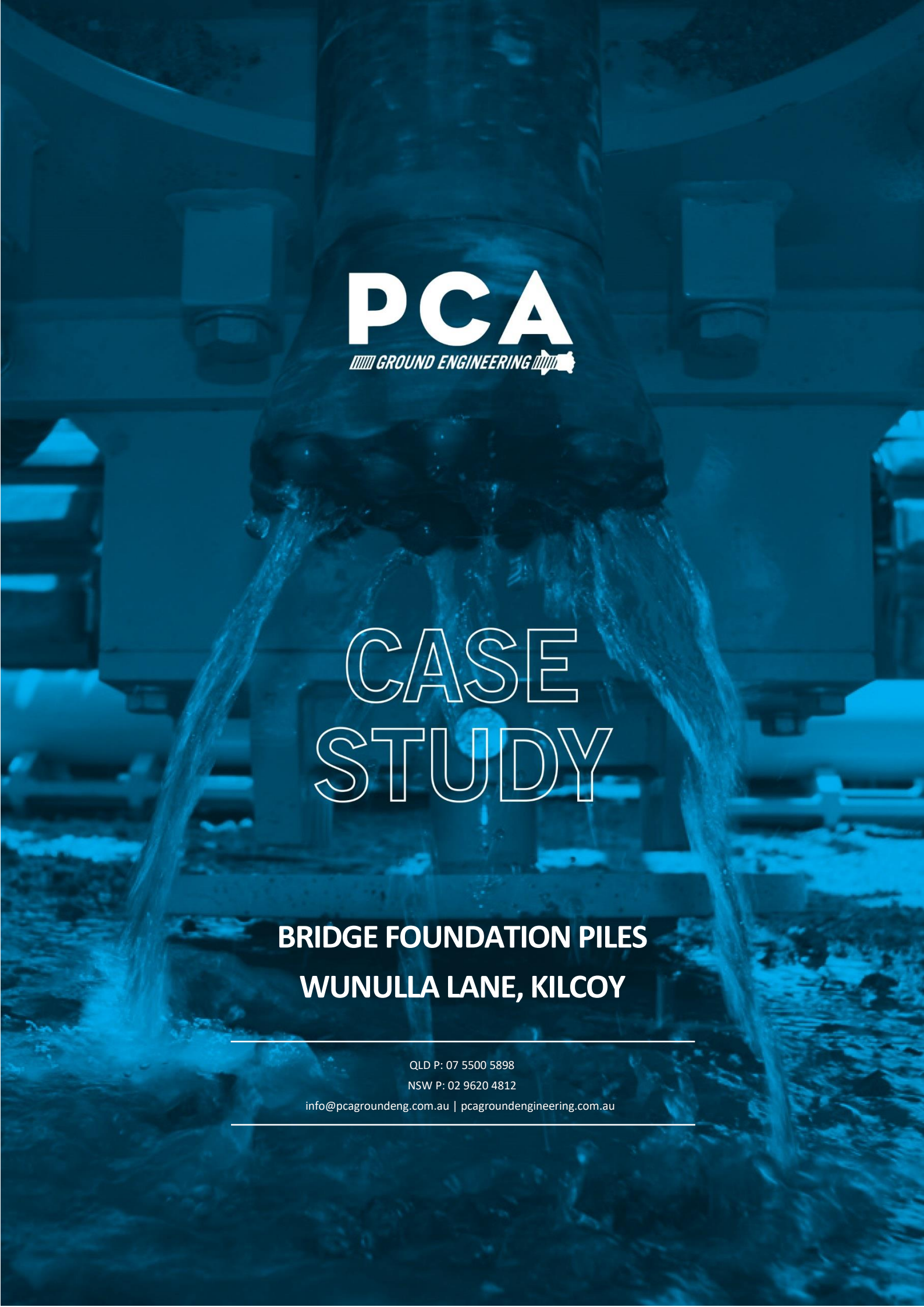


PCA

GROUND ENGINEERING

CASE STUDY

BRIDGE FOUNDATION PILES

WUNULLA LANE, KILCOY

QLD P: 07 5500 5898

NSW P: 02 9620 4812

info@pcagroundeng.com.au | pcagroundengineering.com.au

CASE STUDY

PCA GROUND ENGINEERING

SHOTCRETING I EARTH RETENTION I PILING I GROUTING I ENGINEERING GROUND IMPROVEMENT I CIVIL CONSTRUCTION

PROJECT TYPE:	**MICROPILED FOUNDATION FOR SINGLE SPAN BRIDGE**
CLIENT:	**SOMERSET REGIONAL COUNCIL**
MAIN CONTRACTORS:	**ARK CONSTRUCTION GROUP**
PROJECT ENGINEERS:	**PCA (MICROPILE FOUNDATION)**

