

A465 Heads of the Valleys Dualling Section 3 - Brynmawr to Tredegar



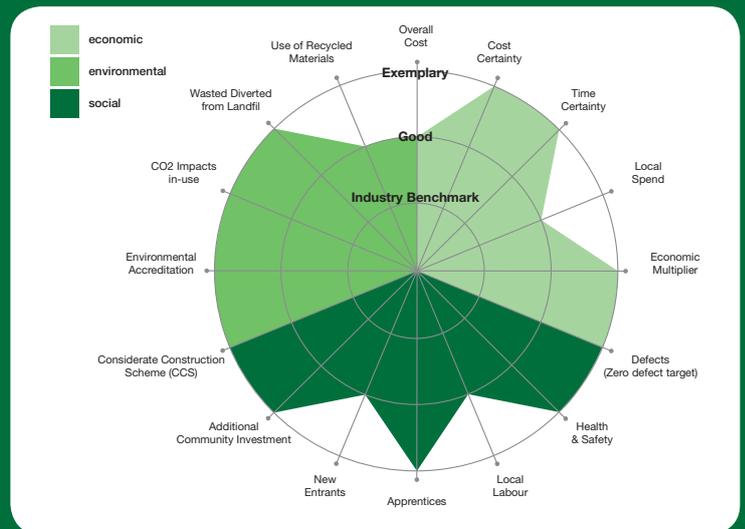
The Welsh Government set out their vision for stimulating Wales' first Strategic Regeneration Area in 'Turning Heads - A strategy for the Heads of the Valleys 2020'. One of the key drivers for social and economic regeneration was the delivery of the A465 dualling programme.

Section 3 is the next phase of the Welsh Government's plan to upgrade the A465 road between Abergavenny and Hirwaun in south Wales. It involves the construction of 7.8km of new dual carriageway road between Brynmawr and Tredegar with 4 junctions, 8 bridges, 6 retaining walls, 3 underpasses and 900,000cu.m of earthworks.

Section 3 sits entirely within Blaenau Gwent County Borough Council which suffers from higher than average levels of unemployment and deprivation. Maximising community benefits during and after construction is a key driver for the project.

An Early Contractor Involvement (ECI) contract was awarded to Carillion in March 2010. Together with their designer Arup and Environmental Consultant, TACP, the team have carried out optioneering, preliminary design and published draft orders. Subsequently they progressed the scheme successfully through the statutory process and into the design and construct phase.

An ethos of open and honest communication has been adopted by the whole team to ensure that the local community are fully engaged in the development and subsequent delivery of the scheme.



project details

client:	Welsh Government
designers:	Arup
contractor:	Carillion
project value:	£115m
project duration:	January 2013 to July 2015
contract:	NEC Option C
procurement strategy:	Design and Build through Early Contractor Involvement (ECI)



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what is an Exemplar project?

An Exemplar is defined as 'something worthy of being copied'. The Exemplar programme has been developed to help identify the reasons why certain projects are successful in a standardised, quantifiable way, and to share with the industry what enabled these successes. An Exemplar considers all aspects of sustainability, including economic, social and environmental. Projects must demonstrate that they have been innovative in one or more of these aspects in a way that exceeds normal industry practices, while achieving at least minimum standards in all other areas of the project. This is to demonstrate that the scheme is well rounded and has not sacrificed one aspect to be successful in another, while also incorporating best practice measures that can advance the state of the industry. An Exemplar project therefore reflects the ideal industry goal of achieving a scheme's primary function aims in a sustainable way, at acceptable costs. Case studies are prepared at 3 key stages : post-design, post-construction, post-occupation. This ensures that lessons learnt can be demonstrated throughout the development of the project.

what will make the project successful?

