

**WOUTER HARTMAN**



**Personal details**

**Nationality**

**Australian**

**Profession**

**Principal Geotechnical Engineer / Director**

**Specialisation**

**Geotechnical Engineer - MSc, BSc(Hons), MBA**

**Year of birth**

**1968**

**Office Address**

**Building 4, Suite 4, 195 Wellington Road, Clayton,  
VIC 3168, Australia**

**Contact Details**

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**<http://www.geohartconsultants.com.au>**

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**Key Experience**

Wouter has established GEOHART Consultants in 2008 with the intention to consult to the civil and mining industry on a range of issues. Wouter has more than 18 years industry experience in exploration, underground and open-cut mining operations, mining and civil tunnelling consulting industries in China, Australia, Chile, UAE, Dubai, Indonesia and South Africa. Wouter has a range of deep, intermediate and shallow gold, copper, lead/zinc, shallow to intermediate platinum, copper, lead/zinc, gold, brown and black coal mining experience.

The experience is coupled with mine ground support design and project management. He has extensive experience in decline / drift tunnel support design, monitoring and damage assessment, risk management and stability for various civil and mining excavations. Wouter was extensively involved in the recent research in shear rigidity of rock reinforcement elements in association with the Mining Research Centre UNSW-Sydney-Australia and ACARP. Wouter has also been instrumental in the development of a world first field shotcrete shear testing device and has extensive experience in shotcrete applications for opencut mines, civil rock and soil slopes, underground mine and tunnel excavations.

**Education and  
professional status**

CABA Training (Drager, & Sabre CABA, FSR, CSE) –  
 Singleton – HV 29510  
 Working from heights certified training - Queensland  
 Coffey International Frontline Management – Course (2007)  
 QMS 1, 2, 3 – Quarrying & Mining Safety Management,  
 National On Site Training – (QLD - 2003)  
 Geomechanics, Advance Geomechanics, Risk Management  
 Courses – UNSW (NSW Australia) – (2002)  
 MSc (Rock Engineering), University of Pretoria (SA), 2000  
 MBA – Strategic Management – University of Potchefstroom  
 (SA), 2000  
 BSc (Hons) – Strata Control - University of Pretoria (SA), 1998  
 Advanced Certificate in Rock Mechanics, 1998 – COM – SA  
 Certificate in Rock Mechanics, 1997 – COM - SA  
 BSc (Geology) - University of Pretoria (SA), 1990

Committee Member of ATS since 2004 (2009/2011  
 Committee), Member EAGCG, Member AGS (ISRM), Member  
 SANIRE

**Software Application**

Elfin 2D & 3D Code, Surpac, MAP3D, Slope-W / Slide,  
 Phase<sup>2</sup>, Flac2D, Examine 2D

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**Language ability**

English      fluent

## Experience Record

September 2008 - Current

### GEOHART Consultants – Principal Geotechnical Engineer & Director

- **Browne Solicitors:** Pezzimenti vs. Thiess: Victoria Desalination Plant Laserbore Dispute – Expert Witness.
- **Mt. Morgan Rehabilitation: DEEDI** Queensland – Project facilitator for rehabilitation plan finalisation and stable landform design. Liaison with Robertson Consultants (Vancouver) and O' Kane.
- **Straits Resources: Tritton & North East Copper Mine** – Development of GCMP.
- **Straits Resources: Tritton & North East Copper Mine** – Geotechnical site assistance project manager.
- **Straits Resources: Tritton & North East Copper Mine** – NSW – Ground control risk assessment.
- **Straits Resources: Tritton & North East Copper Mine** – Geotechnical block modelling concept, design and review.
- **Dargues Reef: Cortona Resources** – NSW – Final Mine Design Study – Underground and Surface Boxcut Geotechnical Study. Geotechnical Block Modelling and dilution model. Boxcut option study and detail stability design.
- **Xuandong Coal Mine** – China: Geotechnical / Local Strata Control Mechanisms, Stress Measurements, Strata control Safety Management Plan, 3D Mine Model Review
- **Copper Chem** – Great Australian Operation (Cloncurry – Australia) – GCMP Framework & Development
- **Citigold / Charters Towers Gold** – Bord and Pillar Design underground Gold Mine. Potential for surface subsidence review.
- **Copper Chem** – Great Australian Operation (Cloncurry – Australia) Copperchem Open pit design – Provide guidance as to pit geometrical / geotechnical domains: Pit geometry optimisation process. Geotechnical Optimisation of new pit design. Potential subsidence or crown pillar collapse review.
- **Copper Chem** – Great Australian Operation (Cloncurry – Australia) Copperchem Open pit drilling, geotechnical logging and reporting – Project Manager.
- **Xuandong Coal Mine** – China-Australia Safety Demonstration Project: Geotechnical / Regional Strata Control Workshop and Presentation. Including mine subsidence reviews.
- **Bezan Copper Caving Project** – Philippines – Geotechnical Parameter Review and cavability potential.
- **Dargues Reef: Cortona Resources** – NSW – Feasibility Study – Underground and Surface Boxcut Geotechnical Study
- **Dargues Reef: Cortona Resources** – NSW – Geotechnical stoping parameters: Peer Review
- **Xuandong Coal Mine** – China: Geotechnical / Regional Strata Control Review. Including mine subsidence reviews and regional pillar stability.
- **Copperchem** – Geotechnical Logging program for open pit optimisation and underground geotechnical design parameters.
- **Director Geohart Consultants** signs 5 year Alliance Agreement with GEOBLAST (Nov' 09) – Blast Designs & Rock Fragmentation.

