



# Improving Performance through Benchmarking

**SRK** Russia was engaged by a local client to review several of its iron ore operations, open pit and underground, to determine what increases in capacity could be achieved through removing bottlenecks in its current operations. The operations included open pit and underground mines, dry and wet magnetic concentrating facilities, sinter plants and a pelletizing plant. The deposits, which are mainly skarn-type, principally contain magnetite ores.

For this assignment SRK assembled a team of experienced mining and process engineers and financial analysts to visit each site, review the statistics available and to benchmark the current operations against international practice. The client was actively involved in the process and members of the client's own Operational Process Enhancement (OPE) team joined SRK's team in the visits and discussions.

Through a process of benchmarking the key parameters for each part of the production cycle, the SRK-OPE team was able to highlight which bottlenecks could be removed relatively easily and what the optimal production rate for each site was. This identified opportunities to

increase productivity by between 11% and 30%, adding \$400m to the value of the company. The types of gains included:

- removing artificial cash constraints enabling the buildup of a reasonable stockpile of spares to improve equipment availability
- Understanding the economic impact of specific key performance indicators
- Sharing information between the company's own operations to highlight best practices
- Buying modern mining equipment to improve development rates and improve the utilization of the ball mills
- Balancing the mining fleets to use spare capacity

- Using modern technology to optimize the pit design and mine plan
- Improving the approach used to evaluate equipment purchases

Whilst some of these improvements can be implemented easily through specific purchases or "hard" changes, SRK's engineers can also provide the support needed to implement the more technically difficult changes, such as optimizing the pit design. In addition, SRK's engineers can help set up the systems to support ongoing performance monitoring and investment analysis, which the client's own teams can use into the future.

David Pearce:  
[dpearce@srk.ru.com](mailto:dpearce@srk.ru.com)



## David Pearce

**D**avid Pearce is a Principal Mining Engineer with 20 years experience and Managing Director of SRK Russia. Before joining SRK he worked in various roles at Rössing Uranium, including implementing a mine management system and designing a system to optimize the uranium leaching system. Also, David was Technical Services Manager at Kaltim Prima Coal, a large open pit coal mine in Indonesia, responsible for exploration, resource estimation, mine design, geotechnics, civil engineering services, blasting contract, survey and quality control.