- Early Contractor Involvement (ECI) to establish an integrated project team from the outset
- A transparent approach to risk management and incentivising of the supply chain fostering a culture of innovation
- Significant use of Building Information Modelling (BIM) to improve the design and construction process and add long term value
- Assessment of whole life costs including carbon impacts
- Proactive approach to realising community benefits
- A specific focus on health, safety and wellbeing
- High levels of stakeholder and community engagement
- Significant use of performance management systems.

notable achievements

- The Procurement and Risk Management Strategies applied by the client will drive cost and time certainty by involving and incentivising the whole team from the earliest project stages
- A collaborative approach fostered through an integrated team established at the outset will ensure that the project objectives are met and local stakeholders are engaged throughout
- The project had zero defects at handover target in line with the delivery team's desire to deliver right first time
- The use of Building Information Modelling (BIM) is supporting the project's development through the early planning and consultation stages although its full value is expected to be realised throughout the life of the asset
- The long term sustainability of the project has been carefully assessed using whole life carbon techniques and scheme adjustments made to reduce carbon impacts
- Integrated teamworking is supporting the achievement of a CEEQUAL Excellent rating
- Specific community benefits targets have been set across five key sectors within the local community : primary education; secondary education; higher education; employment / local economy and community
- Shared Health and Safety systems will be implemented to raise the bar across the whole supply chain.

economic considerations

The Procurement and Risk Management Strategies applied by the client will drive cost and time certainty by involving and incentivising the whole team from the earliest project stages.

The client's procurement strategy is based on Early Contractor Involvement (ECI) with a pain/gain incentive mechanism to encourage integrated teamworking and an innovative approach. The delivery team developed an outline design and published orders before going on to design and construct the works. This meant that design proposals were fully considered and that stakeholder consultation was placed at the forefront of the process. The early involvement of the contractor brought a strong focus on cost and time from the outset as well as clarity and accountability of decision-making.

For the client the procurement model represents a "third generation" ECI which combines a partnered approach with quality and financial rigour. The financial element includes a fee and target price for the development stage and the design and construct phase. This ensured that all the target prices proposed were developed in open competition and gave the client early visibility of the contract value.

To avoid tenderers making wildly differing assumptions the tender model required bidders to submit a mid-tender budget assumptions report highlighting areas of uncertainty and, hence, risk. The client removed this uncertainty from the tender by using the reports to develop a small number of Mandatory Budget Assumption for all bidders to follow. This helped to ensure valid "like for like" comparisons of tender sums.

The Mandatory Budget Assumptions ensured that all bidders dealt with strategic requirements such as grade separating junctions and risk areas such as mine workings treatment and earthworks disposal in the same manner.

Having awarded the tender the team worked closely to manage the strategic risks associated with the Mandatory Assumptions. The risk of excess material disposal was reduced from 750,000m³ to 50,000m³ and transferred back to the contractor as the party best able to manage this risk. As well as greatly reducing the overall project risk exposure the pain/gain mechanism ensured that the client was only exposed to a maximum of 50% of any overspend and recovered a minimum of 50% of any underspend. A similar approach to old mine workings treatment has allowed the development of a risk based approach. Costly traditional grouting solutions are reserved for high risk areas while the lower risk majority of the new carriageway is protected by geogrid to ensure that the impact of any subsidence event is controlled.

A collaborative approach fostered through an integrated team established at the outset will ensure that the project objectives are met and local stakeholders are engaged throughout.

The procurement strategy has enabled an integrated team to be established from the outset.

From early development stage the team analysed the transport and social issues to develop clear targeted project objectives. A focus on delivering these objectives together with a clear programme and budget provided a structured framework for effective delivery. Planned hold points or "gateways" within the project allowed for review, adjustment and refocus. These ongoing processes of plan, do, check and review are ensuring delivery on time and on budget. Maintaining focus on the project objectives is avoiding scope creep and assisting with effective options selection.

An innovative 'light touch' approach has enabled the client and delivery team to support each other while avoiding wasteful and inefficient job shadowing. Allowing specialists to get on with the task in hand in the most productive way has ensured that best value has been achieved for the tax payer whilst producing a design which meets technical and environmental constraints.

The delivery team's approach from tender through public inquiry to construction has been one of open collaboration. The integrated team approach has involved local stakeholders in resolving critical issues. It has also brought programme and cost discipline into the design development and statutory orders process delivering key stages on time and on budget.

The project has a zero defects at handover target in line with the delivery team's desire to deliver right first time.

A full time Quality Manager will monitor non-conformance and "close out" to ensure that all works and inspections are in compliance with the requirements of the specification. Lessons learned and best practice in terms of defects management will be shared across the team. As built drawings, health and safety and operations manuals will be compiled in parallel with construction to be available at completion. This will be supported through BIM.

The use of Building Information Modelling (BIM) is supporting the project's development through the early planning and consultation stages although its full value is expected to be realised throughout the life of the asset.