- **Copper Chem** – Great Australian Operation (Cloncurry – Australia) – Opencut Mine Geotechnical Information Gap Review – Drilling Database, Geotechnical Information, Opencut Mine Extension Mine Design, Historic Workings Interaction and Waste Dump
- **Arex Handelsgesellschaft – East West Logistics** – Consultant for Diamond Mine Investor – Diamond Mine Project Sierra Leone, preliminary cost analysis of mining project (3 projects sites – Bo Province)
- **Project Leader** for Geotechnical Tender for **Shenhua Coal** Mine tender process.
- **Centennial Coal – Mandalong** – Integrity Testing of Resin end anchored 50 Tonne Hi-tens Cable Bolts and Resin Bolts. Comprehensive reporting on Cable Bolt quality and integrity.
- **Project Manager / Director** for Victoria Dam Surveillance Project Tender (GEOTESTA, Integrity Testing Alliance)
- **Project Manager** for Australia-China Coal Mine Safety Demonstration Project Tender Bid – Consultants in QLD, NSW & Victoria
- **Principal / Director** Geohart Consultants Agreement signed with GEOTESTA (Civil Geotechnical) -
- **Xstrata Zinc (Mt. Isa)** – Integrity Testing of Cable Bolts, Resin Bolts and Splitsets. Comprehensive reporting on Cable Bolt quality.
- **Northgate Minerals** – Fosterville Gold Mine: Integrity Testing of Cable Bolts, Resin Bolts and Splitsets. Comprehensive reporting on Cable Bolt quality.
- **Final agreement signed with Freyssinet (Nov '09):** Exclusive rights for using the Modshock System for Non-Destructive Integrity Testing Rock Reinforcement Integrity Testing in whole of Australia for mining and civil tunnelling industries.
- **Citi Gold** – Charters Towers Rockmass Stability Review at the Warrior Goldmine – North Queensland – Provide recommendations for new mining block with regard to stability, ground support, exploration drilling. Ground support review of previous consultant recommendations. This led to the change in ground support selection for extremely to poor ground conditions. It also led to the investigation into various mining layouts. Preparation of Shotcrete Application Procedure and Quality Assurance Procedure for contractor and reporting.
- **Australasia Tunnelling Society Meeting** – Arrangements for the technical meeting on Rock Reinforcement Durability, Melbourne (Victoria).
- **Anglogold Ashanti – Sunrise Dam Mine** - Rock Reinforcement Integrity Testing of Posimix Bolts and Twin Strand Cable Bolts – Calibration and Comprehensive reporting on bolt testing results
- **Modshock System – Rock Reinforcement Integrity Testing** - Advice and interpretation of rock reinforcement integrity testing at Springvale and Mandalong Coal Mines

- **Agreement signed with Rockfield Technologies** with regard 3D hybrid finite element and distinct element numerical analysis of mining excavations (e.g., underground, opencut and waste dumps etc)
- **Agreement signed with GEOTESTA** with regard business relationship civil infrastructure development projects and instrumentation. Review capacity of major project investigation.
- **Rio Tinto Coal – HVO** – Geotechnical Hazard Management Plan review; Slope and Dump Management Plans – GAP Analysis. Stability Review of in-situ coal pillars.
- **Agreement signed with Freyssinet:** Non-Destructive Integrity Testing Rock Reinforcement Integrity Testing –
- **Agreement signed with Geoblast** in Santiago – Chile
- **Agreement signed with Open House Management Solutions** – South Africa
- **Agreement signed with HG Mine Design - Australia**

