

# Worldwide Activities



TUNNEL DESIGN

TEMPORARY WORKS DESIGN

**GEOTECHNICAL ENGINEERING**

CONSTRUCTION MANAGEMENT

INSTRUMENTATION & MONITORING

WATERPROOFING & WATER CONTROL

TUNNEL REHABILITATION

MINING SUPPORT SERVICES

## CONTACT

**SALZBURG**  
Dr. Sauer & Partner GmbH  
T. +43 662 879 999  
F. +43 662 878 999  
Sterneckstrasse 35-37  
5020 Salzburg  
Austria  
salzburg@dr-sauer.com

**WASHINGTON D. C.**  
Dr. Sauer & Partners Corporation  
T. +1 703 707 0700  
F. +1 703 707 0703  
560 Herndon Parkway, Suite 310  
Herndon, VA 20170-5240  
USA  
washington@dr-sauer.com

**TEL AVIV**  
Dr. Sauer & Partners  
T. +972 733903711  
Atrium Tower, 18th Floor  
Zeev Jabotinsky Rd 2  
Ramat Gan 52050501  
Israel  
telaviv@dr-sauer.com

**LONDON**  
Dr. Sauer & Partners Ltd.  
T. +44 208 339 7090  
11 Langley Avenue  
Surbiton, Surrey  
KT6 6QH  
UK  
london@dr-sauer.com

**TORONTO**  
Dr. G. Sauer & Partners Corporation  
T. +1 647 276 4000  
2200 Yonge Street  
Suite 1004  
Toronto, ON M4S 2C6  
Canada  
canada@dr-sauer.com

[www.dr-sauer.com](http://www.dr-sauer.com)



[www.dr-sauer.com](http://www.dr-sauer.com)

Salzburg | London | Washington | Toronto | Tel Aviv



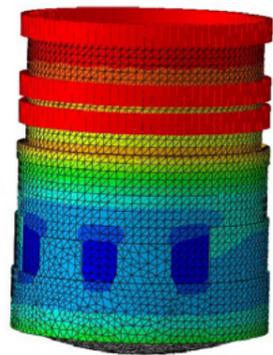
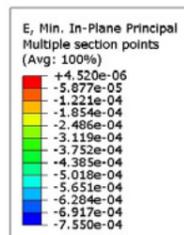
The ground plays a key role in sub-surface engineering; an accurate interpretation of its behaviour is essential. Dr. Sauer & Partners' expert geotechnical engineers provide the highest quality in geotechnical engineering services and value to our clients for both design and execution.

Dr. Sauer & Partners provides the complete range of services in the field of GeoEngineering. This includes the interpretation of the sub-surface conditions, the construction of geological and engineering models up to detailed design and supervision of construction works.

## TECHNICAL EXPERTISE

Designs for underground structures rely on a thorough understanding of the geology and engineering behaviour of the ground. Our geotechnical expertise allows us to provide a variety of related geotechnical services that can be offered individually or as complete, integrated engineering solutions.

### ▼ Crossrail C305 Limmo Auxiliary Shaft – 40m deep, 27m OD

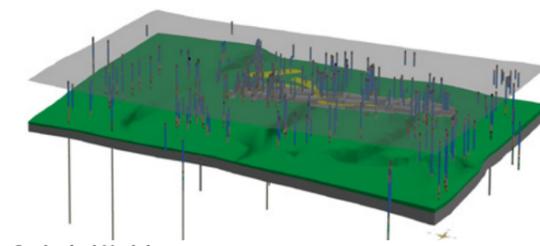


3D Finite Element Design Model



Completed Auxiliary Shaft

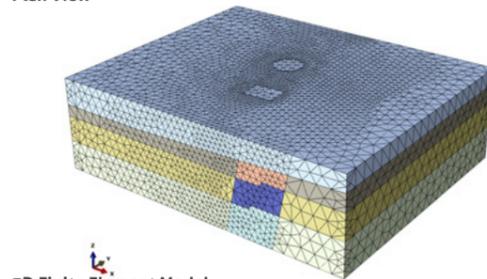
### ▼ Crossrail C435 Farringdon Station - Faulted Lambeth Group



Geological Model



Plan View



3D Finite Element Model

## BENEFITS OF DR. SAUER & PARTNERS' ADVANCED GEOTECHNICAL ASSESSMENT SERVICES:

- Time/Cost savings
- Better understanding of soil/structure interaction
- Geotechnical risk management
- More efficient design
- Reduced need for additional investigation
- Programme risk reduction
- Improved structural performance
- Asset protection
- Reduced uncertainties

### • DEEP EXCAVATIONS & RETAINING STRUCTURES

The choice of the optimal construction method that meets our clients' requirements triggers the process of identifying and delivering the most efficient design and construction solution for deep excavation and retaining structures.