The delivery team have been developing their visual planning capability and exploring the value added opportunities for safer, more efficient delivery of highway infrastructure.

In highway construction, models received from the designers detail the various aspects of the permanent works principally earthworks, structures and drainage. Visual planning tools add value through automated clash detection leading towards a "right first time" delivery on site.

Visual construction planning needs to consider:

- The incremental progression of the earthworks in line with the mass haul and material classification
- The 3 dimensional interface with existing underground services, their temporary and permanent diversions
- The sequencing of the works with temporary traffic management interfaces.

The delivery team have developed their skills to model earthwork sequences in detail, allowing full integration of the construction programme and the visual planning model. This has improved communication between the delivery team, stimulated debate over potential alternatives and allowed dynamic investigation of the effect of change as earthwork materials are dug, classified, transported and deposited in different weather conditions throughout the year.

All the earthworks and drainage operations on site are controlled directly by GPS machine control using the planning model. This offers a clear safety benefit with less people working around machines and is beginning to demonstrate improved efficiency. The team are developing their ability to visually plan and manage service diversions. The ultimate goal is to set up 'virtual' exclusion zones around services in the model to prevent accidental excavation.

Early visual planning of traffic management has provided clear benefit in terms of communicating intentions to approving authorities, the client and to local stakeholders. The team will continue developing this area to increase the likelihood of approval of proposals.

While this work is beginning to identify value in the construction process the real untapped potential of BIM is in the long term management of the asset in service. Early lessons learnt include:

- Early work to understand the way in which the client stores and accesses maintenance data has allowed consideration of data storage referencing and formats enabling the efficient transfer into maintenance data bases without further processing
- Working with clients and maintaining agents is key to identifying what construction data adds value to future maintenance operations
- Exploring appropriate visual interfaces with that data is key to maximising accessibility. For highway infrastructure the network is geographically spread, in which case the design and construction 3d model interface may be too complex and a 2d GIS (Geographical Information System) interface may be more appropriate
- Appropriate use of transferrable data formats to allow easy transfer of data into whichever software package best meets the specialist need is important and must be supported by suitably flexible IT systems.



environmental considerations

The long term sustainability of the project has been carefully assessed using whole life carbon techniques and scheme adjustments made to reduce carbon impacts.

A whole life carbon assessment has been undertaken to inform design development. The aim was to understand the difference in carbon emissions for options to cross the Carno Valley and the carbon cost / benefits associated with the scheme over a 60 year appraisal period.

Construction carbon emissions were estimated at 51,657 tonnes of which 9,761t were required for a viaduct structure crossing the Carno Valley. A reinforced earth embankment option required 4,358t. The embankment solution was adopted producing a saving of 5,403t or 10% of the total construction carbon

Detailed traffic modelling using VISSIM software enabled consideration of effects on individual vehicles. This showed that in the opening year carbon emissions would decrease by 10% as a result of grade separating the junctions, saving 2,541t of carbon. Over the first 15 years of service 18,304t of carbon is expected to be saved as a result of this improved efficiency. This carbon reduction offsets approximately 35% of the carbon produced during construction.

The clients outline scheme required disposal of some 750,000m³ of surplus earthworks materials. Detailed consideration of the vertical alignment, junction provision and requirements for noise and visual mitigation have reduced this to under 50,000 m³. This represents a substantial client budget saving as well a substantial carbon saving from not having to haul the material to a disposal site.

The team have learnt a number of lessons in relation to carbon impact management :

- Steelwork, concrete and bituminous surfacing typically account for 80% of construction generated carbon. To make meaningful savings these areas need to be targeted at the design stage as efficiency gains during construction will never recoup inefficient design. Having an integrated team approach is essential if this is to happen

- When considering the whole life carbon cost of this project over 60 years 78% comes from the road users. To make meaningful carbon savings highway design should try to make the road as carbon efficient as possible for the users. 'In use' efficiency should be considered when appraising short term construction carbon gains from, for example, adjusting the vertical alignment to balance the earthworks.

Integrated teamworking is supporting the achievement of a CEEQUAL Excellent rating

In order to achieve the requirements of CEEQUAL 'Excellent' the project team work together to achieve environmental best practice.

