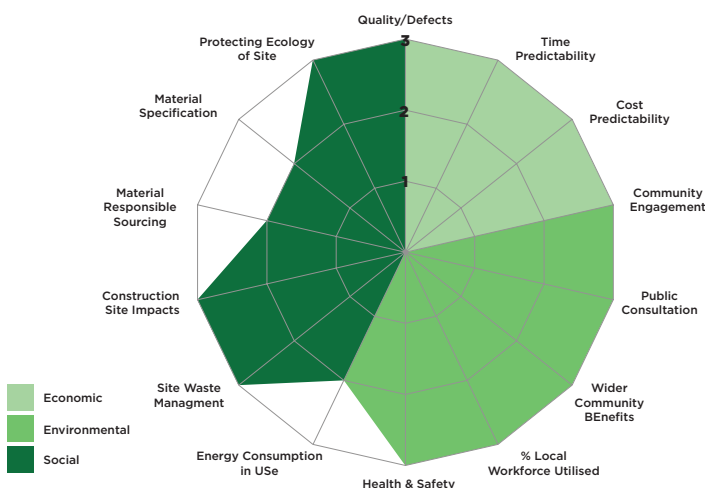




## A477 Improvement: St Clears to Red Roses



**The A477 St Clears to Red Roses Improvement was constructed by SRB (Roadbridge Sisk JV) and designed by Ramboll on behalf of Welsh Government under an Early Contractor Involvement (ECI) form of procurement. The integrated team, with Hyder Consulting as the Employer's Agent, successfully brought the project through the statutory process, detailed design and construction.**

The decision by Edwina Hart, Minister for Economy, Science and Transport, to proceed to construction was followed by a prompt start on site, enabling site clearance to be carried out immediately in the winter environmental constraint window, without delay to the project. This was only possible because the team had worked together on the preliminary design under ECI. Early consultations with stakeholders and the local community enabled many concerns and requirements to be dealt with during the design process, while at the same time managing land acquisition needs, minimising effects on the environment and maintaining value throughout.

During construction, effects on the local community, road users and the environment were minimised through careful and considerate works planning, and in full dialogue with them. The project was delivered within time and budget and was successfully opened on 16th April 2014.

This case study sets out the achievements of an integrated team established from a very early stage. It follows a previous study prepared at the design stage, which explains the procurement strategy in detail. The success of the project is demonstrated by the way the team has dealt with;

- Buildability and Logistics
- Sustainability
- Maintaining Traffic Flows
- Community Engagement
- Time and Cost Certainty.

### PROJECT DETAILS

<b>Client</b>	Welsh Government
<b>Agent</b>	Hyder Consulting UK Ltd (now Arcadis)
<b>Contractor</b>	SRB Civil Engineering UK Ltd Roadbridge Sisk JV
<b>Designer</b>	Ramboll UK Ltd
<b>Value</b>	£44,500,000 outturn cost
<b>Size</b>	9.3km single carriageway
<b>Timeline</b>	Employer's Agent July 2008
	ECI Award Sept 2009
	Public Inquiry June 2011
	Start Construction Feb 2012
	Completion April 2014
<b>Procurement Strategy</b>	Early Contractor Involvement (ECI)
<b>Contract Strategy</b>	NEC Target Cost with Activity Schedules

### KEY CONTACT

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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 involvement of the Contractor was a key feature of this project. The ECI model enabled a partnership approach to be established at an early stage. It provided an integrated delivery team to work with the Employer to manage risks and design issues, engage with local communities and stakeholders and provide local employment, training and business opportunities. It also ensured that time and costs were actively considered by all parties throughout the project, allowing value to be managed and added from start to finish. The involvement of the Contractor in the preliminary design and statutory consenting process stages brought a range of benefits including the early:

- Identification of buildability issues and impacts, which improved preliminary design and better informed the statutory process, particularly in relation to programme, cost and land take
- Consideration of sustainability objectives, including minimising land take, balancing cut/fill activities, minimising imported material and maximising retention of environmental features
- Consideration of buildability during the design and consenting stages
- Identification of need for temporary traffic diversions, site compound and accesses, drainage balancing ponds
- Community interaction, allowing the most appropriate design solution to go forward for Public Inquiry with the knowledge that the majority of stakeholders had bought in to the proposals
- Commencement of construction.



