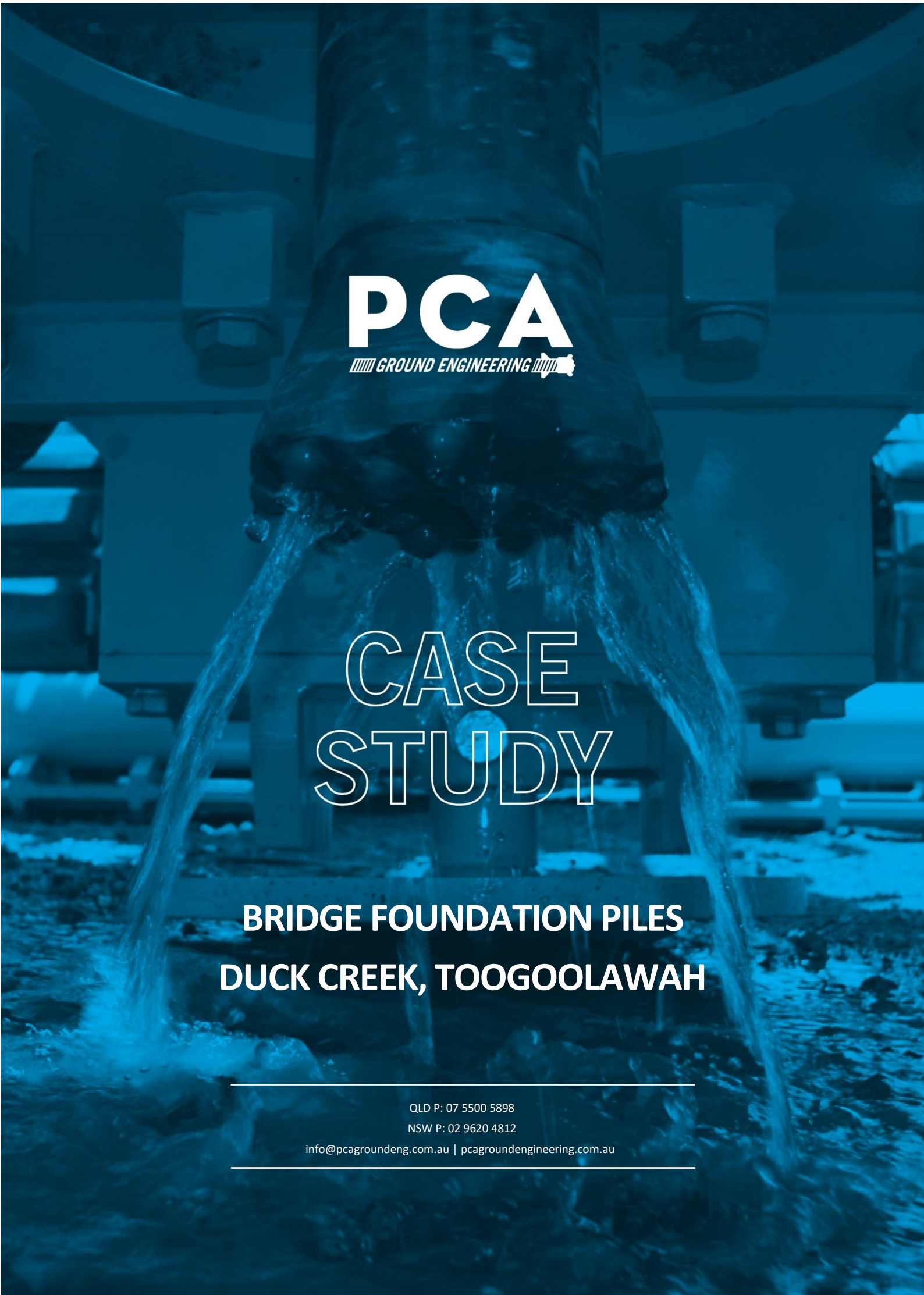

PCA GROUND ENGINEERING

CASE STUDY

BRIDGE FOUNDATION PILES
DUCK CREEK, TOOGOOLAWAH

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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 DOUBLE SPAN BRIDGE**
CLIENT:	**SOMERSET REGIONAL COUNCIL**
MAIN CONTRACTORS:	**SOMERSET REGIONAL COUNCIL**
PROJECT ENGINEERS:	**PCA**

Duck Creek bridge prior to replacement

PROJECT DESCRIPTION AND CHALLENGES

The bridge over Duck Creek is typical of many small timber rural bridges that are dotted around the country in need of replacement. The new bridge was designed as a double span reinforced concrete deck supported on concrete bored piles. The bored piles were to be socketed over 2m into the underlying DW Andesite rock with the piles under the central pier extended up to a headstock supporting the deck units.

The geotechnical report indicated the water table was situated 3m below the road level which meant the bored piles would require steel liners to prevent water ingress and collapse of the soils above the rock within the silty clays and gravelly sands. Driven piles or auger piles such as CFA or screw piles also had inherent risks from potential obstacles such as boulders and debris in the soil strata, particularly at the central pier location.

Large traditional piling rigs would have been expensive to mobilise to the semi remote location just outside of Toogoolawah and would have required environmentally intrusive platform works for site access. Moving a tradition piling rig from one abutment to the other would also have required a partial demobilisation and relocation by semitrailer on the local road network.

Inherent risks for traditional piling methods had the potential for cost and program overruns and the client was open for risk adverse alternative solutions.

THE SOLUTION

Grout injected hollow bar micropiles were modelled using the design loads on the abutments and central pier provided by the bridge design engineer. The lateral forces from the vehicle and flood loads were largely resolved through a series of raked piles and residual bending forces within the micropiles were catered for using a steel sleave in the upper 4m of each micropile. Tungsten carbide drill bits were selected to enable the micropiles to be drilled through boulders and other obstructions and to create the required rock socket length.

The central pier required the construction of a pile cap at creek bed level with columns extending up from the pile cap to a headstock beneath the bridge deck.

CASE STUDY

PCA GROUND ENGINEERING

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

Micropiles installed in abutment prior to installation of reinforcing cage

Micropiles installed in the central pier pile cap with column extensions for mid span headstock

Installing micropiles in the central pier

THE MICROPILE ADVANTAGE

The use of grout injected micropiles on the Duck Creek project enabled the client to eliminate the risks associated with installing driven or bored piles. The drill bits and installation techniques used by PCA in the installation process meant that the project could be tendered as a lump sum and the Somerset Regional Council was immune from unforeseen budgetary blowouts.

The flexible and relatively light weight micropile rigs took away the need for major civil works in the environmentally sensitive creek bed where engineered piling platforms would have been required if traditional large diameter bored piers were adopted. The amount of excavation required for the two abutments was also reduced due to the ability of the piling rigs to reach the work area from up to 6m away and work several metres below grade. Multiple micropile locations were also accessible without moving the piling rig which improved worker safety and increased productivity.

The spoil created by the installation of the micropiles was also minimal which meant that truck movements on local roads were kept to a minimum which reduced the impact on residents.

All grout was mixed on site from an environmentally controlled area with all grout waste pumped into containment bins and removed from site to reduce the overall environmental footprint. This also meant that less concrete trucks were required than would have been the case with traditional bored piers which further limited the impact on local road users.

The Duck Creek micropile bridge foundation was delivered on program and within budget without any safety or environmental incidents and is a great example of how micropiles can add value to bridge replacement or repair projects particularly in rural and semi-remote areas.

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