

Robert Swindell

Principal Engineer

Expertise Engineering Geology, Rock Engineering

Education MSc Engineering Geology, 2002
Leeds University, UK
BSc Applied Geology, 1997
Leicester University, UK

Professional Affiliations Member: International Society of Rock Mechanics,
Member: Swedish Geotechnical Society

Professional Experience

2022 – present	<i>Itasca Consultants AB, Stockholm, Sweden</i> <i>Principal Rock Mechanics Engineer</i>
2017 – 2022	<i>Sweco, Stockholm, Sweden</i> <i>Senior Engineering Geologist/Lead Designer Rock Engineering Works</i>
2013 – 2017	<i>Swedish Transport Administration (Trafikverket), Stockholm, Sweden</i> <i>Technical Specialist Rock Engineering</i>
2013 – 2017	<i>NCC Construction, Stockholm, Sweden</i> <i>Chief Engineering Geologist, Norrströmstunneln</i>
2002 – 2013	<i>WSP, Stockholm, Sweden</i> <i>Engineering Geologist/Designer Rock Engineering Works</i>
1999 – 2001	<i>Anglo American plc, Malå, Sweden / London, UK</i> <i>Exploration Geologist</i>
1998 – 1999	<i>Anaconda Nickel, Perth, Australia</i> <i>Exploration Geologist</i>

Project Experience

Infrastructure (Tunneling): Lead rock engineering designer for the construction of three new underground metro stations in Stockholm (Sickla, Järla and Nacka Station). The contracts include track and service tunnels, station caverns, escalator and elevator shafts with an estimated value of \$250 million. The role involves providing expert rock engineering support to the client (Stockholm Local Authority), including optimization of existing designs for reinforcement, excavation sequences and grouting works. Close collaboration with the client's and contractor's rock engineers, flexibility and good knowledge of production methods is a pre-requisite in order to provide technical solutions that can easily be applied on site. The work includes supervision of several rock engineering designers and requires working to tight time schedules.

Lead rock engineering designer for detailed design of a light rail line expansion in Kista, Stockholm. The project involved complex rock excavations above the portal of three existing metro tunnels. The final

technical solution involved pre-reinforcement of the metro tunnels, cored steel piles for the foundation of a bridge structure for the light rail line and diamond wire cutting of rock slopes for the light rail line.

Lead rock engineering designer during the construction of a double track rail tunnel and open cut excavations connecting to the Norvik port. Rock excavations were performed in graphite bearing gneiss, which caused stability problems, primarily in the open cut. The tunnel passed beneath two sections with extremely low rock cover, which required casting of a concrete slab above the tunnel prior to excavation work to provide sufficient arching above the tunnel. Excavations were performed using spiles, modified grout screens and split headings.

Lead rock engineering designer for the detailed design of six access tunnels for the expansion of the Stockholm metro between Kungsträdgården and Sockenplan/Nacka in central Stockholm. The tunnels have a combined length of approximately 5 km. The role included leading a design team of 10 geologists and engineers who together produced detailed designs, models and technical specifications.

Chief engineering geologist for the Stockholm Bypass, which is comprised of over 60 km of highway tunnels. Numerous rock engineering challenges including three passages under Lake Mälaren were included in the project. The position involved reviewing rock engineering designs (geological models, excavation measures, reinforcement and grouting) as part of a team of specialists within the Swedish Transport Administration's technical department. The role also included leading a team of geologists to perform geological mapping and prescribing reinforcement measures for the excavations.

Project manager – Rock Engineering Design Guidelines for the Swedish Transport Administration. In 2014 the Swedish Transport Administration published new guidelines for the design of surface and underground structures in rock. The guidelines cover strategy for rock engineering design, ground investigation methods, methods for forecasting and presenting expected ground conditions, excavation mapping, rock mass characterization, risk analysis, design methods (empirical, analytical, numerical) and design for fire and explosion loads. The role as project manager included managing a team of technical experts and contributing to the content of the publication.

Site engineering geologist on two tunnel projects (Tollare Road tunnel and Norrtälje bypass). The position involved conducting engineering geological mapping along with providing instructions for rock excavation and reinforcement measures for the tunnels and open cuts.

