Client
New Zealand Transport Agency.

Project overview
Auckland’s Waterview Connection is the largest and most ambitious motorway project ever undertaken in New Zealand.

Due for completion in early 2017, it’s a large-scale, high-risk and complex project that will provide an alternative major transportation route that circumvents the congested Auckland motorway network.

This major infrastructure project will provide a new five kilometre stretch of multi-lane motorway 2.5 kilometres of which is underground and an upgraded interchange.

The project involved construction of twin tunnels (using the largest tunnel boring machine in the Southern Hemisphere), four major motorway interchange viaducts, motorway bridges, multiple retention structures and significant secondary infrastructure including rehabilitation of an urban watercourse and multiple community-based facilities.

Tonkin + Taylor (T+T) is a Non-Owner Participant (NOP) of the Well Connected Alliance (WCA) which is delivering the project.

Project challenges
Tunnelling - the project is located in the centre of suburban Auckland meaning the tunnel alignment passes beneath suburban rail, commercial and residential buildings through volcanic soils and reclaimed land.

The tunnelling activity was directly beneath a multi-lane arterial route with live traffic and significant buried services.

Twin 14.5m diameter tunnels were constructed using the world’s 10th largest tunnel boring machine (TBM) that was specifically designed and manufactured for the project.

There are 15 mined cross-passages between the main TBM tunnels with retained approaches up to 30m deep at each end.

Traffic flows - the project connects to an existing multi-lane state highway interchange and one of the city’s busiest suburban roads.

The five year project is almost complete and has been successfully and safely constructed while minimising disruption to one of New Zealand’s busiest sections of motorway.

Environmental - an ecologically sensitive watercourse, which ran through the northern tunnel area, had to be relocated.

The proposed positioning of tunnel ventilation emission location affected a neighbouring primary school.
Expertise and services provided by T+T
T+T provided a range of consulting services - the most significant being design expertise across key aspects of the project including engineering geology, geotechnical, civil, hydrology, stormwater, ecology, environmental management and construction observation.

In addition to our core engineering work, T+T has a range of specialist services and skills that have been utilised on the project and identified as key elements to the project’s success. They include the development and supply of all core IT systems and the Alliance Culture Manager who has had responsibility for ensuring high performance of the Alliance team, since inception in 2011.

T+T’s key contributions to the project include:
- Being a Non-Owner Participant (NOP)
- Design management for the delivery of all civil and geotechnical components
- Civil engineering design including roadworks, utilities, motorway network drainage and stormwater treatment design
- Geotechnical interpretation of ground conditions along the entire project route
- Geotechnical design for retention works, earthworks, tunnelling, bridge and building foundations, slope stabilisation and instrumentation and monitoring works
- Hydrological modelling and streamworks design
- Structural design lead for the major retention works
- Monitoring and mitigation of tunnelling effects
- Construction phase support and quality assurance for above ground and tunnelling works
- Planning and Ecology expertise to manage and protect flora and fauna
- Assisted in finalising the position of the tunnel ventilation discharge
- Ground contamination assessment and management
- Erosion and sediment control design and construction support
- IT infrastructure design, setup and ongoing technical and helpdesk support
- Electronic document management system for all project documentation using T+T’s unique data solution portal, ProjectOrbit
- Alliance culture management.

Innovation and value engineering
The design provided an ideal opportunity to develop smart solutions allowing cost reductions on the project. Some of the major opportunities realised in which T+T played a key part included:

- Relocating stormwater pipes within the tunnelling system, saving $NZD 2.3M
- Removing cement stabilisation from the tunnel backfill material, saving $NZD 1.9M
- Changing retaining walls from double-piled to soil-nailed walls, saving $NZD 1.8M
- Reducing tunnel lining thickness due to optimisation of ground parameters, saving $NZD 1.7M
- Various other geotechnical and structural designs, saving $NZD 1.7M.

In total, the Alliance generated savings of $NZD 36M through value engineering and innovations, of which, T+T was a significant contributor.