Case Analysis

Brunswick Sewerage Treatment Plant NSW

Market Sector
INFRASTRUCTURE

Application
DEEP IMPACT COMPACTION

Project Phase
IN-SITU SAND

LANDPAC
INTELLIGENT GROUND ENGINEERING SOLUTIONS

Project

The development comprised the construction of a new sewerage treatment plant in the Brunswick Valley area, NSW. Landpac were engaged to carry out Impact Compaction and Verification on 1.32ha. The main objective was to achieve 150kPa bearing pressure to an equivalent depth of 3.5m in the sand stratum for the use of upper level footings.

Soil Conditions

The soils are of recent alluvial origin formed by terrestrial and coastal processes. Pre-compaction bore holes encountered 1m to 3.8m of loose and silty sand over medium dense to dense sand. Weaker soil (very loose sand and soft clay) was encountered below the medium dense/dense sand in some locations.

Geotechnical Solution

Generally the top 3.5m consisted of some silts and layers with organic material, with clay fines and with a dark brown colour that maybe the result of high fines content. The logs also reported some clays. It was considered that Impact Compaction using Landpac's 135kJ machine was the fastest and most economical solution in providing 150kPa in the top 3.5m. Although some of these layers consisted of high fines content and did not achieve the required medium dense condition it was considered that the magnitude and depth of these layers would not matter in terms of footing and sub-grade performance with respect to150kPa bearing capacity for shallow foundations. The density index of 'cohesionless' soil and the shear strength of 'cohesive soil' was analysed and determined for each CPT conducted on site.