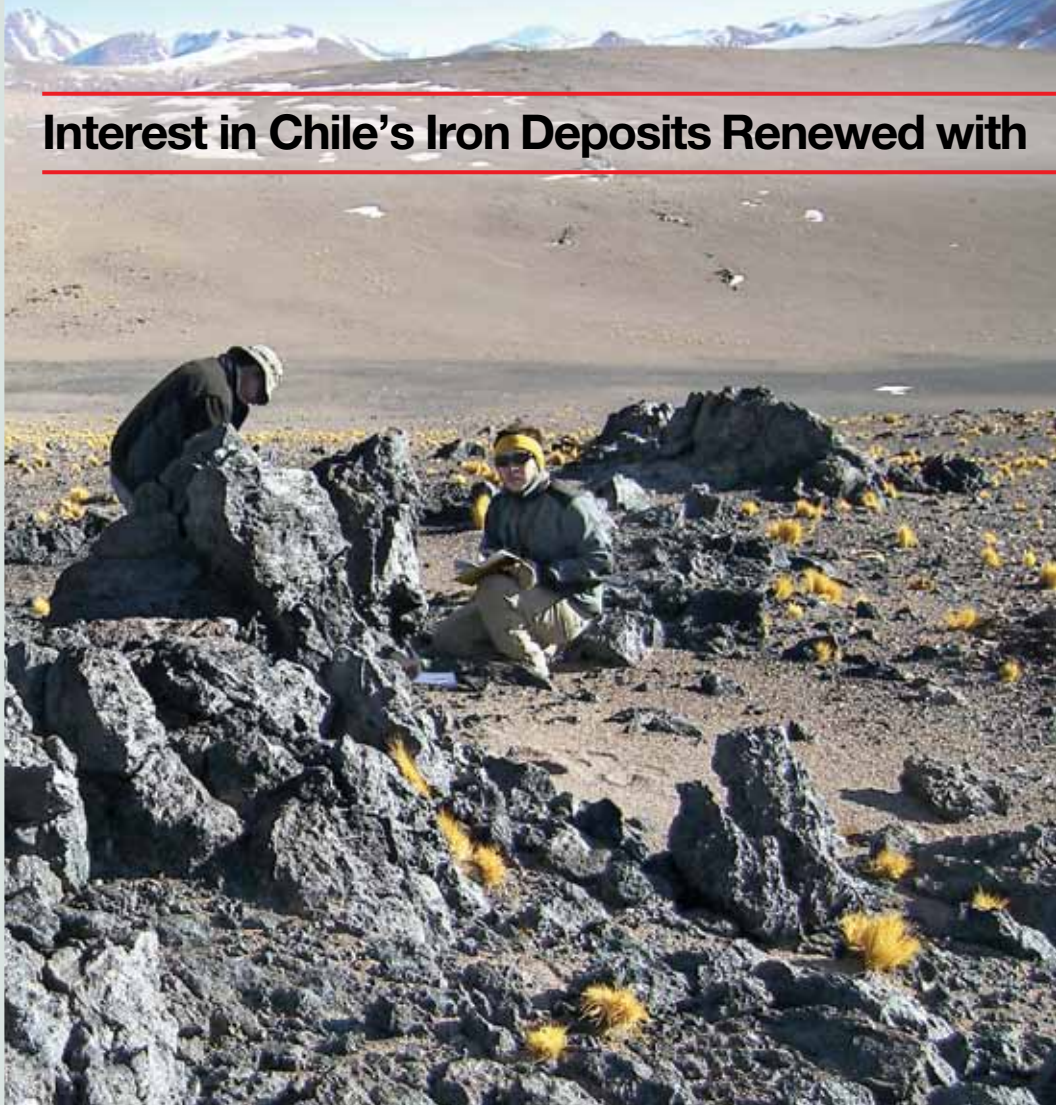


*David Pearce*

On behalf of SRK, he established SRK Russia in August 2006; it now has 31 full-time employees. The office provides technical studies (geological modeling, mine design, environmental impact assessment and economic analysis), audits and debottlenecking studies.

David Pearce dpearce@srk.ru.com

## Interest in Chile's Iron Deposits Renewed with



*Outcrops of hematite and magnetite veins in the Andes, 4,300 MASL*

**A**s the price of commodities has increased in the rest of the world, so has the production of iron ore in Chile. Historically, Chile has only been attractive to local companies interested in iron. However, for the past three years, junior exploration companies specializing in iron have shown increased interest, as have local producers and international companies looking for more sources of iron ore.

SRK has worked extensively with clients on exploration programs, mineral

resource estimation, and scoping analyses of potential mines. Both well-established clients and juniors have focused on traditional iron exploration and extraction, either through exploiting structurally-related massive magnetite veins, or Iron Oxide/Copper/Gold (IOCG) deposits.

In 2006, SRK's Geology - Resources & Reserves group in Santiago teamed up with a client to find new deposits, and explore new alternatives. This led to the discovery of previously unmined bulk-tonnage iron sources in Chile. With the current market conditions, "stockworked" magnetite zones bordering the massive magnetite veins create a viable target for open pit mining. Generally classed as Kiruna (magmatic) style iron ore deposits,



*Partially crystallized  
Magnetite/Hematite*



# Application of Modern Exploration Techniques

SRK believes they are more properly classed as hydrothermal deposits or, in some cases, hybrid magmatic-hydrothermal deposits.

Hydrothermal magnetite ore deposition was accompanied by the pervasive occurrence of actinolite. In many deposits, movement on the north-south trending Atacama Fault Zone was concurrent with ore deposition and intra-mineral dikes. Other spatially-related dikes are clearly post-mineralization. Host rocks are generally early Cretaceous intermediate volcanics and intrusives.

Once a client takes an exploration claim position along the 600km-long prospective iron belt, exploration for these deposits can be done using remote spectral analysis, through which ASTER and high resolution satellite images are studied to identify the associated bandwidth and footprint, and thus determine the target exploration

zones. Aeromagnetic data are also used where available. This is followed by reconnaissance field work to further define target zones for more detailed surface mapping and sampling. Ground magnetics are used to help focus initial drill targets.

Based on pilot drill results of prospective areas, grid drilling is planned, and where successful, after geological modeling and resource estimation, SRK's Mining Engineering department carries out preliminary mining scoping studies.

While full metallurgical work is still pending, the initial scoping studies show very positive economic results for several of these deposits.

George Even: [geven@srk.cl](mailto:geven@srk.cl)  
Ernesto Jaramillo: [ejaramillo@srk.cl](mailto:ejaramillo@srk.cl)

## George Even

**G**eorge is a Principal Geologist and Partner in our Santiago, Chile office. After spending 10 years in both exploration and mining in North America, his work for the last 25 years has been based in Santiago. His project experience includes design and execution of exploration programs, development of structural, geological and geotechnical models, and due diligence reviews throughout Latin America.



In the last few years, under his leadership, the geology team at SRK Chile has grown and diversified. SRK's Santiago geologists are able to run exploration programs and mine-based resource-reserve estimations, as well as integrate their services to the mining and geotechnical departments.

