



SRK News

Cape Focus

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Team Spirit and Enthusiasm Drive the Cape Offices

Why are the Cape offices of SRK so special? Is it because of the climate and natural environment, as the SRK family in Gauteng would think, or is there something more fundamental? Yes there is a team spirit, which arises from the integration of talents and enthusiasm that pervades the offices.

John Brown (Director) explains, " 'Coastal' is not exclusively the near tidal zone and beyond, but is complementary to 'inland' in a wide sense.

While truly 'coastal' is an area we are currently developing, the services we offer are those of the broader SRK, stylised more for the civil and environmental markets than mining. Services cover the geotechnical, ground

team for the benefit of our clients' projects. The support of our clients is seen as a key contributing factor in our success."

The senior Cape office is in Cape Town (established 1978) and is ably complemented by an office in Port Elizabeth (established in 1993). The articles in this publication cover a wide range of projects in which SRK's Cape offices have been involved and clearly demonstrate the depth of expertise and experience available.

John concludes, "Yes, we are a special group under the SRK banner, motivated, experienced, responsive to changing needs, and with that special team spirit. Without it we could do no more than cast the shadow of our potential on those coastal waters which inspire us."

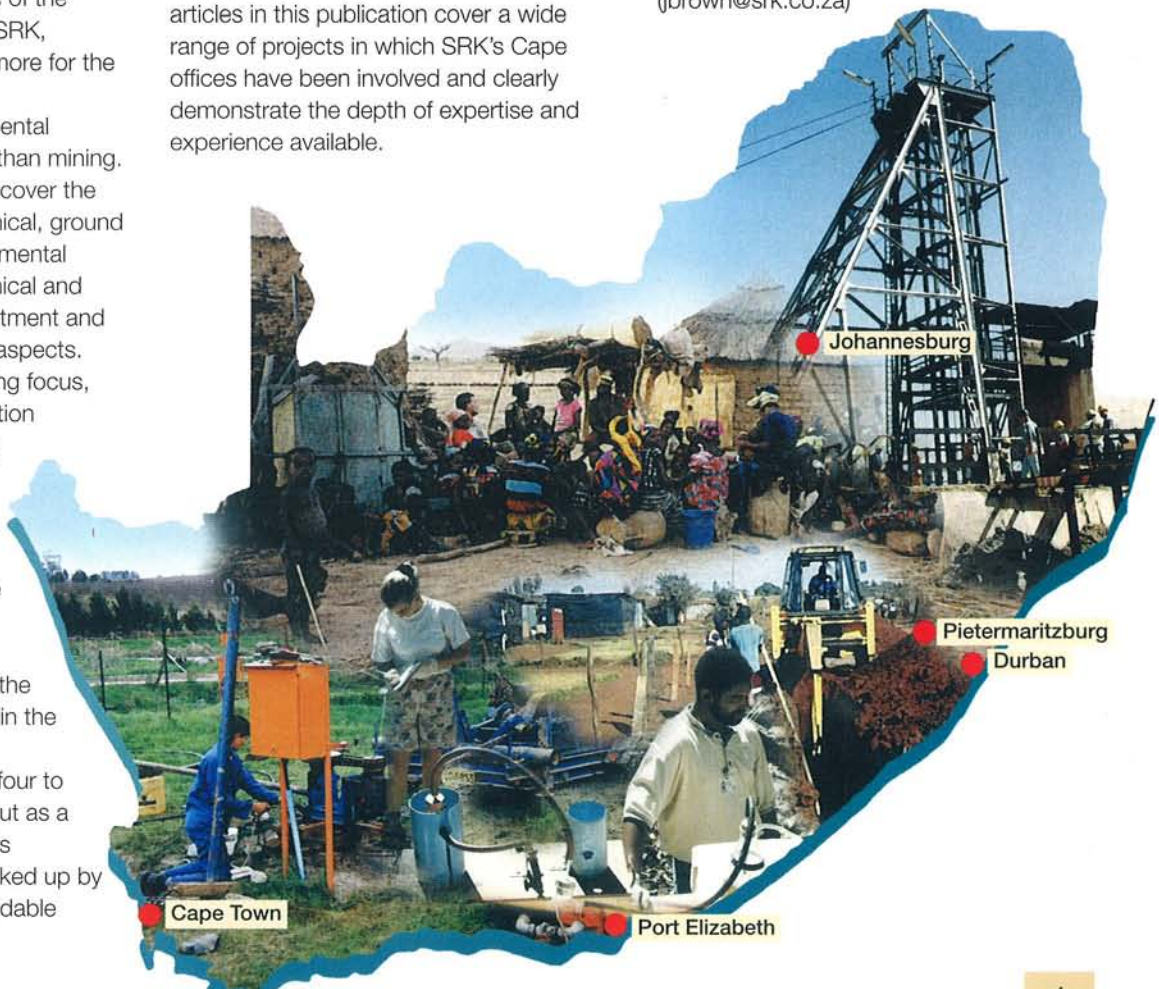
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John Brown