The team is seeking to:

- Reduce waste and the consumption of resources, in particular, materials, fuel and energy
- Eliminate the release of polluting agents into the environment
- Influence and control the design so as to minimise the environmental impact of materials production, use and disposal
- Positively influence the environmental effects of raw material sourcing
- Enhance the living, working and leisure environment of employees
- Collect information from trade and specialist contractors and assess and validate their environmental performance

The project team considered the following during the design and procurement stages:

- Neighbour sensitivities identified through consultation
- The effects of access and egress routes, deliveries and waste removal
- Statutory requirements including noise restrictions and hours of working

A Register of Commitments sets out what needs to be achieved and the Construction Environmental Management Plan (CEMP) details how they will be delivered.

A full time environmental clerk of works is embedded within the team to offer advice, monitor compliance and drive improvement in environmental performance. Close partnerships with local environment bodies including Blaenau Gwent County Borough Council, the Gwent Wildlife Trust and Natural Resources Wales are helping the project team deliver their commitments.

social considerations

Specific community benefits targets have been set across five key sectors within the local community: primary education; secondary education; higher education; employment / local economy and community.

The project is entirely situated within Blaenau Gwent, South Wales. Blaenau Gwent is an area of high deprivation with below average educational achievement, low skill levels and high rates of long term unemployment.

The construction phase will support regeneration of the Heads of the Valleys through; direct employment enhanced by structured education and training, secondary employment and development opportunities through subcontracting to local companies and structured inspirational engagement with schools to support curriculum achievement and ignite ambition.

In the long term, improvement of this section of the road in conjunction with completion of three other phases of improvement works along the Heads of the Valleys will open up opportunities for inward investment and development. This in turn will bring greater employment opportunities and greater prosperity for the area.

To deliver these aspirations the delivery team are:

- Focusing on building strong relationships with the local authority and local population who will, effectively, be neighbours during the construction phase
- Reducing objections through the statutory processes by actively promoting face-to-face discussions and enabling the team to understand and respond effectively to concerns. With only three formal objections heard at Public Local Inquiry it is clear that the strategy has been successful and has laid strong foundations for successful relationships throughout the construction phase
- Appointing a Sustainable Communities Manager to coordinate engagement activities
- Developing a Community Benefits Plan to set challenging targets across all areas of the community including primary, secondary and higher education, maximising local employment and business use and support of wider community initiatives
- Supporting the implementation of south Wales' first BITC Business Class Cluster which will achieve long term partnerships between a number of schools and businesses in the Heads of the Valleys

- Developing a site 'Job Shop' and three way partnership with Blaenau Gwent's Employment Coordinator and training centre to maximise local accessibility to jobs
- Applying to become Wales's first National Skills Academy for Construction and the first one on a road construction project in the UK. This brings additional investment and challenging targets across a broad range of employment and training key performance indicators. Quarterly external review by the CITB ensures documented and consistent high quality delivery
- Forming the nucleus of an A465 Apprentice Academy providing high quality opportunities for Technical Apprenticeships in Quantity Surveying and Civil Engineering.

The delivery team are targeting the following key performance indicators in terms of social outcomes

- Employ 18 level 2 or 3 apprentices
- Employ 52 new entrant trainees
- Target 50% of the workforce to come from Heads of the Valleys region (HoV)
- Target 50% of subcontractor and supplier spend to be in HoV with 90% to be in Wales.

Shared Health and Safety systems will be implemented to raise the bar across the whole supply chain.

All new arrivals on site will undergo a "prestart engagement" setting out the project team's requirements for safety behaviour and standards on site. For many this will be their first taste of Behavioural Safety and will continue with monthly Group Engagement and Behavioural Safety engagement sessions. All workers will be encouraged to join the site Safety Action Group which will meet monthly and give the workforce a voice to drive improvement. Don't Walk By cards will be used to raise issues, drive up standards or suggest new ideas. Free training will be organised and delivered centrally including specialist supervisor training for all supervisors and underground services awareness for everyone digging in the ground regardless of employer.

The team will be developing 'Health like Safety' initiatives to target work related ill health across the supply chain.

Building Information Modelling will be used to support health and safety improvements. Visual simulations of work activities will be used as highly effective communication tools, generating alternative work methods and sequences to help develop shared methods across the delivery team.

An Accident Frequency Ratio (AFR) of zero is being targeted.