site access via new section of motorway or directly from Meadows Road; • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls; • install temporary sheet piles and excavate along line of existing Lakes Reen. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• lift into place culvert and waterproof the outside face of the buried elements and backfill; • wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure and remove piling; • install the field access track over the culvert.
SMN-1230	12,350	Lakes Reen Culvert	Structure carries Lakes Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 56 m.	• Site access via new section of motorway or directly from Meadows Road; • divert / protect existing services and install temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1235	12,350	Lake's Reen North Access Culvert	Structure carries realigned Lake's Reen. An access road would pass over this culvert. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 10 m.	• Site access via new section of motorway or directly from Meadows Road; • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls; • install temporary sheet piles and excavate along line of existing Lakes Reen. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place; • lift into place culvert and waterproof the outside face of the buried elements and backfill;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure and remove piling; • install the field access track over the culvert..
SMN-1240	12,450	Julian's Reen Side Road Culvert	Structure carries Julian's Reen on current alignment. Existing side road would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 15 m.	• Site access via Meadows Road and Broad Street Common or new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to east and west of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the reen profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1250	12,500	Julian's Reen Farm Access Culvert	Structure carries realigned Julian's Reen. A field access track would pass over this culvert. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 10 m.	• Site access via new section of motorway or directly from Meadows Road; • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls; • install temporary sheet piles and excavate along line of existing Julian's Reen. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place; • lift into place the concrete box sections and waterproof the outside face of the buried elements and backfill; • wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure and construct penstock structures on culvert;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• remove piling, install metal parapets and construct highway carriageway.
SMN-1300	13,000	Julian's Reen Culvert	Structure carries Julian's Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 56 m.	• The water main to Tatton Farm would be diverted ahead of the works; • Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1305	13,050	Tatton Farm Access Culvert	Structure carries realigned an unnamed waterway. An access track would pass over this culvert. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 11 m.	• Site access via new section of motorway or directly from Meadows Road; • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls; • install temporary sheet piles and excavate along line of existing waterway. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place; • lift into place the concrete box sections and waterproof the outside face of the buried elements and backfill; • wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure; • remove piling, remove overpumping and install new farm

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				access.
SMN-1310	13,050	Julian's Reen Access Track Culvert	Structure carries Julian's Reen on current alignment. The access road to Tatton Farm would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 11 m.	• Site access via new section of motorway • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls; • install temporary sheet piles and excavate along line of Julian's reen. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place; • lift into place the concrete box sections and waterproof the outside face of the buried elements and backfill; • wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure; • construct penstock structures, remove piling and overpumping, and install metal parapets and construct access road.
SMN-1330	13,300	Tatton Farm Culvert	Structure carries realigned unnamed waterway. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 55 m.	• Site access via new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-1350	13,540	Field Culvert	Structure carries realigned unnamed waterway. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x	• Site access via new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • establish temporary pipework in existing reen alignment and backfill to allow haul road over;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			54 m.	• lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-1430	13,900	Ellen's Reen Culvert	Structure carries Ellen's Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 56 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1445	14,400	Ellen's Reen Diversion Track Culvert	Structure carries the diverted Ellen's Reen on a new alignment. Access road to Water Treatment Area 8 would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 11 m.	• Site access via new section of motorway; • Ensure bunding restrict site run-off enters the reens; • lay down stone to allow safe access for the piling rig; • drive pre cast piles over width of track and sheet piles along the line of the culvert; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• cast transfer slab in place; • install precast concrete box sections and waterproof the outside face of the buried elements and backfill; • position wing walls and backfill around whole structure; • new reen is excavated to the new culvert and construct penstock structures on culvert; • break through to existing reen and divert flows. Install metal parapets and construct carriageway over.
SMN-1480	14,880	Black Wall Reen Culvert	Structure carries Black Wall Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 101 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1655	16,575	Elver Pill Reen Culvert	Structure carries Elver Pill Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 61 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1720	17,220	New Cut Reen Culvert	Structure carries New Cut Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 60 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1760	17,550	North Row Highway Drainage North	Structure carries channel drainage system below the approach embankment for North Row Bridge. Approach embankment for North Row would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 2.7 x 1.0 x 44 m.	• See North Row Overbridge in the Overbridge table above.
SMN-1765	17,550	North Row Highway Drainage South	Structure carries channel drainage system below the approach embankment for North Row Bridge. Approach embankment for North Row would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 2.7 x 1.0 x 44 m.	• See North Row Overbridge in the Overbridge table above.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SMN-1850	18,500	Cock Street Reen Culvert	Structure carries Cock Street Reen on current alignment. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 60 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SMN-1925	19,275	Petty Reen Culvert	Structure carries realigned Petty Reen. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.8 x 1.8 x 60 m.	• Site access via new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-1940	19,400	Rush Wall Reen Culvert	Structure carries realigned Rush Wall Reen. A field access track would pass over this culvert. Single span pre-cast box culvert section.	• Site access via new section of motorway • stone laid down to allow safe access for plant; • establish temporary overpumping facility and drive sheet pile cut-off walls;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			Internal dimensions would be 1.8 x 1.8 x 12 m.	• install temporary sheet piles and excavate along line of existing waterway. Backfill with compacted stone; • piles are driven and the pile head load transfer slab cast in place; • lift into place the concrete box sections and waterproof the outside face of the buried elements and backfill; • wing walls are positioned and backfilling is completed; • remodel the reen profile from sheet piling to the new culvert structure. Withdraw sheet piles and remove overpumping; • install field access track over.
SMN-1970	19,700	Bareland Street East North Culvert	Structure carries new drainage ditch system to the south of the new motorway embankment. Bareland Street would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.5 x 1.5 x 25 m.	• Site access via new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SMN-1980	19,750	Bareland Street East South Culvert	Structure carries realigned unnamed waterway. New section of motorway would pass over this structure. Single span pre-cast box culvert section. Internal dimensions would be 1.5x1.5x 37 m.	• There is no existing drainage ditch in this location; • site access via new section of motorway; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • establish new ditch drainage system to run through the new culvert; and • install metal parapets and construct the highway carriageway over.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-2140	21,375	Mill Reen Culvert	Proposed extension to existing culvert carrying Mill Reen. New section of dual carriageway would pass over this structure. Existing structure is an in situ reinforced concrete arch roof structure. Proposed extension would be similar in form and appearance. Proposed structure would have a clear span of 6 m, a clear height of 4 m above the right of way and a length of 135 m (including existing culvert).	• Put in place temporary diversion for the public right of way; • install temporary sheet piling to stop up flow and introduce overpumping; • demolish existing wing walls to the northern end of the existing culvert; • excavate unsuitable material from alignment of the reen; • construct reinforced concrete base slab and side walls for the culvert; • construct roof arch; • construct internal mass concrete and cantilever platform to form new public right of way; • construct the reinforced concrete wing walls, headwall and apron; • apply waterproofing to all buried surfaces and backfill; • excavate from new culvert apron to cut-off sheet piles to create new reen alignment; • withdraw sheet piles to allow reen to flow through new culvert; • remove overpumping; and • install metal parapets and construct the highway carriageway over.

Table 12.4: New Reen Bridges

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
SBR-0570	5,7500	Percoed Reen Bridge	Structure carries realigned Percoed Reen. New section of motorway would pass over this structure. Single span box culvert. Internal dimensions 4.2 x 2.1 x 52.4 m.	• Site access via new section of motorway; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				using suitable material; and • install metal parapets and construct the highway carriageway over.
SBR-0835	8,400	Sea Wall Reen Bridge	Structure carries realigned Sea Wall Reen. New section of motorway would pass over this structure. Single span box culvert. Internal dimensions 4.2 x 2.1x 93.6 m.	• A temporary access road would allow access from Lighthouse Road and would be the point of access until the temporary rail crossing is available at Duffryn; • ensure retaining bund restricts site run-off from entering reen; • install temporary pipework in existing reen alignment and backfill to allow haul road over; • lay down stone to allow safe access for the piling rig; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • construct new compensatory reen diversion, construct penstock structures and divert flow through new culvert; • excavate temporary pipework and backfill original reen using suitable material; and • install metal parapets and construct the highway carriageway over.
SBR-1475	N/A	Glan Llyn Junction Link Underbridge	Structure spans Monk's Ditch. New link road from Glan Llyn Junction would pass over this structure. Single span integral bridge. Span would be 20 m.	• Access from TATA land access from the A4810; • ensure water run-off from the construction process does not directly enter Monk's Ditch; • lay down stone to allow safe access for the piling rig; • install bored in-situ concrete piles for the abutment walls on both banks of Monk's Ditch; • construct both abutment walls and install precast concrete beams; • construct in-situ concrete bridge desk and cast beam ends; • install drainage and apply waterproofing; • complete backfilling; and • install metal parapets and construct carriageway over.
SBR-1480	14,900	Monk's Ditch Bridge	Structure carries Monk's Ditch. New section of motorway would pass over this structure.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			Single span box culvert. Internal dimensions 4.2 x 2.1 x 95 m.	• lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SBR-1640	16,375	Steelworks Dedicated Reen Bridge	Structure carries Steelworks Dedicated Reen. New section of motorway would pass over this structure. Single span pre box culvert. Internal dimensions 4.2 x 4.0 x 54 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SBR-1755	N/A	Middle Road Reen Bridge	Structure carries realigned Middle Road Reen. The realigned North Row would	• Site access via new section of motorway; • establish temporary over-pumping facility for reen;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			pass over this structure. Single span box culvert. Internal dimensions 4.2 x 2.1 x 18 m.	• lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SBR-1770	N/A	North Row Middle Road Diversion Reen Bridge	Structure carries realigned Middle Road Diversion Reen. The realigned North Row would pass over this structure. Single span box culvert. Internal dimensions 4.2 x 2.1 x 25 m.	• Site access via new section of motorway; • establish temporary over-pumping facility for reen; • lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.
SBR-1780	17,875	M4 Middle Road Diversion Reen	Structure carries realigned Middle Road Diversion Reen. New section of motorway	• Site access via new section of motorway; • establish temporary over-pumping facility for reen;

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
		Bridge	would pass over this structure. Single span pre box culvert. Internal dimensions 4.2 x 2.1 x 56 m.	• lay down stone to allow safe access for the piling rig; • drive sheet pile cut-off walls to north and south of area where new culvert is to be constructed; • install temporary sheet piles and excavate along line of existing reen to remove unsuitable material and backfill with compacted stone; • drive precast piles and sheet piles; • cast transfer slab in place; • install precast concrete culvert sections and waterproof the outside face of the buried elements and backfill; • remodel the ditch profile from sheet piling to the new culvert; • construct penstock structures; • withdraw sheet piles and remove over-pumping; and • install metal parapets and construct the highway carriageway over.

Table 12.5: Temporary Structures

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
TEMP 0655		Duffryn Railway Bridge	A temporary bridge spaning the South Wales to London Main Railway Line, which would be electrified at the time of construction It comprises 2 Retro Heavy Temporary Bridge structures, side by side (or similar) each with an overall length of 40.5m and a span between supports of 40.05m. The overall width of each bridge structure is 6.0m and a road width kerb to kerb of 5.0m. The temporary embankments would have to be piled in this location to prevent settlement.	• Site access to be via the mainline construction of the new M4. • The reinforced earth embankments to the east and west of the South Wales to London Main line would be constructed in advance of delivery of the temporary bridge, supported on driven concrete piles. • On both the north and south embankments the concrete bank seats required for the temporary bridge would be constructed. • To the north of the west embankment lay down a temporary stone bed 50m by 18m for assembly area. • The sections of the temporary bridge would be delivered to the west side of the rail tracks and off-loaded on the east side of the reinforced earth embankment. • The Retro Heavy Bridge would be pre-assembled on temporary timber supports into two 40.5m by 3.0m sections ready for lifting into position.. • Two bearings shall be fixed on each concrete bank seat, fixed on the south bank seat and sliding on the north bank seat.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
				• During a 6 hour rail possession period, the two bridge sections would be lifted into place
TEMP 2000		Llandevenny Railway Bridge	The temporary bridge spaning the South Wales to London Main Railway Line, which would be electrified at the time of construction There is an existing signal gantry positioned adjacent to where the temporary bridge is to be located. 2 Retro Light Temporary Bridge structures, side by side (or similar), each with an overall length of 31.5m and a span between supports of 30.8m. The overall width of each bridge structure is 7.0m and a road width, kerb to kerb of 6.0m. The bearing supports would be founded on concrete bank seats on temporary reinforced earth embankments.	• Site access to be via the mainline construction of the new M4. • The reinforced earth embankments to the north and south of the South Wales to London Mainline would be constructed in advance of delivery of the temporary bridge. • On both the north and south embankments the concrete bank seats required for the temporary bridge would be constructed. • To the east of the north embankment lay down a temporary stone bed 40m by 18m for assembly area. • The sections of the temporary bridge would be delivered to the north side of the rail tracks and off-loaded on the east side of the reinforced earth embankment • The Retro Light Bridge would be pre-assembled on temporary timber supports into two 31.5m by 3.5m sections ready for lifting into position. • Two bearings shall be fixed on each concrete bank seat, fixed on the south bank seat and sliding on the north bank seat. • During a 6 hour rail possession period, the two bridge sections would be lifted into place.
TEMP 2085		Newport Road Temporary Crossing	The bridges are to span the existing alignment of the B4245, Newport Road, which would continue to be trafficked during its use. Two Retro Light Temporary Bridge structures (or similar) are required, with an overall length of 31.5m and a span between supports of 30.8m. The overall width of each bridge structure is 7.0m and a road width, kerb to kerb of 6.0m. The bearing supports are founded on concrete bank seats on temporary reinforced earth embankments. Newport Road needs to be closed during the installation of the bridges; this would	• Site access to be via the mainline construction of the new M4. • The reinforced earth embankments to the north and south of Newport Road need to be constructed in advance of delivery of the temporary bridges. • On both the north and south embankments the concrete bank seats required for the temporary bridge are constructed. • To the west of the north embankment lay down a temporary stone bed 40m by 18m for assembly area. • The sections of the temporary bridges are delivered to the north side of Newport Road and off-loaded on the west side of the reinforced earth embankment • The Retro Light Bridges are pre-assembled on temporary timber supports into four 31.5m by 3.5m sections ready for lifting into position. • Bearings shall be fixed on each concrete bank seat for each bridge, fixed on the south bank seat and sliding on the north bank seat.

Ref	Chainage	Name	Details	Sequence of Principal Construction Activities
			most likely take the form of an overnight or weekend closure.	• During the required possession period, the four bridge sections are lifted into place
TEMP 2160		Existing M4 Temporary Crossing	The bridge spans the existing alignment of the M4, which would continue to be trafficked during its use. A two span Retro Light Temporary Bridge structures (or similar) is required, each span with an overall length of 31.5m and a span between supports of 30.8m. The overall width of the bridge structure is 7.0m and a road width, kerb to kerb of 6.0m. The end bearing supports are founded on concrete bank seats on temporary reinforced earth embankments, with the central supports on a temporary shoring, centred on the central reserve of the existing M4. The M4 would need to be closed, or partially closed during the installation of the bridge; this is most likely to take the form of an overnight or weekend closure.	• Site access to be via the mainline construction of the new J23 to J23A trunk road link to the north of the existing M4 and along the proposed haul route to the south of the existing M4. • The reinforced earth embankments to the north and south of the existing M4 need to be constructed in advance of delivery of the temporary bridges. • Traffic management is imposed on the existing M4 to allow construction of the temporary central support tower and would remain in use until the temporary bridge is removed. • On both the north and south embankments the concrete bank seats required for the temporary bridge are constructed. • To the north of the north embankment and to the south of the south embankment, lay down a temporary stone bed 40m by 18m for assembly area. • The sections of the temporary bridges are delivered to the north and south sides of the M4 motorway and off-loaded on the temporary lay down areas. • The Retro Light Bridges are pre-assembled on temporary timber supports into four 31.5m by 3.5m sections ready for lifting into position. • Bearings shall be fixed on each concrete bank seat and the temporary central support for each bridge. • During the required closure of the east bound carriageway of the M4 the two bridge sections would be lifted into place and the longitudinal joint between each pair bolted as required. • During the required closure of the west bound carriageway of the M4 the two bridge sections would be lifted into place

13 Complementary Measures

13.1 Introduction

13.1.1 In addition to the new section of motorway, the Scheme would incorporate Complementary Measures, including the following.

- Improvements to safety, access arrangements and the ability to manage traffic by reclassifying the existing M4 between Magor and Castleton as a trunk road.
- Relief to Junction 23A of the existing M4 and the local road network with a new M4/M48/B4245 connection
- Providing cycle and walking friendly infrastructure.

13.2 Reclassification works

13.2.1 The existing M4 between Junction 23a and Junction 29 and the A48(M) is reclassified from its current motorway status and is to be considered a 2-lane dual all-purpose trunk road. It is envisaged that lanes 2 and 3 would be retained and lane 1 would be used to lengthen slip road egress and access and provide continuous hard shoulder provision except at Brynglas Tunnels.

13.2.2 Reclassification works would predominantly be within the existing highway boundary. The works would include:

- Slip road tie-ins to the motorway would move further downstream to their current positions, effectively lengthening the slip roads.
- Traffic signs along the existing motorway and the adjacent road network would be changed from motorway signs to trunk road signs (i.e. from blue to green), in line with the reclassification of the highway's status.

13.2.3 Sign removal and replacement would be conducted under localised temporary traffic management to enable closure of the adjacent lane for the works area and safety zone. Works would be conducted avoiding peak traffic hours and maintaining traffic flow past the worksite. Gantry and larger matrix sign removal requiring crane lifting would be undertaken during night time full road closures with signed diversion routes. Signs and matrix boards mounted on gantries spanning the carriageway would also be removed during full road closure to implement a safety exclusion zone below.

13.2.4 Alterations to road markings would be undertaken outside of peak hours under lane closure traffic management. Road marking removal would be undertaken where possible by alternative methods to thermic lance to reduce noise and dust exposure to operatives and the public.

13.2.5 Junction 25A eastbound merge (on) slip road is proposed to be stopped up and new diverge (off) slip road created. Similarly the westbound diverge (off) slip road would be stopped up and new merge (on) slip road created. This involves alteration to road marking and construction of running lane over existing unpaved verge. Works would be undertaken with adjacent lane closure traffic

management to create the worksite and provide segregation from highway vehicles.

13.2.6 A proposed 120m long up to 8m high retaining wall between Junction 25 westbound off slip road and the main westbound carriageway at marker post 222/1 would provide a revised slip road diverge layout with an auxiliary lane. The existing inside lane of the main carriageway is the start of the filter lane for the Junction 25A westbound diverge (off) slip road which is being stopped up, and thus becomes a non-trafficked area. The detailed design of this retaining wall is yet to be undertaken, however it is anticipated that the proposed wall would be tied back to the existing slip road retaining wall, to provide structural stability and minimise the structural foundation extent of the proposed new retaining wall. Construction works would be programmed to be undertaken after the implementation of the Junction 25A westbound diverge slip closure and could be then be undertaken with traffic management lane closure of the remaining inside lane and off peak closures of the Junction 25 westbound of slip road. Offsite fabrication solutions would also minimise the impact to traffic during on site during installation. The void between the two walls would then be filled and the coping and parapet fence to the existing wall removed. The widened slip road carriageway surfacing and finishes could then be installed.

13.2.7 Junction 25 roundabout over the reclassified M4 is also proposed to be signalised to accommodate the forecast traffic flows through this interchange.

14 Temporary Land Requirements

14.1 Site Compounds

14.1.1 Three types of compounds would be provided during the construction of the new section of motorway:

- main site compound;
- section offices compounds; and
- satellite site compounds.

14.1.2 The majority of compounds would provide welfare facilities, ranging from simple toilet facilities and a canteen at the satellite compounds, to showers, lockers and mess facilities at the main compound and section offices.

14.1.3 Fuel would be stored in dedicated bunded areas at several compounds including the main compound and the section offices. Fuel would not be stored in compounds located within the Gwent Levels SSSIs to reduce the risk of damaging the sensitive environment.

14.1.4 Drainage from the office facilities would be connected to a foul sewer or collected in tanks and periodically removed from site. Oil interceptors would be installed in the compound vehicle parking areas to control runoff. Pollution control measures would be implemented elsewhere in the compounds where required (for example, chemical storage areas). It is expected that all vehicle parking areas and access roads within the compound areas would be paved with base course surfacing. Material storage areas are likely to be left unpaved, but formed of compacted aggregate or recycled road planings. The proposed location of site compounds is shown on Annex 2.

Main Site Compound

14.1.5 The main compound would be established to the south of Imperial Park close to the A48 at Coedkernew. The main compound would accommodate approximately 100 staff and would provide car parking, office and welfare facilities, overnight plant storage, small tool and material stores and areas for traffic management. It would also house a precast pile manufacturing facility with its own dedicated concrete plant.