## Notable Achievements

- The project was delivered below the agreed target cost and 6 weeks ahead of construction programme
- Value and risk were managed by the integrated team throughout the life of the project from inception to completion, which resulted in the outturn cost being managed below the agreed target cost
- High quality standards and customer satisfaction levels were maintained throughout by a combination of process and performance management techniques
- High levels of engagement from the outset resulted in minimal complaints from stakeholders and the local community
- An Accident Frequency Rate (AFR) of 0.17 against a current industry average of 0.4 demonstrates the high priority given to health & safety on site and within the design process
- The majority of the workforce were employed locally, given the opportunity to gain experience and trained to develop key skills, ensuring a lasting legacy as a result of the project
- The project team ensured that employment opportunities, skills and qualifications were provided to the unemployed, those in higher education and those with learning disabilities
- The main contractor demonstrated a commitment to quality through high achievement in the Considerate Constructors Scheme
- In addition to the positive impacts on road users, significant benefits were also delivered to the wider community and additional contribution to education
- A CEEQUAL whole project award of 90.4% was achieved, which is the highest for a road scheme in Wales. As part of this process, energy consumption and carbon impacts were mitigated throughout the construction process
- Construction Site Impacts were minimised throughout the design and construction process
- Materials were sourced and specified carefully to minimise carbon impacts
- Given the ecological sensitivity of the site, the early involvement of an integrated project team helped to ensure that the ecology of the site was protected
- High standards of waste management were practiced throughout the construction period.

## Economic Considerations

### The project was delivered below the agreed target cost and 6 weeks ahead of construction programme

The early establishment of an integrated team allowed cost and time predictability to be managed throughout the project from inception to completion

Project costs were monitored and managed using an open book accounting system with open access to all and supplemented by regular internal and third party audits to ensure accountability and traceability within the system.

- NEC target cost with activity schedules with pain/gain sharing mechanism and open book accounting incentivised all parties to manage costs effectively
- All parties signed a project charter.

After a 12 month preliminary design period, successful Public Local Inquiry, followed by a 27 month construction programme the project was opened on 16th April 2014, six weeks ahead of time and 13% under the agreed target cost (£44,500,000 actual versus agreed target cost of £51,000,000 – a £6,500,000 saving).

- A full time planner and risk manager was appointed,
- Programming software was used to manage change, early warnings, compensation events etc.

### Value and risk were managed by the integrated team throughout the life of the project from inception to completion, which resulted in the outturn cost being managed within the agreed target cost

- £2m savings were achieved during the design stage by the integrated team:
  - £500,000 saving achieved by switching under-pass to an over-bridge configuration
  - Supply chain collaboration developed an alternative Cement Bound Granular Material pavement solution (£800,000 saving)
  - Identification and use of 104,500T of site-won rock to reduce import from non-renewable sources
- £2m inflationary costs encompassed within the original target cost that were not required
- £2.3m through procurement and out-performing production targets and reuse of materials
- These and other savings contributed to the project being well under target cost.

### High quality standards and customer satisfaction levels were maintained throughout by a combination of process and performance management techniques

- All stages were managed using an integrated project quality plan, certified to ISO9001 - encompassing health, safety and environmental management systems
- A Quality Manager was appointed
- A range of KPIs were selected to track performance on quality
- PRINCE2 project management technique was used to develop lessons learned reports from within the project team and to promote continual improvement
- Lessons learned exercises were also undertaken with stakeholders.