**May 2008 – September 2008**

**Halcrow Pacific Pty Limited – Principal Geotechnical Group Leader – Managing a group of senior / junior Geotechnical Engineers – Victoria, NSW & QLD – Tasked with Developing the Geotechnical Group and presence in the mining industry**

- Reporting to me - 3 Snr Consulting Engineers, Two intermediate consulting engineer and 3 Graduates
- Developing budgets for three States, software purchase for three States, recruitment for three States

**Chile: Cinnabrio** – Mining Sequence & Crown Pillar stability review – site review reporting

**Australia: Northern Sewer Project Melbourne** - Review of Geotechnical Design Parameters for Temporary Works Design – Vanberg Shaft Slope Stability

**Australia: Melbourne Main Sewer** – Review of Geotechnical Design Parameters for Temporary Works Design

**Dubai: LNG** – Gas tunnel geotechnical review of parameters governing stability of tunnel.

**Shirjah: Diftah-Shis Road Tunnel** – Portal Stability Review – for long term stability.

**Australia: Bogong Hydropower Scheme - Victoria**  
Review of Geotechnical Conditions of the Bogong Hydropower Scheme – i.e. Hydrofracturing testing, Grouting, Tunnel Risk Areas, Stress measurement locations,

**September 2007 – May 2008**  
**January 2006 – September 2007**

**Coffey Mining – Principal Geotechnical Engineer**  
**Associate Geotechnical Engineer**

**Chile: Cinnabrio Mine – Tamaya Resources**

- Quarterly Reviews (Jan' 08, May '08)
- Geotechnical Review of Mine Crown Pillars – Three dimensional stress analysis (MAP3D)
- Review of mine's proposed 12<sup>th</sup> month scheduling
- Ground support design for large in-stope wedges

**Australia: Xstrata Copper Mt. Isa Operations**

- 3<sup>rd</sup> Annual Review of Ground Control Management Plan - Shotcrete specification assessment

**Australia: ActewAGL**

Cotter Dam No. 3-Tunnel – Geotechnical review of current tunnel conditions. Review of Parsons Brinkerhoff (PB) and Douglas & Partners Geotechnical reports. Report for latent condition claim

**Australia: Jubilee Mines (WA) – Cosmos Nickel Project**

Review of Numerical Analysis and Ground Support Design

**Australia: Bluestone Tin – Collingwood Mine**

Geotechnical Review of all the stopping lodes and 12 month schedule through numerical analysis and empirical methods – Following a Queensland DME Mine Stoppage Directive

**Australia: Loy Yang Mine – Overburden Dump optimisation**

- Limit Equilibrium Analysis, material parameters sensitivity analysis and design optimisation and Loy Yang Operators presentation.
- Mine Overburden Dump Training. Discussions with GM Mining and Safety Reps with regards to operating the stacker in close proximity of the clay cap crest.
- Review of the limit equilibrium analysis to optimise Stacker operating location.

**Australia: CBH Resources – Endeavour Underground Pb/Zn Mine – NSW Australia**

- ML5 Stope review – Primary Stope on the 290 level (current bottom of mine level)
- 37z24 Stope Review – Mining against fill and over broken waste

**Australia: Bluestone Tin – Collingwood Mine**

- Geotechnical Review of the Airleg Mining – Flat and Incline Development – Following a Queensland DME Mine Stoppage Directive
- Geotechnical Training for Mining Engineers and Geologists in aspects of rock mass classifications and ground support requirement assessments.

**Coffey Mining Internal**

Review of the Mathew stability Graph Method for Open Stopping. Incorporating the influence of tensile stresses on stope walls due to enlarged stope geometries.



**Australia: NSW Inspector of Mines – Ground Support Workshop - Orange**

Training on Ground Rock Reinforcement Elements and Surface Support. Case studies to highlight the importance of dynamic ground support for areas subjected to seismicity. Also discussions held about the future of monitoring of ground behaviour.

**CBH Resources – Endeavour Underground Pb/Zn Mine – NSW Australia**

- Probability of failure analysis of the proposed rib pillar between the 65z51/52 Stopes and the 6z45 Central Stope.
- Significant review of the Pastefill monthly review memo. This memo highlighted certain elements of risk to the Endeavor Operation.
- Review of 290 level stress measurements. Two separate stress measurements have been completed, reported and reviewed.
- Review of pillar stability between the 29z13 and 29z12 stope following major in-stope fall of ground.
- Review of 6/1 and 6z1 rib pillar stability.
- Review of the Ground Support Design for the Upper Decline Road Header Section.
- Review of the short surface ventilation shaft stability
- Development and Review of a Ground Control Management Plan (**GCMP**) - Fall of Ground Investigation following failure of the shoulder of the 29z13 stope

**Australia: Angas Zinc - Terramin (Lead/Zinc) - SA**

- Review of proposed decline ground support. Steel arches and shotcrete application in highly weathered clayey material. Finite element analysis review.
- Review Crown Pillar report for the Angas Zinc Project – South Australia

**Australia: Beaconsfield Gold (Tasmania)**

Review of the proposed seismic network geophone location expansion with Mr. Rob Walton.