and surface water and environmental fields and extend to civil, chemical and mining engineering, waste treatment and beneficiation, and interrelated aspects. Coastal engineering is a growing focus, with offshore seismic investigation and interpretation as a primary product."

John continues, "Clients cover diverse areas of business and the strength of the services we provide relates directly to the interaction among disciplines within our offices and those in the wider departmental structures in the Group. Typically the individual disciplines comprise teams of four to ten scientists and engineers, but as a group of some 40 professionals integrating our talents and backed up by 200 nationally, we form a formidable



SRK Cape Town's New Recruit - Gordon Maclear

Gordon Maclear graduated from Rhodes University in 1987 with a BSc (Hons) in Geohydrology and worked as a geologist on Loraine Gold Mine. He subsequently joined the Department of Water Affairs and Forestry's (DWAFF) Geohydrology Directorate and headed the Regional Directorate for the Western Cape before resigning to join SRK.

During his employment with DWAFF, he gained experience in coastal aquifer hydrogeology including aquifer exploitation, characterisation, pollution assessment and monitoring network design. His hydrogeological input into an integrated catchment management project for the Swartkops River Basin earned him an MSc from UCT in 1996.

Gordon joined SRK's Cape Town office in May 1998. His work to date has included



Gordon Maclear

being project manager for a groundwater exploration and exploitation project for Lamberts Bay; test pumping in the Hex River Valley; geophysical surveys and drilling for water supply to two golf estates in the Cape

Town area; and the installation of monitoring wells at an industrial site.

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Geophysical Survey Across the Zambezi

A geophysical survey was carried out on behalf of Africon at the site of a proposed new bridge across the Zambezi River at Chirundu, on the border between Zimbabwe and Zambia, in order to determine water depth and thickness of river deposits overlying bedrock. The site extends 250 m to either side of the existing suspension bridge, with fast flowing water at about 5 to 6 km per hour. Its depth varies from less than 1 m to more than 10 m and changes during the day and throughout the week as variable amounts of water are released from Kariba Dam.

A small boat was used to carry out the survey; equipment was erected fore and aft and comprised a 'boomer' seismic profiler transmitter, receiver and graphic recorder. The navigation was achieved by way of a high resolution Global Positioning System (GPS), with accuracy of

approximately 50 cm. In total 13 lines parallel to the riverbank were traversed.



The existing Chirundu Bridge and small boat used for the survey.

SRK's Ted Mills says, "Excluding a delay of three days at customs in Zimbabwe, the project was completed without a hitch."

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Emission Control System for TRW

SRK was commissioned by TRW to design an emission control system for their newly acquired safety belt plant in Atlantis near Cape Town.

Although TRW's plant is essentially an assembly plant, most of the metal components are manufactured and surface treated on site. Surface treatment includes zinc plating, and clear, black and yellow passivation. A Zinc cyanide-based plating and chromium (VI) based passivation process is used. Due to the hazardous nature of emissions from the operation, workers were previously exposed to unacceptable health risks. Proper ventilation of the plating room was required but, under TRW's environmental

policy, ventilation of hazardous emissions to the atmosphere is unacceptable. Accordingly, SRK was requested to design an integrated emission control system, including emission extraction followed by off-gas treatment.

