



**Newmarket Viaduct**  
 – delivery of design solution to  
 counter thermo-reflective issues

“Work was undertaken on one of the busiest sections of the motorway, with 150,000 VPD making this one of New Zealand’s most critical pieces of roading infrastructure.”

“The development of ‘blonde asphalt’ as a solution for the Newmarket Viaduct, mitigated temperature stresses allowing for an extended design life for the Viaduct.”

CLIENT NZ Transport Authority (Transit NZ)  
 CONSULTANT OPUS International Consultants Ltd



Analyse | Solve | Construct



Research | Design | Analysis



Recycle | Produce | Aggregate

## Refining the concept design to create a blonde asphalt was crucial to success

The proposed concept design for the asphaltic concrete needed refinement and to achieve this, a purpose designed clear binder was developed. A clear bitumen ('Blonde bitumen') was also sourced and a dye was added to make sure the final material was all white in colour to maximise the reflective qualities of dacite.

In order to manufacture the blonde asphalt, a portable hotmix plant had to be steam cleaned and all plant, trucks and storage tanks had to be free of any black bitumen residue.

As well as the logistics of the manufacturing process being difficult, access to the viaduct site to mill out the chipseal and lay the hotmix was challenging, with the motorway having to be closed to traffic overnight.

**Unintended design side effects meant absorption of sunlight on viaduct deck was destroying it**

The Newmarket Viaduct was the first bridge in New Zealand to use a pre-stressed continuous box-girder design (a method for overcoming concrete's natural weakness in tension), Freyssinet (prestressed) concrete hinges at the base and cantilever construction techniques.

Despite utilising a groundbreaking design at the time the viaduct has a shortened design-life because temperature effects were not fully realised in the first design; the existing viaduct being subject to very high stresses resulting from temperature variations.

The traditional black chipseal surface attracted heat, with a high level of thermo-reflectivity resulting in more heat retention and significant structural stresses and movement. To extend the life of the bridge an alternative sealing solution was sought to mitigate against this scenario.

An asphaltic concrete mix design was developed utilising white dacite as a base material to reduce levels of thermo-reflectivity. The dacite, as a material would reflect light.

There was a hitch though, in order to source this aggregate a quarry in Northland had to be specially re-opened, stone blasted and crushed to create chip for asphalt paving.



The resultant blonde asphalt solution developed was very successful, reducing levels of light reflectivity, ultimately achieving the desired outcome of extending the lifespan of the viaduct.

This was recognised as a challenging project and a significant achievement with Blacktop Construction winning the **Goughs Regional Supreme Award 2006** for its work on the State Highway 1 Newmarket Viaduct resurfacing contract.