**Australia: CBH Resources – Endeavour Underground Pb/Zn Mine – NSW Australia – Project Management & Review of the Following Geotechnical Stope Review Reports:**

- 43z23 and 43z24 – Secondary stoping against primary Pastefill stope
- 37z23 and 37z24 – Secondary stoping against primary Pastefill stope
- 29z21, 32z21 and 32z22 Stopes
- 65z51&52 Stopes
- Crown Pillar stability of the ML1, 2, 3, 4 & 5 Stopes
- 560 MLW Bridge VCR Open Stope – Leaving Bridge Pillar for stability reasons, Monitoring & Instrumentation Design for stability assessment
- 29z12 & 29z13 – Stope Note
- 450 MLE – Stope Note
- 43z43 South Geotechnical Stope Note
- 37z44 Geotechnical Stope Note
- 43z44 Geotechnical Stope Note
- 7z1 Crown Pillar – Option Study
- 6\_1 VCR – Geotechnical Stope Note & Monitoring & Instrumentation Design for stability assessment
- 6z1 Stope waste withdrawal

**Australia: Ballarat Gold – Ventilation Shaft**

Review of Geotechnical Investigation and Design Report

**Australia: Rio Tinto – Kestrel Coal Mine**

- High Level Risk Review of Contractual Agreements for proposed Box Cut, Drifts and Ventilation Shaft.
- Review of Kevin Rosengren & Associates Geotechnical Report for Kestrel Coal mine involved 2 declines/drifts and a ventilation shaft.

**Australia: CBH Resources – Endeavour Underground Pb/Zn Mine – NSW Australia**

- April '07 – June '07 - Project Management for Mine scheduling & Mine Design Scoping Study - Involved in managing Coffey Senior Mining Engineering & Planning personnel
- Jan '06 – June '07 - Project Management for Onsite Geotechnical Support. Involved managing Coffey junior and senior geotechnical personnel.
- Project Management for Onsite Geotechnical Support, Backfilling process and Mining Engineering.
- Resource & Reserve Review - Project Manager
- Nov 2006 Resource and Reserve Audit Project Manager
- Training and Project Management of the Endeavor Seismic Network expansion with the site Geotechnical Engineer.
- Review of the proposed seismic network sensitivity

**Australia: Beaconsfield Gold (Tasmania)**



- Fall of Ground (26<sup>th</sup> April 2006) – Fatal Incident – Mine Wide Underground Investigation following fatality fall of ground incident for risk assessment purposes.
- Background research on Ground Support and Ground Control.

**Australia: Barmingo Contractors**

- Development of a Code of Practice for Underground Shotcrete Application –
- Development of State of the art shotcrete shear testing device for early strength determination

**Sept '04 – Dec '05**

**GHD - Senior Geotechnical Consultant**

**Indonesia: Archipelago Resources - Toka Tindung Gold Project**

Indonesia Lenders Construction Engineers review for Rothschild – Risk Assessment, Open cut mine design review, geotechnical information review.

**Loy Yang Open Cut Mine (Energy Coal) - Operations Geotechnical Project Manager**

- Geotechnical Support inclusive of managing fortnightly Geotechnical inspections and stress relief crack database management and remediation.
- Six Monthly (September) and Annual (March) Batter stability performance reporting
- Innovative External Overburden Dump Design for TS5 & TS4 (TS – Stacker), interim trial, implementation and monitoring
- Over Burden Dump Operational manual and procedure review
- Facilitating activity based process risk assessment with Mine Project Manager, Mine Production Manager, Mine Planning / Services Manager and Two highly experienced Shift Supervisors management process for new limited dozing and dumping methodology
- Horizontal drainage drilling program
- Subsurface stability bores and shear extensometer monitoring drilling program
- Material Property reviews from Laboratory Tests
- Risk Management Strategies – Process risk analysis
- Mine Planning and special projects

**Australia: Yallourn Energy /TRUenergy Open Cut Mine**

- Fortnightly In-pit inspections review
- External overburden dump design (Flow Slides)
- Fortnightly external overburden dump inspections, review/ monitoring
- Project Risk Manager - Proposed overburden dredge mining operation – Drilling program, geotechnical logging program, parameter review, Slope-W and Phase2 numerical analysis (parameter sensitivity) for slope stability

**Australia: Alinta Gas Pipeline Infrastructure**

Review of proposed Longwall Mining and Subsidence prediction for BHPBilliton's Appin Colliery.