The emission extraction system comprises two main extraction ducts from which a network of smaller ducts connects to extraction pylons. Extracted emissions are then treated in a chemical venturi scrubber system. SRK selected venturi and open tower technology above that of conventional packed bed scrubbers to comply with TRW's stringent standards and to avoid downtime associated with clogging of packing.

SRK Port Elizabeth - Small, Versatile, Ambitious

SRK Port Elizabeth is a satellite office handling a wide range of earth science and civil engineering work. Started in 1993, the office had grown to seven very busy staff members by January 1999.

More importantly the range and scope of projects blossomed from groundwater and geotechnical work to include waste site licensing, sub-surface contamination, geophysics, mining hydrogeology and rock mechanics, as the client base became established. Foundation and retaining structure design, stormwater management and bridge remediation still

form the core of civil engineering projects. The PE team believes this success is largely attributable to their goal of becoming the 'consultant of choice' and employing multi-skilled, dedicated and versatile people capable of producing a high quality product.

Current local projects include location and licensing for a regional waste site, dewatering for the construction of the new Coega Harbour, stormwater planning and management, and several sub-surface contamination projects.

The Serious Effects of CHCs on Landfill Clays

The disposing of soil, industrial sludges and oil contaminated by chlorinated hydrocarbons (CHCs) at unsuitable landfill sites may affect the integrity of the underlying clay and dramatically increase the potential for toxic leachate.

SRK's Ritchie Morris says, "An understanding of the behaviour, mobility and fate of CHCs in soil is required to determine the risks and design a successful monitoring and remediation plan. Serious attention should be given to sites containing CHCs because of their toxic effects even at low concentrations and their movement through the soil to groundwater."

Hypotheses made in the past five to ten years have covered the chemico-structural influences of CHCs on clays and concluded that they cause shrinkage and cracking which increases hydraulic conductivity. More recent research shows that chemical diffusion into the matrix of fractured porous geological media is also important

for the migration of CHCs in clay soils.

Contamination through seepage is of particular concern in South Africa where it is common practice to excavate chemically contaminated soils and dispose of them in landfills which are often not licensed or designed to receive such waste.

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The seepage of hydrocarbons and ground water from a clay embankment.

Health, Safety and Environmental Review for SABITA


SRK recently reviewed the South African Bitumen Association's (SABITA) *Health, Safety and Environmental (HSE) Guidelines for Bitumen and Coal Tar Products*. The guidelines alert producers and users of bitumen products to potential health, safety and environmental risks and provide comment on relevant legislation. During the review it became clear that although little had changed on HSE issues surrounding bitumen, there have been significant changes in legislation aimed at protecting the environment.

Following the review, SRK has assessed the requirements for developing a set of Best Available Technique (BAT) Guidelines for the southern African bitumen industry. The objective of BAT guidelines is to establish how different operations involving the use of bituminous products should be undertaken so as to meet the required health, safety, legal and environmental requirements. An assessment of guidelines currently in use overseas has been undertaken with a view to identifying specific requirements for southern Africa.

SRK's Cheryl Jenks comments, "The final BAT Guidelines should provide SABITA's members with reasonable, economic and proven-in-practice methods of achieving HSE standards."

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River Management Plan for Stellenbosch



SRK is currently developing a river management plan for the Stellenbosch Municipality for the Eerste, Krom and Plankenbrug Rivers within its boundaries. Underpinning the study is the philosophy that river systems within the urban environment are valuable assets that function as aesthetic and recreational amenities, provide habitats and migration routes for fauna and flora, absorb and disperse pollution, act as stormwater conduits and control floods. The river management plan aims to optimise these various functions.

In order to achieve this, the study aims to produce an action-oriented management plan that utilises a GIS to store and analyse data. Immediate, medium and long-term goals will be formulated in conjunction with the municipality and key stakeholders. Involvement of key stakeholders and surrounding communities is important for the successful implementation of the plan, and the resolution of many of the present problems involving the rivers.

SRK's Cheryl Jenks comments, "An initial assessment has been completed which identifies the opportunities, concerns and problems associated with each river. Following the development of initial suggested actions for management, a workshop will be held with key stakeholders to identify and develop an overall goal or vision for the rivers and prioritise issues for action."