Section Offices Compounds

14.1.6 Section offices compounds would be established at the following locations:

- Castleton West compound;
- River Usk Bridge Crossing West compound;
- River Usk Bridge Crossing East compound;
- Glan Lyn compound; and
- Caldicot compound.

14.1.7 Where possible, the compound would utilise existing hard standing surfaces to minimise preparation works. Where new car parks are required, blacktop and/or sub base/crushed concrete would be used as necessary.

14.1.8 The compounds and offices would typically be accessed from the existing road network. However, the Caldicot compound would only be accessible from the B4245 by cars and small vans. A temporary works access would be provided for Heavy Goods Vehicles (HGVs) and construction plant from the M48 slip roads until the new M4 Junction 23 is fully operational.

River Usk Section Offices Compounds

14.1.9 The River Usk Bridge Crossing West compound would accommodate the staff working on the west approach viaduct, the western part of the River Usk Crossing and construction staff for the River Ebbw Underbridge. The River Usk Bridge Crossing East compound would accommodate staff working on the east approach viaduct and eastern part of the cable-stayed bridge. The compounds at the River Usk Crossing would provide offices and welfare accommodation and overnight plant storage as well as precast yards and concrete batching plants (one on each side of the river). The precast yards would be used for the manufacture and storage of the precast slabs that would form the deck of the approach viaducts and cable-stayed bridge.

14.1.10 The compounds are predominantly located within ABP land at Newport Docks and the industrialised area located off Corporation Road. The land on both sides of the River Usk is occupied by small industrial buildings. Currently, vacant land and derelict buildings within the port and the industrial areas on the east banks of the River Usk would be temporarily used for storage and fabrication. However, some businesses would be affected by the construction requirements to build the River Usk Crossing bridge. The temporary construction land locations and access routes have been selected with the view to minimise the impact on these businesses so far as possible.

14.1.11 The construction of the River Usk Crossing would also require launching areas. These are dedicated working platforms where the steel structure of the deck would be assembled and launched into its final position. For the west approach viaduct, the launching platform would be located behind the west abutment (WA). There would be two launching platforms for the east approach viaduct as the horizontal alignment does not allow for the launch of the viaduct from a single location.

Other Section Offices Compounds

14.1.12 The other section offices compounds would be slightly smaller and would provide office and welfare accommodation. They would also include overnight plant storage, and small tool and material storage for works on the structures.

Satellite Site Compounds

14.1.13 Satellite compounds would be established at structure locations (for example, at North Row). These areas would be used to store plant, equipment and materials, as well as providing mixed storage areas for subcontractors and traffic management. The compounds would also be used for preassembly of reinforcement and construction of formwork.

14.1.14 Overnight parking for earthworks plant would be provided at:

- Berryhill Farm (for plant serving the works at Castleton and mass haul activities);
- TATA remediation area;
- Magor (for plant serving the works at Magor); and
- Ifton quarry (for plant serving the quarry and mass haul activities).

14.1.15 The list of site compounds is set out below.

Table 13.1 List of Site Compounds

Compound	Type	Chainage (km)	Total Area (m^2)	Workers	Staff	Storage Areas (m^2)
Castleton West	Section	Ch 2+400	8,340	46	6	8,030
Castleton East	Satellite	Ch 3+600	8,340	68	26	7,837
Church Lane	Satellite	Ch 4+600	1,697	16	3	1,650
Imperial Park	Main & section	Ch 5+400	122,390	76	54	112,000
Duffryn Railway West	Satellite	Ch 6+400	1,999	21	3	1,952
Duffryn Railway East	Satellite	Ch 6+800	947	21	3	900
Lighthouse Road	Satellite	Ch 7+300	1,917	16	4	1,700
River Ebbw West	Satellite	Ch 8+400	3,089	26	6	2,825
River Ebbw East	Satellite	Ch 8+700	7,089	16	3	7,039
River Usk Crossing West	Section	Ch 9+200	6,400	200	60	76,050
River Usk Crossing East	Section	Ch 10+700	5,980	120	50	46,400
Nash Road	Satellite	Ch 12+600	2,464	27	9	2,200
Glan Llyn	Section	Ch 14+650	6,158	122	57	5,150
North Row	Satellite	Ch 17+600	2,817	16	4	2,600
Llandevenny East and West	Satellite	Ch 20+100	5,932	52	9	5,622
Newport Road	Satellite	Ch 20+850	3,286	119	28	2,650
St Brides Road	Satellite	Ch 21+300	3,543	18	4	3,450
Knollbury Lane	Satellite	Ch 22+000	818	15	3	725
Rockfield Lane	Satellite	Ch 22+700	818	15	3	725
Caldicot	Section	Ch 23+600	4,607	52	12	4,250
TOTAL			198,617	1,062	347	293,756

14.2 Storage Areas

14.2.1 As part of the earthworks operation land would be required to temporarily store excavated material that could not be immediately placed within its final permanent location. These areas are described below and shown on Annex 2.

Topsoil and Subsoil Storage Areas

14.2.2 Topsoil (and subsoil) stockpiles would be created at the Castleton and Magor Interchanges early in the construction programme and would be in place for the duration of the construction phase. The stockpiles would be used to store the soil stripped prior to the bulk earthworks at the junction tie-in works at Castleton and Magor and from the borrow pit areas. The topsoil from the soil storage areas would not be stripped, but instead the topsoil would be protected *in situ* by geo-textile matting. The procedures and controls for handling and storage of topsoil would be set out in the Soil Management Strategy.

14.2.3 The topsoil and subsoil stockpiles would be up to 3 metres (topsoil) and 5 metres (subsoil) in height and the sides would be graded to prevent ponding. Once the stockpiles have been prepared, they would be seeded with a standard Rye Grass seed mix to minimise soil erosion and colonisation by nuisance weeds.

14.2.4 Following completion of the construction works, topsoil storage areas would be restored to their former use. An aftercare management plan would be developed for each area.

Unsuitable Material Storage Areas

14.2.5 These stores would predominantly comprise organic and clay material generated during the initial works (for example, arisings from piling and the construction of culverts). This material is considered unsuitable to be used in the construction of the embankments of the new section of motorway and instead would be used to restore the borrow pits subject to satisfying suitability requirements to ensure risks from any contamination are managed appropriately.

14.2.6 The preparation and management of the unsuitable material stores would follow the same approach as the topsoil stockpiles (i.e. topsoil remains *in situ* protected by geotextile matting and seeded to prevent erosion). Additional measures (for example, bunding) may also be required to contain the stores due to the potential instability of the unsuitable material. The height of the unsuitable material stores would be up to 7 metres.

14.2.7 Following completion of construction activities, unsuitable material storage areas would be restored to their former use. An aftercare management plan would be developed for each area.

14.3 Borrow Pits

14.3.1 Borrow areas are required to provide an early source of suitable bulk material to form embankments and the surcharge material necessary to construct the new section of motorway across the Gwent Levels. Due to the topography and the geology of the route of the new section of motorway, the only areas where suitable general fill material can be extracted is at either end of the scheme at Castleton and Magor.

14.3.2 Once the borrow areas have reached their expected extraction volumes, they would be restored using the unsuitable material generated from the creation of the water treatment areas towards the end of the construction phase. The material would be excavated and directly placed into the borrow pits to avoid double handling. Other unsuitable material already excavated and stored in the stockpiles would also be used to restore the borrow pits.

Castleton

14.3.3 A number of borrow pit areas have been identified at Castleton, the largest of which is at Berryhill Farm. The area may potentially provide approximately 600,000 m^3 of good quality class 2 material that would be used in the embankment construction for the Castleton Interchange Overbridge Link B (see SBR-0360, see Section 12) over the A48. It would also be used to construct the embankment across the Gwent Levels once the ground treatment measures have been installed.

Magor

14.3.4 A number of borrow areas have been identified in the Magor and Undy area. These areas would be located where limestone and sandstone are present. The material is likely to require a combination of open cut excavation and controlled blasting. The borrow areas are required to provide the embankment core material and the surcharge material for embankments across the Caldicot Levels.

14.4 Batching Plants

14.4.1 Dedicated batching plants would be provided to ensure a continuous supply of materials is available. A summary of the batching plants is set out below.

- Concrete (structural and cement bound material):
  - Two mobile concrete batching plants located at either side of the River Usk Crossing would provide a supply of concrete for all structural and cement bound material mixes. These wet batch concrete plants would be capable of producing a combined volume in excess of 150 m^3 per hour of fresh pump mix concrete into truck mixers. The facilities would have silos, aggregate storage bins and material testing laboratories to monitoring the quality of the products being batched. A washout facility for the plant and trucks would be established to reduce the amount of waste removed from the site. All discharges from the batching plants would be managed in accordance with the Pre-CEMP (Appendix 3.2) and the measures within Chapter 16 Road Drainage and the Environment.
  - A dedicated batching plant would be provided for the precast piles production. This would be established by the precast piling contractor and would be located in the main compound at Imperial Park.
- Cementitious Grout: Generally this would be batched in small quantities close to the point of use (for example, where soil nailing and rock anchoring works may be required at Castleton and Magor). For large grout quantities (for example infilling abandoned services and pipelines) foamed concrete could be used and this would be delivered to site from external readymix plants using truck mixers.

14.4.2 The existing readymix plants at Cardiff and Newport would provide the early requirements for concrete until the new batching plants are established. They also may be used to provide alternative or back-up supplies during construction, if required.

14.5 Temporary Bridges

14.5.1 Four temporary bridges are likely to be required for construction for the new section of motorway. The location of the bridges would be:

- across the South Wales to London Mainline at Duffryn;
- across the South Wales to London Mainline at Llandevenny;
- across the B4245 Newport Road at Magor; and
- across the existing M4 at Magor.

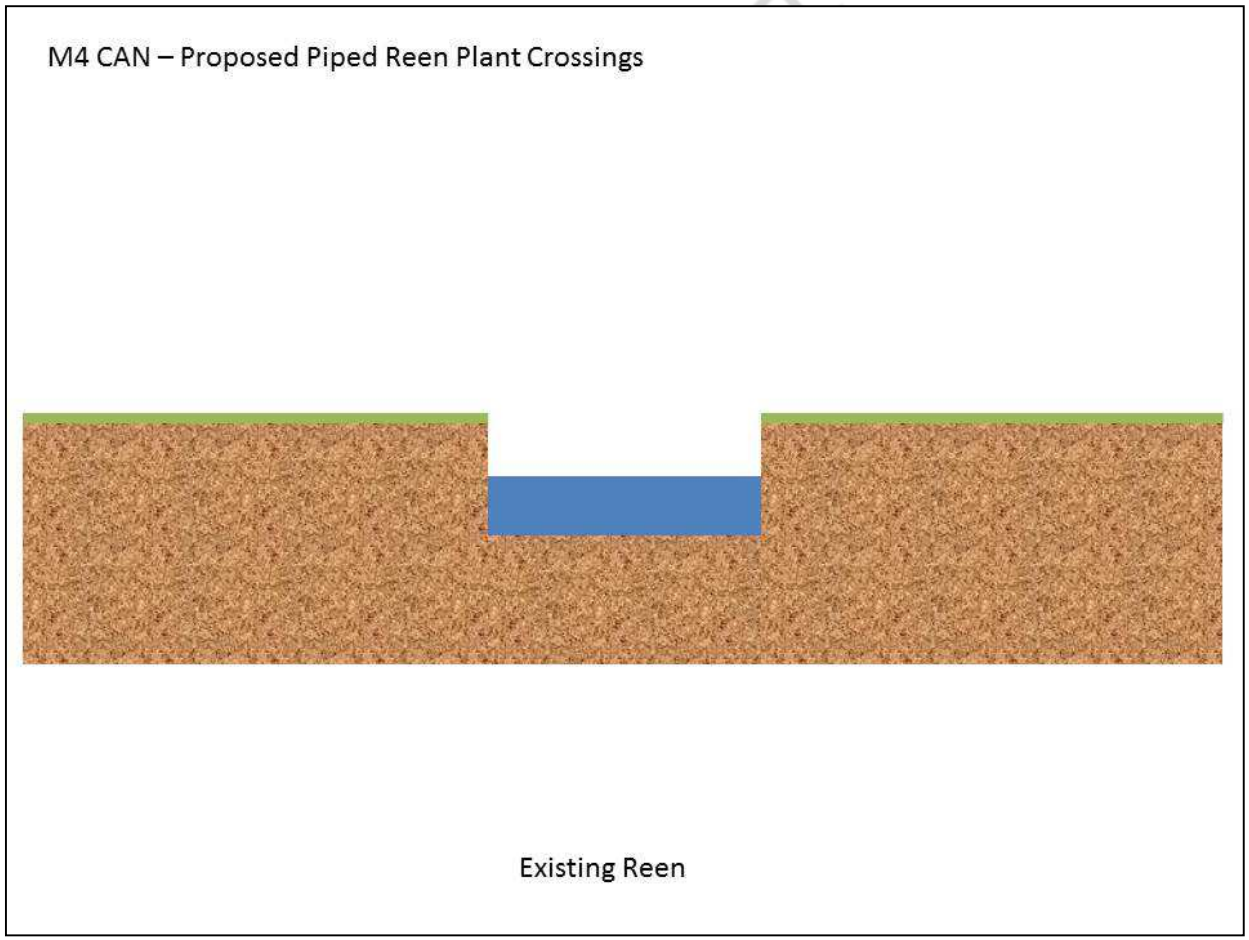
14.5.2 The bridges would be constructed early in the programme to facilitate the earth moving operation for the new section of motorway. The bridges would be single span structures (with the exception of the bridge over the existing M4, which would be double span) built upon embankments and abutments. It is considered likely that the majority of the abutments would be piled.

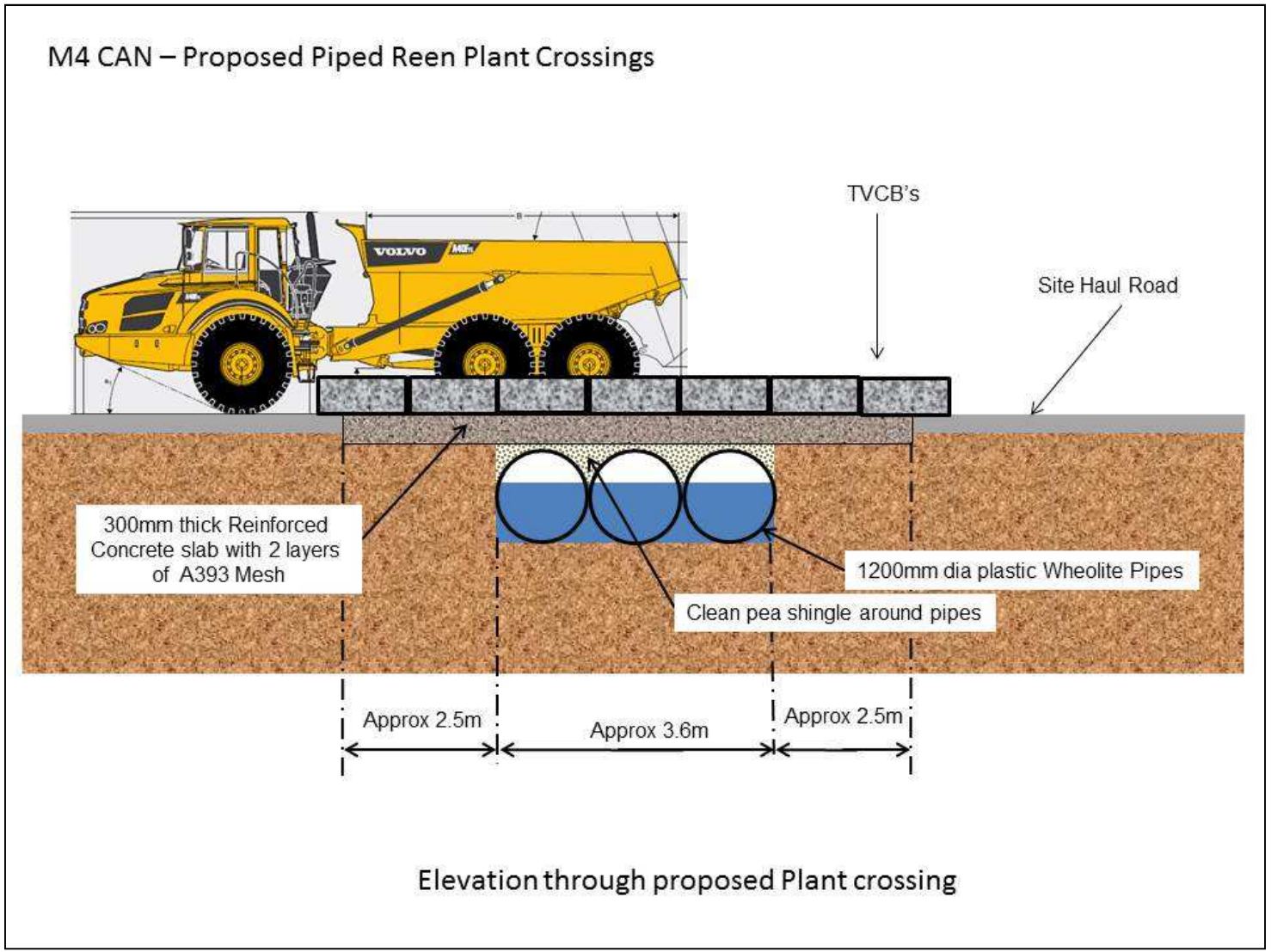
14.5.3 The bridges would remain in position until the permanent structures are installed and can be used by construction plant. The temporary bridges would then be removed and the granular material (for the abutments and approach ramps) would be reused as backfill elsewhere within the construction programme.

