Government and industry is building on the work of the Low Carbon Construction IGT and working collaboratively through the “Green Construction Board” (GCB) to drive forward the actions set out in the Low Carbon Construction Action Plan.

**Green Construction Board:**

*Working in partnership with industry to provide a platform for green growth*

Grasping the opportunities for growth presented by a sustainable construction, infrastructure and property sector is the main priority for the newly formed Green Construction Board.

The Board, co-chaired by Minister of State for Business, Rt Hon Michael Fallon MP and President and CEO of Skanska UK, Mike Putnam, is focused on taking a unified approach to the problems facing the industry, providing strategic leadership on key issues and identifying steps to promote the UK’s excellence in green construction. The Board will also work to promote the message that a ‘green’ construction sector can lead to business opportunities and economic growth.

**Purpose**

As well as monitoring the delivery of this Action Plan, the Board is also updating and refreshing actions going forward and takes collective responsibility for leading the change to a low carbon economy. The Green Construction Board will look more widely at green property and construction issues, encompassing priority activities of the Sustainable Construction Strategy.

**Membership**

The membership of the Green Construction Board represents both Government and senior representatives from industry and is jointly chaired by the Minister of State, Rt Hon Michael Fallon MP, who will act as the Government co-Chair together with Mike Putnam, President and CEO Skanska UK. DECC, Defra, DCLG, Cabinet Office and BIS are among the key Departments represented on the Group.
The Green Construction Board

**Fundamental Truths - Low-carbon design in UK construction**

- **2009**
  - Encourage innovation by clarity of objective.
  - Provide leadership commitment and vision.
  - Recognise key role in delivering low-carbon designs.

- **2011**
  - Understand and raise awareness of drivers behind reducing GHG emissions.
  - Promote carbon measurement and reduction with staff and supply chain.

- **2012**
  - Forge a culture driving low carbon.
  - Educate and support.
  - Optioneer and reduce carbon through user-friendly tools.

- **2017**
  - Deliver clear and consistent policies.
  - Strive to beat the target.
  - Measure the performance against the baseline.

- **2019**
  - Measure/report carbon in materials and products.
  - Re-use assets/materials.
  - Use low-carbon materials.

**Goals, aspirations and leadership**

- Communication and buy-in
- Baseline target/measurement
- Asset standards and innovation
- Commercial solutions
- Process governance

**Key stakeholders**
- Government/Policy Makers
- Regulators
- Funder/Promoter/Owner
- End users
- Designers/Contractors
- Suppliers

**CONCEPTS**
- Foster low-carbon skills
- Measure and challenge carbon at each key stage of delivery
- Embed dynamic performance reporting

**ENABLERS**
- Support positive behaviours through long-term incentives
- Support evidence-based investment programmes

**OUTCOMES**
- Continuous access to carbon reduction in products from cradle to 'as built'
- Set targets at scheme level through to programme level
- Measure the performance against the baseline

**Options**
- Optioneer between designs prior to construction
- Share low-carbon skills throughout the industry
- Disseminate best practice on low-carbon solutions

**Strive to beat the target**

**Reduced carbon/Reduced cost**
- Contribution to climate change mitigation
- Reduced use of resources
- Lower embodied carbon and capital cost
- Lower operational carbon running costs
- Improved solutions
- Increased UK competitive advantage

**Progress**
- 2009
  - 5% (early adopters)
  - 30% (early adopters)
  - 50% (early adopters)
- 2011
- 2012
- 2017
‘Carbon analysis supports efficient design development’
Carillion, Heads of the Valleys, A465 Dualling, Brynmawr to Tredegar

The Heads of the Valleys, A465 Dualling, Brynmawr to Tredegar is an Early Contractor Involvement road improvement scheme for the Welsh Government.

The existing substandard three lane carriageway will be replaced by 7.8 km of new dual carriageway. Approximately 5 km is off line with the remainder on line reconstruction.

The project includes eight bridges, three underpasses, six major retaining walls and a number of smaller drainage underpass structures. Over 900,000 cubic meters of earthworks are required of which 300,000 is in rock.

The site presents many challenges as it passes over the highest point of the Heads of the Valleys road adjacent to the Brecon Beacons National Park with a rich industrial heritage of coal and ironstone mining.