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Eerste River, Stellenbosch.

Groundwater Study in the Klein Karoo

The Table Mountain Sandstone (TMS) aquifer is one of the largest and most important in South Africa, extending from Vanrynsdorp in the north-western Cape to Port Elizabeth in the east. To ensure sustainable water supplies, the limitations and water balance of the TMS aquifer must be understood. A research proposal to address these issues was submitted to the Water Research Commission (WRC) in 1996 and approved in March 1997.

SRK's Johanita Kotze comments, "The overall aim and specific objectives of the study are to investigate and develop a conceptual model for inter-regional groundwater flow as a basis for a numerical model. The purpose of this model is to quantify the inter-regional and local hydrological balance and forecast the response to different scenarios of extraction and recharge."

The working hypothesis is that the TMS aquifer is a regional aquifer with recharge taking place primarily in the higher altitudes. The study involved isotopic sampling of all the hot springs in the western Cape and of seepages from the mountains to obtain isotopic signatures of both the hot springs and water recharged at certain altitudes. Comparison of the O-18./ deuterium signatures confirms that the groundwater of the hot springs is initially recharged in the higher altitudes of the mountain ranges. The TMS aquifer is therefore a significant regional aquifer with a large storage capacity.

Johanita concludes, "The study is interesting because it includes an interdisciplinary approach to groundwater management and combines structural lineament mapping, hydrochemical fingerprinting of the different groundwater types and groundwater flow modelling."

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Geohydrological Investigation of the Beachfront at Paaltjies



Test pumping rig at the beach at Paaltjies, south of Walvis Bay.

SRK, in association with Interconsult Namibia, recently carried out a geohydrological investigation for Namwater (formerly the Bulk Water Component of the Department of Water Affairs), Namibia. The study aimed to determine the ability of beach wells to supply 5 Mm³/a of saline water to each of four stages of a proposed desalination plant.

The Inception Report reviewed previous investigations along the coastline and in the Kuiseb River delta system. Preliminary fieldwork suggested a marked increase in the salinities of shallow groundwater inland towards the coastal dunes and salt flats. Measured salinities were considerably higher than for normal seawater.

Mud-rotary drilling of 19 boreholes was carried out along approximately 30 km of coastline south of Pelican Point and revealed hypersaline water at depths of 24 to 34 m in the south. Constant discharge pumping over 14 days caused the saline-hypersaline interface to rise by more than 3 m. Test-pumping in the north, where no hypersaline water was encountered, showed that a borehole 24 m deep could sustain a discharge of 70m³/hour of seawater quality over a period of at least 30 days.

A 3D-groundwater flow model was constructed and calibrated, and recommendations were made.

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Environmental Overview of the City of Tygerberg

The City of Tygerberg is formulating a spatial development framework (SDF) and an urbanisation strategy as components of an integrated plan to guide the future development of the City on a metropolitan scale. The main objective of this is to ensure sustainable socio-economic development in all sectors.

A planning consortium has been appointed to co-ordinate a fast-track process and SRK was requested to conduct an environmental study to inform the proposed SDF.

The findings of the initial investigation were contained in a report that identifies areas of conservation, amenity and recreational value, and makes broad recommendations on the spatial integration and management of these assets within the context of the SDF and the vision for the City of Tygerberg. The final report contains more specific recommendations relating to those areas which could be affected by the proposed SDF and identifies priorities for conservation, recreation and amenities.

SRK's Piet Theron says, "The aspects covered by these reports are dealt with at a city scale level and do not provide specific or detailed comments on development proposals for certain areas."



Piet Theron

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Allan Haines Returns to the Cape

Allan Haines graduated from Strathclyde University in 1975 with a BSc (Hons) in Applied Geology and spent two years as a mine geologist on the Zambian Copperbelt followed by three years studying and working in the UK on local and international tunnelling projects. He started with SRK, Johannesburg in 1980 under the guidance of Dick Stacey and Peter Terbrugge.