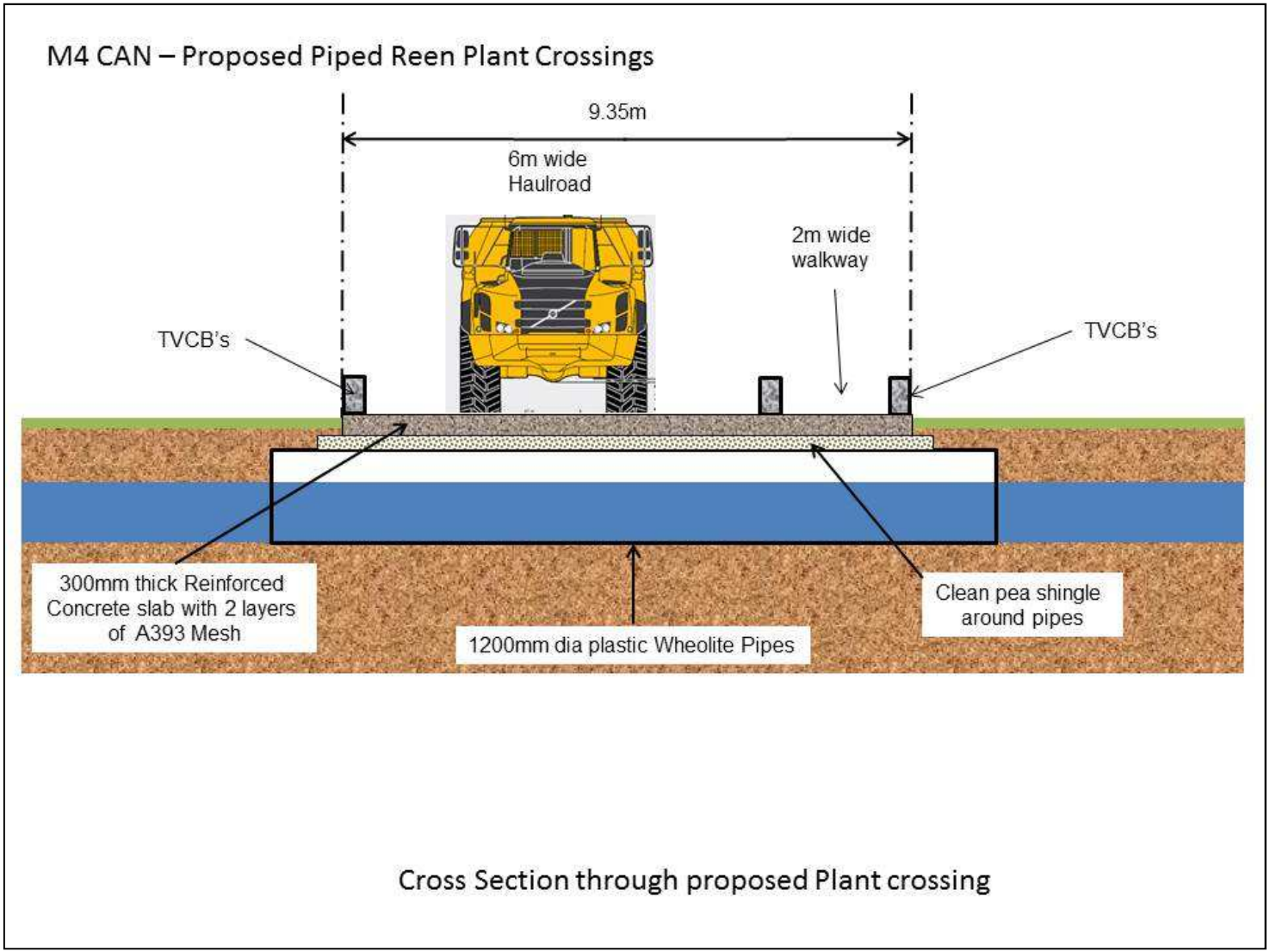
Annexes

Annex 1 - Temporary Reen Crossings

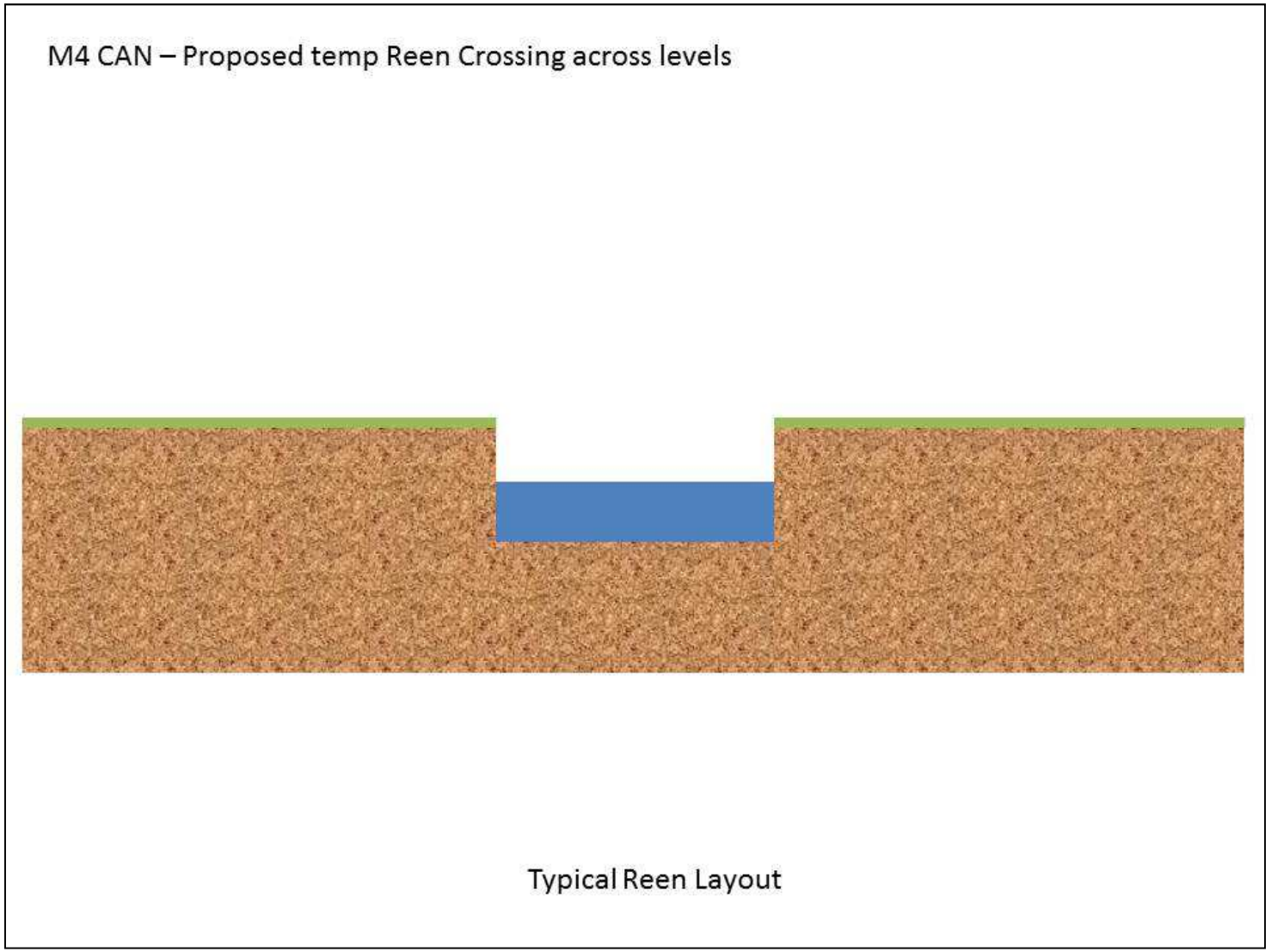
Heavily trafficked robust crossing

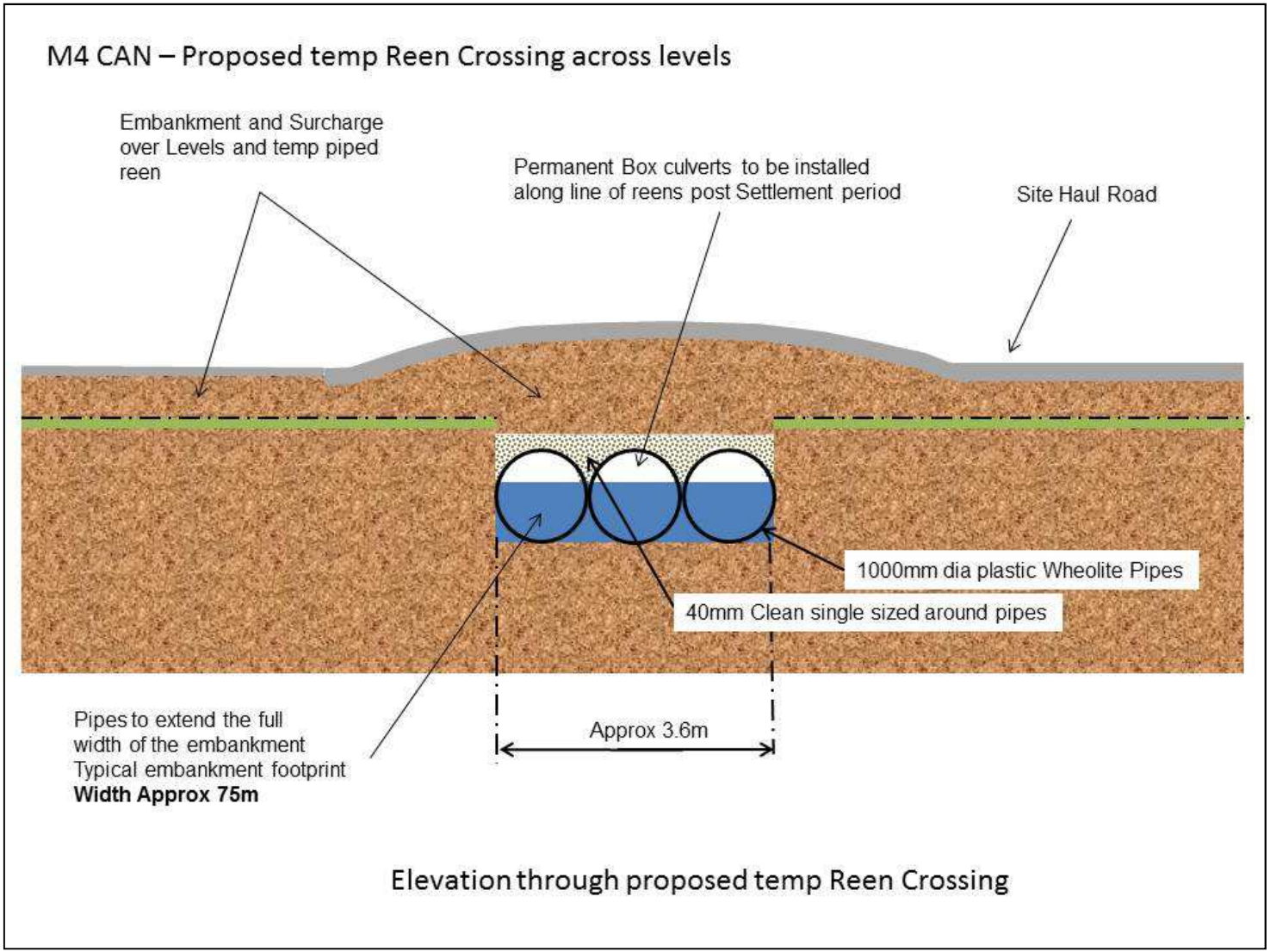



M4 CAN – Proposed Piped Reen Plant Crossings
TVCB's
Site Haul Road
VOLVO
300mm thick Reinforced Concrete slab with 2 layers of A393 Mesh
1200mm dia plastic Wheolite Pipes
Clean pea shingle around pipes
Approx 2.5m
Approx 3.6m
Approx 2.5m
Elevation through proposed Plant crossing


M4 CAN – Proposed Piped Reen Plant Crossings
9.35m
6m wide
Haulroad
2m wide
walkway
TVCB's
TVCB's
300mm thick Reinforced
Concrete slab with 2 layers
of A393 Mesh
1200mm dia plastic Wheolite Pipes
Clean pea shingle
around pipes
Cross Section through proposed Plant crossing

Heavily trafficked short duration crossing




M4 CAN – Proposed temp Reen Crossing across levels
Embankment and Surcharge over Levels and temp piped reen
Permanent Box culverts to be installed along line of reens post Settlement period
Site Haul Road
1000mm dia plastic Wheolite Pipes
40mm Clean single sized around pipes
Pipes to extend the full width of the embankment
Typical embankment footprint
Width Approx 75m
Approx 3.6m
Elevation through proposed temp Reen Crossing

Annex 2 - Temporary Land Requirements

DO NOT SCALE

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

🟥 PERMANENT TITLE
🟪 LANDSCAPING EASEMENT
- - - EASEMENT
🟧 CONTRACTOR'S TEMPORARY LAND BOUNDARY
- - - HAUL ROAD
🟩 REQUIRED TEMPORARY LAND
XXXX-XX→ TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	---	SECOND ISSUE - BOUNDARIES REVISED	KAH	CLJ	---

Drawing Status

Suitability

Project Team

Client

Llywodraeth Cymru
Welsh Government

Project Title
M4 CORRIDOR AROUND NEWPORT

Drawing Title
CONTRACTOR'S TEMPORARY
LAND INPUT
SHEET 1 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	---
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	---

Drawing Number
Project | Originator | Volume
M4CaN - CJV - GEN -
ZG_GEN - DR - WM - 0001
Location | Type | Role | Number

Revision
P02.1

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0001

PENYLAN FARM

0002-05
TEMPORARY EARTHWORKS STOCKPILES AND PROCESSING AREAS FOR MATERIALS FROM CASTLETON INTERCHANGE WORKS

POUND HILL

CASTLETON INTERCHANGE

SBR-0365 CASTLETON INTERCHANGE GAS MAIN CULVERT

SBR-0355 CASTLETON INTERCHANGE OVERBRIDGE LINK C

SBR-0375 A48 UNDERBRIDGE EASTBOUND

0002-04
EARTHWORKS AREA LANDLOCKED BY WELSH GOVERNMENT LAND AND LITTLE ORCHARD CULVERT DOWNSTREAM OUTFALL DITCH

EXISTING M4

A48

SMN-0395A BERRYHILL CULVERT

SMN-0395B LITTLE ORCHARD CULVERT

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0003

SMN-0255 CASTLETON INTERCHANGE CULVERT

EXISTING CASTLETON 1C OVERBRIDGE TO BE DEMOLISHED

SMN-0305 OLD RECTORY CULVERT

0002-02
TEMPORARY ACCESS AND WORKING SPACE FOR THE CONSTRUCTION OF SBR-0360 CASTLETON INTERCHANGE OVERBRIDGE LINK B RETAINING WALL

SBR-0360 CASTLETON INTERCHANGE OVERBRIDGE LINK B

SMN-0370 LONGHOUSE CULVERT

SBR-0370 A48 UNDERBRIDGE WESTBOUND

CASTLETON EAST COMPOUND AND STORAGE

SBR-0245 CASTLETON INTERCHANGE OVERBRIDGE LINK A

0002-01
WORKING SPACE EITHER SIDE OF EASEMENT TO CONSTRUCTED PIPED CULVERT OUTFALL

EXISTING SMN-0250 M4S 29-29 C20 CASTLETON GARDEN CENTRE CULVERT

SMN-0390 THE CONIFERS CULVERT

0002-03
TEMPORARY EARTHWORKS STOCKPILES AND PROCESSING AREAS FOR MATERIALS FROM CASTLETON INTERCHANGE WORKS

WTA 1

WTA 2

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: | Suitability:

Project Team:

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 2 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	—	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	—	—

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0002

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

0003-01
TEMPORARY ACCESS WORKING SPACE FOR THE CONSTRUCTION OF THE NEW ACCESS TRACK

0003-03
PLOT REQUIRED FOR MAIN SITE COMPOUND AND OFFICES. WELSH GOVERNMENT OWNED BROWNFIELD LAND OUTSIDE OF SSSI BOUNDARY

0003-02
NEWPORT CITY COUNCIL LAND FOR WORKING SPACE PARALLEL TO THE REALIGNED CARRIAGEWAY DURING ITS CONSTRUCTION

SMN-0430 ATHENSWAY CULVERT

SMN-0450 ELM CULVERT

SMN-0460 CHURCH LANE CULVERT

SBR-0460 CHURCH LANE OVERBRIDGE

SMN-0510 NANT-Y-MOOR REEN CULVERT

SBR-0580 PERCOED NMU BRIDGE

SBR-0570 PERCOED REEN BRIDGE

SMN-0550 SDR REEN CULVERT

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0002

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0004

COEDKERNEW

DUFFRYN LINK

DUFFRYN LANE

CHURCH LANE

PERCOED REEN

PERCOED LANE

ELECTRICITY SUB-STATION

GWENT LEVELS - St. BRIDES SSSI

A48

WTA 2

WTA 4b

Staff Parking
Offices
Welfare
Operative Parking
Precast Yard
TM Yard
Overnight Road Weapon Tipper Parking
Abnormal Load Area
Abnormal Load Area
Potentially Contaminated Land
Pile Storage
Plant Storage
Material Storage
Secure Storage
Water Treatment Area
Wash Out Area

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX — TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 3 OF 16

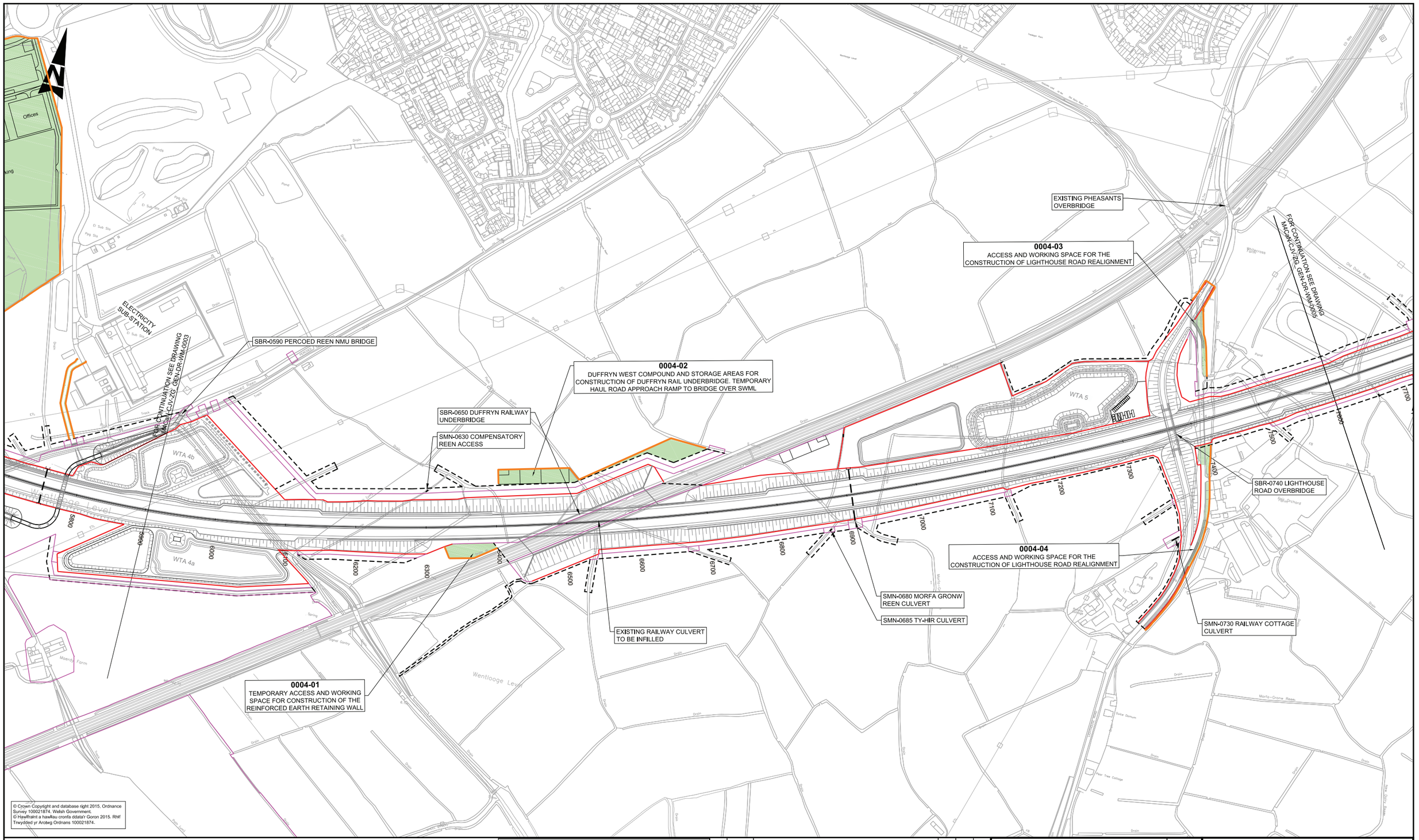
Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size: A1	Date: 01/02/16	Date: 01/02/16	Date: ---	Date: —

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0003

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction (Enter "None" if applicable)	
Maintenance / Cleaning (Enter "None" if applicable)	
Use (Enter "None" if applicable)	
Decommissioning / Demolition (Enter "None" if applicable)	

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 4 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0004

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

0005-01
ACCESS AND WORKING SPACE TO ALLOW CONSTRUCTION OF SIDE ROAD REALIGNMENT ON BOTH SIDES

0005-02
RIVER EBBW WEST AND NEW DAIRY FARM OVERBRIDGE COMPOUND, ACCESS AND WORKING ROOM FOR CONSTRUCTION OF CULVERT

0005-03
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF STRUCTURE

0005-04
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF STRUCTURE

0005-05
RIVER USK VIADUCT AND BRIDGE SITE COMPOUND, WELFARE AND STORAGE

0005-06
TEMPORARY ACCESS AND WORKING SPACE FOR RIVER USK VIADUCT CONSTRUCTION

0005-07
TEMPORARY ACCESS AND WORKING SPACE FOR RIVER USK VIADUCT CONSTRUCTION

SMN-0770 OLD DAIRY REEN FIELD ACCESS CULVERT

SMN-0775 OLD DAIRY REEN CULVERT

SMN-0800 PONT-Y-CWCW REEN CULVERT

SMN-0805 PONT-Y-CWCW COMPENSATORY REEN CULVERT

SMN-0810 NEW DAIRY FARM CULVERT

SBR-0805 NEW DAIRY FARM OVERBRIDGE

SBR-0835 SEA WALL REEN BRIDGE

SBR-0850 RIVER EBBW UNDERBRIDGE

SBR-0875 DOCKS JUNCTION UNDERBRIDGE WEST

SBR-0880 DOCKS JUNCTION UNDERBRIDGE EAST

SRW-0895 DOCKS LINK ROAD RETAINING WALL

RETAINING WALLS ASSOCIATED WITH SBR-0850

RETAINING WALLS ASSOCIATED WITH SBR-0875

RETAINING WALLS ASSOCIATED WITH SBR-1000

RETAINING WALL ASSOCIATED WITH SBR-1000

RIVER EBBW

DOCKS JUNCTION

SOUTH DOCK

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0004

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-016

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-006

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

PERMANENT TITLE
LANDSCAPING EASEMENT
EASEMENT
CONTRACTOR'S TEMPORARY LAND BOUNDARY
HAUL ROAD
REQUIRED TEMPORARY LAND
XXXX-XX TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 5 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0005
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 100 0 10

N

0006-01
TEMPORARY ACCESS, WORKING SPACE, STORAGE AND FABRICATION AREAS FOR CONSTRUCTION OF RIVER USK BRIDGE AND VIADUCT, AND PYLONS

0006-02
TEMPORARY ACCESS, WORKING SPACE, STORAGE AND FABRICATION AREAS FOR CONSTRUCTION OF RIVER USK BRIDGE AND VIADUCT, AND PYLONS

0006-03
TEMPORARY ACCESS, WORKING SPACE, STORAGE AND FABRICATION AREAS FOR CONSTRUCTION OF RIVER USK BRIDGE AND VIADUCT, AND PYLONS