Carillion were awarded the contract in March 2010 to develop the design and publish Orders. A Public Local Inquiry was held to examine the orders in March 2012. Extensive local consultation resulted in only 14 objections, only three of which remained when the Inquiry opened. Eight letters of support were received. The Minister made the decision to proceed with construction in August 2012. Carillion will design and build the project completing in 2015 with ongoing environmental management until 2020.

Facts and figures

| SECTOR TYPE: | Infrastructure |
| LOCATION: | South Wales |
| CLIENT: | Welsh Government |
| PRINCIPAL CONTRACTOR: | Carillion |
| CONTRACTS DESIGNER: | Arup |
| CONTRACTORS ENVIRONMENTAL CONSULTANT: | TACP |
| CONTRACT VALUE: | KS 3 (Development) £4m |
| | KS 4 (Statutory Process) £2m |
| | KS 6 (Construction) £87m |
| | KS 4 Sept 2011 – Oct 2012 |

1) Construction Carbon (Replacing Viaduct with Embankment)

<table>
<thead>
<tr>
<th>CAPEX</th>
<th>Embodied Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional solution</td>
<td>£94m</td>
</tr>
<tr>
<td>Sustainable solution</td>
<td>£88m (-6%)</td>
</tr>
</tbody>
</table>

2) In Operation Junction Efficiency (Grade separating junctions)

<table>
<thead>
<tr>
<th>Operational Carbon (first 15 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional solution</td>
</tr>
<tr>
<td>Sustainable solution</td>
</tr>
</tbody>
</table>

3) Total carbon saving in context of first 60 years of service

<table>
<thead>
<tr>
<th>Whole Life Carbon (60 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional solution</td>
</tr>
<tr>
<td>Sustainable solution</td>
</tr>
</tbody>
</table>

The Green Construction Board

Establish baseline to measure performance against

This document was published on: 29/11/2012
The benefits (to the client and/or end user)

A whole-life carbon assessment identified carbon expenditure during construction and 60 years of operation to inform design development.

Construction Carbon

* Construction carbon emissions were estimated at 57,059 tonnes (t), 54,000t contained in the road pavement, steel and concrete structures. A structure crossing the Carno Valley contained 9,761t. An alternative reinforced earth embankment solution required 4,358t – a saving of 5,403t or 10% of the total construction carbon.

* The client’s scheme required off-site disposal of some 750,000m³ of earthworks. Detailed consideration of vertical alignment, junction provision and requirements for noise and visual mitigation reduced this to under 75,000 m³ – a client saving of £9m. Construction earthworks accounts for only 2000t or 4% of the total construction carbon. Already on site, earthworks are far more carbon-efficient than structures.

Operational Carbon

* The existing highway section has three ‘at grade’ junctions, requiring vehicles to stop and start, increasing emissions. Detailed traffic modelling, using VISSIM software, showed that grade separating the junctions would decrease emissions by 10% in the first year, saving 2,541t of carbon and 18,304t over the first 15 years. This reduction offsets about 35% of the construction carbon.

The process

The Carillion team invested in the initial Carbon Assessment to support design development and provide evidence for public consultation.

The report has provided a valuable learning opportunity for the team and helped provide evidence to support decision making and options appraisal.

The change to the Carno crossing, earthworks profile improvements and grade separation at junctions have all been taken forward into the final design. Measurement of actual carbon expenditure during the construction operation will be benchmarked against that predicted in the assessment.

Key learning points

Efficient construction will never recoup inefficient design

Steelwork, concrete and bituminous surfacing accounted for 80% of construction carbon. Meaningful savings need to be targeted in the design development.

User-efficiencies have greater impact than construction carbon gains

78% of the whole-life carbon cost comes from the road users. Design need to focus on long term savings, rather than short-term gains.

End user feedback

The Inspector at the Public Local Inquiry in his opening remarks said that “the evidence is clear and of excellent quality”, “the Environmental Statement quality is immaculate” and “it is all most commendable”.

For more information on The Green Construction Board visit www.greenconstructionboard.org or email gcb@bis.gsi.gov.uk
The M25 DBFO is a 30-year project to both widen the M25 to four lanes, predominately in the northern section, and to operate and maintain the project road. This includes the M25 orbital and a series of major feeder roads onto the M25 (spurs and tails), making up half the 400km length of the total project road. Connect Plus, a consortium of Skanska, Balfour Beatty, Atkins and EGIS Projects, was formed with to deliver these services on behalf of the Highways Agency.