## Social Considerations

### High levels of engagement from the outset resulted in minimal complaints from stakeholders and the local community

- 6.5 million traffic movements were maintained through the works without complaint to SWTRA (the maintaining agent) or the local authorities
- No complaints were received by Carmarthenshire County Council regarding any aspect of the works
- Technical working group meetings were held throughout the project e.g. Traffic Management Group, Protected Species Group and Environmental Liaison Group
- A bi-lingual Public Liaison Officer (PLO) was appointed at the start of the construction phase and an information room set up at the site. Local people were kept informed of progress via a specific bi-lingual A477 project website, Twitter feeds and the issuing of bilingual newsletters delivered to properties locally
- At an early stage, landowners who were affected by the project were visited by the team and detailed arrangements discussed to enable them to continue to operate with the minimum of impact during the construction phase. Regular dialogue continued during the construction phase with landowners
- Engagement was supported by a 3D drive-through of the proposed route to aid consultations.

### An Accident Frequency Rate (AFR) of 0.17 against a current industry average of 0.4 demonstrates high safety levels

- During the project 612,317 hours were worked without Lost Time Incident (LTI)
- “Safety Conversation & Agreements” behavioural safety programme were conducted on site with a focus on using the hierarchy of hazard control – eliminate, replace, with mitigation as the last option
- On site casting of Tavernspite Road Bridge arch segments at ground level reduced the need for working at height
- Residual hazards were clearly communicated to construction personnel and included in Operations Manuals for SWTRA, and
- An emphasis on pre-fabricating materials to reduce the need for temporary works and reduce worker exposure in excavations, at height, future maintenance etc.

### The majority of the workforce were employed locally, given the opportunity to gain experience and trained to develop key skills, ensuring a lasting legacy as a result of the project

- 64% from the South West Wales Integrated Transport Consortium (SWWITCH) Area
- 13% from the rest of Wales
- 20% from the rest of the UK
- 3% from outside the UK
- 64% of project spend with local supply chain (85% of supply chain sourced in Wales)
- £61,000 spent with local catering suppliers

Main contractor partnered with over 140 local SME

The main contractor signed up to Fair Payment Charter, ensuring suppliers were paid fairly - 30 days credit terms for supply chain (21 days for pavement sub-contractor).





**The project team ensured that employment opportunities, skills and qualifications were provided to the unemployed, those in higher education and those with learning disabilities**

Five local long-term unemployed persons were recruited and trained, with skills transferrable to other local employers following scheme completion. A partnership with TRAC, a local recruitment company, developed a works programme specifically designed to promote job opportunities for these individuals

- Three graduates from local third level colleges and universities were employed, providing them with valuable working experience on a large scale construction site
- A partnership with Esteam (a local group of adults with learning disabilities) delivered opportunities as part of a landscape contract.

**The main contractor demonstrated a commitment to quality through high achievement in the Considerate Constructors Scheme**

The main contractor achieved a score of 43 against a maximum score of 50 placing the site within the top 4% of all registered construction sites in the UK. The Project received a silver award in 2015 and 2014 at the National Considerate Constructors Award in London.

**In addition to the positive impacts on road users, significant benefits were also delivered to the wider community and additional contribution to education**

A range of initiatives were undertaken to involve local communities in the project and also provide support for local organisations and good causes. The team worked proactively with local primary schools in the area to deliver messages about safety around a major construction site. The civil engineers of the future were also encouraged through the use of the Institution of Civil Engineers’ Bridge to Schools initiative. This enabled local young people to gain a practical understanding of the principles of bridge building.

A number of additional local benefits were also achieved:

- Refurbishment of disabled anglers platform for St Clears Angling Association
- Charity tractor run through scheme
- Various financial donations including West Wales Prostate Cancer and Carmarthen Food Bank