0006-04
TEMPORARY ACCESS, WORKING SPACE, STORAGE AND FABRICATION AREAS FOR CONSTRUCTION OF RIVER USK BRIDGE AND VIADUCT, AND PYLONS

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0005

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0007

EAST WAY ROAD

DOCKS RAILWAY

USKMOUTH RAILWAY LINE

RIVER USK

NORTH DOCK

SOUTH DOCK

ALEXANDRA DOCKS

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 6 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0006

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

0007-03
DRAIN LANDLOCKED BY WELSH GOVERNMENT LAND. SURROUNDING AREA FOR USE AS COMPOUND AND STORAGE

SMN-1235 LAKE'S REEN NORTH ACCESS CULVERT

0007-04
TEMPORARY ACCESS,WORKING SPACE,STORAGE AND FABRICATION AREAS FOR CONSTRUCTION OF VIADUCT

SMN-1225 LAKE'S REEN SOUTH ACCESS CULVERT

SBR-1210 NASH ROAD OVERBRIDGE

SMN-1245 PYE CORNER CULVERT

SMN-1250 JULIAN'S REEN FARM ACCESS CULVERT

SMN-1230 LAKE'S REEN CULVERT

SMN-1180 PICKED LANE CULVERT

SMN-1240 JULIAN'S REEN SIDE ROAD CULVERT

0007-01
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF HEADWALLS AND SERVICE PROTECTION SLABS

0007-02
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF HEADWALL

NASH ROAD

MEADOWS ROAD

PICKED LANE

FOR CONSTRUCTION SEE DRAWING M4CAN-CJV-GEN-ZG_GEN-DR-WM-0008

FOR CONSTRUCTION SEE DRAWING M4CAN-CJV-GEN-ZG_GEN-DR-WM-0006

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 7 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0007
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

0008-01
TEMPORARY WORKING SPACE
FOR TATA STEEL REED BEDS

FOR CONTINUATION SEE DRAWING
M4CaN-CJV-GEN-ZG_GEN-DR-WM-0009

SMN-1310 JULIAN'S REEN
ACCESS TRACK CULVERT

SMN-1295 TATTON
ROAD CULVERT

SMN-1305 TATTON FARM
ACCESS CULVERT

SMN-1330 TATTON
FARM CULVERT

SMN-1350 FIELD CULVERT

SMN-1430 ELLEN'S
REEN CULVERT

SMN-1300 JULIAN'S
REEN CULVERT

MEADOWS ROAD

FOR CONTINUATION SEE DRAWING
M4CaN-CJV-GEN-ZG_GEN-DR-WM-0007

WTA 7

WTA 8

Caldicot Level

BROADSTREET COMMON

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX — TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction (Enter "None" if applicable)
Maintenance / Cleaning (Enter "None" if applicable)
Use (Enter "None" if applicable)
Decommissioning / Demolition (Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status | Suitability

Project Team

Client: Llywodraeth Cymru / Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 8 OF 16

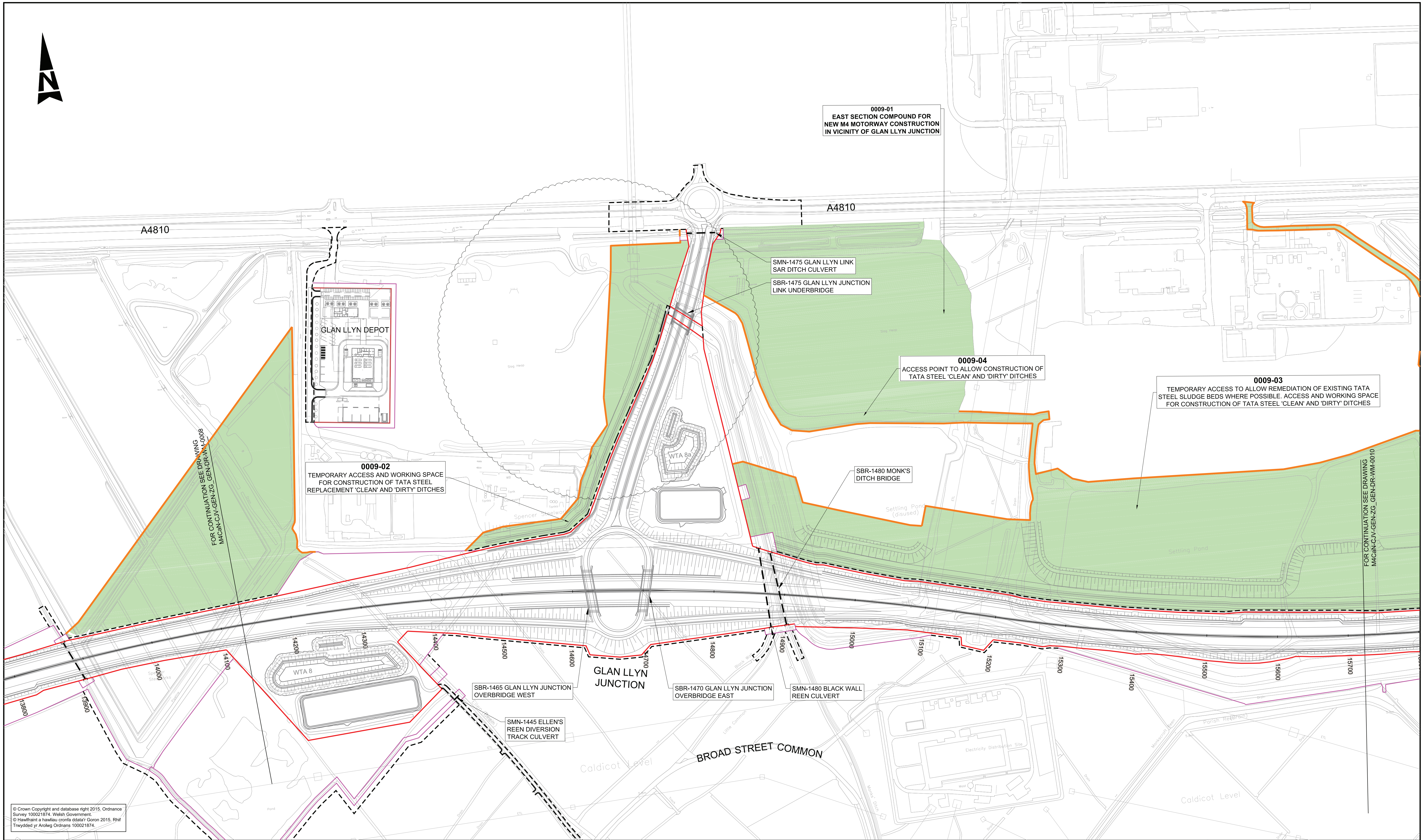
Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0008

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status

Suitability

Project Team

Client

Llywodraeth Cymru
Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 9 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	—	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	—	—

Drawing Number (Project | Originator | Volume | Location | Type | Role | Number): M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0009

Revision: P02.1

DO NOT SCALE

Millimetres 100 10 0

0010-01
ACCESS FROM PROPOSED M4 FOOTPRINT TO CONSTRUCT TEMPORARY AND PERMANENT ADAPTATION AND BUNDING OF EXISTING TATA STEEL POND

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

🟥	PERMANENT TITLE
—	LANDSCAPING EASEMENT
- - -	EASEMENT
—	CONTRACTOR'S TEMPORARY LAND BOUNDARY
- - -	HAUL ROAD
🟩	REQUIRED TEMPORARY LAND
XXXX-XX→	TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	---	FIRST ISSUE	KAH	CLJ	---

Drawing Status

Suitability

Project Team

Client

Llywodraeth Cymru
Welsh Government

Project Title
M4 CORRIDOR AROUND NEWPORT

Drawing Title
CONTRACTOR'S TEMPORARY
LAND INPUT
SHEET 10 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	---
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	---

Drawing Number
Project | Originator | Volume
M4CaN - CJV - GEN -
ZG_GEN - DR - WM - 0010
Location | Type | Role | Number

Revision
P02.1

DO NOT SCALE

Millimetres 0 10 100

SBR-1755 MIDDLE ROW REEN BRIDGE

SMN-1750 NORTH ROW SAR CULVERT

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0010

NORTH ROW

SBR-1780 MIDDLE ROAD REEN DIVERSION M4 BRIDGE

SBR-1760 NORTH ROW OVERBRIDGE

SMN-1850 COCK STREET REEN CULVERT

SMN-1925 PETTY REEN CULVERT

BARELAND STREET

A4810

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0012

SBR-1770 NORTH ROW MIDDLE ROAD DIVERSION REEN BRIDGE

SMN-1790 NORTH ROW DRAIN CULVERT

Caldicot Level

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 11 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	---
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	---

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0011
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

SOUTH WALES MAINLINE RAILWAY (SWML)

BARELAND STREET

A4810

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG-GEN-DR-WM-0011

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0013

B4245 NEWPORT ROAD

0012-02
TEMPORARY ACCESS REQUIREMENTS FOR HAUL ROUTE AND GREEN LANE NMU TRACK

SMN-1970 BARELAND STREET EAST NORTH CULVERT

SBR-1980 BARELAND STREET UNDERBRIDGE

SMN-1980 BARELAND STREET EAST SOUTH CULVERT

SBR-2000 LLANDEVENNY RAILWAY UNDERBRIDGE

0012-01
COMPOUND AND WELFARE FACILITIES TO SERVE BARELAND STREET UNDERBRIDGE, LLANDEVENNY RAILWAY UNDERBRIDGE AND SURROUNDING CULVERTS

PROPOSED HOUSING

PROPOSED HOUSING

0012-03
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF GREEN MORE LANE LINK ROAD

WTA 10

WTA 11b

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX — TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction	(Enter "None" if applicable)
Maintenance / Cleaning	(Enter "None" if applicable)
Use	(Enter "None" if applicable)
Decommissioning / Demolition	(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status | Suitability

Project Team

Client

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 12 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0012

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

0013-03
AREA OF CONSTRUCTION OF TEMPORARY DIVERSION OF ST BRIDES ROAD

0013-05
TEMPORARY HAUL ROUTE

ST BRIDES ROAD

SBR-2120A ST BRIDE'S ROAD UNDERBRIDGE

0013-07
TEMPORARY ACCESS AND TOPSOIL STORAGE

KNOLLBURY LANE

SBR-2205 KNOLLBURY LANE OVERBRIDGE 2

0013-08
KNOLLBURY LANE SATELLITE COMPOUND AND WELFARE

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-LM-0014

0013-01
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF NEW PRIVATE MEANS OF ACCESS OF REALIGNED NEWPORT ROAD

0013-02
AREA WITHIN PROPOSED PRIVATE ACCESS OFF NEWPORT ROAD TO BE UTILISED AS MAGOR COMPOUND AND WELFARE

B4245 NEWPORT ROAD

J23 TO J23A TRUNK ROAD LINK

M4

WTA 11b

WTA 11a

EXISTING KNOLLBURY - UNDY BRIDGE

SBR-2120 M4 23-23A 77 MAGOR PENHOW UNDERBRIDGE

SBR-2140 M4 23-23A 66 MILL REEN CULVERT

0013-04
TEMPORARY HAUL ROUTE AND EARTHWORK BUNDS FOR NOISE MITIGATION

0013-06
TEMPORARY ACCESS AND WORKING SPACE FOR CONSTRUCTION OF HIGHWAY DRAINAGE OUTFALL PIPE AND TEMPORARY HAUL ROAD

SBR-2080 NEWPORT ROAD OVERBRIDGE

MAGOR

PROPOSED HOUSING

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-LM-0012

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX — TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 13 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0013
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

N

0014-01
TEMPORARY AREA OF SROCKPILES,BORROWS AND PROCESSING AREA OF EARTHWORK MATERIALS

0014-02
TEMPORARY HAUL ROUTE

TOPSOIL STOCKPILES FOR USE NORTH OF MAGOR JUNCTION

SBR-2265 ROCKFIELD LANE UNDERBRIDGE 2

SRW-2280 ROCKFIELD LANE RETAINING WALL

SBR-2330 M4 ON LINK UNDERBRIDGE

SBR-2340 BENCROFT LANE UNDERBRIDGE

SBR-2340A BENCROFT LANE NO.2 UNDERBRIDGE

SBR-2360B BENCROFT LANE UNDERBRIDGE

BENCROFT LANE

BENCROFT LANE

FOR CONTINUATION SEE DRAWING MaCaN-CJV-GEN-ZG_GEN-DR-WM-0015

FOR CONTINUATION SEE DRAWING MaCaN-CJV-GEN-ZG_GEN-DR-WM-0013

J23 TO J23A TRUNK ROAD LINK

M48

B4245

Structure Laydown Area

SBR-2269 MAGOR INTERCHANGE BRIDGE

SBR-2270 ROCKFIELD LANE UNDERBRIDGE

SRW-2320 MAGOR RETAINING WALL

WTA 12b

WTA 12

0014-05
WORKING SPACE ADJACENT TO EASEMENT TO HIGHWAY DRAINAGE OUTFALL PIPE

SBR-2365A RED BARN ACCESS BRIDGE

SBR-2365 LLANFIHANGEL UNDERBRIDGE

0014-04
CALDICOT COMPOUND AND STORAGE AREA

FOR CONTINUATION SEE DRAWING MaCaN-CJV-GEN-ZG_GEN-DR-WM-0015

M4

SRW-2350 CALDICOT ROAD R.E. RETAINING WALL

SBR-2360A CALDICOT ROAD UNDERBRIDGE 1

SBR-2360 CALDICOT ROAD UNDERBRIDGE

0014-03
TOPSOIL STOCKPILES FOR USE OF MAGOR JUNCTION

B4245

SOUTH WALES MAINLINE RAILWAY (SWML)

PROPOSED HOUSING

THE ELMS

Gwndy/Undy

Llanfihangel

Caldicot Level

Caldicot Moor

CALDICOT LEVEL

CALDICOT MOOR

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability:

Project Team:

Client:

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 14 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	—

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0014
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100

N

MINNETT'S LANE

CALDICOT ROAD

M48

B4245

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0014

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0014

Llanfihangel near Rogiet

SOUTH WALES MAINLINE RAILWAY (SWML)

M4

CALDICOT LEVEL

CALDICOT MOOR

Caldicot Level
Caldicot Moor

SOUTH WALES MAINLINE RAILWAY (SWML)

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX → TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	—	FIRST ISSUE	KAH	CLJ	—

Drawing Status: Suitability

Project Team

Client

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 15 OF 16

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	—
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	—

Drawing Number: M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0015
(Project | Originator | Volume | Location | Type | Role | Number)

Revision: P02.1

DO NOT SCALE

Millimetres 100 0 10

EXISTING CULVERT

EXISTING ROAD UNDERBRIDGE

EXISTING RAIL UNDERBRIDGE

SOUTHERN DISTRIBUTOR ROAD

SMN-0905 MAES GLAS PILL CULVERT

0016-01
SEGREGATED TEMPORARY ACCESS TO WORKS VIA WEST WAY ROAD

RIVER USK

DOCKS RAILWAY

EAST WAY ROAD

NORTH DOCK

Newport Docks North Dock

FOR CONTINUATION SEE DRAWING M4CaN-CJV-GEN-ZG_GEN-DR-WM-0005

9300 9400 9500 9600 9700 9800 9900 10000

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

- PERMANENT TITLE
- LANDSCAPING EASEMENT
- EASEMENT
- CONTRACTOR'S TEMPORARY LAND BOUNDARY
- HAUL ROAD
- REQUIRED TEMPORARY LAND
- XXXX-XX — TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	---	FIRST ISSUE	KAH	CLJ	---

Drawing Status | Suitability

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: CONTRACTOR'S TEMPORARY LAND INPUT SHEET 16 OF 16

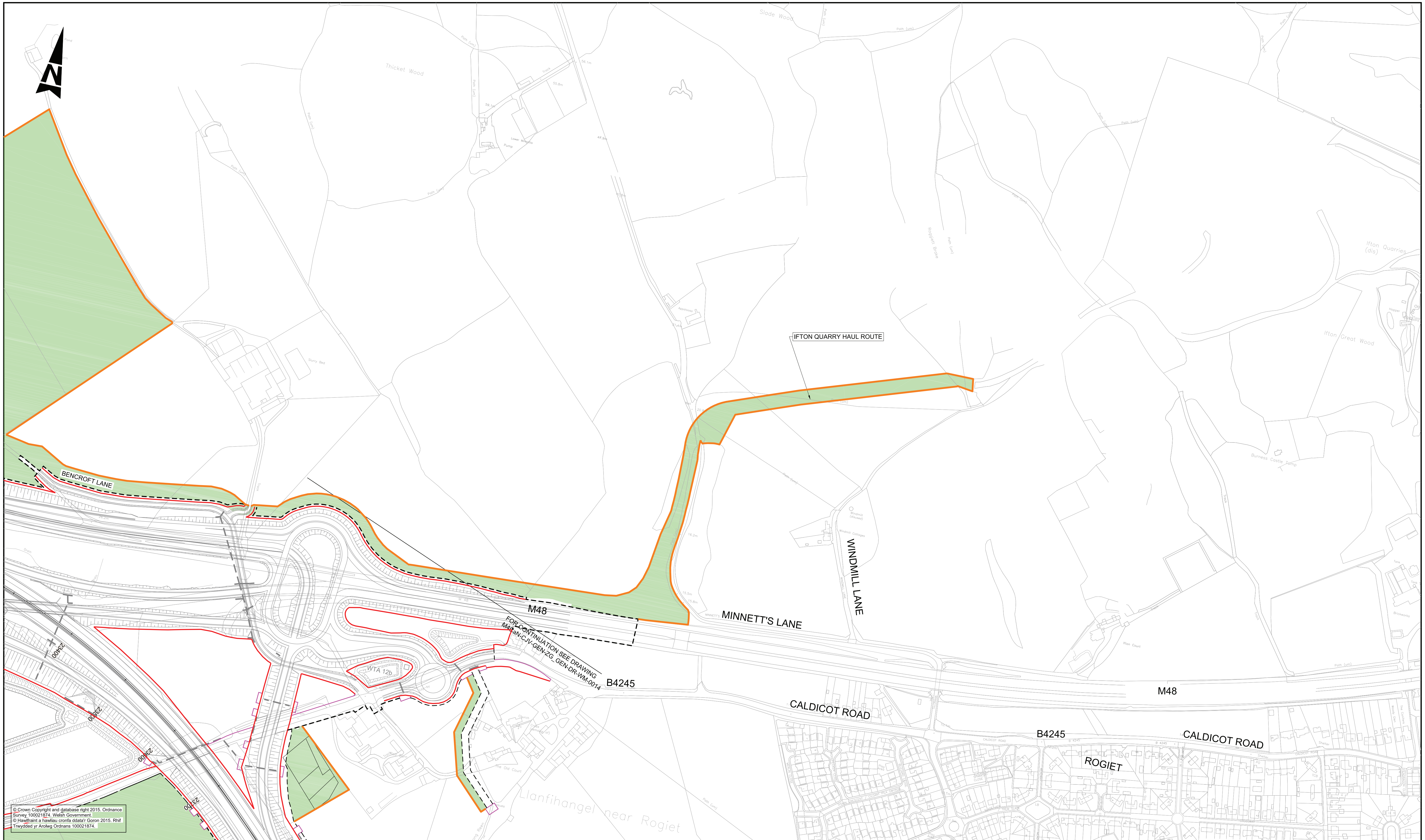
Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	---
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01/02/16	01/02/16	---	---

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0016
Location | Type | Role | Number

Revision: P02.1

DO NOT SCALE

Millimetres 0 10 100



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.
3. WHERE NO CONSTRUCTION BOUNDARY IS SHOWN, THE PERMANENT TITLE OR LANDSCAPING FENCE SHALL FORM THE CONSTRUCTION BOUNDARY.

