



# **Enhancing Ground Stabilisation in Newcastle, NSW: The Vital Role of 3D Sonar and Laser Cavity Surveys Prior to Grouting Operations**

## **Executive Summary**

Newcastle, New South Wales (NSW), Australia, is known for its dynamic geology and historical abandoned mine workings, which presents unique challenges for ground stabilisation projects. To address these challenges effectively, this report underscores the critical importance of 3D sonar and laser cavity surveys as indispensable tools for assessing underground cavities before initiating grouting operations. By providing precise, non-invasive, and real-time data, these advanced survey methods significantly contribute to the success of ground stabilisation projects, ensuring the safety of infrastructure and safeguarding the environment.

A recent decision by the NSW Government to axe the 'Newcastle Mines Grouting Fund' will have implementations on the standard of works carried out prior to major infrastructure projects. In light of this Groundsearch wishes to share the following words on the importance of accurate 3D cavity scanning prior to grouting operations. These surveys ensure the integrity of infrastructure to be built above abandoned mine works and more importantly the safety of the greater population who will use these future projects on a daily basis.

Seismic events such as the 1989 Newcastle earthquake can and probably will happen again, ensuring ground stability below infrastructure mitigates some of the inherent risks involved with seismic events.

# Introduction

## Background

Newcastle, NSW, boasts a rich history and diverse geology, which includes abandoned coal workings, coal mines, natural caves, and various geological formations. As urbanisation and infrastructure development continue, ensuring the stability of the ground is paramount. Grouting operations are often employed to enhance ground stability, but their success depends on accurate pre-operation surveys.

## Objective

This report aims to emphasise the importance of 3D sonar and laser cavity surveys in Newcastle, NSW, before grouting operations for ground stabilisation. These surveys offer a thorough understanding of subsurface conditions, ensuring the effectiveness and safety of grouting processes.

# Challenges in Ground Stabilisation in Newcastle

## Geological Diversity

Newcastle's geological diversity presents challenges, including underground cavities, mine voids, and varying soil types, all of which can affect ground stability.

## Historical Mining

Historical coal mining activities have left behind abandoned mine workings and voids, which can collapse and result in subsidence issues if not addressed adequately.

## Urbanisation

The growth of urban areas increases the demand for infrastructure, necessitating ground stabilisation efforts to protect new developments and existing structures.

# The Role of Grouting Operations

## Grouting as a Solution

Grouting involves injecting specialised materials into voids and cavities to stabilise the ground and prevent subsidence. It is a proven technique for mitigating ground instability.

## Need for Pre-Operation Surveys

To ensure the success of grouting operations, accurate and comprehensive pre-operation surveys are essential.

## 3D Sonar Cavity Surveys

### Principles and Benefits

3D sonar surveys utilise sound waves to create detailed images of underground cavities. They offer numerous advantages:

**Precision:** High-resolution 3D images provide precise cavity dimensions.

**Non-invasiveness:** Sonar surveys do not disrupt the ground, preserving the integrity of the area.

**Real-time Data:** Real-time data acquisition enables immediate decision-making during grouting operations.

### Applications in Newcastle

3D sonar surveys in Newcastle are a crucial tool for mapping water-filled historical mine workings and assessing subsurface conditions in urban areas.

# 3D Laser Cavity Surveys

## Principles and Benefits

3D laser surveys employ laser technology to create detailed scans of underground cavities. They offer several advantages:

**Accuracy:** Laser scans produce highly accurate 3D representations of cavities.

**Efficiency:** Rapid data acquisition reduces survey time and costs.

**Visualisation:** 3D laser scans provide clear visual representations of cavities, aiding in planning and decision-making.

## Applications in Newcastle

3D laser surveys in Newcastle are a crucial tool for mapping non water-filled historical mine workings and assessing subsurface conditions in urban areas.

## Best Practices for 3D Surveys in Newcastle

### Survey Planning and Preparation

Effective planning, including selecting the right equipment and survey parameters, is crucial for accurate results.

### Data Interpretation

Trained professionals should interpret survey data to extract meaningful information about cavity dimensions.

### Safety Measures

Safety protocols should be in place to protect survey engineers and ensure the surveys are conducted without incidents.

# Case Studies in Newcastle

Groundsearch Australia has carried out numerous successful sonar and laser imaging surveys prior to grouting processes in various infrastructure projects. From city centre through the suburbs and out into remote access sites Groundsearch has the ability and equipment to cover all aspects of cavity scanning. Detailed information on previous projects can be made available to the right parties upon request.



# Conclusion

## Summary of Key Points

3D sonar and laser cavity surveys are essential tools for assessing underground cavities before grouting operations, ensuring the success and safety of ground stabilisation efforts in Newcastle, NSW.

## Contributions and Implications

Their precision, non-invasiveness, and real-time data provide a solid foundation for ground stabilisation projects, safeguarding infrastructure and the environment.