**Australia: Glenmaggie Quarry**

Blast Vibration, quarry design and layout review

**Ashton Coal – NSW – Hunter Valley –Open cut coal operations**

Risk Assessment and batter stability review

**Australia: Walhalla Goldmine – Goldstar Resources**

Project Leader for Scoping Study preparation and liaison

**Australia: Walhalla Goldfields Rail – Tourist Rail**

Landslip rail geotechnical investigation and Risk Assessment

**Bogong Landslip – Contractor Remediation work**

Site investigation, primary spot bolting and work progress risk assessment

**Australia: Exergen – Latrobe Valley**

Geotechnical Investigation for 1200m deep, 6m diameter shaft in the Latrobe Valley for innovative coal processing process

**July 2003 – September 2004 AMC – Consultants - Senior Geotechnical Consultant**

**China: Sino Gold – Feasibility study**

Geotechnical Review / Assessment for open cut and underground mine deposit, project team determining mining method – Proposal for site visit,

**Australia: Clark Shaft Pillar Design Olympic Dam WMC**

Strategic Risk Management concern with shaft pillar. Robinson and Whenan Shaft stability at Olympic Dam Operation. Green west stopes in close proximity of shaft determination of shaft pillar

**Australia: Casallis Gold Mine – Feasibility Study**

Geotechnical Risk Assessment and reporting -

**Australia: Brisbane City Council: Brisbane North/South Tunnel**

Project Manager for Hydraulic Fracture (HF) stress measurement – north and south of the Brisbane River

**Australia: Wonthaggi State Coal Mine**

Peer Reviewer – Occupational Health & Safety risk assessment and residential rezoning for total extraction coal Longwall panels risk management, expansive clay investigation and coal mining subsidence residential zoning

**Australia: Coal Creek**

Risk assessment health and tourist safety aspects – Peer Review

**Australia: Walhalla Goldmine Chamber Ground Control**

Assessment of ground control in access development, large excavation geotechnical review and support design – Peer Review

**Australia: Wonthaggi State Coal Mine**

Residential rezoning for total extraction coal Longwall panels Risk Management, expansive clay investigation and coal mining subsidence residential zoning - Peer Review

**Australia: Costerfield Gold Mine Feasibility Study**

Geotechnical assessment and advice on open pit geotechnical drilling program and slope stability – Review of Geological and Geotechnical Information

**Australia: Costerfield Gold Mine Feasibility Study**

Geotechnical assessment and advice on underground stope stability, development stability and geotechnical drilling program - Review of Geological and Geotechnical Information

**Australia: Pajingo Gold Mine**

Ventilation shaft raisebore operation stability analysis and Peer Review

**December 2002 – July 2003**

**Newmont Australia – Pajingo Operations - Senior Geotechnical Engineer**

- Advise Manager Mining on strategies to combat rock falls and rock related injuries.
- Review and development of a ground control management plan.
- Maintenance and control of geotechnical documentation.
- Raisebore geotechnical analysis Jandam Fresh Air Rise – review of all vent shafts done by raisebore method for evaluation purpose.
- Establishment of standards and procedures pertaining to safety and ground control.
- Establish training manuals for underground operators and ground hazard awareness programs.
- Create and maintain rockfall register and database for statistical analysis.

- Management and design of long hole open stoping operations – pillar design hydraulic radius and stope stability ratio, cable support design and backfill placing.
- Support design of Vera South Deeps and Jandam declines.
- Slope stability prism monitoring for Vera Open Pit - main access to underground workings.
- Scott Lode open pit tailings thickener placement - geotechnical risk assessment and investigation into possible roadway stability for plant maintenance shift supervisors and layout for prism monitoring.
- Jandam Explosive Magazine - support design and shotcrete application - design of safety bolt application for mono rail system.
- Leading teams in incident and serious incident investigation and reporting other than rock fall incidents.
- Leading team investigations: - major rockfall in decline near miss, two backfill slump incidents, rockfall in decline access assistant surveyor involvement, stope failure and equipment damage.
- Participate in CIBETS change management strategies and business processes.