PERMANENT TITLE
LANDSCAPING EASEMENT
EASEMENT
CONTRACTOR'S TEMPORARY LAND BOUNDARY
HAUL ROAD
REQUIRED TEMPORARY LAND
XXXX-XX —— TEMPORARY LAND REFERENCE (SEE BUILDABILITY REPORT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	03/08/15	FIRST ISSUE	KAH	KAH	KAH
P02.1	---	FIRST ISSUE	KAH	CLJ	---

Drawing Status

Suitability

Project Team

Client

Project Title
M4 CORRIDOR AROUND NEWPORT

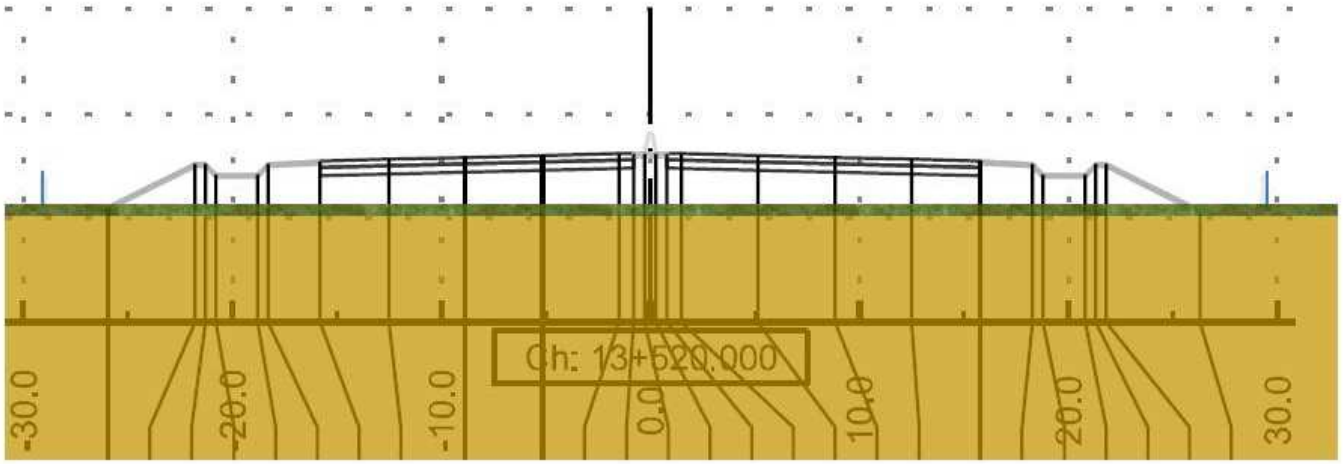
Drawing Title
CONTRACTOR'S TEMPORARY LAND INPUT
IFTON QUARRY HAUL ROUTE

Scale	Designed / Drawn	Checked	Approved	Authorised
1:2500	KAH	CLJ	---	---
Original Size	Date	Date	Date	Date
A1	01/02/16	01/02/16	---	---

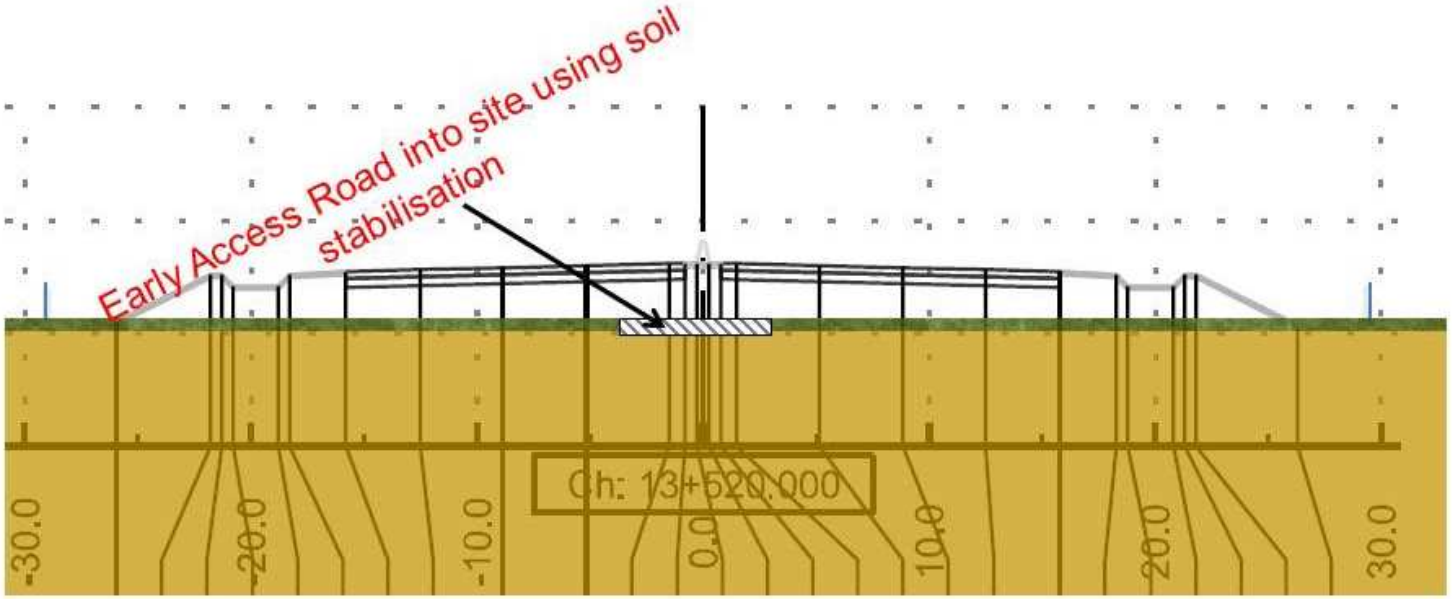
Drawing Number (Project | Originator | Volume | Location | Type | Role | Number)
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0017

Revision
P02.1

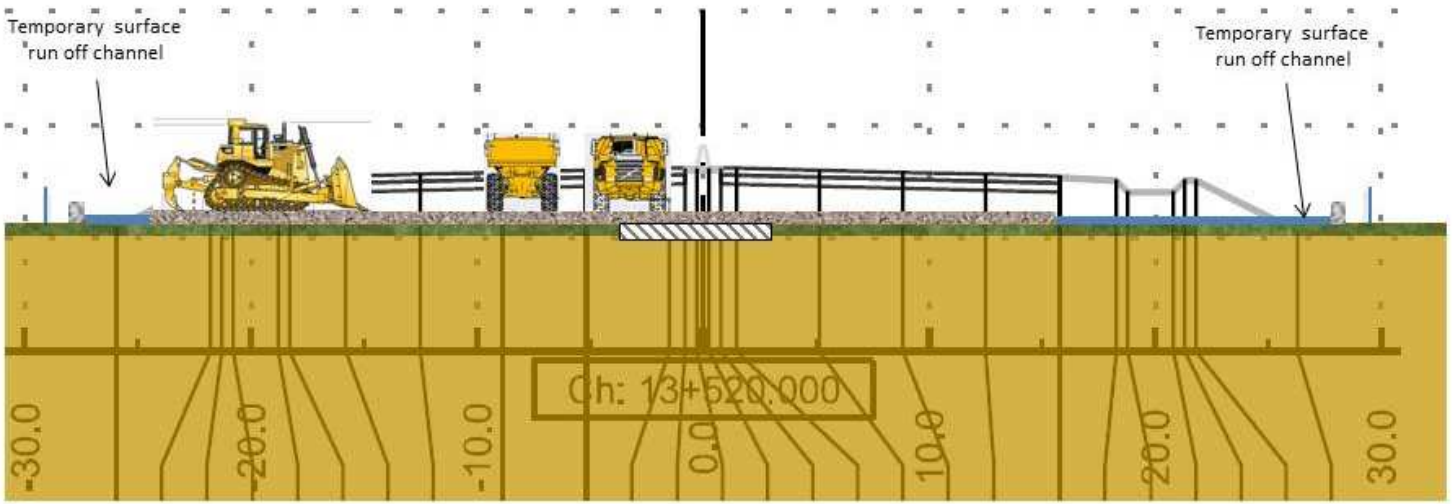
Annex 3 - Haul Road & Embankment Construction



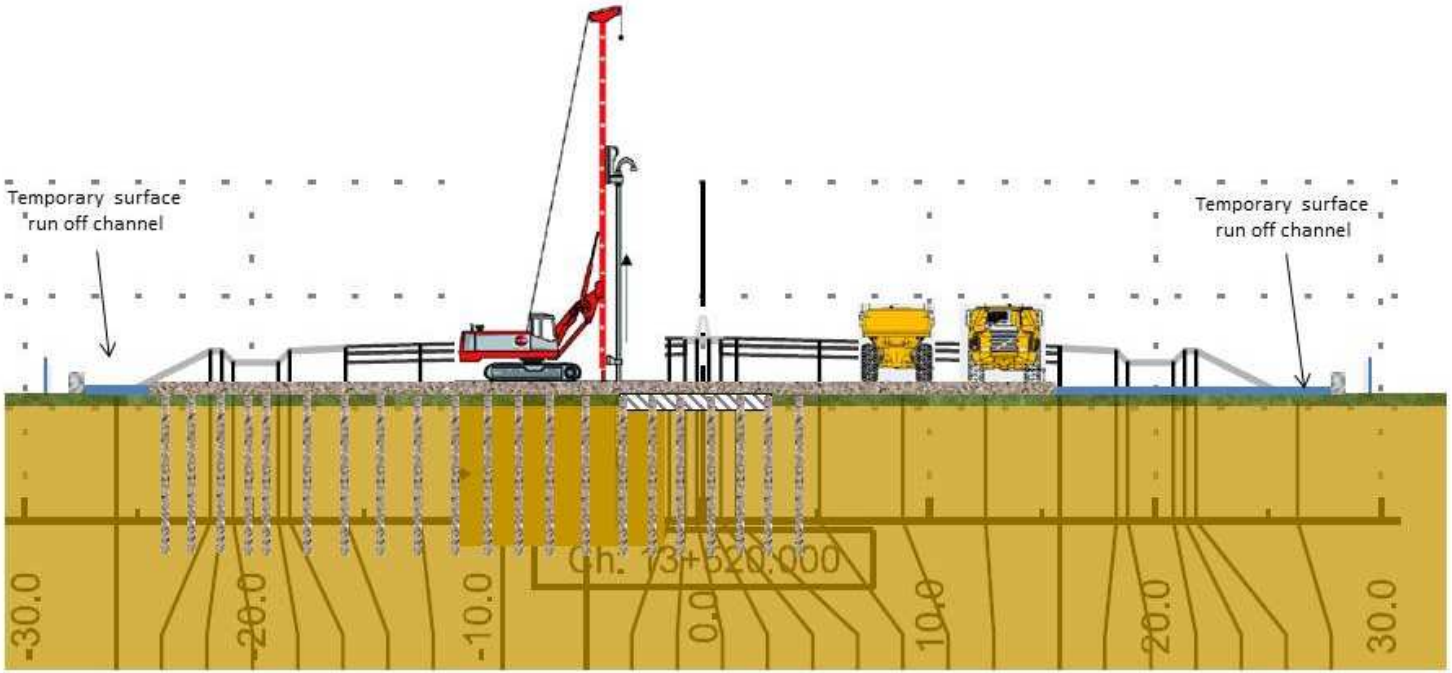
- Establish site boundary fencing (Temporary & Permanent)
- Construct field / reen cut off ditches where required to maintain connectivity of reens / channels



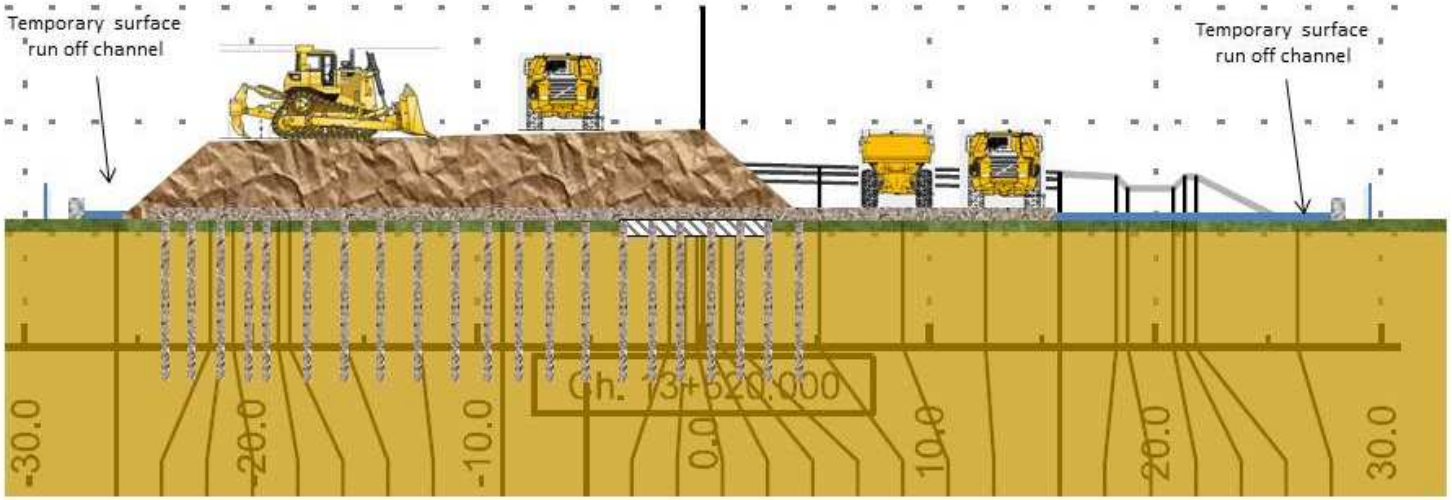
- Install stabilised haul road (haul road to be left within the embankment core when no longer required)



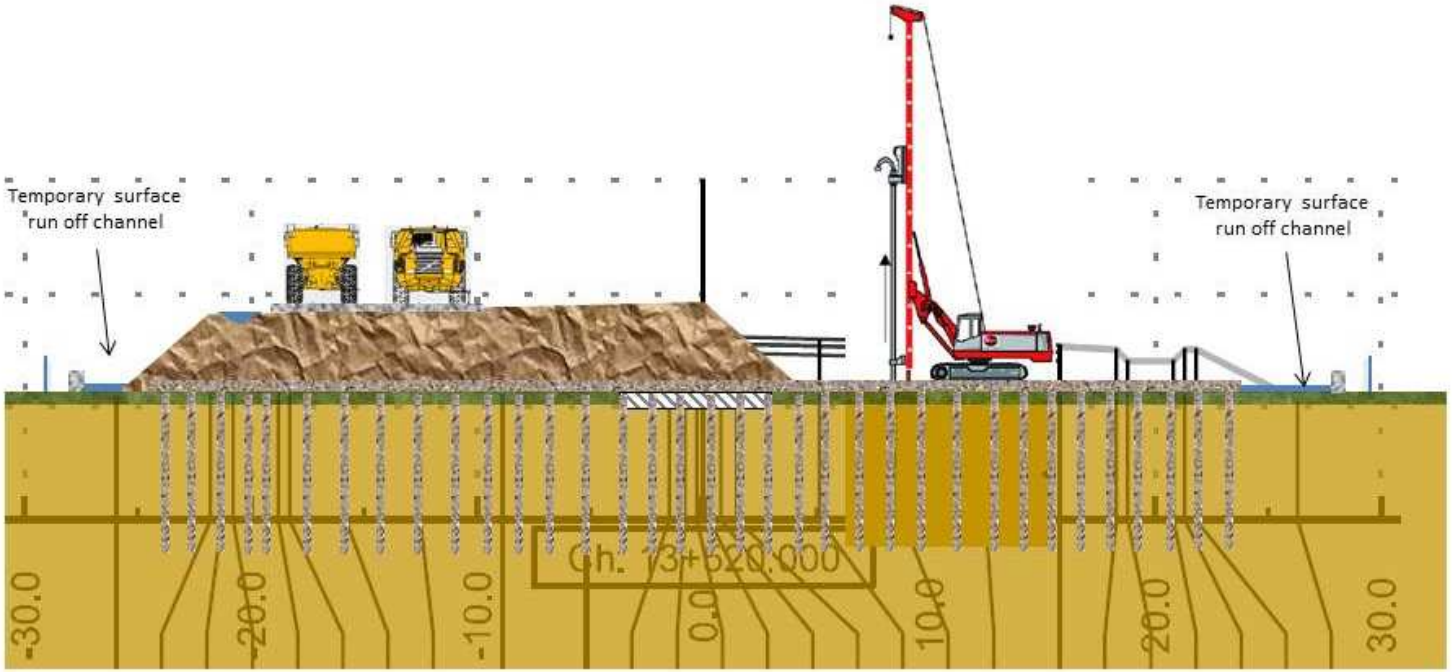
- Construct temporary run off containment bunds
- Install piling mat for band drains / precast driven embankment areas (Haul road now established through site)



- Install Band Drains / Precast Driven piles
- Haul road established to one side of footprint through site

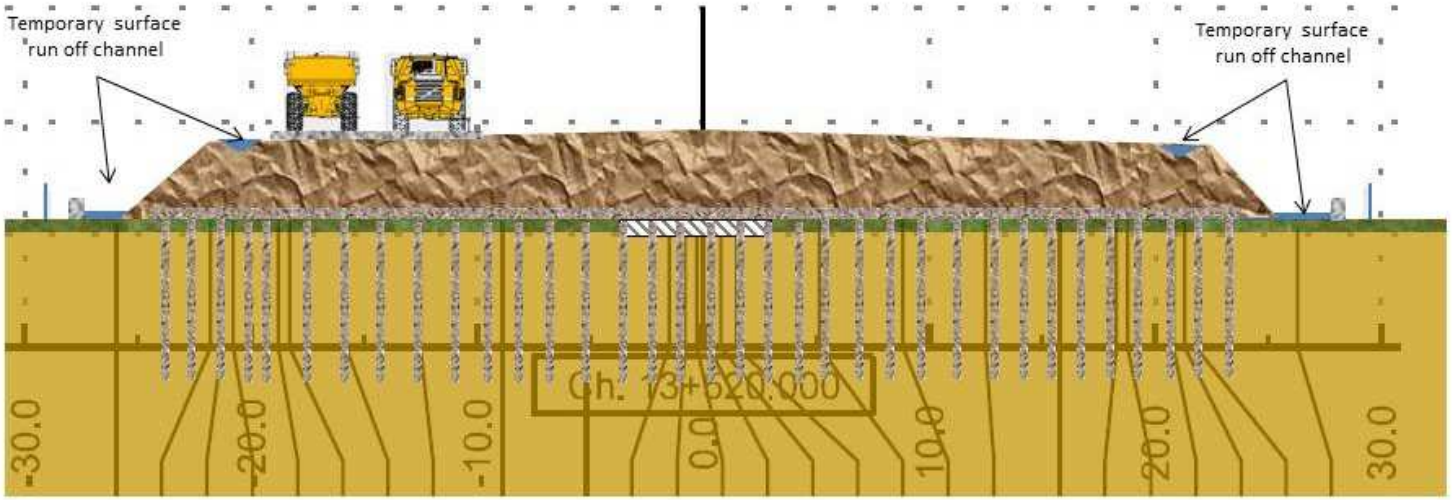


- Install embankment and 1m surcharge where required
- Haul road established to one side of footprint through site

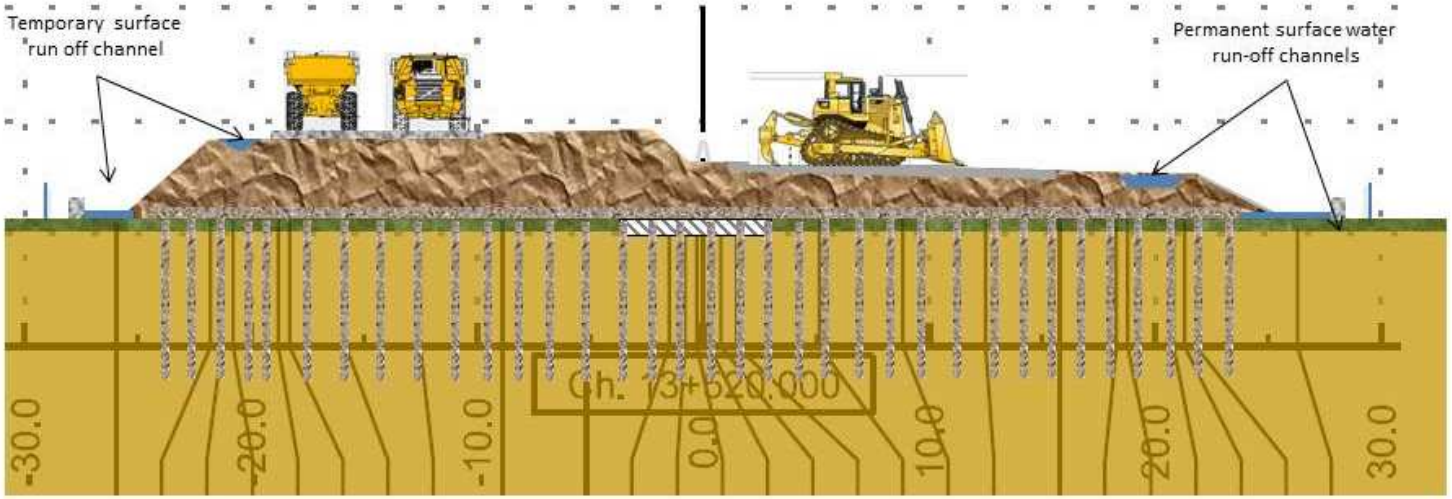


- Switch Haul road on top of surcharged embankment and leave for 12months
- Complete piling mat on other carriageway
- Install Band Drains / Precast Driven piles

