Leica Geosystems TruStory
Connecting through monitoring

Once a major infrastructure project is completed, engineers need to monitor for movement. This is to ensure that movement or settlement occurs within expected tolerance levels, ensuring the safety of motorists and others.

For the South Road Superway project it was particularly important to analyse differential settlements, or deformation occurring at a faster or slower pace on the infrastructure. These positional changes if unchecked could eventually lead to a step in the road. Any deformation of the road surface can lead to rapid deterioration of the asset, which in turn means costly repairs and required resurfacing. This puts additional pressure on the project's budget and can impair its profitability.

When the South Road Superway in South Australia was completed, the joint venture was tasked with this important monitoring project:

- John Holland, leading contractor and service operator for Australia, New Zealand and South East Asia
- LEED Civil & Engineering, specialists of complex infrastructures projects

Some facts about the South Road Superway project:

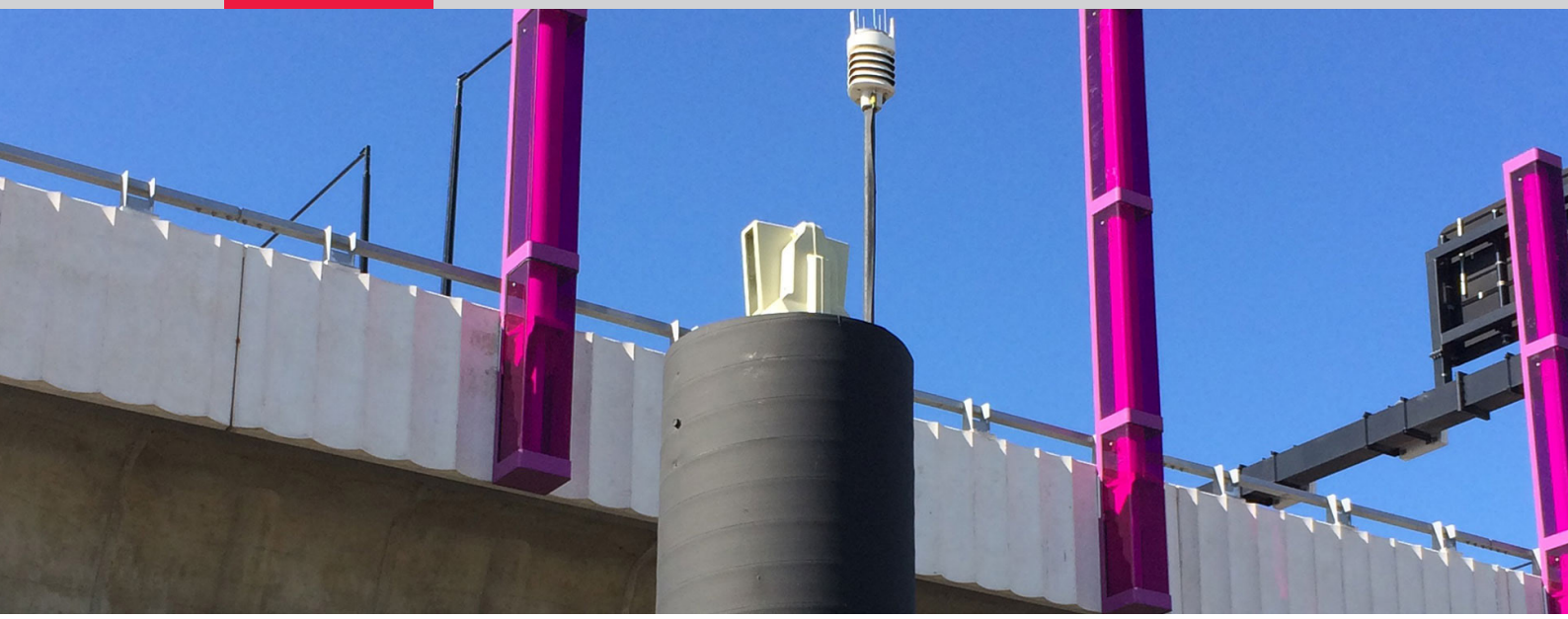
- 4.8 kilometre major road corridor
- Non-stop connection between the northern and southern parts of the South Australian capital city of Adelaide.
- Project cost $812 million AUD
- Now known as part of the North South Motorway
- Included 2.8 km of elevated roadway over the original South Road, which is the longest and largest single investment in South Australia's history
- Supports up to 6 lanes of traffic for the 1.3 million residents of the capital city