The widening works spanned 63km of motorway between Junctions 16-23 and 27-30, to provide four lanes with hard shoulder, plus refurbishment of the Hatfield Tunnel on the A1(M). The works were completed in May 2012, three months ahead of schedule.

### Facts and figures

**SECTOR TYPE:** Infrastructure – roads  
**LOCATION:** Greater London  
**CLIENT:** Highways Agency  
**PRINCIPAL DESIGNER:** Atkins  
**PRINCIPAL CONTRACTOR:** JV Skanska/Balfour Beatty  
**CONTRACT VALUE:** £1.1bn

### Sheet Piles

<table>
<thead>
<tr>
<th></th>
<th>CAPEX</th>
<th>Embodied Carbon</th>
<th>Operational Carbon</th>
<th>WL Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>-</td>
<td>70,000 T/CO2e</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sustainable</td>
<td>-</td>
<td>15,000 T/CO2e &amp; 79%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Aggregates

<table>
<thead>
<tr>
<th></th>
<th>CAPEX</th>
<th>Embodied Carbon</th>
<th>Operational Carbon</th>
<th>WL Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>£38.4m</td>
<td>42,000 T/CO2e</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sustainable</td>
<td>£19.8m &amp; 48%</td>
<td>14,000 T/CO2e &amp; 65%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### The benefits

- **Better sheet piling to achieve lower CO2 emissions and improved safety**
  - Balfour Beatty's KingSheetPile (KSP™) system achieved double the normal piling output, taking retaining wall construction off the critical path
  - £10m savings from 30% reduction in steel usage and less installation time
  - 44,000-tonne CO$_2$e reduction and lower transport emissions through the use of sheet piles manufactured using 100%-recycled steel from Europe
  - Improved safety from quicker installation and less time working alongside M25
  - Virtually zero maintenance by using uncoated piles with sacrificial thickness

- **Recycled aggregate to reduce programme risk, CO2 emissions and costs**
  - Improved certainty of aggregate quantity and quality through on-site control of production, resulting in greatly reduced programme risk
  - 2.4 million tonnes of aggregate (around 92%) used was either recycled or from a secondary source, which reduced embodied energy and transport emissions
The benefits continued...

- Around £18m savings through use of recycled and secondary aggregates
- Reduced pavement thickness, achieved by matching existing construction rather than creating a fully flexible pavement by ‘crack and seat’. This saved around 400,000 tonnes of asphalt and reduced embodied carbon by 25,000t CO₂e
- Savings of £25m through overall reduction in material usage
- Trialling of system to provide dimming or completely switch off lighting depending on the volume of traffic using the motorway reduced electricity consumption by 25%
- Use of sustainable drainage to reduce complicated inline attenuation and reduce carbon emissions and costs
- Selective use of reduced pipe sizes and improved routing reduced earthworks by 90%

The process

**Sheet piles**
The widening of the M25 motorway required a significant quantity of retaining wall to be constructed. The team achieved an innovative, sustainable, solution by installing long piles interspersed with shorter intermediate piles. In combination with the sheet pile profile, this reduced the quantity of steel required by 30%. We sourced sheet piles fabricated in Luxembourg from 100% scrap steel in a highly efficient electric arc furnace. This resulted in a 75% saving in embodied CO₂ and reduced transport emissions compared with more traditional suppliers in China and Japan.

The shorter intermediate pile lengths allowed quicker installation, requiring less driving time and hence creating less emissions from the piling rig. Less time spent working adjacent to the live carriageway also provided obvious safety benefits.

By incorporating a small sacrificial thickness to the piles, the exposed faces required no initial treatment or ongoing maintenance.

**Recycled aggregate**
The team developed a materials strategy to maximise the use of recycled, secondary and manufactured aggregates, including the use of materials like glass, sand and incinerator bottom ash aggregate. This resulted in 35,000 tonnes of reduced CO₂e and approximately £18m in cost savings compared to primary aggregate.

Key learning points

Innovation in design and procurement of the major materials for the project has led to a reduced carbon footprint, reduced cost, increased programme security and benefits to safety.

