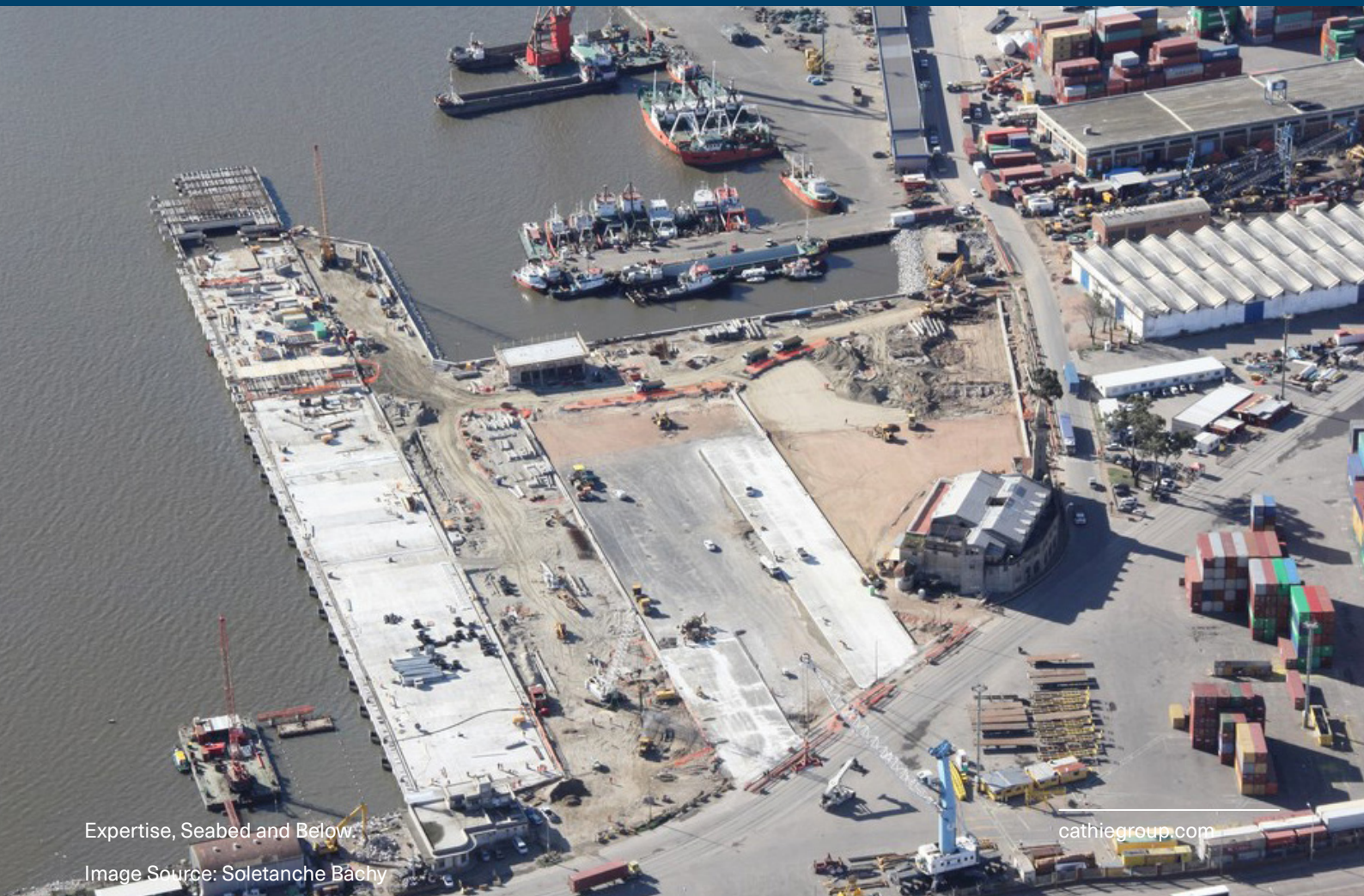




Case Study : Ports and Harbours

# Cathie performs geotechnical analysis of dock foundation piles for the Multipurpose Harbour of Montevideo





The National Harbour Administration of Uruguay contracted Soletanche Bachy, Dredging International and Saceem to expand the Multipurpose Port of Montevideo. To understand the lateral variability of the soil profile along the dock and its effect on pile design and installation, Soletanche Bachy partnered with Cathie.

The foundation system comprised:

- Open-ended steel sleeve piles driven first,
- Soil inside the steel piles was drilled out to the final depth,
- Concrete piles were case inside sleeves.

256 piles were built to support the dock concrete slab.

## Challenge

During preparation works for pile driving installation, the contractor performed static loading pile tests, in which pile damage (toe buckling) was observed. Complex geology is characteristic of the site with presence of interbedded cemented sandy layers, hard clay, gravelly-cobbles and very weathered horizons of amphibolite. A more detailed cross-section had to be defined, to better evaluate the allowable pile penetration and safe driveability criteria for each pile, and then reduce the risk of pile damage.

The client also asked to define the dredging target depth, which is variable across the dock, following the variable thickness of surficial muds.

## Solution

We made a detailed soil model, developed using gINT (Geotechnical and Geoenvironmental Software). Entry data consisted of 16 geotechnical sampling boreholes, Standard Penetration Tests (SPT) to refusal (each 1.5m), and the results of static pile load tests.

Detailed pile design was performed, including the estimation of allowable penetration of each pile, determination of pile bearing capacity and evaluation of safe pile driveability criteria.

Detailed profiles of dredging target depths were defined along and across the dock area.



**CATHIE**

## Impact

This analysis was useful to:

- Identify the position and strength of weathered amphibolite
- Define the dredging target depth variable across the quay
- Perform a refined analysis of the sleeve pile penetration
- Determine safe driveability criteria

Analyses were helpful to avoid pile damage, as the sleeve piles must keep their initial shape to allow drilling equipment to go through.

Analyses also helped to reduce cost by avoiding pile damage and save time by keeping the expected driving rates.



**CATHIE**