November 2000 – December 2002 **Rock Engineering / Geotechnical Consultant - Civil Tunnelling & Mining Research Centre, The University of New South Wales (2002)**

- **Consulting for the mining industry**  
 Geomechanical laboratory tests, analysis and reporting for Newlands Coal Mine.  
 Market survey for innovative bolting technology for Hilti Pty Ltd.
- **Unisearch, The University of New South Wales (2002)**  
 Consulting for the mining industry  
 Geomechanical laboratory tests, analysis and reporting for Douglas and Partners.
- **PPK Consultants**  
 Consulting for civil infrastructure related to mining  
 Peer review of finite element analysis for access tunnel under the Newcastle-Sydney highway.
- **SMEC International (2001-2002)**  
 Responsible for geotechnical excavation and support design.  
 Sydney Parramatta Rail Link Twin Tunnels Geotechnical Design – design and review of existing geotechnical information, bolt installation and shotcrete recommendation, rock mass classification, beam stability, geo-hydrology water inflow prediction (Empirical, Mathematical Statistical, Seep-W) drainage design.
- **Douglas & Partners (2001)**  
 Responsible for geotechnical excavation and support design.  
 Melbourne Eastern Freeway Extension Tender design – geotechnical investigation (Joint Venture: SMEC, Leighton Contractors, EUROCC and Douglas Partners – investigation included support recommendations for twin 4 lane tunnels 18m width 8m high, geo-hydrology
- Analysis (hydraulic conductivity etc.) water inflow predictions, wedge analysis for stability, Shaft stability analysis.  
 Sydney Parramatta Rail Link Station Geotechnical Advice – Review of existing geotechnical information, bolt installation recommendation, rock mass classification, beam stability.
- **Connell Wagner (2000-2001)**  
 Preliminary geotechnical investigation into ventilation shaft stability and excavation method – Nebo colliery (BHP) - Dendrobium Coal Mine.
- Soft ground Tunnelling investigation – ore conveyance system and transport of men, material and equipment – Nebo Colliery – (BHP) – Dendrobium Mine.
- Preliminary geotechnical investigation into portal design and long term stability, Dendrobium Mine.
- Bondi Rail Link – Turn Backs Extension – Cost estimate of project \$115 m.

**May 1999 – November 2000      Senior Rock Engineer (Projects) - Impala Platinum Mines, South Africa**

- Reporting to me: 2 Strata Control Officers, 3 Strata Control Observers.
- Advise management on matters pertaining to Rock Engineering Designs for all mining related projects.
- Provide advice concerning new projects at project management meetings.
- Excavation size designs and medium and long term support capabilities.
- Contractor liaisons with respect to quality monitoring of shotcrete Brandrill & Torrex Joint Venture.
- No. 1-Shaft declines – (Conveyor, Chairlift, Silo's, Dams etc.) Resin grouting & Fibre-reinforced shotcrete.
- No. 10-Shaft Conveyor decline - Mesh & Lace, Shotcrete & 6m Long Anchors.
- No. 11-Shaft Declines - (Conveyor, Chairlift, RAW, Vent Shaft, dams, etc) Galvanized splitsets full column grout and Fibre re-enforced shotcrete.
- No. 14-Shaft - Conveyor, Chairlift, RAW, Vent Shaft, dams, etc) Ausiebar and Wet Fibre re-enforced shotcrete.
- Crocodile River – Barplats - Geotechnical investigations into UG2 reef for bord and pillar design. Geotechnical investigations into slope stability for boxcut – decline entrance.
- Impala Seismic Network - Implementation of Aura Prisms Mini Seismic Network connecting with Existing 3 Surface Geophones; New Project for the extension of the seismic network with capital application.
- Accident Inquiry Impala Mine Expert Advise.

**August 1999 to June 2000      Act. Rock Engineering Manager - Impala Platinum Mines South Africa**



- Reporting to me: 3 Snr. Rock Engineering Officers, 2 Rock Engineering Officers, 4 Strata Control Officers, 7 Jnr. Strata Control Officers, 18 Strata Control Observers and 5 Learner Strata Control Observers.
- Managing of the rock engineering function – setting two monthly targets.
- Check strategies and projects.
- Taking responsibility of the complete rock engineering function including accident investigation.