His first move to the Cape came in 1985 as project manager for SRK on the Hex River railway tunnel project,



Allan Haines

the largest contract yet completed for South African Transport Services. Here his consulting abilities were complemented by new skills as an expert witness in court. During this period he was appointed to the Board and subsequently as Managing Director of what was then the SRK Kaap practice.

He returned to Johannesburg in 1990 to concentrate on the geotechnical aspects of mining projects. He set up a geotechnical group for the Mantos Blancos Mine in Chile in 1992 and moved

to Santiago to begin SRK SudAmerica in 1994. Today the practice has a complement of 45 based in Santiago and Lima plus two project offices on major mines in Chile.

In 1997 Allan returned to South Africa and Cape Town. He continues to make a significant mark on international mining for SRK in east and west Africa consulting to a range of clients from project exploration stage through to bankable feasibility studies.

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Introducing the LMIS

A Land Management Information System (LMIS) has been designed to effectively manage large volumes of data for a site assessment, remediation and land

Other advantages of the system include:

- the advanced querying capabilities of both GIS and relational database systems;
- the ability to incorporate information stored in a variety of formats;
- the capacity to establish links with third party specialised software;
- standardisation at various sites can

be achieved through the use of templates and protocols;

- details of original data sources are kept;
- any revisions made to spatial data are recorded.

SRK's John Murray comments, "The LMIS is an extremely useful data store and querying tool, and similar technology is

being applied to numerous other projects."

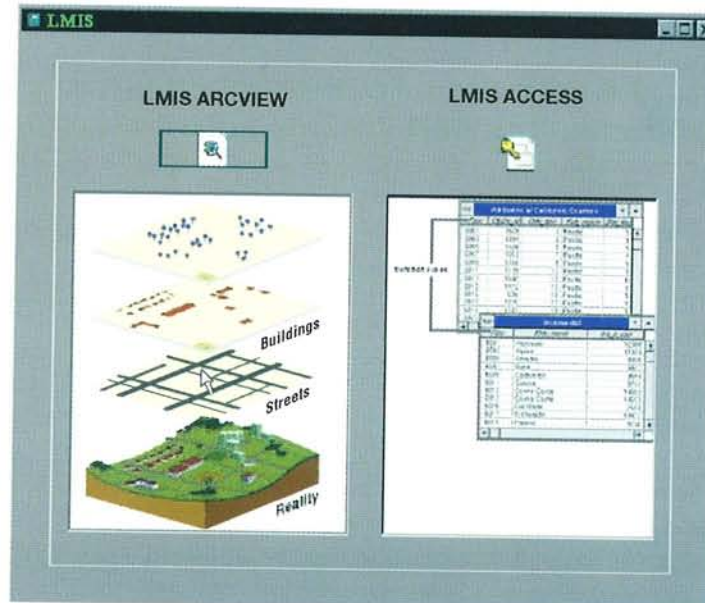
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John Murray

development project on a large industrial site near Cape Town. The LMIS has two main components: ArcView LMIS, which is a geographic information system (GIS), and LMIS Access, which is the database component. These

components are linked using Open Database Technology which enables text and image data stored in LMIS Access to be accessed through the mapping component - LMIS ArcView. Customised buttons and pull-down menus have been developed to enable the project team to extract, query and print data effortlessly.



Groundwater Investigations in the Citrusdal Area

In mid-1997 SRK teamed up with Umvoto Africa to form a specialist groundwater



Peter Rosewarne

consulting joint venture, to tackle projects related to Table Mountain Sandstone aquifers. The association was subsequently awarded two major projects in the Citrusdal area: a wellfield development for the municipality

and a catchment study funded by the Department of Water Affairs and Forestry.

One of the boreholes drilled for the municipality delivered a record blow-out yield of 120 l/s from a depth of 178 m. SRK carried out the supervision of the drilling, construction and yield testing of the boreholes and analysis of the results. The target yield of 55 l/s required by the municipality has been attained.