End user feedback

“The Highways Agency was pleased to see the JV recognising innovation as a contributor to more sustainable development. The JV have approached the construction challenges intelligently and conscious of numerous sustainability aspects. Together, these have delivered efficient and effective solutions to the motorway widening without compromising the essential operational requirements. The keen awareness of costs, resource consumption, efficient production and transportation led to solutions which the Agency should seek to transfer to comparable locations were prudent and practical.”

Dean Kerwick-Chrisp, Sustainability, Equality and Diversity, Highways Agency

For more information on
The Green Construction Board
visit www.greenconstructionboard.org
or email gcb@bis.gsi.gov.uk
The proposed scheme included 61 km of 600 mm diameter pipe and an intermediate pumping station.

Anglian Water has set challenging project targets for reducing the capital costs by 19%, embodied CO2e by 50% and operational CO2e emissions by 20%. The project brief aligns with Anglian Water’s ‘Love Every Drop’ campaign, a leadership platform designed to highlight the importance water plays in all our lives.

In order to deliver the scheme against these demanding targets, extensive optioneering was undertaken using Anglian Water’s Risk and Value intervention process. The solution taken forward for implementation includes a 15.6 Ml/day pumping station and transfer pipeline from Covenham WTW to Boston. During a resilience event, the balance of 11.6 Ml/day

The benefits
The client will take delivery of a scheme that meets its defined objectives in terms of cost, programme and carbon targets by:

1. Utilising existing assets – up to 40% of the water will be transferred using the existing supply network, thereby reducing the size of the pipeline required from a 600 mm diameter to 450 mm diameter and reducing the size of the new pumping station.

2. Re-routing the pipeline - to design out the intermediate pumping station and save both capex and additional operating costs.

3. Using PE as the pipeline material. PE offers the overall lowest cost and embodied carbon solution. By transporting in 18m length, reduced the number of deliveries by c30% and also the number of joints programmed for the welding machine.

Facts and figures

| SECTOR TYPE: | Infrastructure - water |
| LOCATION:   | Lincolnshire           |
| CLIENT:     | Anglian Water          |
| PRINCIPAL CONTRACTOR: | JN Bentley |
| PRINCIPAL DESIGNER: | Mott MacDonald |
| PRINCIPAL ENGINEER: | Mott MacDonald |
| CONTRACT VALUE: | £40m |
| CONTRACT DURATION: | 33 Months |

| SECTOR TYPE: | Infrastructure - water |
| LOCATION:   | Lincolnshire           |
| CLIENT:     | Anglian Water          |
| PRINCIPAL CONTRACTOR: | JN Bentley |
| PRINCIPAL DESIGNER: | Mott MacDonald |
| PRINCIPAL ENGINEER: | Mott MacDonald |
| CONTRACT VALUE: | £40m |
| CONTRACT DURATION: | 33 Months |

<table>
<thead>
<tr>
<th>Traditional solution</th>
<th>CAPEX £(M)</th>
<th>Embodied Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£41.5</td>
<td>20.723 tC02e</td>
</tr>
<tr>
<td>Target</td>
<td>£33.6 (-19%)</td>
<td>10.361 (-50%) tC02e</td>
</tr>
<tr>
<td>Sustainable solution</td>
<td>£31.1 (-25%)</td>
<td>8.830 (-57%) tC02e</td>
</tr>
</tbody>
</table>

The Covenham to Boston pipeline is a scheme designed to address the future water needs of the town of Boston in Lincolnshire. There are two key drivers for the scheme, significant population growth and the need to ensure that customer’s supplies are resilient in the unlikely event of a major problem with the treatment works supplying the area.

As part of its 2010-2015 Asset Management Plan (AMP5) business plan Anglian Water’s identified the need for a new 27 Ml/day transfer scheme from Covenham WTW to Boston, comprising of 15.6 Ml/day due demand growth and 11.4 Ml/day to provide resilience.
4. Implementing a stepped pressure rating - the pipeline rating is designed to match the pressure profile; this reduces material usage and therefore saves both cost and carbon. The reduced welding time associated with this decrease in wall thickness saves further on carbon during construction.

5. Utilising excavated material as backfill along most of the pipeline route – and reworking the material for re-use in certain areas where site investigations indicate that natural material may be unsuitable reduces the environmental impact of importing and exporting material.

6. Developing standard products - for 108 air valves, 60 washouts along the route has resulted in a forecast capex saving of £450k and a reduction in embodied carbon of 1,770t (CO2e).

