Like a giant python, it snakes high above Auckland’s Newmarket. Awesome, perhaps intrusive to the businesses and sports facilities below, the Newmarket viaduct is a vital link for 120,000 vehicles a day.
The 46-year-old structure is currently being replaced with a slightly wider and higher viaduct, built at the same time as the old one is being torn down, while the rush hour traffic keeps moving – most of the time. All pretty challenging, but why did the NZ Transport Agency (NZTA) decide to knock down the old viaduct? And what are the challenges with tearing it down in a safe manner, while allowing people to get to work?

The NZTA did consider adding a lane to each side of the existing structure, but its study found that the cost savings of keeping the old one were just 15 per cent, or $32 million out of $215 million.

Minimising risk from earthquakes and accidents was also a key factor in the decision to replace, rather than rebuild, despite Auckland’s low earthquake risk. A 1995 report for the Auckland Regional Council describes Auckland as “one of the lowest earthquake activity places in New Zealand”. In fact there has only been one earthquake causing significant damage during the past 150 years. The report states that the most likely danger point is far from town – like Beachlands and Orewa.

Having said that, the old viaduct would have been damaged by a once-in-200-years quake and Auckland had a noticeable shake up as recently as early 2007. Aucklanders can expect an earthquake of over six on the Modified Mercalli (MM) scale every 90 years and a MM7 quake every 650 years, the report says. An MM7 quake is serious stuff, damaging but not destructive. You have to stop your car and people are shaken off their feet. An MM6 might shake over an old chimney or two.

The new viaduct is rated for dealing with a once-in-2,500-years seismic event, an improvement of two orders of magnitude. It is designed to “resist larger forces and react in a much more ductile way,” says Tommy Parker, the NZTA’s State Highway Manager, Auckland and Northern, than was possible with the 1950s design. He says that the strength will be “achieved by proper detailing of the reinforcing bars in the concrete piers”.

But earthquake protection was just one factor among several in the decision to replace, rather than upgrade. Overloaded trucks are banned from the current viaduct, because they shake it to pieces. A truck crashed through the steel handrail in 2006 and the lack of room hinders emergency vehicles. More than the odd piece of debris flies off onto buildings alongside. The viaduct is also noisy – traffic can allegedly be heard five kilometres away at Mission Bay at night. It also gets hotter than was expected – expansion and contraction has caused wear and tear and has reduced the viaduct’s strength. In part, the heat issue has been alleviated with light-coloured chip – now hard to source.

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But thanks partly to a new sound-absorbing asphalt, a noise wall on one section and solid concrete barriers instead of today’s steel ones, the new viaduct should be quieter and more neighbour-friendly. Less stuff should fall off the sides.

There are four main stages in the project. First is the construction of the southbound lanes, second is dismantling the old southbound lanes alongside, third is building the new northbound lanes and fourthly, the demolition of the old northbound lanes. The new southbound lanes will be completed in 2011 and the replacement northbound lanes by 2013. Construction on the fourth southbound lane from Market Road, at the viaduct’s southern end to Greenlane, has already begun.

A consortium was formed for the project, called NGA Newmarket. It comprises the NZTA, Leighton Contractors, Beca, Fulton Hogan, URS New Zealand, Tonkin & Taylor, and Boffa Miskell.

The viaduct is New Zealand’s busiest section of motorway, so being without six lanes for four years was unthinkable. The consortium says at least three lanes will always be open and the major roads of Broadway and Gillies Avenue will be kept open during rush hours, although they will be closed when a huge gantry crane moves across the roads. It’s not surprising you can see workers doing the midnight shift.

Dismantling an old viaduct is a massive and tricky operation, accounting for one fifth of the project's total cost. A huge gantry crane will disassemble the old viaduct piece by piece, and should make the dismantling process somewhat less challenging.

The gantry – relocated from the new toll road north of Auckland – will be a key part to both demolition and construction. The 650-tonne beast, spanning 140 metres, will be used to lift pre-cast components of up to 70 tonnes apiece, some 20 metres up. Once the initial sections are cemented in place, the gantry will be able to lift up everything else in place, effectively building the whole viaduct by cantilever. The first sections are being lifted in place with a traditional crane. It is planned that the gantry will be in operation by late January.

Like the new viaduct, the old one is actually two separate structures strapped together. Removing this strapping will weaken the structure and the gantry crane is a very heavy piece of equipment strapped to one side. So the two old structures are being heavily braced before dismantling occurs. This should reduce the risk of damage from earthquakes during the process to a once-in-500-years event.

The Newmarket viaduct replacement has been controversial from the start. The new viaduct will have just one more lane than the old one. Why not make it eight lanes, many have asked?

The structure will in fact have room for eight lanes, but will be limited to seven lanes, for the foreseeable future. That means an extra southbound lane, but only three going north.

Improving Spaghetti Junction has always been challenging. At the northern end of the viaduct, two schools are right up against a bull-rush of motorway off-ramps and onramps. And at one point the northern side is just three lanes wide. The NZTA has decided not to widen this part yet, although there would appear to be room.