



## Lakeside Office Development on Dolomitic Ground

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### Abstract

Lakeside Office Development is a 43 000 m<sup>2</sup>, 9 storey commercial office building. The site geology consists of dolomitic bedrock including four cavities and a highly fluctuating profile. The design required sufficient robustness to adapt to the known and unknown variabilities of the ground and the potential 15 m wide sinkholes that could develop. The solution was a 2.25 m thick concrete raft poured in 10 individual continuous pours of up to 1,400 m<sup>3</sup> each. This solution worked with a geotechnical system of blasting, excavating and dynamically compacting the underlying material. In conjunction with the design solution, a measurement and testing regime was established to allow the early prediction of propagating sinkholes; and a strict water management system was implemented to prevent water ingress, the main instigator of dolomitic sinkhole propagation. This project used the mega-structural element of the raft to ensure robustness against severe accidental loading while the innovative monitoring system ensures an early warning system.

**Keywords:** Dolomite, concrete raft, large foundations, dynamic compaction, commercial structures

### 1 Introduction

Commercial developments in the Centurion Central Business District in South Africa must strike a delicate balance between highly-desirable locations at a key economic hub, and potentially-difficult foundation conditions due to underlying dolomitic rock. The variability of the underlying bedrock has shaped the formation of the Centurion CBD for decades, with highly-attractive, centrally-based erven lying only partially developed between other successful ventures.

### 2 Dolomitic Rock

Dolomite is a sedimentary carbonaceous rock similar to limestone. As with limestone, caves or receptacles can form within the dolomitic rock due to interaction with weak carbonic acid.

The unweathered bedrock is typically overlain by partially weathered, segmented bedrock, then by totally weathered and low-strength residual

material consisting mainly of WAD (Weathered Altered Dolomite), chert and iron oxides <sup>[1]</sup>.

Due to the nature of the dolomite dissolution, over time, instability would occur naturally. This is exacerbated by mans' activities. Changes in water tables (draw downs and leaks etc.) typically trigger stability events in the soil that can lead to significant effects at surface.

### 3 Site Identification

The site identified for development was located across the road from a transportation hub, bounded by other commercial developments on two sides and a lake on the third.

An existing development occupied one third of the site but this showed indications of structural damage and was due to be demolished.