Although often thought of as static, engineering structures are continually in a state of motion. Consider the several elements that stress a structure on a daily basis:

- John Holland, leading contractor and service operator for Australia, New Zealand and South East Asia
- LEED Civil & Engineering, specialists of complex infrastructures projects

Some facts about the South Road Superway project:

- Expansion and contraction caused by temperature change
- Differential heating effects caused by the movement of the sun across a structure
- Wind loading
- Ocean loading and earth tides caused by daily tidal movements
- Vehicular traffic loading



All of this combines to produce constant movement in a structure. Such movements are typically small and occur slowly over the cause of a day. It is critical, therefore, to understanding the structures' behaviour that monitoring is conducted automatically and frequently so that these changes can be tracked.

The striking design of the South Road Superway, with its unusual curved piers, complex geometry, and size presented some challenging measurement tasks.

C. R. Kennedy, the largest surveying solutions supplier in Australia, was able to supply and consult the combined venture as to the best solution for this long-term monitoring project. C.R. Kennedy recommended Leica GeoMoS monitoring software and hardware:

- GeoMos Monitor
- GeoMos Option 1 (Computations)
- GeoMos Option 2 (Limit checks & Messaging)
- GeoMos Analyser
- 230x GeoMos Sensor Licences
- 5x TM50 Total Stations
- 2x TS15 Total Stations
- 7x Instrument environmental housings
- 2x Vaisala weather stations
- 7x Modems
- 7x Power supply/UPS systems
- 290x Prisms

Real-time monitoring for safety The Leica GeoMos automated monitoring system continues to monitor structural movements 24/7 delivering the data required to analyse the structures behaviour and ensuring the safety of road users.

"We recommended Leica GeoMos and total stations because we've used them in many other projects around the country with excellent results," Richard Ingham, C.R. Kennedy Survey Division New South Wales state manager. "With the real-time ability to alert engineers to any changes and the high-precision data collected by the Leica Geosystems total stations, this was a perfect fit for the super highway project."

Monitoring is to be conducted for a minimum period of 7 years to ensure that the structure 'settles down' and any movement remains within expected levels.

GeoMoS software manages the data collected by the total stations of the bridge's dramatically curved piers. These piers support the bridge deck, or road, and have finger joints built into the expansion joints of the articulated deck. These joints enable the needed expansion of the bridge in order to accommodate the forces and stresses caused by the usage and environmental factors.

Levels on either side of the joints are monitored with particular care because if settlement happens at different rates, a step in the roadway can occur. If any positioning data collected by GeoMoS should exceed the set tolerance levels, the software will send out an alert in real time to the project management, alerting them that limits have been reached. This level of information allows action to be taken avoiding any costly repairs or long term damage to the structure.

GeoMos is able to use 'virtual sensors' (calculations) to derive key performance indicators on the project, such as pier rotations needle beams deflections and separations. These 'derived' "Using Leica GeoMoS, we're seamlessly processing and managing the data collected by the total stations. The software is automatically delivering us information on the roadway piers, around-the-clock," said Stephen Singline from John Holland. "We receive reports that are easily understandable, and we can even customise the graphs and visuals for what we need. This informs our decision making processes with the most current and reliable data available.

Long-term analysis reports can also be used to improve design of infrastructure in the future and also help improve construction practices.

Leica Geosystems AG
leica-geosystems.com

- when it has to be **right**