**Key learning points**

In preparing the Environmental Statement and Planning submission, a strong collaborative spirit between stakeholders – the environmental consultant, contractor, client, Environment Agency, IDB and third parties, including Parish Councils and the Local Planning Authorities – was essential to obtaining timely planning permission.

**End user feedback**

“The way the team forged a strong working relationship from the start of the project was exemplary in terms of collaboration. They worked within our risk and value intervention process, challenging scope and cost through the optioneering and detailed design stages to realise an efficiency in excess of 19% on cost and a carbon reduction in excess of our 50% target. Of particular note is the way the team formed a strong relationship with our operational colleagues, the ultimate end user.”

Anglian Water’s Special Project Management Team confirmed

---

**The benefits continued...**

**The process**

**Detailed network modelling and existing asset assessments during the optioneering stage released the opportunity to transfer 40% of the 27ML/day through existing assets, decreasing the scale of the new infrastructure required.**

Using specialist software (Civil 3D) to prepare pipeline plans and long sections allowed asset information to be stored such that the model – which will be handed to the client on completion – will be able to provide as built information in the future. The software allowed design changes to be undertaken efficiently and also has a clash detection facility which aided the design process and reduced the risk to the contractor.

The consultant’s ability to offer all required expertise – from structural designers to pipeline and process specialists to ecologists, archaeologists, hydrologists and town planners – ensured that the design, environmental and planning teams were able to work closely to deliver a timely economical submission. Early contractor involvement brought supply chain management to the forefront of all design decisions and resulted in efficiencies.

Public exhibitions informed the community early on in the project and major concerns were dealt with prior to submission of the planning application and environmental statement.

---

**For more information on**
The Green Construction Board
visit www.greenconstructionboard.org
or email gcb@bis.gsi.gov.uk
At Bedford Wastewater Treatment Works (WWTW) we are expanding our treatment capacity to the equivalent of an additional 30,000 population. Through minimising build and using new innovative technologies; installing high efficiency aeration and Integrated Film Activated Sludge (IFAS), refurbishing filters to more efficient operation, and replacing new primary settlement tanks with an alternative filter-based technology, the @one Alliance has risen to the challenge of low carbon, low cost and has provided Anglian Water with an industry leading sustainable solution.

Base-lined against our traditional solution, which would involve building a large aeration lane, two primary settlement tanks and four final settlement tanks, we delivered a 43% reduction in capital cost, a 66% reduction in embodied carbon, and a significant reduction in the site operating costs.

The new processes give more efficient oxygen transfer, and hold a higher concentration of effluent treatment than traditional methods meaning that we can treat greater effluent loads largely with existing structures at the works. This reduces the need for new buildings, reduces our embodied carbon and as the processes use less energy, lowers operating carbon emissions significantly. The modular nature of the design also allows for ease of maintenance and expansion through additional modules.

This project was referenced in the UK Government National Infrastructure Plan (2011) as an excellent case study of sustainable construction.
### Traditional solution
1. CAPEX (£M) 24.5
2. Emb Carbon (tCO2e) 7,938
3. Op Carbon (tCO2e/year) 1,100
4. WL Carbon (tCO2e) 51,938

### Target
5. CAPEX (£M) 19.6 (20%)
6. Emb Carbon (tCO2e) 3.969 (-50%)
7. Op Carbon (tCO2e/year) 800 (-20%)
8. WL Carbon (tCO2e) 39,169

### Sustainable solution
9. CAPEX (£M) 14 (-43%)
10. Emb Carbon (tCO2e) 2,683 (-66%)
11. Op Carbon (tCO2e/year) -790 (-170%)
12. WL Carbon (tCO2e) -28,917

### The process

**Major growth was forecast in the Bedford catchment, estimated at 30,000pe to the year 2021. On this basis the existing WWTW would exceed its design capacity by 2010. As part of the original mandate an extension was suggested to accommodate the additional load.**

With a process for measuring, managing and reducing carbon embedded into asset design, engineers clearly understood the goals of halving embodied carbon and reducing operational carbon by 20% by 2015 from a 2010 baseline. A bespoke carbon modelling tool is used to measure carbon impacts of individual designs and a robust governance process in place to challenge on carbon reduction.

