

# State Highway 16 Causeway Project



The eight-span Whau River Bridge, at the western end of the causeway, and the five-span Causeway Bridge, further east, are strategically significant to the city of Auckland. The bridges traverse an environmentally sensitive coastal marine reserve and carry on average 90,000 vehicles per day. The original structures were built in the 1950s and 1960s.

Location  
**Auckland, New Zealand**

Client  
**NZ Transport Agency and Causeway Alliance**

Completed  
**2017**

Structure  
**Bridges**



## The Problem Identified

Extensive assessment identified that the bridge piles were exhibiting differing levels of deterioration ranging from cracking and delamination to spalling and section loss. Cover to the reinforcement and chloride content varied significantly depending on pile type and age of construction.

Overall, the results of the investigations indicated that the observed deterioration was due to chloride induced corrosion.



## The Solution Developed

A DuoGuard hybrid anode system was proposed to halt ongoing corrosion and prevent further damage to the contaminated bridge piles. Each bridge pile was zoned according to its environmental exposure to create 3 distinct zones: tidal, splash and atmospheric.

DuoGuard anodes were installed into drilled holes in the concrete and connected in series using titanium wire recessed into saw cuts. Using an external power source, an impressed current was applied to stop active corrosion and render the steel passive. The anodes were then disconnected from the power source and left in place to self-generate a galvanic current, sufficient to maintain steel passivity and control corrosion.

A bespoke monitoring system was included in the design to allow the performance of the corrosion control system to be checked and supervised.



The structural problem identified



DuoGuard installation prior to infilling holes and saw cuts

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## The Benefits Provided

Corrosion related deterioration of the Whau and Causeway Bridges has been halted. Following the application of a brief current electrochemical treatment, corrosion rates have remained at low levels. After the initial power up period, using an external power source, the DuoGuard system is self-powered thus minimising future maintenance requirements and associated life costs.

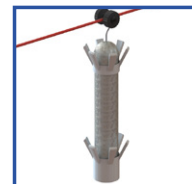
The Highway 16 Causeway Project contract required a 50 year service life extension. The cost of completely replacing the existing bridges, which had not yet reached the end of their service life, would have been substantially more expensive and replacement would have also caused significant disruption in an environmentally sensitive coastal marine reserve.

DuoGuard hybrid anodes provide long-term corrosion protection of reinforced concrete elements and are a practical alternative to traditional electrochemical treatments. The anodes are well suited to installation in areas of constrained access such as marine structures, subject to the cyclic variation of tides, and offer a substantially reduced residual risk against hydrogen embrittlement for the protection of prestressed concrete elements.



Highway 16 Whau River Bridge

## CPT Products Used



DuoGuard™  
Anodes



DuoCrete  
SD Mortar



Certificate Number 10159  
ISO 9001, ISO 14001