- 7,100 tonnes of topsoil was donated to Ammanford High School for development of playing pitches
- 2,580m<sup>3</sup> of clay was donated free of charge to NRW Flood relief schemes in Llangennech and Llanelli
- Over 137 community initiatives carried out including:
  - o Presentations to ICE Cymru, Welsh Assembly and Community Councils
  - o “Ivor Goodsite” and ICE “Bridges to Schools” visits
  - o Traffic Management Tweets, texts and email alerts
  - o Flood map surveyed for local Flood Defence Group to aid future flood prevention and planning strategy
  - o Construction of rugby playing pitch for Whitland RFC
- The Project Team donated a number of by-products from the scheme to the local community including timber from ancient woodland to make outside classroom, wood chipping to biomass plant and topsoil for vegetable gardens
- Workers undertook lasting legacy projects including, construction of 11 additional parking places at Tavernspite school
- Workers adopted two “Clean Mile” areas around the Llandowror environs to undertake regular litter picking
- All of these best practices were made available for download on the project website
- A Twitter account and traffic text alert system was developed to update on general site activities and upcoming TM arrangements
- Llandowror community council and flood group – SRB donated 600 sandbags and two repositories for flood resilience
- Red Roses Community Council – surfaced car park adjacent to the community hall
- Carmarthenshire County Council – co-located CCC and SRB air monitors to provide a comparison study
- The geological features along the route are unique to this area of Wales and were made available to NRW Scientific Officers, British Geological Survey and local colleges and Universities. A number of site visits were facilitated resulting in an extensive bank of knowledge being made available to the geological profession, including to fossil experts where a number of rare fossils were found.



## Environmental Considerations

**A CEEQUAL whole project award of 90.4% was achieved, which is the highest to-date for a road scheme in Wales. As part of this process, energy consumption and carbon impacts were mitigated throughout the construction process**

- Energy use was constantly reviewed with a nightly energy audit carried out
- A “power booster” button was utilised out of hours for those working late and the power to the main compound (except for safety lighting and canteen, server room etc.) was switched off from 9pm to 6am.
- For the site compound offices, SRB installed clear Perspex sheeting for the roof over the corridor effectively eliminating the use of lighting for much of the office hours during the project and gaining a reduction of 1.8 tonnes of CO<sub>2</sub>e
- The carbon footprint of the project was tracked and monitored during construction with substantial savings made on vehicle emissions through reducing part-load deliveries and minimising haulage distances
- A Lifecycle Assessment (LCA) report was carried out for the earthworks element of the project
- The requirement for public lighting was designed out of the project, except for upgrading the existing small number of lights to LED units. This significantly reduced the light pollution impact potential and energy consumption in use
- Retention and extension of the existing flood relief culverts and use of geo-grid within pavement works significantly reduced the need for new construction and use of quarried and processed materials
- The use of pre-cast elements for many of the structures (beams, culvert units, headwalls) allowed factory production control to be maximized leading to an estimated 10-15% reduction in wastage of materials, over traditional in-situ construction methods, as well as significant savings in powering power tools, welfare units, task lighting etc.
- Fuel usage was tracked and reviewed weekly with optimum use of fuel efficient plant, regular servicing etc.
- A Smarter Driving Course was run in conjunction with the Carbon Trust leading to estimated 13% savings in fuel use for those participating.

## Construction Site Impacts were minimised throughout the design and construction process

- A balanced Cut / Fill earthworks was achieved (originally 194,000m<sup>3</sup> deficit), ensuring buildability and removing the requirement for import / export of non-renewable materials (12,000 HGV movements eliminated)
- 900,000m<sup>3</sup> of earthworks movement undertaken in the third wettest (2012) and the wettest (2013) winters on record
- Collaboration with suppliers and the use of site-won materials led to 12,000 vehicle movements diverted from Llanddowror village
- 1620m of existing hedgerow translocated
- 6,500 tonnes of pavement planings reused on site
- 99% of total waste reused and recycled
- 1178m<sup>3</sup> of Japanese Knotweed buried within completed embankments, reducing waste to landfill
- 14.5km of services diverted/protected
- 640m of high pressure gas and oil pipelines protected, including an innovative sleeving and grouting solution to protect 1200mm high pressure gas-line - first time used in the UK
- Phasing of traffic management to reduce potential conflict and reduce on-line works - temporary diversions taken into the temporary construction land take.

