

Road design rules

Two very different projects in the US underline the mainstream use of the road design packages from Bentley, Inroads in the first case and Geopak the second. Consultant Parsons Brinckerhoff has also made good use of its in-house project document portal system for the larger scheme.

This larger project is part of the I-69 project, a long-term long-distance addition to the interstate highway system to facilitate the trade connections established as part of NAFTA, the North American Free Trade Association. It will run 4,000km (2,700miles) from Mexico to the Canadian border.

The work in Indiana is being pushed through at an accelerated pace by the state government, as part of economic boosting to try and counter the impact of the 2008 banking and mortgage crisis. The downturn has hit construction particularly hard so measures to try and give the sector a stimulus are important. Originally an 88km section of the scheme was to be built over a five year period to 2015. "But the Governor here wants to see it all opened by 2012 cutting three years off the schedule," explained Edward Leonard, Parsons Brinckerhoff project manager for the scheme. With the contracts all running at once he suspects it will be the longest contiguous construction project in the states.

"The object of the project for us has been to expedite the design and letting of the contracts as fast as possible," he said. "That has meant getting the drawing and information prepared in just a 12-14 month long period and leaving two years of construction." Parsons was appointed in August 2009 and is just winding up the last of the contract documents.

The road design is not exceptionally complex for most of the alignment which runs primarily across plains land, now rural farmland. As a dual two-lane highway though, it abruptly enters some hills at one end. In addition there are some 90 bridges to deal with, "...and arrangements to sort out or move utilities from around 30 different companies," he said.

Biggest of the structures is a

Two US projects highlight the continuing importance of the mainstream road design software packages



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The new I-69 highway provides an important link that runs through the USA and will connect Canada with Mexico

1.5km long bridge over the Potoca River, the length made necessary by wildlife protection issues in the wetlands around the river. Doing everything quickly has meant some innovative engineering he said, achieved only by working in close cooperation with the Indiana State Department of Transportation, which he praised for its partnership approach.

The first job was to sort out environmental questions, which although studied by another consultant, had to be taken into the design work. Esri Arcview was used for the GIS work. There were also potentially difficult geotechnical questions. "The line runs across old mining areas and there are both shallow and deep workings on the route. The latter have mostly settled already but the shallow areas had to be handled," said Leonard. To deal with this issue, mechanical compaction has been used to force settlement.

Together with the DoT the consultant has had to find ways to speed up land acquisition, telescoping a normally 18 month or more process into 12 months. "We also had to sort out mineral resources and oil and gas rights," Leonard said.

Telescoping the original two years of design work into under 14 months also needed some organisation he said, "...drawing

on resources in various offices." Both other Parsons Brinckerhoff offices were tapped for support and additional resources from subconsultants. These were tied together by standardising on Bentley Inroads for the work, which the state also uses.

The various projects communicated then via Parsons' own Project Solve Two software which gives interoffice communication for documents and drawings via the web. Leonard said he was very pleased that the DoT took it on and quickly become familiar with it, "...because it was very important to have real time communication between all these sections if we were to hold this schedule."

That was helped too by a three month starting period, organised together with the DoT deputy commissioner of major program management Samuel Sarvis. Coming at the beginning of the project it allowed the potential issues arising in the scheme to be thought through and discussed at a series of joint meetings. "Then we went into 'production mode,'" said Leonard.

During the 14 months the entire series of contracts have been completed and let bar a couple still waiting. "The idea was to try and space them every couple of months to give bid losers the chance to prepare for the next round. We also did the

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Edward Leonard, Project manager, Parsons Brinckerhoff

packages in a variety of large and small sections from US\$50 million to \$100 million and to try and spread the work in the state. Some were straight bid contracts and others design-build for the same reason," explained Leonard.

The industry benefits of the accelerated work have also bounced back on the state, since the bids coming in are around 25% under levels in past times said Leonard, "...saving money for the taxpayers." And the work has drawn attention from other states he adds, keen to see how it was done.

Meanwhile in Nebraska Bentley's other road tool, Geopak, has been providing the designs for a regeneration of the state capital centre. The city of Lincoln has suffered from costly flooding for many years as urban sprawl has paved over the watershed. A decade ago it began a major scheme, the Antelope Valley project in conjunction with the Corp of Engineers and the important Lincoln University, to deal with the issue. The same scheme has included a restructuring of some 10km of arterial routes through the city, with design and coordination being carried out by Parsons Brinckerhoff.

The dual three lane roads form a cross shape through the city and include a dozen significant bridges across the Antelope Creek, and equally importantly a major railway corridor run by the Burlington Northern Santa Fe railway. The largest structure on the project is here, a 420m long welded plate girder bridge to cross a four track width of the rail corridor

Its steel sections weigh up to 240tonnes and were lifted in by 500tonne mobile cranes, the largest lifts seen in the state. The team practised the lift several times in advance, according to Parsons Brinckerhoff's project leader. The bridge has an S shape on plan and was a complex design since its central 30m straddle beam was fracture critical. The job's difficulties have included tight constraints on the available working space for the road construction limited in places by the railroad and the creek or by the large university campus which dominates much of the inner city.

Most of the \$270 million scheme is now complete though a remaining 2km section of the north-south arterial road is just starting. ■

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Above: The Antelope valley project provides a key route through the state of Nebraska

Below: Lifting in the beams for the new Antelope valley bridge crossing was a tricky job and the on-site team practised beforehand to make sure the work could be carried out correctly

