

Case Study

Customer:
Costain

Project:
A34 Oxford Bypass, Wolvercote

Solution:
Trimble R8 GNSS, Trimble VRS Now, Trimble S6 Robotic Total Station



A Night to Remember

Dean Bain, Survey Manager for Costain, explains how reliable surveying practices helped achieve Britain's longest bridge slide with the new Wolvercote Viaduct

In 1961 the Wolvercote viaduct was constructed to carry the A34 Oxford Bypass over the Oxford to Birmingham mainline railway, Oxford Canal and the A40 Oxford to Cheltenham road. Today the A34 remains a heavily used strategic route between the Midlands and the south coast with around 70,000 vehicles using the stretch of road every day. However, the intervening years have not been kind to the viaduct. Despite regular repairs, water leaking through the deck joints meant that the viaduct's condition had further deteriorated and any supplementary work would be difficult, expensive and disruptive to the traffic. The Highways Agency therefore decided that the best option would be to replace the viaduct and in February 2006 appointed Costain as the contractor.

Right from the start of this project, the Highways Agency stressed that current level traffic flows along the A34 had to be

maintained at all times and that any work undertaken had to have as small an impact as possible on residents, road users and the environment. The obvious answer would have been an off-line solution, however Costain was able to develop an online solution that would reduce environmental impact, invite greater public support and be economically viable.

From the day that we arrived on site in 2008, everything was geared towards March 2010 and the night of the big slide. It was therefore vital that we got the survey fundamentals spot on from the start. Whether we were undertaking the earthworks, setting out the embankments or monitoring the railway for Network Rail during piling operations, it was imperative that the instruments we used performed well in the period before the slide. This would ensure that our engineers and partners had total trust in our survey

▲ Costain surveyors using the S6 to position the slide tracks within the 5mm tolerance.

methods on the night of the slide when we would be monitoring the bridge throughout the process.

Our first decision was to contact Trimble's UK distributor, **KOREC**, and take up a Trimble VRS Now License for the site. A major advance in precision surveying

"Using the S6, we could prove that nothing was out of tolerance and Network Rail were fully reassured simultaneously."

productivity, Trimble VRS Now is a subscription service that provides instant access to RTK corrections throughout Great Britain. As a solution, it would enable us to achieve real-time cm

accuracy with our new Trimble R8 GNSS receiver, all without the cost and time consuming maintenance of a base station. The Wolvercote site really lent itself to this technology being open and having good Vodafone coverage to provide the required mobile connection.

Continued overleaf ►

Not only would VRS Now keep our costs down, but it would deliver the accuracy we required and provide us with a solution that was fast, easy to use and reliable.

We also purchased a Trimble Robotic S6 3' Total Station and TSC2 data loggers for this and our new R8. The S6 would be used for all our monitoring tasks, precision surveying, initial placing of control and for any work directly under the bridge if the GPS signal was ever compromised.

However, the real key for us was Trimble's Survey Controller software and in particular its data handling abilities. I was able to produce all my setting out data in a CAD format in the office and then once it had been approved, put it onto both of our TSC2's and set out the bridge directly from the dxf CAD file. This reduced the need for any on-site hand calculations and

open and on slide night, the road was shut for just 19 hours. Under the guidance of our Project Manager, Darren Dobson, eight huge hydraulic rams pushed the 5,000 tonne, 250m long bridge deck 16m horizontally from where we had constructed it on temporary piers alongside the A34 to become the new southbound carriageway and rest alongside the northbound carriageway which was finished last year.

During the slide we had settlement issues on the north abutment which required us to monitor it for movement throughout the slide process. We had full confidence in the Trimble S6 from our previous monitoring experiences and it didn't let us down on the night. As the bridge was pushed in 300mm stages, we fed back the monitoring information to our design team who approved that we were not out of tolerance



▲ S6 being used to reset the earthworks profile



▲ An aerial view of the old viaduct built in 1961

consequently reduced the possibility of any errors creeping in. Importantly, everyone, whether they were using GPS or optical surveying methods, were working from the same data and the same user interface. Basically we had a single data flow source for the whole site which simplified things greatly. The MOSS data handling for our road alignments was also excellent.

A major part of our work was to undertake various monitoring tasks using the Trimble S6. When piling near the railway, Network Rail required us to monitor the tracks for any movement. Using the S6, we could prove that nothing was out of tolerance and Network Rail were fully reassured and happy for us to continue.

These initial monitoring jobs were also the perfect build up for the monitoring tasks that we would undertake on the night of the slide. From the very first day we arrived on site, our focus was on the preparation for the slide night. For the whole period of work, we had managed to keep four lines of traffic

and allowed us to continue. The consistent results we achieved gave the design team the assurance they required and I have to say the S6 did a cracking job for us.

Once in its new online position, the expansion joints were reconnected, the bearings fixed and the road reopened at 3.15pm on the Sunday. The temporary piers which the southbound deck was built on have now been demolished, the ground landscaped and the whole project was completed in June, two months ahead of schedule.

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Contact us:

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For the Costain survey team, the highlight of this job has to be the perfect positioning of the eight tracks – one for each abutment. Using the S6 we could ensure that each track was parallel to within 10mm (independently checked) and this was just the result we needed to show that our survey techniques had been spot on from start to finish.

As a surveyor, it's very encouraging to see Costain going for jobs as technical and exciting as this one. Costain knows that its survey teams have the expertise required for projects of this type and that these teams are prepared to really make the most of the technological advances that we have recently witnessed in surveying instrumentation. This has been a fantastically interesting job to work on and the Highways Agency have announced that they are delighted at how well this project has gone - a real feather in Costain's cap. ■ ■ ■

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