The second project is an investigation into the development and use of Table Mountain Sandstone aquifer artesian groundwater, using the Olifants/Doring River Basin as a pilot study area. A Phase I Inception Report has been submitted outlining current knowledge on geology, structure and groundwater occurrence in the area, and Phase II will involve remote sensing, structural analysis, water sampling and monitoring and computer modelling of groundwater flow, which will be integrated with surface water models. The project aims to develop a management strategy for optimal use of total water resources, not only within the study area, but also in other similar catchments.

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Collector Well System for Atlantic Beach Golf Estate



Excavation for a collector well showing dewatering wellpoints.

Johnnic Properties is developing a residential golf course complex called Atlantic Beach at Melkbosstrand.

Irrigation water requirements are being met by treated sewage effluent and groundwater. SRK's Graeme Engelbrecht elaborates, "Finding a source of groundwater within an economic distance proved to be an interesting problem. There are thin sands with an intermittent, seasonal perched water table overlying Malmesbury metasediments at the site. Neither of these is a viable source of groundwater."

Exploration further afield identified the bed and banks of the Soutrivier as being the only 'local' viable source. Investigation showed that the optimum design would be a system of horizontal collector wells under the bed of the river. Each well was constructed by first installing a concrete

caisson on the river bank down to bedrock at about 8 m, and then laying horizontal PVC slotted pipe in a gravel pack 50 m out into the river bed at about 5,5 m below surface.

Pre-dewatering of the excavation was required. Five such wells were installed and the system was overdesigned to allow for silting up, encrustation of pipes and downtime for maintenance. The system, believed to be unique in the western Cape, is designed to provide a combined yield of 6 l/s.

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Graeme Engelbrecht

Hazard Ranking Limits Environmental Liabilities and Reduces Risks

Hazard ranking helps a company or a management authority such as a municipality to prioritise environmental issues. This contributes to an improved



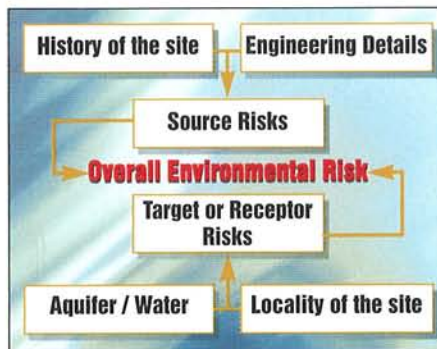
Ritchie Morris

overall environmental management system and reduces environmental risks.

Of importance to most organisations is the manner in which their 'environmental rands' are spent and their ability to react timeously and

appropriately according to the level of environmental risk. The aim of hazard ranking is to prioritise sites or

environmental issues according to their level of associated hazards and the



Flow diagram showing components of the hazard ranking process.

sensitivity of environmental receptors, and ensure that those in the high-risk category are managed so as to limit liabilities.

Two types of environmental risk are assessed as part of the hazard ranking process, namely source risk and target risk. The overall environmental risk is a combination of these and one site or area can be ranked against another. It is possible to identify key influencing criteria which dictate the ranking results and reduce risk by managing them.

SRK's Ritchie Morris says, "Hazard ranking is particularly applicable to contamination problems and enables a company, for example an oil company, to rank its facilities in terms of potential liability."

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Improved Profile for Zoutkloof Quarry

The Zoutkloof Quarry near Cape Town is operated by Pretoria Portland Cement. In late 1997 the mine planning engineer reported excessive slope displacements in the south-east corner of the quarry. SRK's Cape Town office was called in.

A monitoring programme was implemented and the failure was classified in the creeping category, which is slow, continuous movement over a long period. The resultant failure is not catastrophic but eventually the slope becomes unusable and unsafe.

SRK's investigation programme included the drilling of geotechnical cored holes to determine the geological profile, piezometer holes to monitor groundwater conditions and field testing to determine representative rock mass parameters.

A series of design sections was created through the centre of the failed mass, enabling the slope to be modelled from its initial to final state. Remedial measures including dewatering, and cutting back the

profile in the highly deformable graphite schist in the central portion of the 190 m high slope, were introduced.

SRK design engineer Allan Haines comments, "The new profile for this sector of the quarry prevented the eventual destruction of a haul road and major drainage canal, both of which would otherwise have been relocated."

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Zoutkloof south-east corner failure in progress.

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