**January 1997 to April 1999**

**Rock Engineering Officer - Impala Platinum Mines, South Africa**

- Reporting to me: 2 Strata Control Officers and two Rock Mechanics Observers.
- 9 and 10 Shaft Responsibility - approximately 50 000m<sup>3</sup> Reef mining.
- Projects on major declines, incline Shafts, Chair lift, stability analysis.
- Regional pillar design for the depth range 1000m - 1400m below surface.
- Major crosscut pillar design for stability purposes including both shaft pillar designs.
- The No. 9-Shaft - Shaft pillar design had some complications with the second reef (i.e. UG2 reef) situated below the Merensky reef and in proximity of the dams and pump chamber.
- Advise our best practices on support designs for the codes of practice.
- Involvement in the finalisation of the mines code of practice on combating rockfall and rockbursts.
- Fall of ground fatal inquiries.
- Computer modelling stability analysis done on MINAP 94, MINSIM W, JBLOCK, MAP3D.

**May 1996 to January 1997**

**Acting Rock Mechanics Officer - Vaal Reefs Exploration and Mining Company Limited, Anglo American Corporation (Anglo Gold)**

- Advise management to matters pertaining to rock mechanics at the North Division No. 2-Shaft.
- 3 Mine Overseer sections.
- Oversee all off-reef and on-reef development layouts, monthly 1:200 stope sheet audits related to stoping risk
- Establishment of a panel risk rating system at the no. 2-shaft. It is now a well established Stopping Risk Rating tool.
- Assessment, off-reef and on-reef support recommendations.
- Establishing a macro and micro mining sequence to minimise seismicity associated with major geological structures.
- Code of practice for No. 2-shaft stoping panels – alternative ground support regime to combat areas of high seismic potential.
- Meetings with representatives from mining support companies, monthly scrutiny meetings with the assistant mine manager, planning meetings with the relevant production personnel.
- Shaft pillar extraction project team meetings.
- Support Strategy layouts revision reports, extensive computer modelling for on-reef and off-reef stresses determination, as well as ESS calculations for geological discontinuities with Besol/MS 3-dimensional computer program '95 MINAP '94 2-dimensional computer program both Windows applications.
- Sub-regular underground visits to assess ground conditions and support quality: shotcrete quality control (normal and re-enforced shotcrete).
- Extensive experience in concrete technology (Concor technicrete – shotcrete for wall rock support application).
- Evaluate the suitability for continued Hydraulic Fill for No. 2-Shaft. All high risk stopes with classified tailings through a backfill system. Drainage was controlled through decant semi permeable geofabric and flocculant.

**March 1994 to April 1996**

**Strata Control Officer - Vaal Reefs Exploration and Mining Company Limited, Anglo American Corporation (Anglo Gold) – South Africa**

- MINSIM three dimensional boundary element analysis of stope face stability associated with bracket pillars.
- Pillar stability monitoring
- Underground support quality control.
- Regular visits to stoping operations for support and ground condition assessments.
- Fall of ground reporting
- Seismic damage assessments
- Fatal and incident inquiry investigations

**August 1993 to March 1994      Project Assistant - Vaal Reefs Exploration and Mining Company Limited, Anglo American Corporation (Anglo Gold) – South Africa**

- Intermediate Gold Mining Tunnel Instrumentation monitoring.
- Mesh and Lacing quality control.
- Stope audits
- Seismic system expansion u/g locations
- Seismic event locations and u/g damage assessments
- In house training.

**March 1992 to December 1992      Field Assistant - De Beers Consolidated Mines Transvaal Diamond Exploration (TDE) – South Africa**

- Reporting to the senior geologist at Central Treatment.
- In charge of the ultra-fine drying section and the sample storage at Cullinan stores.
- Setting up a database on QA4 computer data base application program for all the samples stored

**October 1988 – January 1989      Field Assistant De Beers (Transvaal Diamond Exploration)**  
**October 1989 – January 1990**  
**October 1991 – January 1992**

- Collecting of soil samples on farms in the Transvaal area. Some Geological projects like mapping (Zebediela fault –Northern Transvaal).
- Work with Bison magnetic susceptibility meter testing the magnetic susceptibility of boreholes drilled, drilling project in the Western Transvaal
- Drainage networks and river sediments project for future prospecting prospects.