## Materials were sourced and specified carefully to minimise carbon impacts

- Maintenance requirements were considered throughout the design and construction phases with elements designed and chosen for their durability and reduced maintenance e.g. all bridges were designed as integral structures eliminating the need for bearings or expansion joint replacements and associated traffic management measures
- All structures and elements were designed for ease of disassembly e.g. a number of the underpass units were pre-cast to be lifted out in sections for demolition
- 138 pre-cast concrete headwalls were utilised on the project with a carbon offset certificate for 26 tonnes of CO<sub>2</sub>
- Vertical alignments were designed to release additional materials to construct a capping layer using 104,500 tonnes of site-won rock and reduce import from non-renewable sources to eliminate 5,000 HGVs from local roads



- A number of specific sustainability plans were developed to manage the use of materials and waste management on the project. These included a Sustainable Resource Management Framework, Responsible Sourcing Code of Practice, Sustainable Construction Plan, a Materials Transportation Strategy and a Green Travel Plan
- 100% of all timber came from sustainable FSC Certified sources.

**Given the ecological sensitivity of the site, the early involvement of an integrated project team helped to ensure that the ecology of the site was protected**

- An Environmental Clerk of Works was appointed full-time to monitor and validate the delivery of commitments
- Ecological sign-off sheets were put in place for all works
- 1620m of hedgerow translocation was carried out (environmental statement target was 1200m) – Original hedge bank soils were carefully handled, ensuring a high proportion of native ground-flora seeds were retained within the soils structure – this resulted in quicker reestablishment of the translocated hedgerow
- 10% spare storage capacity was provided in all balancing ponds. This was in addition to the 20% standard climate change requirement
- Standing deadwood area created at two locations, two hibernacular log piles created
- Relocation of pond areas early in the construction phase enabled additional mature trees and hedgerows to be retained
- Dormouse crossings were incorporated into two underpass structures, providing continuity of access for this protected species
- As part of the Welsh Government’s Action Plan for Pollinators, an area at the site entrance was developed as a Bee Garden; this incorporated plants known to attract bees and other pollinators and demonstrated what can be done to improve biodiversity on a construction site
- On completion of the project, new planting of native, local provenance woodland has increased the habitat area to 8.5ha, giving a net gain of 6.5ha of woodland
- Landscape design and procurement strategies ensured local provenance
- Specialist Bat and Mammal experts consulted to design and oversee mitigation measures
- Early seeding and “greening” of slopes carried out to create an established landscape ahead of scheme opening - also aided run-off silt management during construction
- 450m of false cuttings created, reducing noise to surrounding properties
- Topsoiling and seeding were carried out at the earliest stages of the project on completion of sections of earthworks. This minimised the visual impact of the construction works within a predominately agricultural setting and stabilised the slopes well in advance of opening
- Woodland soils were identified for use within areas of new planting to provide an ecologically diverse habitat early in the project

- SRB Environmental Engineers consulted with Hydro-Industries, a local Llanelli based SME developer of water treatment units. Electro-coagulation (the passing of electrodes through inlet water to encourage particles to settle out) was specified and Hydro deployed three of their treatment units to site. The electrostatic treatment improved the quality of silt laden runoff prior to discharge, to significantly reduce silt from the site run-off to well below statutory required levels. The use of this state of the art treatment, more common to the waste water treatment industry, was its first deployment on a linear construction project in the UK. The lessons learned on the project have made it a realistic option for the treatment of surface water runoff as a standard for the future.
- The project team partnered with the local angling association to restock the River Taf (within a SAC) for two seasons and to carry out refurbishment works on a disabled angler’s platform.

**High standards of waste management were practiced throughout the construction period**

- A WRAP site waste management plan tracker was used to predict waste quantities, identify waste streams and monitor and track legislative compliance and waste management
- No earthworks material was sent to landfill and 94% of excavated material (855,603 m<sup>3</sup>) was beneficially reused on site with the remainder (55,000 m<sup>3</sup>) being beneficially reused nearby
- 1178 m<sup>3</sup> of Japanese Knotweed were buried within the completed embankment construction, which would otherwise have to be sent to landfill
- 100% of all coatings and treatments for permanent works materials were factory applied
- 74% of mixed waste reused and recycled, 99% of total waste reused and recycled
- 6,500 tonnes of milled pavement planning’s were recovered and reused for highway construction including granular sub-base material under footpaths, verge strengthening etc.
- 107,000 m<sup>3</sup> of surplus material reused in landscaped areas contiguous to the site under four separate CL:AIRE Soil Management Plans – up to 24,000 traffic movement reduced from local road network.