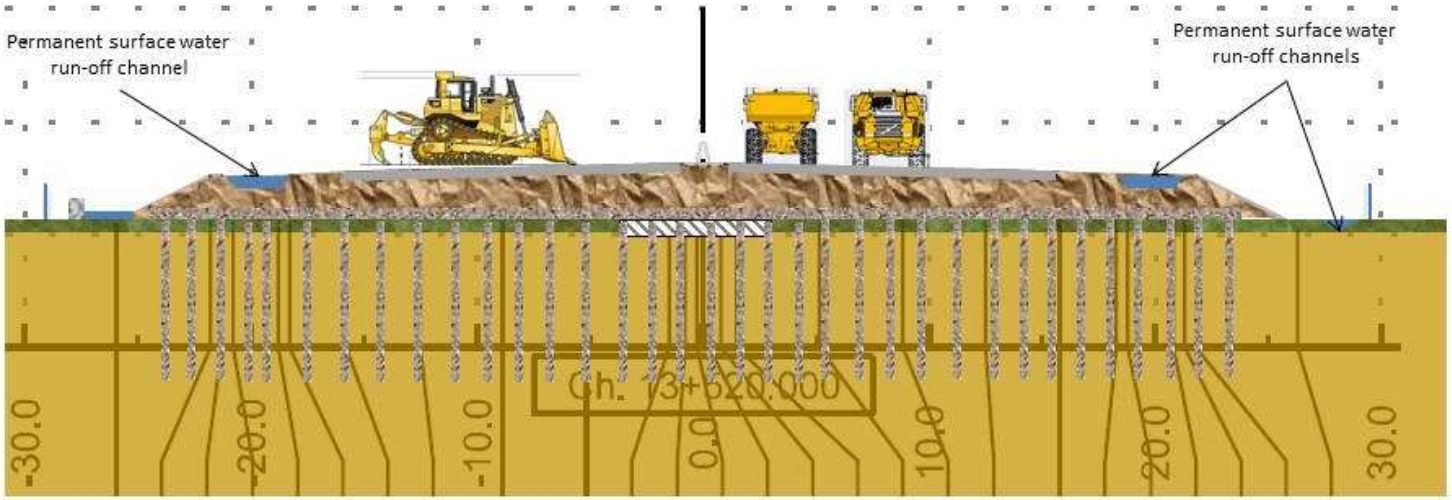
(Haul road will need to accommodate Road wagons too – Earthworks trucks could run to one side of embankment)



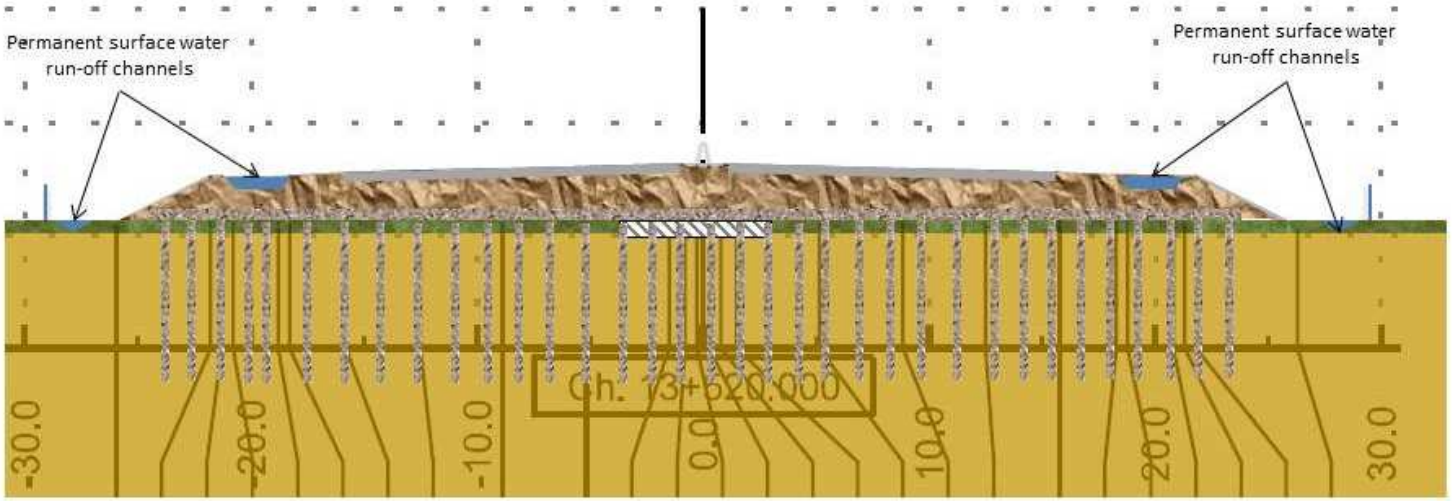
- Leave completed embankment with 1m surcharge for at least 12months (1 side of embankment would have a longer surcharge period to avoid constructing haul road twice)



- Remove 1m Surcharge from last completed section of embankment (this section of embankment would have settled for a minimum of 12 months)
- Removed surcharge material will be used to form embankments greater that 5m in height (within piled embankments)
- Construct carriageway foundation and place carriageway base course surfacing
- Permanent Water management ponds could be partially commissioned as earthworks operations are being completed
- Risk of site water run off polluting reens / drainage ditches is being greatly reduced as final surfacing layers are constructed.



- Remove 1m Surcharge from first completed section of embankment (this material would have had a slightly longer settlement period)
- Removed surcharge material will be used to form embankments greater that 5m in height (within piled embankments)
- Construct carriageway foundation and place carriageway base course surfacing
- Remove temporary water management and utilise permanent solution once earthworks are complete.

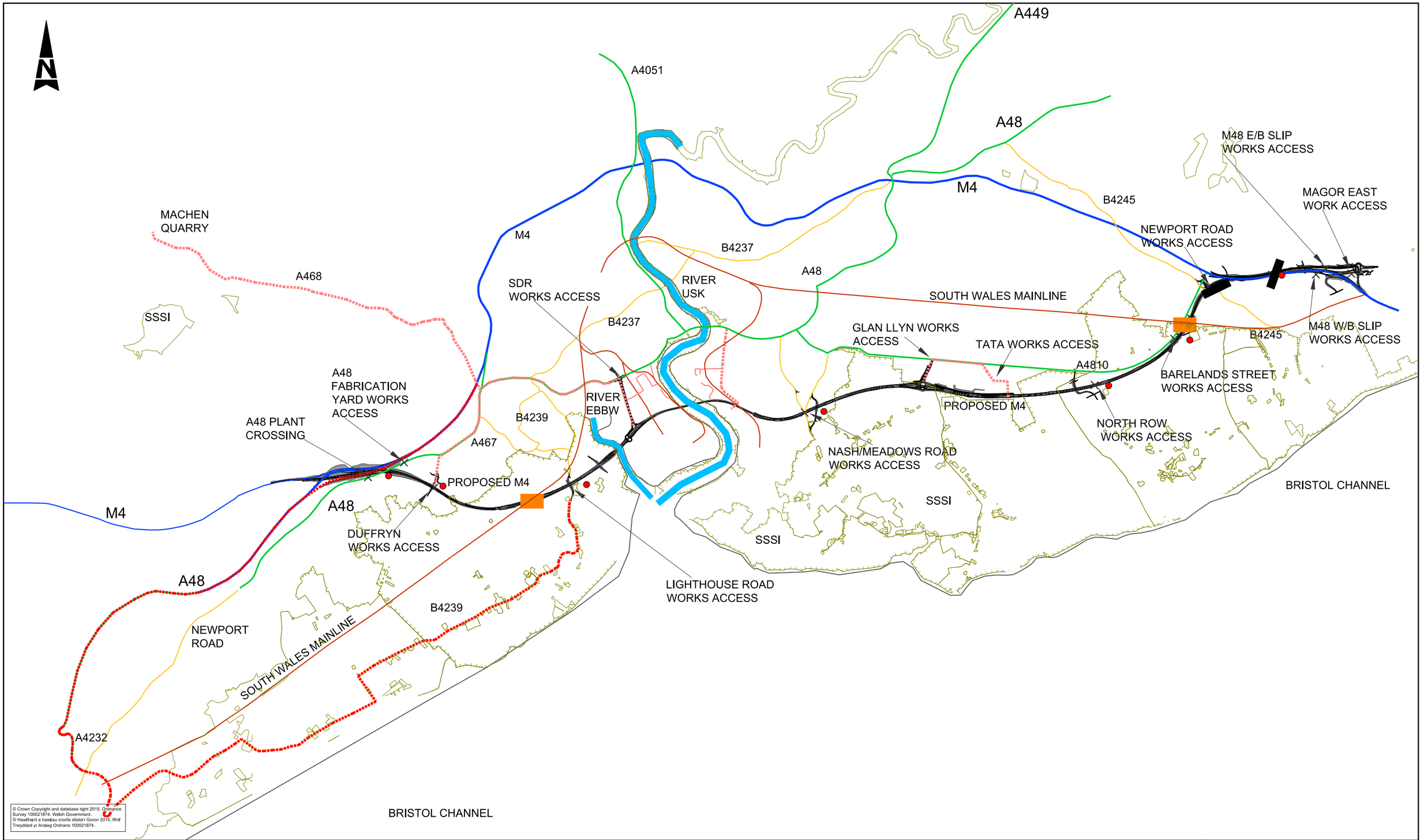


- Complete Safety Barrier, Gantries etc etc
- Install final wearing course
- Complete finishes including planting / mitigation where required
- Open to traffic

Annex 4 - Work Access Point

DO NOT SCALE

Millimetres 0 10 100



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

- TEMPORARY MATERIAL TRANSPORT ROUTE FOR LIGHTHOUSE ROAD USED FOR APPROXIMATELY 6 MONTHS
- MATERIAL TRANSPORT ROUTE
- MOTORWAY
- A ROAD
- B ROAD
- SOUTH WALES MAINLINE
- TEMPORARY BRIDGE FOR CONSTRUCTION PLANT
- SSSI
- PROPOSED M4
- TEMP AT GRADE SIGNALISED PLANT CROSSING AT THESE LOCATIONS
- TEMPORARY BRIDGE OVER SOUTH WALES MAINLINE FOR CONSTRUCTION PLANT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction	(Enter "None" if applicable)
Maintenance / Cleaning	(Enter "None" if applicable)
Use	(Enter "None" if applicable)
Decommissioning / Demolition	(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	05/02/16	First Issue	RAB	RJS	CLJ

Drawing Status: FOR INFORMATION
Suitability: S2

Project Team

Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT

Drawing Title: WORKS ACCESS POINTS

Scale	Designed / Drawn	Checked	Approved	Authorised
1:1	RAB	RJS	CLJ	CLJ
Original Size: A1	Date 05/02/16	Date 05/02/16	Date 05/02/16	Date 05/02/16

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZG_GEN - DR - WM - 0025
Location | Type | Role | Number

Revision: P01

DO NOT SCALE

Millimetres 0 10 100

A4051
A48
M4
B4245
M4
B4237
A48
SOUTH WALES MAINLINE
RIVER USK
B4237
B4245
A4810
RIVER EBBW
B4239
PROPOSED M4
A467
MEADOWS ROAD
SSSI
A48
PROPOSED M4
SSSI
BRISTOL CHANNEL
SOUTH WALES MAINLINE
SSSI
BRISTOL CHANNEL

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

- ABNORMAL LOAD ROUTE
- MOTORWAY
- A ROAD
- B ROAD
- RIVER
- COASTLINE
- MATERIAL TRANSPORT ROUTE
- SOUTH WALES MAIN LINE
- SSSI (SITES OF SPECIAL SCIENTIFIC INTEREST)
- PROPOSED M4

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	By	Chk'd	App'd
P01	05/02/16	First Issue	RAB	RJS	CLJ
P02.1	—		—	--	—

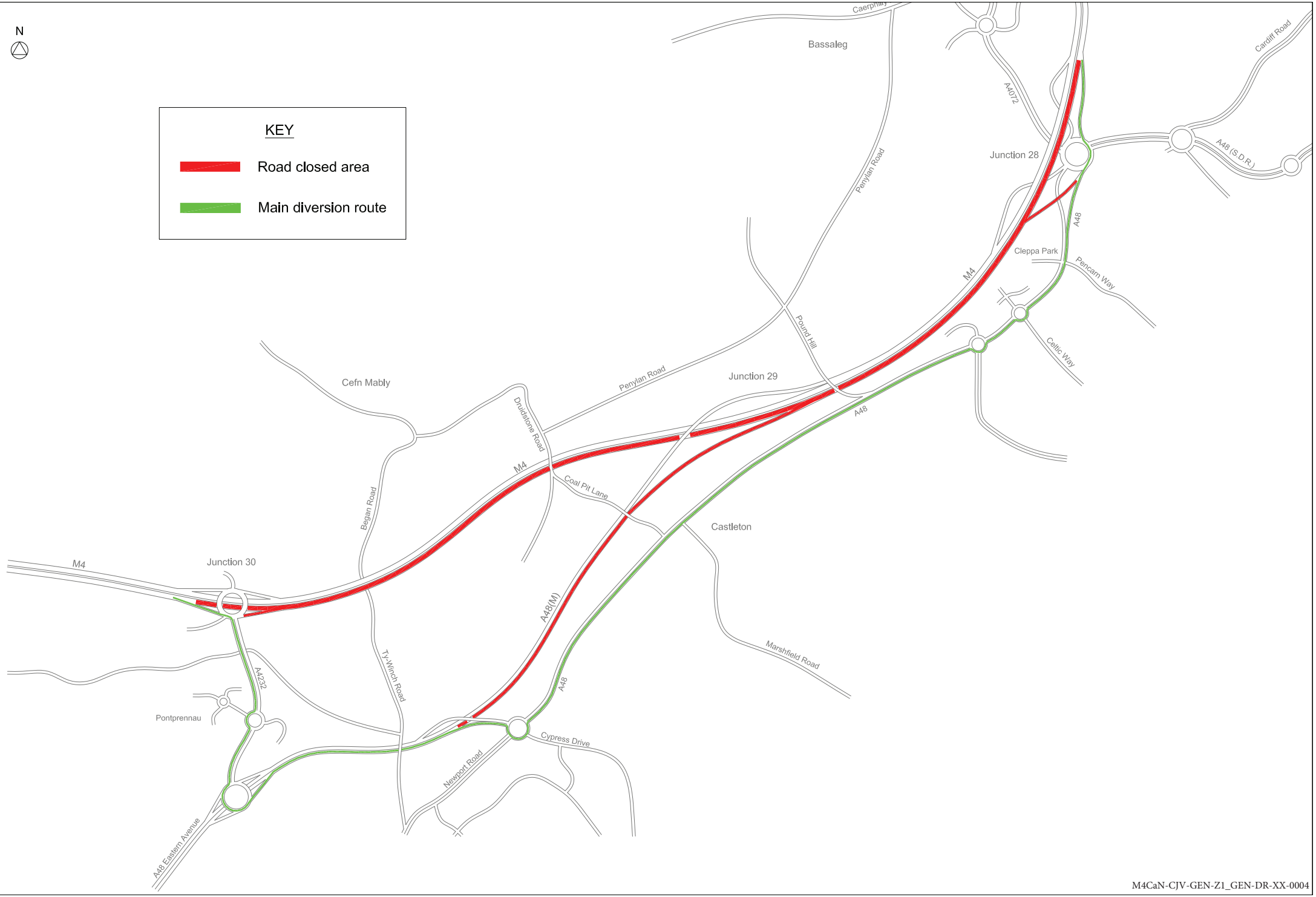
Drawing Status: WORK IN PROGRESS
Suitability: S0
Project Team
Client: Llywodraeth Cymru Welsh Government

Project Title: M4 CORRIDOR AROUND NEWPORT
Drawing Title: ABNORMAL LOAD ROUTES

Scale	Designed / Drawn	Checked	Approved	Authorised
1:1	---	---	---	CRS
Original Size	Date	Date	Date	Date
A1	---	---	---	—

Drawing Number: Project | Originator | Volume
M4CaN - CJV - GEN - ZX_GEN - SK - WM - 0003
Location | Type | Role | Number
Revision: P02.1

Annex 5 - Diversions

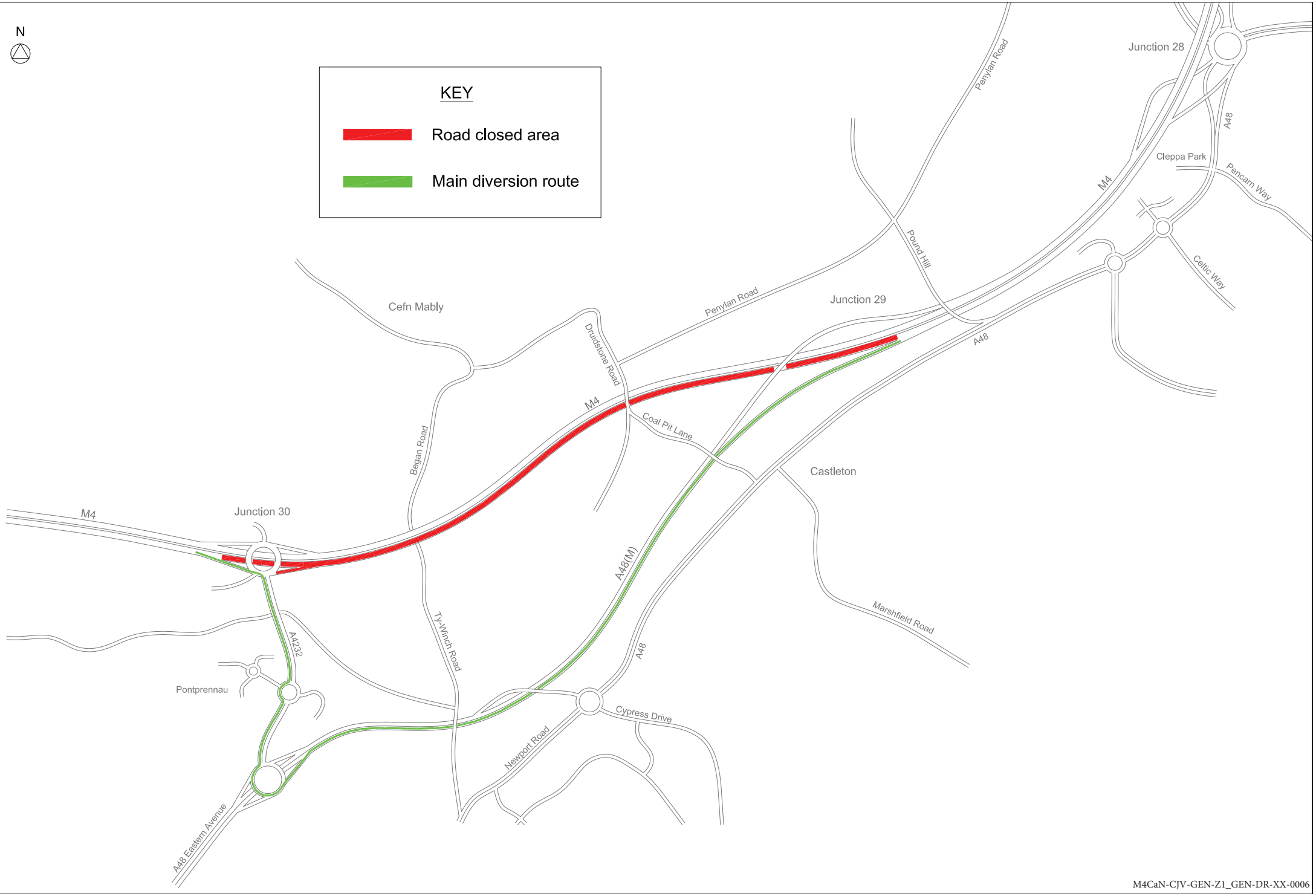


M4CaN-CJV-GEN-Z1_GEN-DR-XX-0004

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - M4 J28 - J30 Westbound	Drawing no: DIV 03
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												

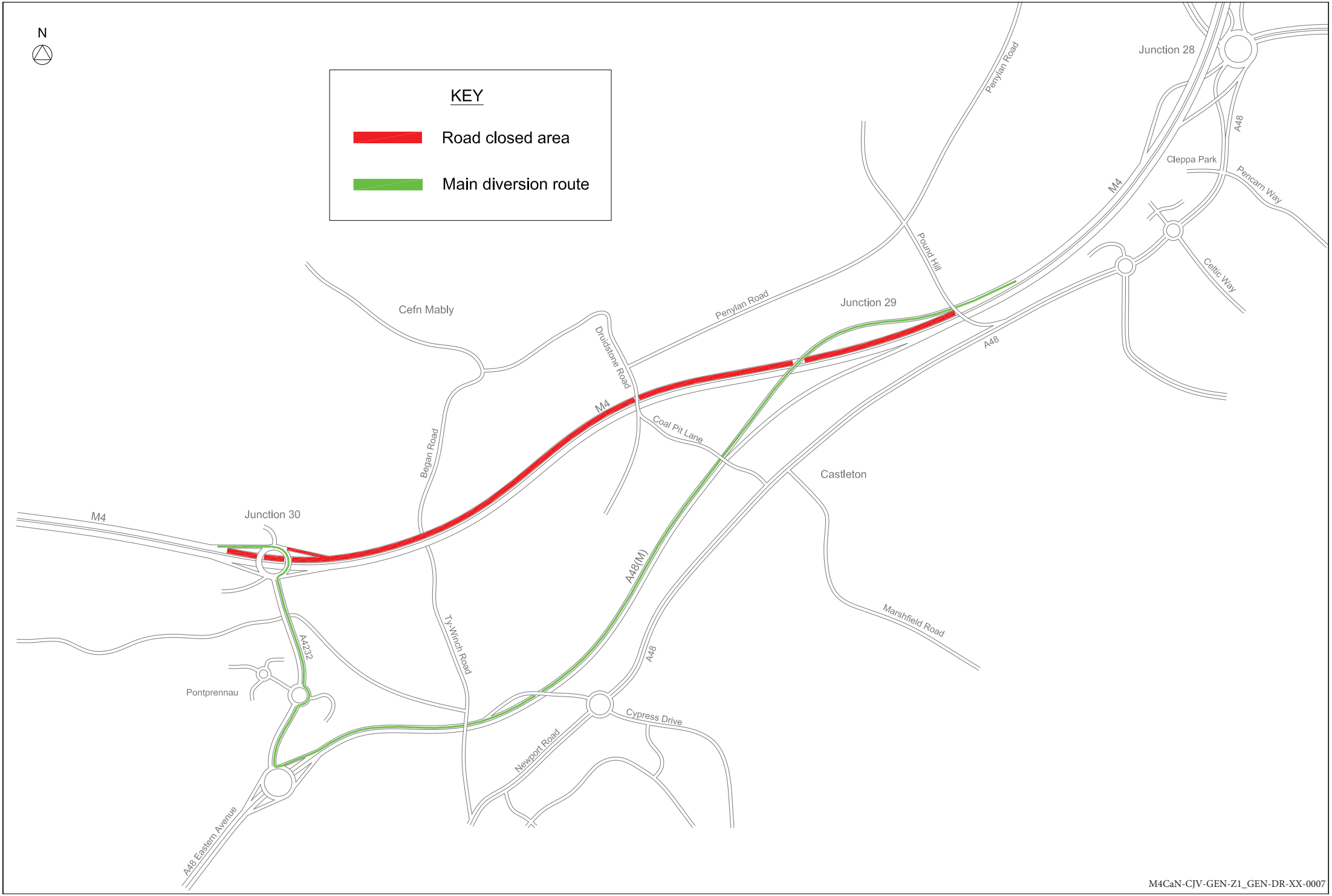
M4CaN-CJV-GEN-Z1_GEN-DR-XX-0005

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212							Client: Costain	Project: M4 Corridor Around Newport			Drawing: Road closure area & diversion route - M4 J30 - J28 Eastbound	Drawing no: DIV 04
Chk:															Revision:
App:											Office copy	Issued to site	Issued to client		Scale: NTS
Date:	Sept 15			Rev.	Drn.	Chk.	App.	Description	Date.						