A process peer review team was set up to determine routes to optimise operation of the existing Bedford WWTW plant and how feasible re-use of existing structures through a minimal/no build solution could be. If this was possible it would not only significantly reduce CAPEX but also embodied and operational carbon. With this in mind innovative solutions were sought to meet these challenges.

High efficiency aeration had been investigated prior to 2010, and shown to reduce operating costs for sewage treatment by 25-30%. A version of IFAS technology; that was new to the UK and designed to be used in combination with high efficiency aeration, was proposed and found to significantly increase the sewage treatment capacity of an existing aeration tank and provide a sustainable engineering solution. These systems at Bedford allow more bugs to be grown in the same working volume; hence mitigating the need to build an entirely new activated sludge plant.

### Key learning points
1. Targeting embodied carbon as well as cost early in the design gives opportunities for multiple project benefits.
2. Traditional technologies were introduced based on the best design practices at that time. Some can be optimised with updated technologies to boost efficiency of use, and reduce the need for new build.

### End user feedback

With innovative treatment processes being proposed, the importance of engagement and agreement with a number of internal stakeholders was recognised at an early stage in the project. With objectives agreed between the design engineers and operational staff, risk and value workshops were held early on in the process.

A positive response to the project was gained from operational teams due to early involvement in the design. This ‘buy-in’ was further cemented and concerns dispelled by teams travelling to Germany to see the treatment works where IFAS technology was being used.

For more information on The Green Construction Board visit www.greenconstructionboard.org or email gcb@bis.gsi.gov.uk
To mitigate against climate change and to provide sustainable water and wastewater services to a growing population, Anglian Water set some challenging goals to reduce both embodied and operational carbon.

A clear strategy of measuring, managing and reducing emissions required a range of carbon models to be developed and a tool for design engineers to identify and optioneer between low carbon solutions.

Through 2007-08 around a thousand carbon models were developed ranging from complex treatment processes, reinforced concrete tanks, HPPE mains, pumps, valves, etc. The models were created taking into account the carbon/energy required to extract and fabricate raw materials into products together with transport and installation on site.

As part of business planning and capital investment of more than £2bn in Anglian Water’s infrastructure between 2010 and 2015, the models were used to create an embodied carbon baseline for each individual scheme.

In 2008 a proactive in-house carbon modelling tool was developed and introduced, to allow Anglian Water and it’s delivery partner framework engineers to calculate embodied and operational carbon impacts of designs. The tool can be accessed via the internet and requires design engineers to select different items of equipment and process assets, building up the carbon impacts of proposed solutions.
With measurement and management of carbon now fully integrated into the delivery of all capital schemes we have strong evidence of the correlation between embodied carbon and capital expenditure and operational carbon and operational expenditure.

The reductions in embodied carbon through design not only save costs but also reduce the use of irreplaceable finite materials and help with the provision of more sustainable assets for the future.

Design engineers have risen to the challenge of reducing carbon in their designs, moving forward from the singular focus on cost and released from following standard designs. Key framework partners and suppliers have also been energised to deliver low carbon solutions. A number of sectors including the concrete industry have worked hard to improve the measurement of carbon impacts of their products.

By April 2012 Anglian Water had achieved a remarkable 32% reduction in embodied carbon, delivered through intelligent design against the 2010 baseline.

**The benefits**

- Predicted changes in weather patterns, rising sea levels and meeting the needs of a growing population has meant that Anglian Water is one of the most vulnerable UK water companies to be affected by climate change.

In responding to this challenge the company set two clear goals, firstly to halve the embodied carbon impact of assets built in 2015 from a 2010 baseline and secondly to reduce operational carbon by 10% in real terms by 2015 from a 2010 baseline.

Internal conferences on climate change and a number of awareness and training sessions were held between 2008 and 2010 to highlight why managing and reducing carbon is important to Anglian Water and how emissions could be reduced. Design engineers were encouraged to follow a hierarchal approach to emissions reduction through avoiding building assets, re-using existing assets, using alternative low carbon materials and building more efficiently.

In 2010 a robust governance process was put into place requiring all schemes to report embodied and operational carbon against the baseline on three separate occasions prior to work commencing on site.

The benefits of carbon reduction are being delivered through an understanding of the impacts of climate change and population growth, clear organisational goals, a carbon modelling tool to measure and manage emissions and a team of design engineers focussed and enabled to deliver reductions.