Senior engineering geologist and leader of a group of 5 engineering geologists performing engineering geological mapping and prescribing rock reinforcement for the Norrströmstunneln tunneling contract. This position involved working for the tunneling contractor (NCC) as part of their production team. The contract was part of the City Line rail project in central Stockholm and is considered one of Sweden's most complicated engineering projects. It included excavation of two large station caverns, concourse tunnels, escalator, and lift shafts together with track and service tunnels. The excavations were in direct connection to two existing metro stations and in many areas required special excavation methods (diamond wire cutting, hydraulic fracturing). The role also required providing recommendations for excavation procedures, conducting 3D geological mapping in critical areas, and producing geological interpretations/models for design evaluation.

Lead rock engineering designer for conceptual and detailed design of a light rail line expansion in Solna, Stockholm. The project involved rock engineering design of three cut and cover tunnels located adjacent to an existing highway. The work included supervision of several rock engineering designers.

Senior engineering geologist for the City Line Torsgatan, involving working as the client's technical expert on site for tunneling works for the Torsgatan access tunnel. The tunnel was excavated parallel with a major

fault zone in poor rock conditions and involved significant challenges to ensure the tunnel fulfilled requirements for both sealing and stability.

Engineering geologist for the design of two road tunnels with a total length of 2.7 km through the Al Hajar al Gharbi Mountains. The work included engineering geological mapping in the field and planning of a site investigation program in difficult terrain.

Lead engineering geologist responsible for site investigation, engineering geological modelling and estimation of rock engineering parameters as part of a detailed design for two large tunneling contracts (Norrmalmstunneln and Norrströmstunneln) as part of the City Line, Stockholm. The site investigation work included planning in excess of 50 diamond drill holes, setting up routines for core logging, lab testing, packer testing, geophysical investigations, archive studies, field mapping and a variety of other investigations. All available data was analyzed and interpreted in detail to produce a 3D engineering geological model containing domains for the following: Geological Units; Rock Mass Quality; Hydrogeology; Structural Geology. Each domain contained 3D volumes for the different entities, which included the key parameters for each domain. In critical areas refined models were produced to describe the likely failure modes and the rock engineering parameters for each entity (intact rock, rock mass, fracture properties). The final interpretation was then summarized in a series of drawings and models which formed the engineering geological forecast (baseline) for the tender package.

Member of the design team for rail tunnels in the Ådalsbanan project. Responsibilities included field mapping, planning and interpretation of geophysical investigations (seismic refraction), core logging and the production of an engineering geological forecast.

Nuclear Waste Disposal: Member of a rock engineering research and design team for the excavation of tunnels through water bearing fracture zones for a nuclear waste repository. The project looked at a variety of case histories, construction methods and rock mechanical challenges for excavations at various depths (200, 400 and 600 m). Results of the study were published in a formal report to SKB and used as a basis for continuing design work.

Underground caverns: Senior engineering geologist for the Henriksdal sewage treatment plant. This position involved working as the client's engineering geologist on site for the excavation of two large caverns and connecting tunnels for the Henriksdal sewage treatment plant. The caverns were constructed directly adjacent to the existing facilities in the plant.

Responsible for engineering geological mapping and prescribing rock reinforcement for two large caverns (approximately 20 m wide and 15 m high) to be used for sediment capture and storage in the storm water management system in Stockholm.

Rock engineering inspection and maintenance solutions for a large network of tunnels and caverns.

Rock slopes: Lead engineering geologist and responsible for planning and inspection of 36 existing rock slopes in central Stockholm with a maximum height of approximately 35 m. The work included manual inspection of slopes from a crane, assessment of the slope condition and design of remedial measures, e.g., rock bolting, drainage measures, wire mesh, etc.

Mining: Lead rock engineering designer for the design of an open cut and two tunnels as part of a new spillway for the tailings dam at the Aitik mine in Gällivare. The rock cutting had a maximum depth of 40 m and was excavated in a sequence of benches. Two short tunnels were also designed and excavated using diamond wire cutting as part of the structure.

Page 4 of 4

Foundations: Engineering geologist, responsible for engineering geological mapping and rock engineering solutions for the foundation of a 12-story hospital building. The building used pad foundations on gneiss and required the use of cored steel piles to ensure acceptable load transfer.

Responsible for engineering geological mapping for the foundation of several wind turbines in the Åland archipelago.

Teaching and Academic Experience: Guest lecturer to civil engineering undergraduate students in the field of engineering geology at The Royal Institute of Technology (KTH) (2018–Present). Supervision of undergraduate thesis project regarding engineering geological forecasts (Ingrid Khällström, 2015). Supervision of undergraduate thesis project regarding engineering geological forecasts (Mehdi Benhalima, 2016). Supervision of Master's thesis project regarding rock slope design (Johanna Gottlander, 2019).