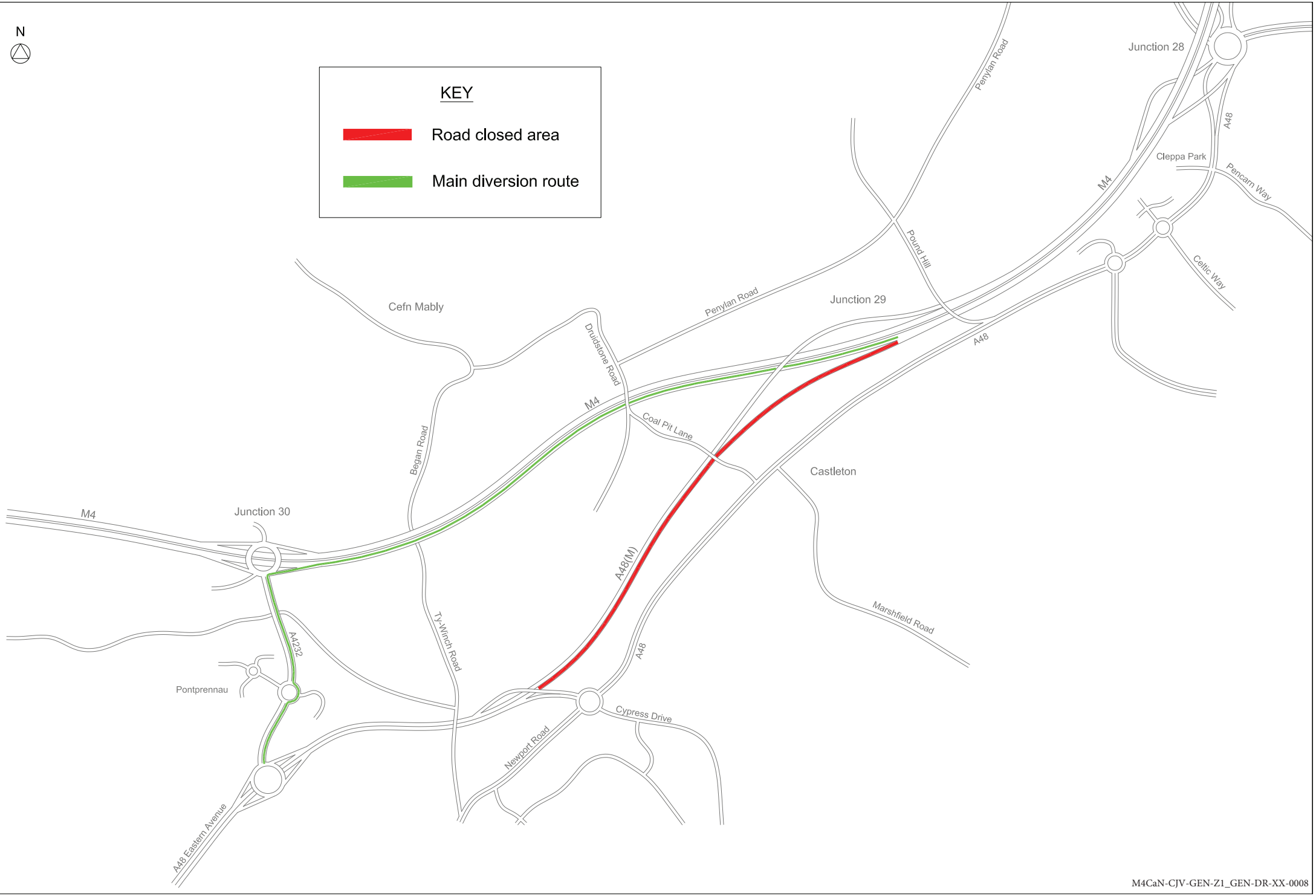
M4CaN-CJV-GEN-Z1_GEN-DR-XX-0006

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - M4 J29 - J30 Westbound	Drawing no: DIV 02
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												



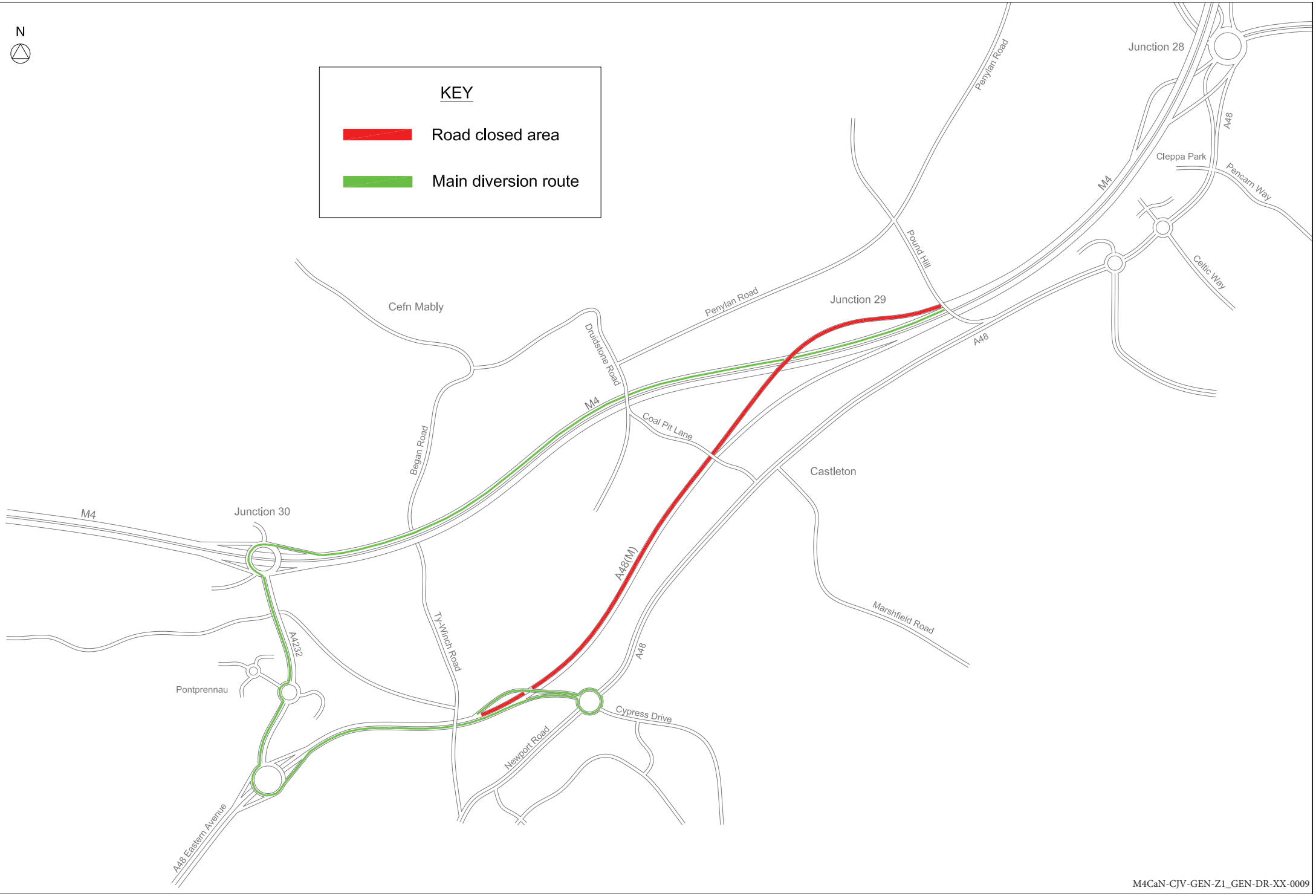
M4CaN-CJV-GEN-Z1_GEN-DR-XX-0007

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - M4 J30 - J29 Eastbound	Drawing no: DIV 01
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												



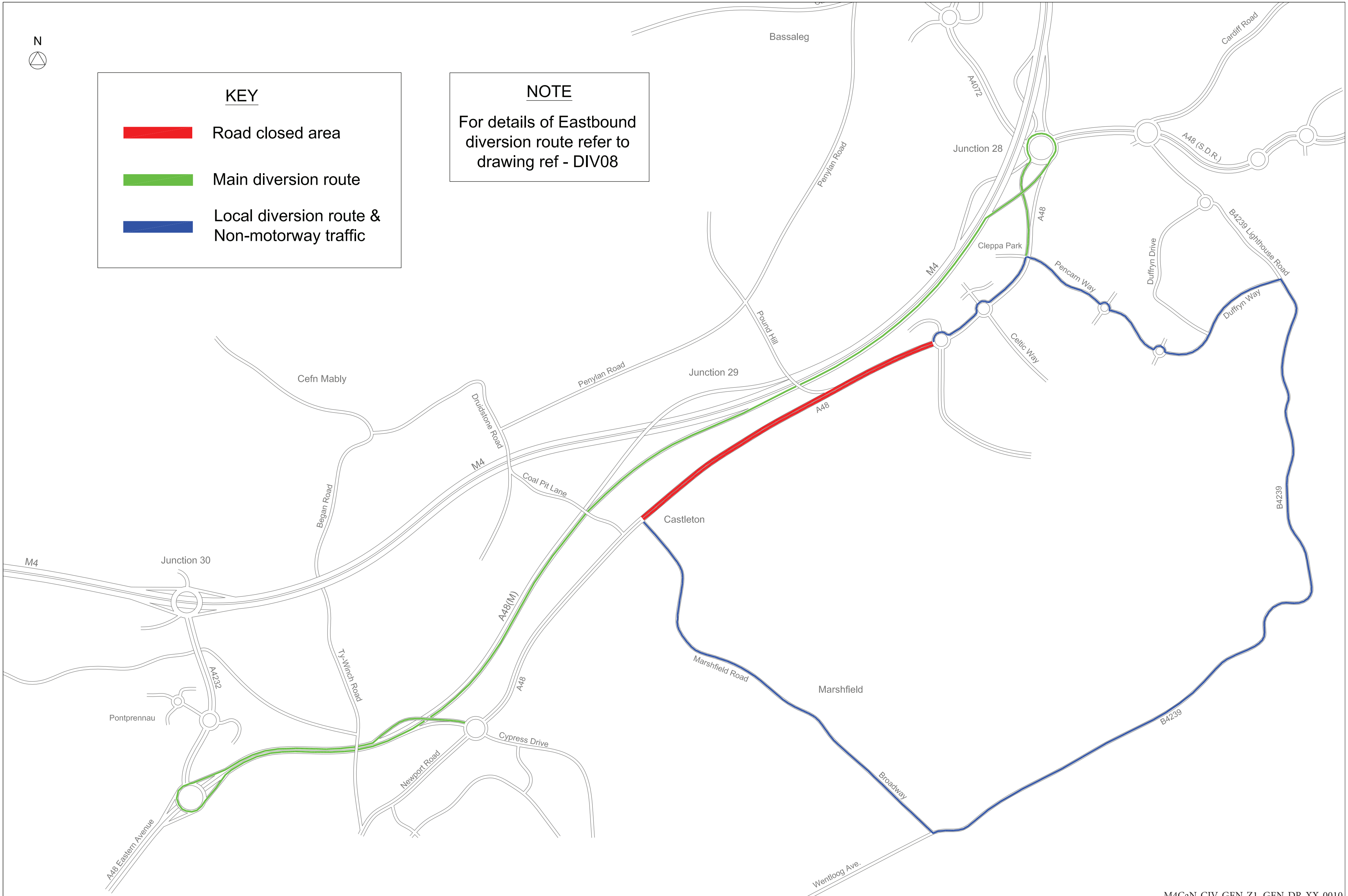
M4CaN-CJV-GEN-Z1_GEN-DR-XX-0008

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - A48(M) Westbound	Drawing no: DIV 05
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												



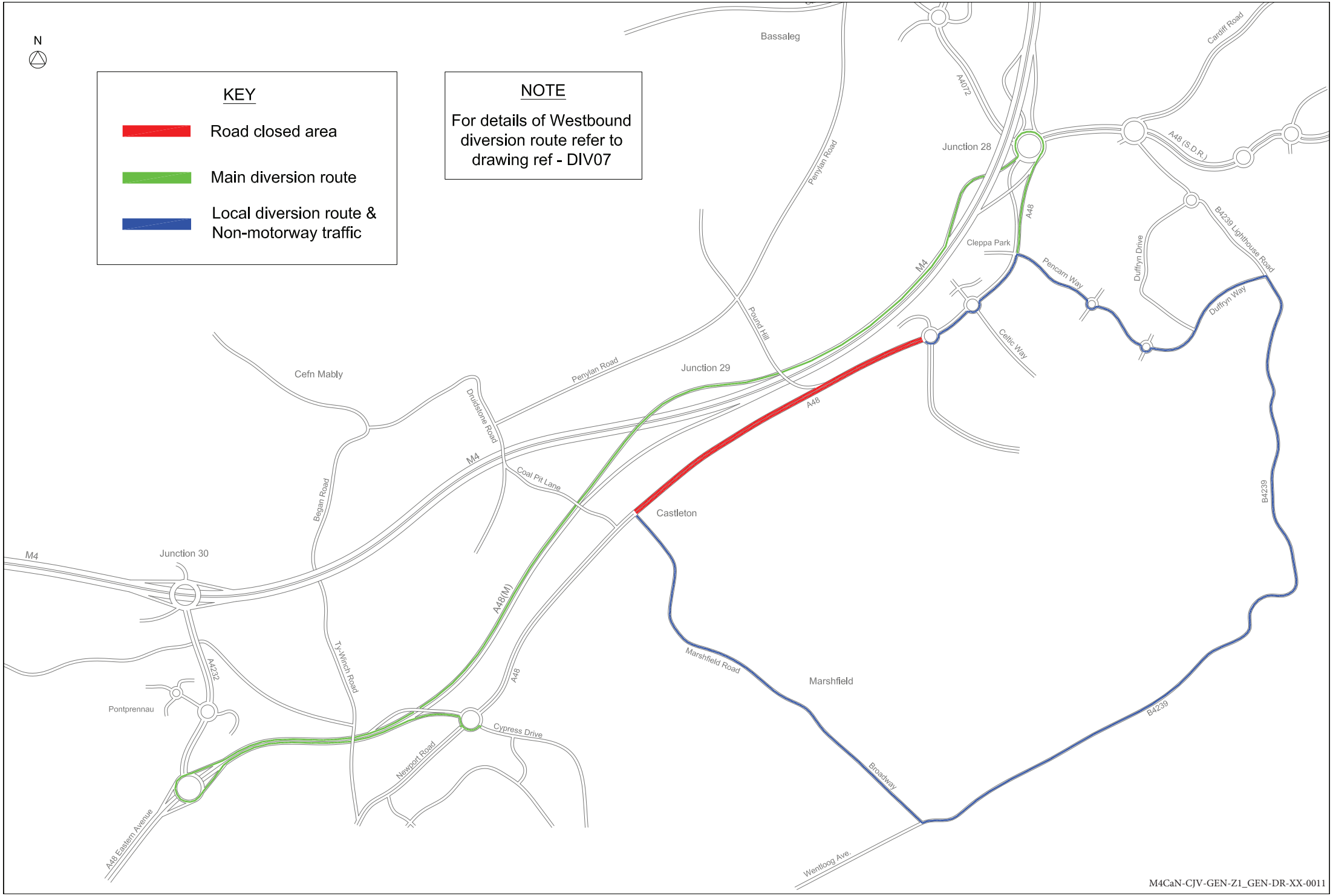
M4CaN-CJV-GEN-Z1_GEN-DR-XX-0009

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - A48(M) Eastbound	Drawing no: DIV 06
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												



M4CaN-CJV-GEN-Z1_GEN-DR-XX-0010

Drn: AJC	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est. Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Client: Costain	Drawing no: DIV 07
Chk:	Rev. / Drn. / Chk. / App. / Description / Date.	Project: M4 Corridor Around Newport	Revision:
App:		Office copy / Issued to site / Issued to client	Scale: NTS
Date: Sept 15		Drawing: Road closure area & diversion route - A48 East & Westbound closure (Westbound diversion route)	



Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - A48 East & Westbound closure (Eastbound diversion route)	Drawing no: DIV 08
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												

M4CaN-CJV-GEN-Z5_GEN-DR-XX-0007

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - M4 J22 - J23A Westbound	Drawing no: DIV 10
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												

M4CaN-CJV-GEN-Z5_GEN-DR-XX-0008

Drn:	AJC	forest	Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212	Rev.	Drn.	Chk.	App.	Description	Date.	Client: Costain	Project: M4 Corridor Around Newport	Drawing: Road closure area & diversion route - M4 J24 - J22 Eastbound	Drawing no: DIV 09
Chk:											Office copy / Issued to site / Issued to client		Revision:
App:													Scale: NTS
Date:	Sept 15												

M4CaN-CJV-GEN-Z5_GEN-DR-XX-0009

Drn:	AJC
Chk:	
App:	
Date:	Sept 15

Forest Traffic Signals Ltd,
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Felnex Ind Est, Newport, NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.