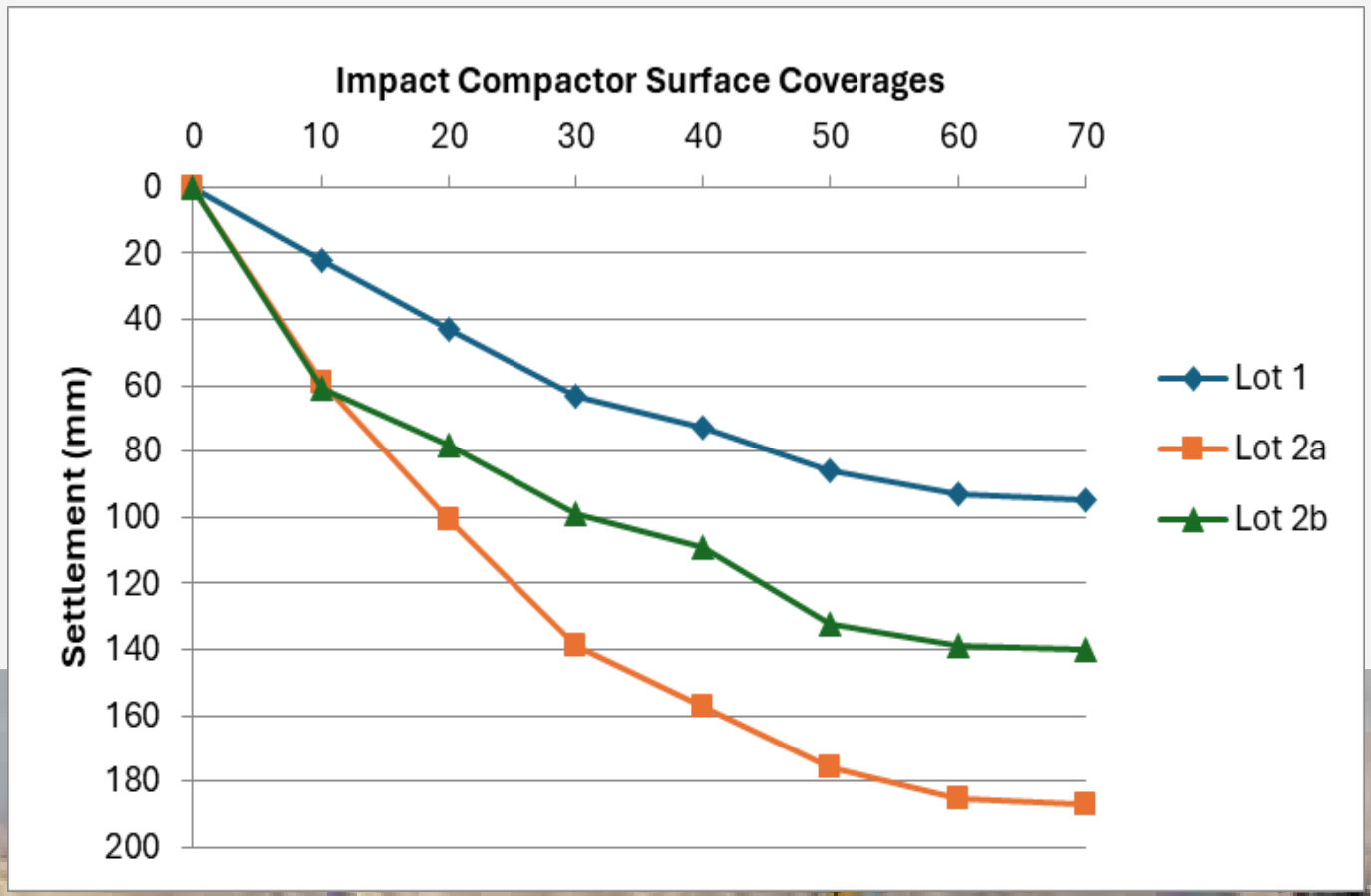
CONTINUED →

Monitoring & Verification/QA

Intelligent Compaction Measurement (ICM) was utilized throughout the Impact Compaction works. The process identified precise locations of softer subsurface material requiring removal and replacement, while also determining when settlement had been reduced to near-zero conditions using the 135kJ Impact Compactor.

The CPT target depth was 5m or earlier refusal in very dense and/or indurated sand. Some tests were pushed deeper to investigate weaker layers. To assess the post high energy impact compaction site sub-surface conditions, 20 piezocone penetration tests (CPT's) were pushed in a depth ranging from 2.82-7.26 metres. Some loose sand and weak compressible soils was encountered. The tests were consistent with the geotechnical investigation data, which indicated a weaker sub-surface in the area where the cone penetration tests had greater penetration. Due to the depth that this material occurred at it was determined that it would not adversely affect the performance of high level footings.

Original Design Analysis



Construction

Construction of the Brunswick Valley Sewerage Treatment Plant, Brunswick Valley, Mullumbimby. The proposed development consists of a series of large tanks and associated infrastructure plant and buildings. The 23m diameter clarifier tanks are up to 4m above, road and tank invert level at 2m above the existing surface level. The bioreactor tank is approximately 70m x 13m with a top water level of about 5m above the existing surface level and the 19m x 7m aerobic digester tank is about 2m above the existing surface level.

Discussion and Recommendations

The acceptance Criteria for HEIC included the following item.

'Required allowable bearing capacity = 150 kPa at existing ground level to an equivalent depth of 3.5m.

Unless there is a uniform soil profile with depth, soil does not have a unique allowable bearing pressure and allowable bearing pressure is a function of the size and shape of the footing or loaded area. Up to a certain size of loaded area, allowable bearing pressure will be controlled by the shear strength of the soil and above a certain size the allowable bearing pressure will be controlled by the settlement of the loaded area.

In this case, the required allowable bearing pressure of 150 kPa is assumed to be for smaller loaded areas where shear strength will control footing capacity. Assuming a footing depth of, say, 600mm, the lower range of a medium dense cohesionless soil (Φ = 32-33) will support an allowable bearing pressure indicated by the cone penetration tests to be dense to very dense.

The loose sand and weak compressible soil was encountered at a depth that will not adversely affect the

150kPa

at 3.5m depth

Summary

- **Target**: 150kPa bearing at 3.5m depth.Superior subgrade strength.
- **Method**: 135kJ High Energy Impact Compaction.Cost savings.
- **Infrastructure**: Heavy tanks and sewerage plant.
- **Verification**: Real-time ICM and CPT testing.

Get in touch

1300 237 045

info@landpac.com.au

www.landpac.com.au

LANDPAC
INTELLIGENT GROUND ENGINEERING SOLUTIONS

LandPac Asia-Pacific is part of the Conplant Group of Companies

Conplant