### • DEPRESSURISATION - DEWATERING

Underground projects often face unavoidable hydrogeological challenges. Dealing with in-situ water pressures and flows ahead of main construction works enable safe, fast and efficient excavation progress.

### • GEOTECHNICAL RISK MANAGEMENT

Underground projects deal with inherent ground risks. We combine expert knowledge and advanced simulation tools to identify, mitigate and manage these risks throughout the lifecycle of a project.

### • SETTLEMENT & IMPACT ASSESSMENT

Underground constructions have an impact on both subsurface and surface assets. Understanding, identifying, modelling, quantifying and mitigating this impact is essential for (third-party approvals and) the successful management of associated project risks.

### • SLOPE STABILITY ANALYSIS

A solid understanding of geotechnical conditions is essential when dealing with unstable ground. Our experience and expertise covers a range of slope stability assessments and design solutions, varying from shallow cuts for temporary works to large-scale landslides.

### • 3D GEOLOGICAL MODELLING

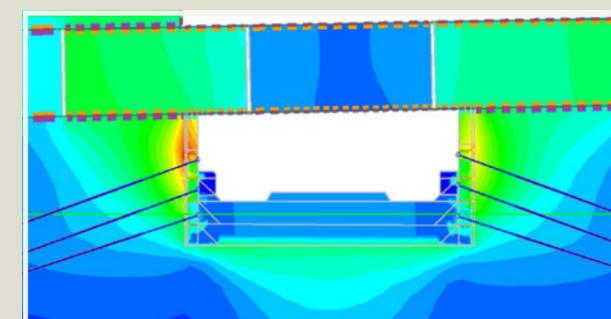
An accurate geological model sets the foundation for further engineering processes such as design, risk assessment and management, impact assessments or ground improvement. Our company combines expert geotechnical knowledge with modern simulation tools to provide the highest value to our clients.

### • BOXES & PORTALS

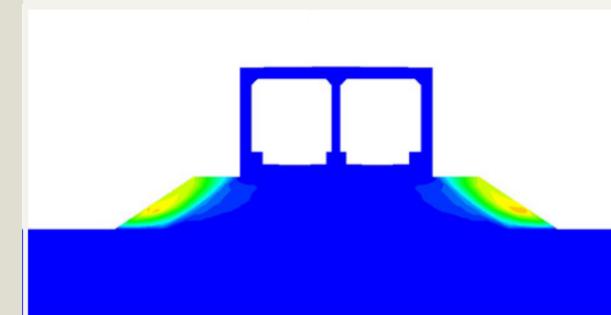
Our design and construction solutions for box structures such as station or cross-over boxes as well as tunnel portals are based on detailed soil-structure interaction modelling using state-of-the-art finite element tools.



▲ TBM Launch Box



▲ Finite Element Model of the Support of Excavation



▲ Slope Stability Assessment

## EVIDENCE OF DELIVERY

### Eglinton Crosstown: Cedarvale Station Underpinning and SOE

Cedarvale station is located on the Eglinton Crosstown Line of the Toronto Light Rail Transit, at an intersection with the Spadina Subway Line. The new station is located under the existing station box utilising a combination of mining and open-cut techniques.

The proposed solution included an underpinning scheme with six small galleries being mined underneath the existing, fully operational station box, to allow the installation of a series of steel girders to underpin the existing structure. After the completion of the underpinning works, the excavation of the new station is proposed as open-cut. The support of excavation consists of prestressed tie-backs, a thin shotcrete wall and a top prop.

Dr. Sauer & Partners delivered a feasibility design for the open-cut excavation and support as well as detailed design for the underpinning galleries and the temporary support elements. Our evaluation included a detailed assessment of the ground conditions, the impact of the works on the operational tunnel box as well as a stability assessment of the portal slopes.