Client: Costain

Project: M4 Corridor Around Newport

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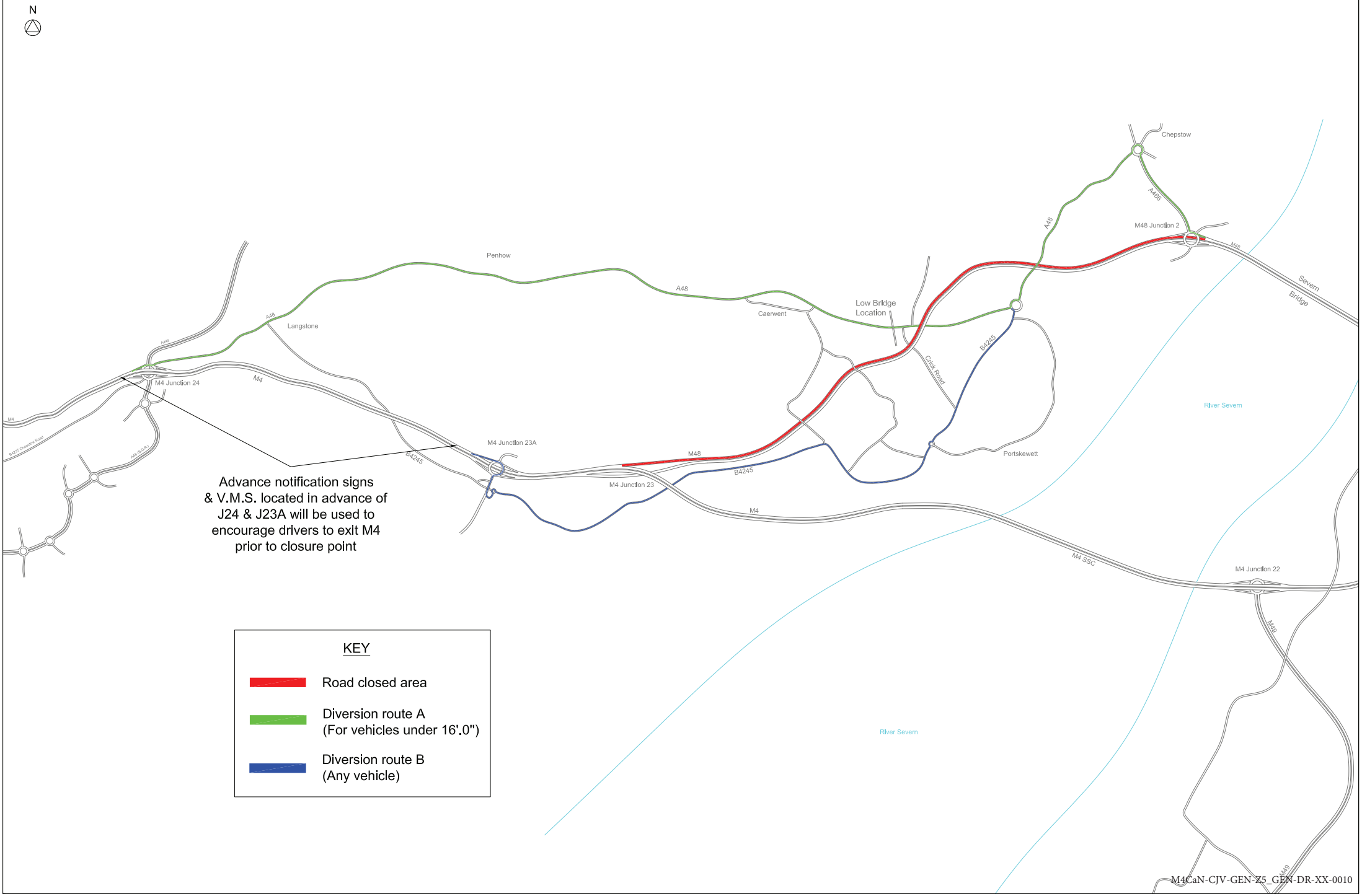
Drawing: Road closure area & diversion route - M48 J2 - M4 J23 Westbound

Drawing no: DIV 17

Revision:

Scale: NTS



M4CaN-CJV-GEN-Z5_GEN-DR-XX-0010

Drn:	AJC
Chk:	
App:	
Date:	Sept 15

Forest Traffic Signals Ltd,
Forest House, Broad Quay Road,
Felnex Ind Est, Newport. NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Diversion route revised to avoid Severn Crossing	16/12/15

Client: Costain

Project: M4 Corridor Around Newport

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Drawing: Road closure area & diversion route - M4 J23 Eastbound Exit to M48

Drawing no: DIV 16
Revision: A
Scale: NTS

M4CaN-CJV-GEN-ZS_GEN-DR-XX-0011

Drn:	AJC
Chk:	
App:	
Date:	Sept 15

Forest Traffic Signals Ltd, Forest House, Broad Quay Road, Felnex Ind Est, Newport. NP19 4PN Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Diversion route for high sided vehicles added	16/12/15

Client: Costain

Project: M4 Corridor Around Newport

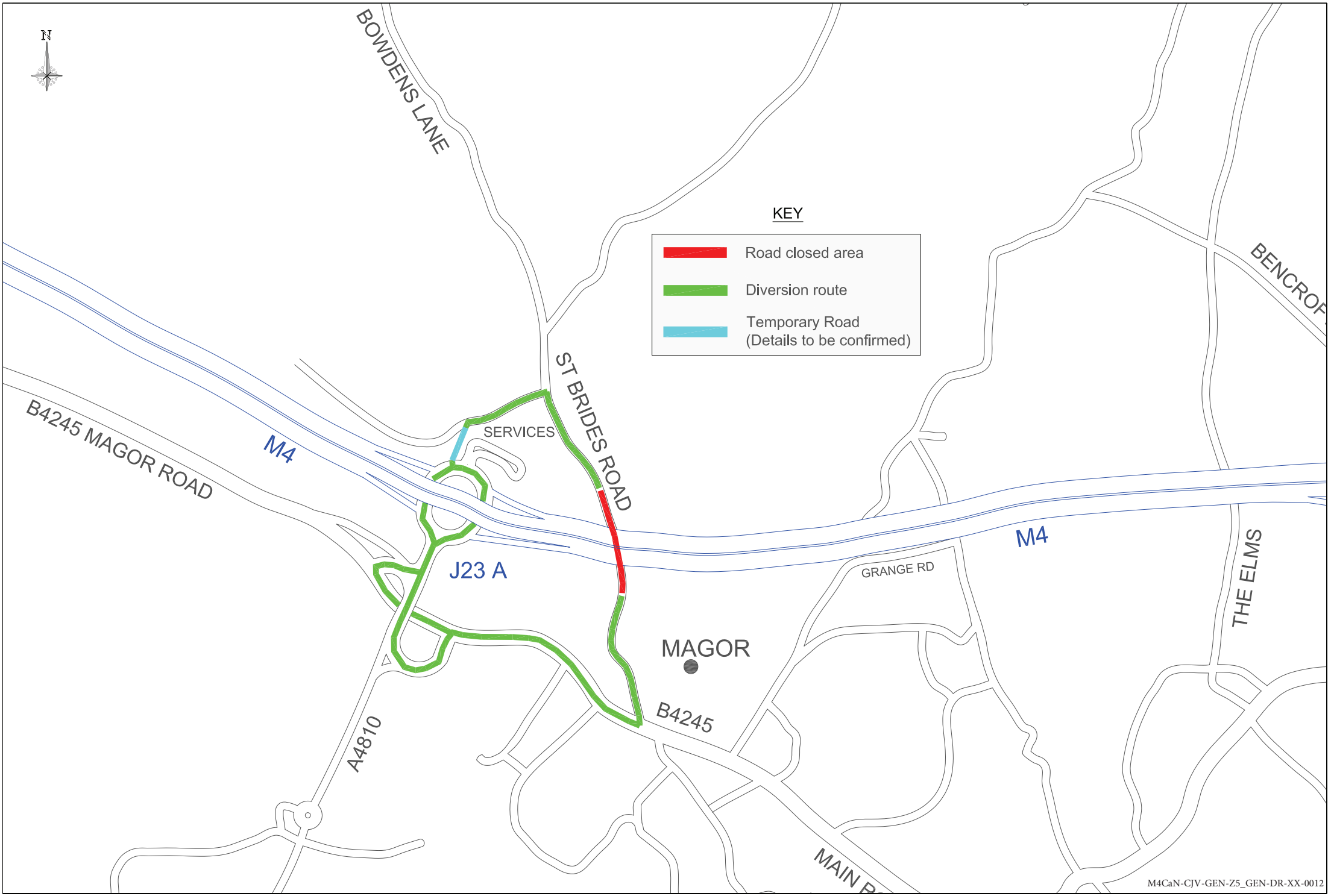
Office copy | Issued to site | Issued to client

Drawing: Road closure area & diversion route - B4245 Magor - Caldicot

Drawing no: DIV 18

Revision: A

Scale: NTS



Drn:	RB
Chk:	AJC
App:	.
Date:	12/11/2015

forest
Forest Traffic Signals Ltd,
Forest House, Broad Quay Road,
Felnex Ind Est. Newport, NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Notes removed	15/12/15

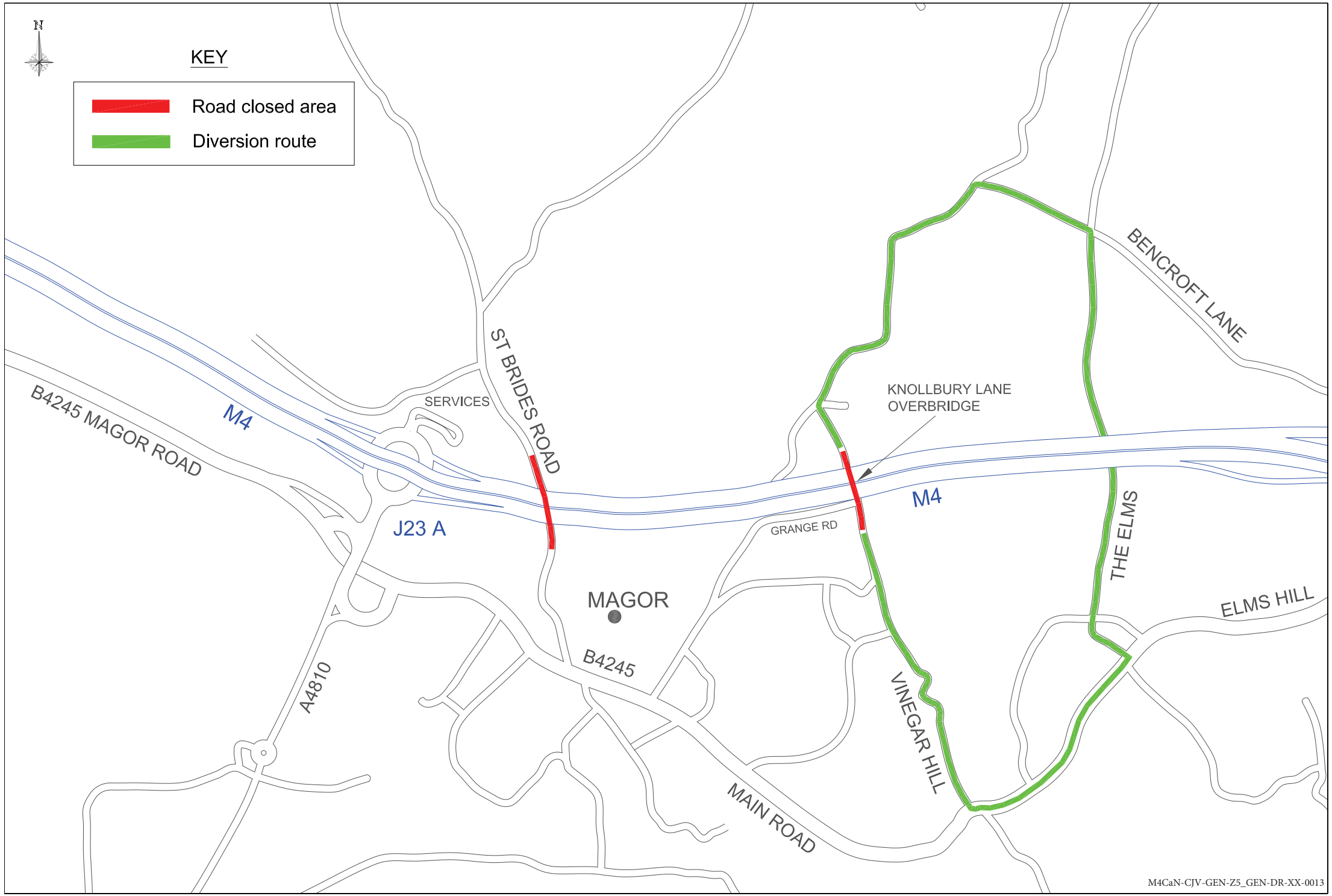
Client: Costain

Project: M4 Corridor Around Newport

Office copy | Issued to site | Issued to client

Drawing: Road closure area & diversion route - St Bride's Road Underbridge

Drawing no: DIV 12
Revision: A
Scale: NTS



M4CaN-CJV-GEN-Z5_GEN-DR-XX-0013

Drn:	RB
Chk:	AJC
App:	.
Date:	12/11/2015

forest

Forest Traffic Signals Ltd,
Forest House, Broad Quay Road,
Felnex Ind Est. Newport, NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Notes removed	15/12/15

Client: Costain

Project: M4 Corridor Around Newport

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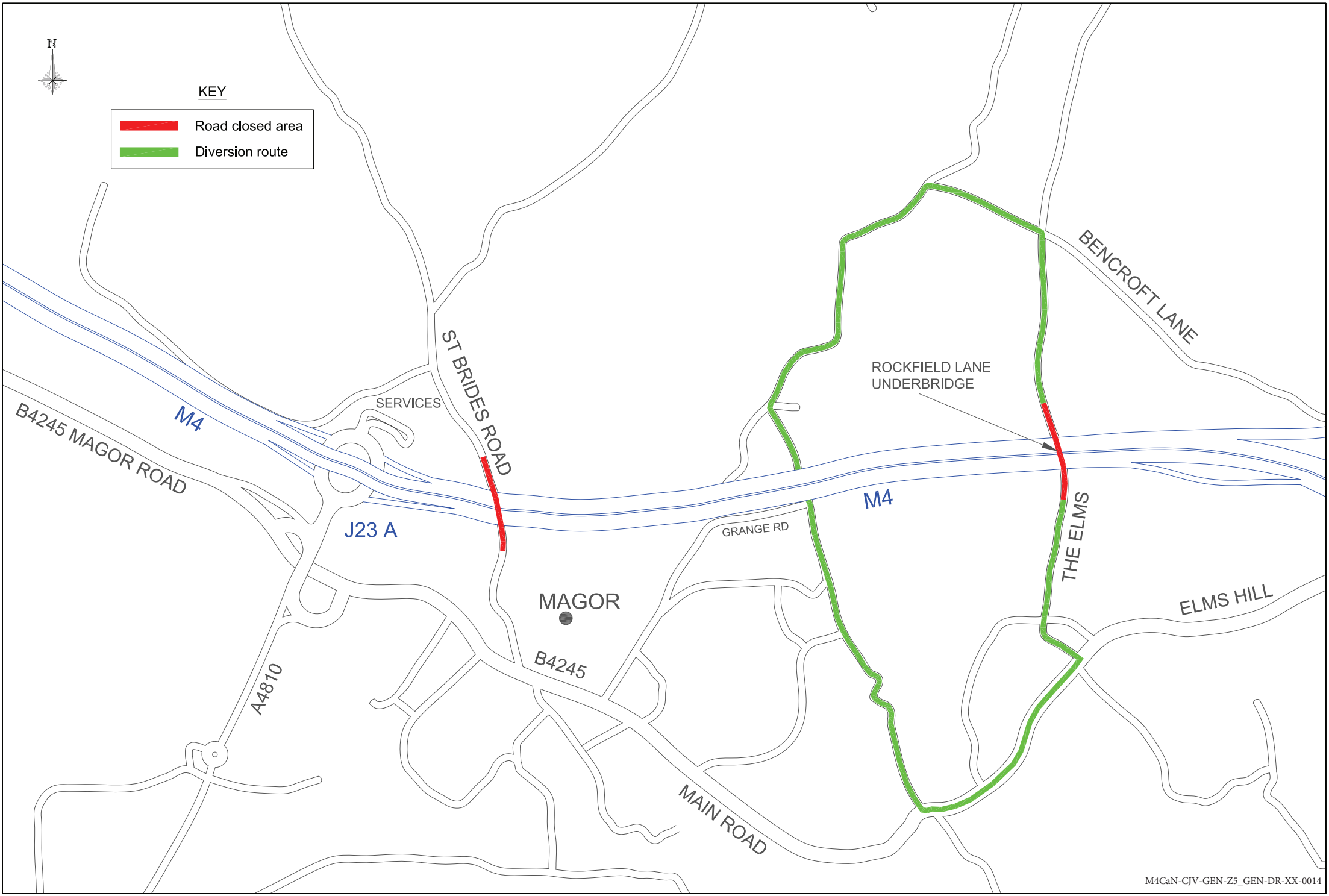
Drawing: Road closure area & diversion route - Knollbury Lane Underbridge

Drawing no: DIV 13
Revision: A
Scale: NTS



M4CaN-CJV-GEN-Z5_GEN-DR-XX-0014

Drn:	RB
Chk:	AJC
App:	.
Date:	12/11/2015

forest

Forest Traffic Signals Ltd,
Forest House, Broad Quay Road,
Felnex Ind Est. Newport, NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Notes removed	15/12/15

Client: Costain

Project: M4 Corridor Around Newport

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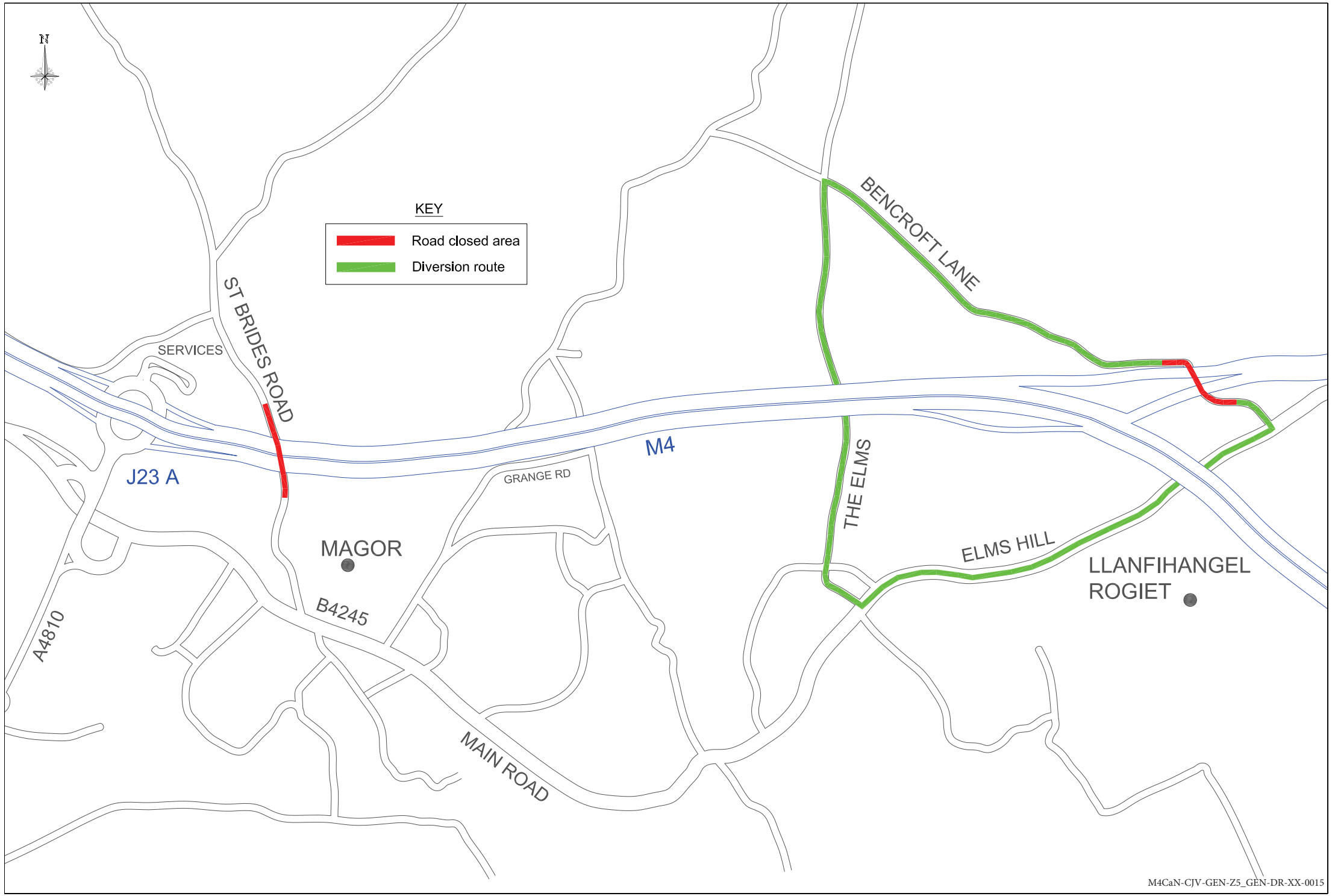
Drawing: Road closure area & diversion route - Rockfield Lane Underbridge

Drawing no: DIV 14
Revision: A
Scale: NTS



M4CaN-CJV-GEN-Z5_GEN-DR-XX-0015

Drn:	RB
Chk:	AJC
App:	.
Date:	12/11/2015

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Felnex Ind Est. Newport, NP19 4PN
Tel: 01633 284700 Fax: 01633 283212

Rev.	Drn.	Chk.	App.	Description	Date.
A	AJC			Notes removed	15/12/15

Client: Costain

Project: M4 Corridor Around Newport

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Drawing: Road closure area & diversion route - Bencroft Lane Underbridge

Drawing no: DIV 15
Revision: A
Scale: NTS