

# Design review adds value to Dublin orbital upgrade

Redesign of junction upgrades has involved substantial engineering input but added value overall to the M50 widening scheme around Dublin.

Current work to upgrade 23km of Ireland's busiest motorway, Dublin's semi circular M50 ring road, "illustrates the best of design and build", according to Atkins highways director Jack Sheehan. The road carries around 100,000 vehicles each day and is being upgraded through a Public Private Partnership (PPP) project which has benefited from review and redesign of key junctions.

The scheme has also profited from some engineering foresight applied when the M50 was built in the 1990s. A wide central reserve was built structurally equal to the road's running lanes, allowing conversion of the M50 from dual two lane to three lanes in both directions by simply narrowing the central reserve. The majority of engineering input has gone into reconfiguring junctions connecting the M50 with roads in and out of Dublin.

At three major interchanges with the M1, N2 and N3, capacity is being increased with construction of new links to allow free flow traffic between the M50 and radial roads without the necessity of using signalled roundabouts. A total of 21 new bridges are being built of various design including steel box girder structures at the N3 junction and curved steel composite bridges at the junction with the M1.

These are part of new elevated circular link roads for free flow traffic between the M50 and M1 towards Dublin and the city's airport. The new link roads encircle the existing roundabout which is now reserved for connecting with the relatively minor N32 road to the east (see picture, right).

Equally if not more complex are the N2 and N3 interchanges. These have been the main subjects of Atkins' 'value engineering' exercise for the firm's client M50 Design & Construct, the contracting arm of the Spanish-Irish M50 PPP concessionaire (see box, page 22).

"The National Roads Authority's (NRA) original design of the N2 junction was for



The newly expanded M50/M1 interchange: Curved steel composite structures carry new free flow links

partial free flow with signals on the grade separated roundabout. We changed this to full separation and free flow, removing the roundabout altogether," says Atkins project manager Richard Neuling.

The N2 interchange is being enlarged

with widened underbridges and both large and tight radius free flow links (see plan, page 22). "This design has added capital cost but has the advantage of greater capacity and potentially less congestion. Analysis proved the benefit is worth >

> more than the extra cost of building the junction," Mr Neuling says.

At the N3 interchange at Castleknock the existing elevated roundabout will remain in place for some movements of traffic between the M50, N3 and local roads, but with additional links to allow N3 traffic to cross over or join the M50 in free flow. The same principle underlined the NRA's initial design. But this had a two way link between the N3 to the north west and M50 to the south crossing beneath a railway and canal through a series of structures, including a concrete box to be jacked under the railway.

The new design has raised this link to cross over the railway and canal on a 155m long, five span concrete viaduct; a change which also precluded a 270° loop – "not a very desirable solution", says Mr Neuling.

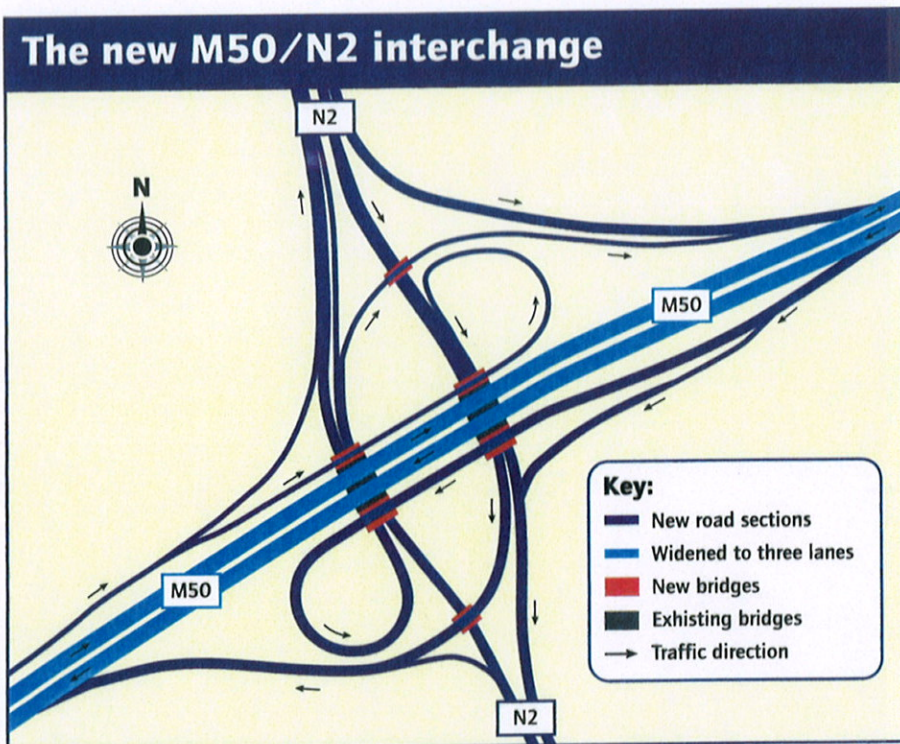
"The risks were high with the original design. Ground conditions are difficult for a box jack as rock is close to the surface. Night time work breaking out rock beneath a railway presented too much risk whereas the new design is much easier to build and has simplified traffic movements."

The trade off returned Atkins to the planning process with a modified N3 interchange design and potentially a significant delay. Eventually this proved a risk worth taking.

The viaduct solution was supported by NRA and preferred by Irish Rail and Waterways. Construction of the eastern half of the N3 interchange was delayed by eight months but M50 D&C could progress work elsewhere. The overall project remains on programme for completion in October 2010, Mr Neuling says.

"Elevating the link road was not visually significant in the context of the area and the rest of the junction. The main impact was noise but this has been mitigated with noise barriers integral to bridge parapets and further barriers on the N3," says Mr Neuling.

With such involving design work and demands on resources Atkins has employed a team of 150 engineers across 14 offices. The firm has also had to adjust to working with the Spanish contractors Fomento de Construcciones y Contratas (FCC) and Sacyr Vallehermoso. "We had to be very flexible as both FCC and Sacyr are very strong in design terms," Mr Neuling says. "The key to working for them was to work as a team to get practical, buildable designs."



The M50/N3 interchange: A viaduct is being built (bottom of picture) where a tunnel was planned

## Partners paid for keeping lanes available

A Spanish-Irish consortium of Globalvia, Sacyr Vallehermoso (SyV) and PJ Hegarty is delivering the M50 Design, Build, Finance & Operate (DBFO) project for the National Roads Authority through a 35 year concession, including operation and maintenance of 42km of M50. The £220M upgrade construction contract is being carried out by M50 Design & Construct, a joint venture of PJ Hegarty, SyV and Fomento de Construcciones y Contratas.

The M50 DBFO is the only one of NRA's

half a dozen Public Private Partnership road projects being repaid on the basis of lane availability instead of from physically collected tolls. The M50 has a tolled section between the N3 and N4 sections remaining from the toll levied for using the River Liffey crossing, but the toll gates were removed in 2008 and a barrier free system installed with number plate recognition technology. This is entirely separate from the M50 widening repayment mechanism.