## Future Prospects

Continued research and development in 3D survey technology, along with increased awareness and adoption, can further enhance the effectiveness of ground stabilisation efforts in Newcastle.

## Recommendations

### Adoption and Awareness

Groundsearch Australia promotes the widespread adoption of 3D sonar and laser cavity surveys as standard practice in ground stabilisation projects in Newcastle.

### Education and Training

Groundsearch Australia supports the education and training programs to equip industry professionals with the skills and knowledge needed for effective 3D surveys.

### Research and Innovation

Groundsearch Australia encourages research initiatives to advance 3D survey technology for ground stabilisation applications in Newcastle.

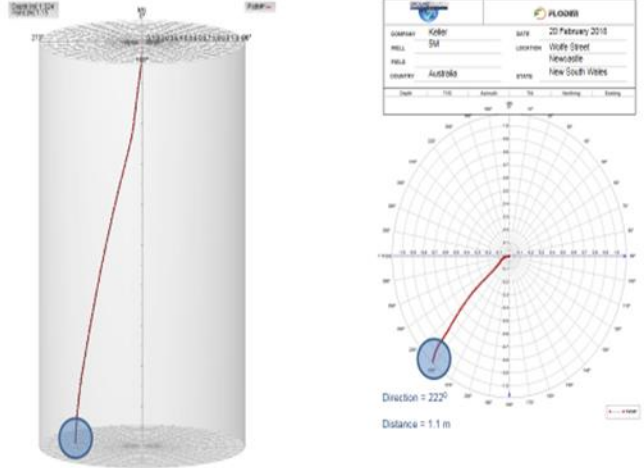
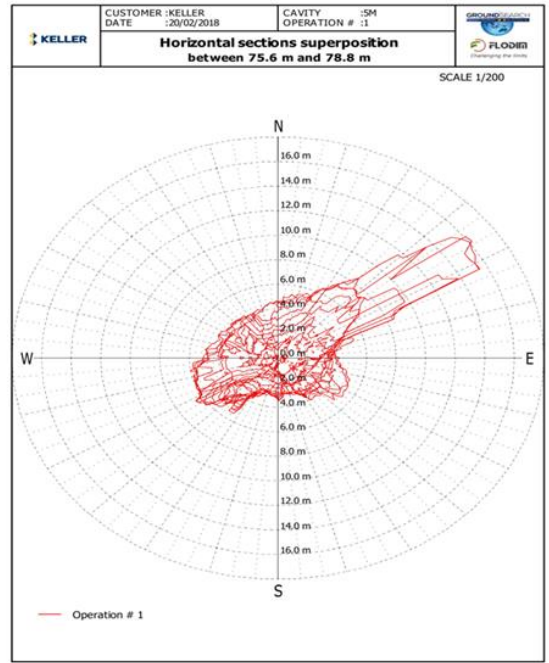
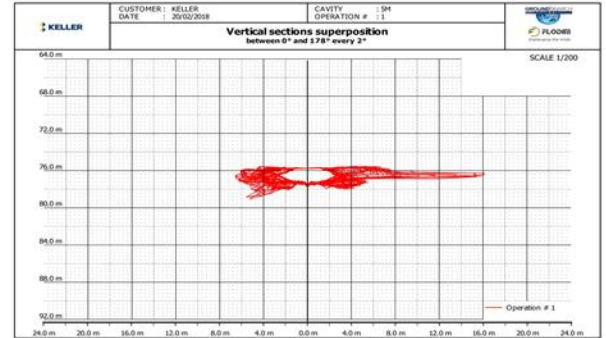
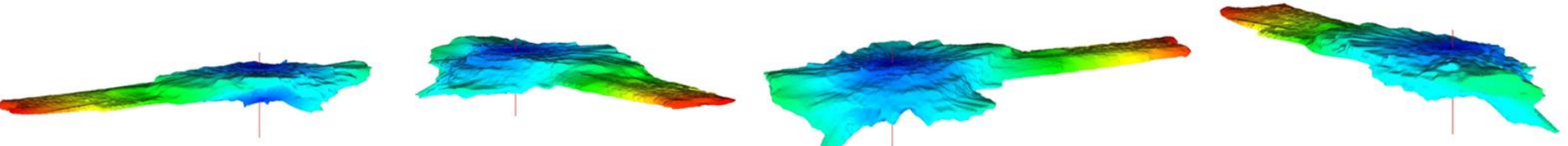
# References

News article referencing the axing of the 'Newcastle Mines Grouting Fund';

<https://newcastleweekly.com.au/newcastle-mines-grouting-fund-axing-a-huge-blow/>

# Appendices

Below: N, E, S & W perspectives of solid models for a Newcastle, NSW Australia Sonar cavity survey





# GROUNDSEARCH AUSTRALIA

*Into the fourth decade of operations*



[www.groundsearch.com.au](http://www.groundsearch.com.au)