**The process**

1. Clear business drivers and goals are needed as to why reducing emissions is important.
2. Tools and a process are required to enable engineers to design out carbon.
3. Robust governance is required to reinforce the process and to measure and challenge carbon reductions.

**Key learning points**

- Design engineers using the modeller have not simply accepted the outputs of the carbon models. As awareness of embodied carbon has evolved through the organisation a greater degree of challenge has been demonstrated from both engineers and suppliers. This has resulted in models becoming more accurate over time.

**End user feedback**

For more information on The Green Construction Board visit www.greenconstructionboard.org or email gcb@bis.gsi.gov.uk
Balfour Beatty Civil Engineering was awarded the early contractor involvement (ECI) contract for the A421 scheme between the M1 and Bedford at the end of 2005.

Construction of the Highways Agency scheme started in early 2008, with the new road scheduled to open in December 2010. During the scheme, M1 Junction 13 has been remodelled and a 13 kilometre dual carriageway has been built linking the M1 with the existing ring road to South Bedford at the A6. Two new, grade-separated interchanges have been constructed. The £170m project also involved widening the bridges over the Bedford-Bletchley and Midland Mainline railway lines and building several smaller road and bridleway bridges. Following completion, the existing A421 will be de-trunked and become a local road serving the local communities.

Environmental innovations and the use of alternative materials were key to meeting the project’s requirements for 2 million m³ of fill material and 400,000 m² of surfacing in a cost effective way. Key features of the project are:

- Construction of the M1 Junction 13
- Grade separated junction at the eastern end tying into the new Bedford western bypass;
- Extensive planting along the entire route to screen the route from the adjacent countryside and housing
The project approach delivered significant environmental, community and financial benefits. First and foremost, the completion of the road provided a major community and road safety benefit to local residents by diverting traffic away from built up areas.

From an environmental perspective:

- 77,000 tonnes of embodied CO2e was avoided through design changes and materials substitution
- 400,000 car tyres were put to beneficial reuse as lightweight fill for embankments on the project
- 30,000 tonnes of glass sand (from recycled bottles) was used as bedding media for the drainage trenches, avoiding the need for traditional quarried sand for this application
- 450,000 tonnes of recycled aggregates were used in the build, including the asphalt surface, avoiding the need for traditional quarried materials
- 400,000 tonnes of pulverised fuel ash (a by-product from power stations) was diverted from landfill for use as an alternative lightweight and fill material on embankments. These material changes reduce the project costs by £3.8 million.

The project team used the Highways Agency’s carbon calculator developed by Parsons Brinckerhoff to establish the scheme’s carbon footprint and quantify the carbon benefits of design changes and materials substitution.

Designing out the need for certain structures avoids the embodied impacts of materials such as concrete, aggregates and steel. Replacing virgin aggregates and traditional fill materials with recycled aggregates and secondary materials or the by-products of other industries also reduces the embodied carbon impacts of the scheme.

This project demonstrated the value of Early Contractor Involvement in creating the time and impetus to identify design changes, material substitutions and other innovations to deliver a lower cost project with reduced environmental impacts. Use of a project carbon calculator helped the project team link carbon with material cost.

For more information on this project contact

Richard Gotheridge
Head of Environment & Sustainability
richard.gotheridge@bbcel.co.uk

For more information on The Green Construction Board visit www.greenconstructionboard.org or email gcb@bis.gsi.gov.uk
The increasing risk of global climate change and with the introduction of government legislations such as the UK Climate Change Act 2008 is steering and motivating businesses to seek best practice solutions to their carbon liabilities.

Establishing a verified carbon footprint through the Certified Emissions Measurement and Reduction Scheme (CEMARS) has allowed The Clancy Group to identify its key areas for carbon mitigation; as a utility engineering contractor the most significant CO2 source for the business is fuel consumption. With approximately 1400 vehicles across the Group, finding and implementing means to reduce fuel use has been at the heart of the challenge.

Actions taken so far to minimise fuel consumption within the business includes procuring new fuel efficient vehicles, utilising more efficient standard diesel fuel and improving our carbon accounting and reporting methodology for greater baseline accuracy.