## **PUBLICATIONS**

### **REFEREED PAPERS**

- Managing Geotechnical Risk through Non-Destructive Rock Reinforcement Testing Trialled at the George Fisher Mine, Mt. Isa. Second Ground Control in Mining Conference. Sydney, 2010.
- Non-Destructive Testing at Sunrise Dam Gold Mine, ITA Conference Vancouver, May 2010.
- Non-Destructive Testing of Rock Reinforcement in Australian Mines – February Coal 2010 Coal Operators Conference, Wollongong
- An integrated Geotechnical Service at Endeavor Mine, ACG News Letter, August 2006.
- Development of a laboratory facility for testing shear performance of installed rock reinforcement tendons, Virginia, Coal Ground support conference, Morgan Town, 2005.
- Risk Management Process for Practicing Geotechnical Engineers, AUSIMM, Bulletin, 2004.
- Understanding the Performance of Rock Reinforcement Elements under shear Loading through Laboratory Testing – A 30 Year History – Ground Control in Mining Technology and Practice, 10-13 November 2003.
- Application of the Q-System in Mine Tunnelling on a South African Platinum Mine – October – SAIMM 2001 – Mining Journal, South Africa.
- Application of the Q-System in Mine Tunnelling on a South African Platinum Mine – October – SANIRE 2000 – Bushveld Conference, South Africa.
- Lessons Learnt in Decline Support Design - October – SANIRE 2000 – Bushveld Conference, South Africa

#### PRESENTATIONS

- No. 2-Shaft, Stope Panel Risk Rating System, Anglo Gold, 1995
- No. 2-Shaft, Tunnel Risk Rating System, Anglo Gold, 1995
- Lessons Learnt in Decline Support Design - October – SANIRE 2000 – Bushveld Conference, South Africa
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#### OTHER PAPERS/REPORTS

- Preliminary Investigation into diamond mine project feasibility  
Sierra Leone - 2010
- Non-Destructive Rock Reinforcement Testing at Mandalong Coal  
Mine – Centennial Coal - 2009
- Non-Destructive Rock Reinforcement Testing at George Fisher  
Zinc Mine - XSTRATA - 2009
- Geotechnical investigation into Rockmass stability at the Warrior  
Gold Mine – City Gold, Charters Towers, QLD - 2009
- Non-Destructive Rock Reinforcement Testing at Fosterville Gold  
Mine – Northgate Minerals - 2009
- Non-Destructive Rock Reinforcement Testing at Sunrise Dam –  
Anglogold Ashanti - 2009
- Shaft protection and stability analysis Olympic Dam Operations –  
AMC 2003
- Wonthaggi State Coal Mine – Residential rezoning of surface  
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- Ground Control Management Plan Review – Pajingo – 2003
- Jandam Decline Fall of Ground Serious Incident Report – Pajingo -  
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- Prism Locations for Vera Pitwall monitoring – Pajingo – 2003
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- Geotechnical Review (Support Design & Water inflow predictions) of  
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- Geotechnical review of rock mass surrounding the stations for  
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- Dendrobium Coal Mine Access and Conveyor Tunnel  
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- Dendrobium Coal Mine Ventilation Shaft Geotechnical Raisebore  
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- Impala Platinum wide ore pass instability and rehabilitation investigation – Rock Engineering Projects – 1999
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- Impala Platinum Mine, No. 10-Shaft Seismic Risk Assessment on violent pillar failure seismic damage back analysis – 1998
- Multi reef cross cut pillar design Impala No. 9-Shaft – 1998
- Deep Narrow tabular mining seismically active structures shear stress analysis with various different layouts and mining steps - – Anglo Gold – Vaal River Operations – 1995
- St. Lucia World Heritage Site – Environmental Impact Study Comments report on proposed mining - 1992

#### **WORKSHOPS/ TRAINING'S ORGANISED**

- ATS – Technical Meeting on Rock Reinforcement Durability - 2009
- Collingwood Mine – Bluestone Tin - Geotechnical Training for Mining Engineers and Geologists in aspects of rock mass classifications and ground support requirement assessments.
- Inspector of Mines – Geotechnical Training Orange 2007 (25 NSW mines Inspectors)
- Pajingo Geotechnical Hazard Awareness Training – Presentations 2003
- Exploration Geotechnical Logging – Importance and Physical Parameters – Pajingo – 2003
- Impala Training centre rock mechanics training refresher course and examinations – 1998
- Impala Strata Control Observers – Setting the Impala Rock Mechanics Entry and Strata Control Exam 1997-1999
- Miners hazard identification training following fall of ground fatality – Anglo Gold – Vaal River Operations - 1995
- Shiftboss Strata Control Training Anglo Gold – Vaal River Operations - 1996

#### **HONOURS / MASTERS GRADUATE STUDENT SUPERVISION/MENTORING**

- Luke Mahoney (BE Mining Engineering Honours thesis) 2002 “Analysis and understanding of the issues that affect the performance of Friction Stabiliser Bolts”
- Luke Mahoney (ME Mining Engineering Masters thesis) 2005 “Development of a laboratory facility for testing shear performance of installed rock reinforcement tendons