PROJECT DESCRIPTION AND CHALLENGES

The new bridge spanning Kilcoy Creek at Wunulla Lane was part of the 2013 NDRRA flood restoration program to replace the old timber bridge washed away during the 2013 floods.

Although only a single span bridge in a rural setting, the new bridge was required to withstand flood velocities of up to 4m/s and a two tonne log impact up to 2m from the flood surface. Scour was also of concern for up to a 1 in 100 flood event along with the added pressure of a debris mat during flood events up to 3m depth acting on the bridge superstructure or the piers.

The geotechnical profile indicated the presence of fresh crystalline Granodiorite rock beneath layers of loose saturated sands which were up to 8m below ground level. The high water table in conjunction with the layers of loose sand excluded the use of open hole bored piles and the underlying fresh rock was identified in the geotechnical report as potentially making the installation of steel liners and rock sockets for traditional bored piles “difficult” and “slow”.

Adding to the complexity of the project was the location of power lines directly adjacent to the site which precluded the use of large, tall masted piling rigs.

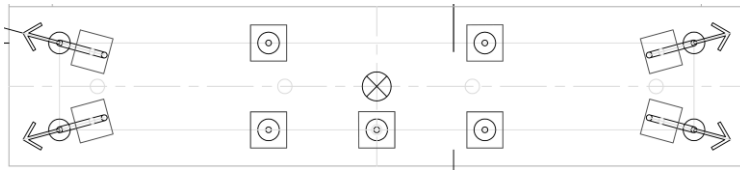
THE SOLUTION

High capacity grout injected micropiles with permanent steel casings were designed by PCA as an alternative foundation solution for the two abutments. Lateral forces from flood and traffic loads were catered for through a combination of raked and vertical micropiles with the permanent steel casings providing both protection from scour and additional support for residual bending and shear forces in the micropiles.

Each micropile was designed to carry a working load of 1100kN in combination with a bending moment of 50kNm with a design life of 100years. One micropile from each abutment was load tested to 1100kN in compression in accordance with AS2159-2009 to verify the design assumptions.

Installing raked micropiles in close proximity to powerlines

Raked and vertical micropiles installed in abutment location



Micropile design layout.

THE MICROPILE ADVANTAGE

The use of grout injected micropiles in the Wunulla Lane project enabled the client to eliminate the risks associated with installing driven or bored piles. The rock drilling technology used in the construction of the micropiles enabled the micropiles to be drilled and bonded within the underlying fresh granodiorite without the need for additional specialist equipment or drilling techniques. As a result, the micropiles were priced to the client as a lump sum which took away the uncertainty and associated potential budget risks that would have been associated with the installation of traditional bored piles.

The relatively small drill rig was able to manoeuvre into position without the need to shut down power supply to local residents and there was no requirement for a specialist piling platform to support the rig which lowered cost and reduced the overall work program.

The light weight and compact componentry used in the micropile construction allowed the use of an all-terrain forklift for material handling. This reduced the risk associated with the overhead power lines by removing the need for overhead cranes for pitching liners and steel reinforcement.

Mixing grout on site with PCA's state of the art mobile batch plant reduced the impact on the local road network by removing the need for concrete deliveries over adjacent load limit bridges. Drill cuttings were also minimised through the use of smaller micropile elements when compared to the original 750mm diameter pile design which lowered the overall environmental footprint of the project.

The completion of two full scale static load tests (one per abutment) proved the design assumptions and provided the client with peace of mind in regard to the piles being checked for their ability to carry the design loads.

The high capacity grout injected micropiles in the Wunulla Lane project enabled the Somerset Regional Council to deliver an asset without risk of budget over runs or costly program extensions. The Wunulla Lane micropiled foundations are a perfect example of how grout injected micropiles can add value to projects with difficult geotechnical conditions and demanding performance requirements.