Environmental aspects

- We have reduced CO2 emissions from fuel combustion by 757.4 tCO2 through continuous replacement of our vehicle fleet with more fuel efficient vehicles, utilising more efficient standard diesel fuel and improving our carbon accounting and reporting methodology for greater baseline accuracy.

Social aspects

- Apart from fuel efficient driving, our company occupational road awareness programme also encourages more responsible driving to ensure the wellbeing of the operator, the vehicle, the environment, and the community too. This programme has helped to create a culture of improved road awareness and unity within the business.

- We are a CO2 externally verified business, and work to increase Best Practice conformity within the utilities and construction industries by promoting CEMARS through the Achilles Information Ltd Steering Group. The business helps partners and clients standardise their own CO2 reporting and accounting via free transparency and communication of our own carbon impact management.

Economic aspects

- All company fuel innovations (fuel efficient vehicles, more efficient standard diesel from our fuel supplier, speed limiters, occupational road risk awareness programme, and vehicle trackers) has enabled the business to achieve a fuel saving 283,483.73 litres which equates approximately to £210k.
The process continued...

- Improved systems- a strategic level innovation where the old IT systems were updated to IFS (Industrial Financial Systems) - an enterprise resource planning (ERP) platform; an all encompassing computer system that allows communication between all internal departments. This allowed for improved data collation and accurate reporting of CO2 and fuel use.
- Maximising opportunities- continually sourcing for more fuel efficient vehicles and efficient standard fuel from suppliers at best value for money.
- Innovations- implementing and utilising speed limiters and vehicle trackers to enable more fuel efficient work scheduling.
- Organisational behavioural change- embedding road risk awareness and fuel efficient driving by delivering and implementing an occupational road risk programme known as Riskmaster across the business.

Key learning points

- Providing verified data that will efficiently and effectively meet client requirements for carbon emissions in a manner that will demonstrate that the company is managing the issue very seriously.
- Developing realistic plans and SMART reduction targets to achieve cost savings and improve efficiencies.

End user feedback

The Clancy Group have completed the Business in the Community's Corporate Responsibility Index for two years and have achieved a Bronze rating for 2012. This shows the public commitment of The Clancy Group to responsible business practice. Particularly impressive is the company's commitment to mitigating their impact on the environment. The group has made good progress in the areas of measurement and reporting, independent verification and reduction of emissions in absolute terms. This movement has positioned them above the index and sector average for the climate change impact area.

Blanca Palos Senior CR Index Manager Business in the Community

For more information on The Green Construction Board visit www.greenconstructionboard.org or email gcb@bis.gsi.gov.uk

The process

Carbon reductions cannot be achieved without establishing a measurable baseline; therefore, the first step for The Clancy Group was measuring its carbon total through a coordinated and best practice approach via the ‘carbonReduction’ programme- ‘CEMARS’. For the financial period of 1st April 2008 to 31st March 2009, the total GHG emission for The Clancy Group is 21,146.63 tonnes of CO2e, which equates to an emission intensity of 105.73 tonnes of CO2e per £1m turnover.

It was clear that Scope 1 emission sources were the most significant contributors with diesel comprising approximately 81% of the emission total. This enabled The Clancy Group to focus its efforts in reducing the most significant carbon source in its GHG Inventory- diesel. By concentrating reduction efforts on reducing fuel consumption, this will bring the added benefit of achieving potential cost savings and minimising the company’s most significant emissions. So far, the process in achieving our reductions was as follows:

- Board level leadership and commitment- company directors signed off on a realistic 10% reduction target in tonnes of CO2 per £1m turnover by a target date of the financial year end of 2012.
- Corporate strategy- the business made CO2 emission caps in the company car policy as a driver towards carbon reduction and compliance to CO2 emission regulations.
- Improved systems- a strategic level innovation where the old IT systems were updated to IFS (Industrial Financial Systems) - an enterprise resource planning (ERP) platform; an all encompassing computer system that allows communication between all internal departments. This allowed for improved data collation and accurate reporting of CO2 and fuel use.
- Maximising opportunities- continually sourcing for more fuel efficient vehicles and efficient standard fuel from suppliers at best value for money.
- Innovations- implementing and utilising speed limiters and vehicle trackers to enable more fuel efficient work scheduling.
- Organisational behavioural change- embedding road risk awareness and fuel efficient driving by delivering and implementing an occupational road risk programme known as Riskmaster across the business.