George Even: [geven@srk.cl](mailto:geven@srk.cl)

## Ernesto Jaramillo

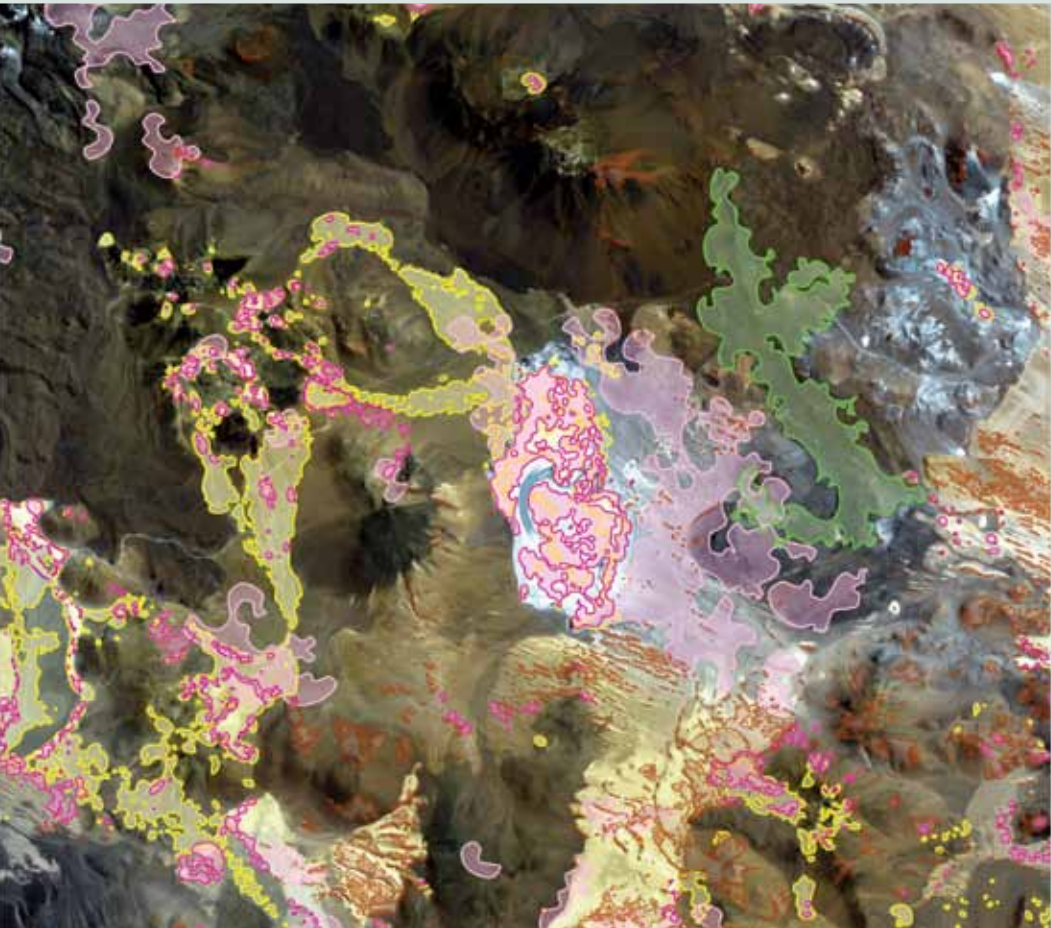
**E**rnesto Jaramillo is a Principal Geologist with more than 19 years of professional experience. As head of SRK Chile's Exploration and Resource & Reserve department, he has specific experience in geological modeling and resource modeling and estimation related to all phases of mine planning as well as to exploration programs. In addition, he has participated in technical studies and due diligence reviews for base and precious metal projects in all of Latin America.



Ernesto Jaramillo: [ejaramillo@srk.cl](mailto:ejaramillo@srk.cl)

Since 2006 Mr. Even and Mr. Jaramillo have developed exploration programs for Minera Santa Fe (where Jindal Steel is a major partner) resulting in mineral resource estimates adding substantial iron resources to Santa Fe's iron properties in Chile.

*Remote spectral mapping of a project prepared by SRK Chile staff from Aster images*



---

## SRK Brazil

---

**SRK** Consultores do Brasil Ltd. commenced its activities in 2005, with a strong team in geology and mining. Currently with 20 staff, it provides services in exploration planning and management, resource estimation, mining design, and advice on mineral rights and environmental licensing. Working together with other SRK consulting practices, SRK Brazil can develop due diligence, scoping and feasibility studies, and independent technical reports for public listing in several countries, with special emphasis on those compliant with NI 43-101 and JORC codes.

---

## Bruno Serra

---

For his degree in computational mathematics, Bruno Serra studied computer-aided applications of mathematics, and specialized in linear and non-linear optimizations using mathematical and statistical methods. He has been working in the mining area for the past four years, since SRK's Brazilian office was established. Bruno has a good knowledge of mining software packages; he worked on developing the database and interface portions of Geopit. He has been working on a number of different projects for SRK involving mineral databases, resource evaluation, pit optimization and pit design. He has coded project data for SRK, such as block models and triangulations. With his strong capabilities in English, Bruno has been acting as a communication bridge between SRK Brazil and other international offices.

Bruno Serra: bserra@srk.com.br



Bruno Serra

---

## Iron Rush

---



Mina do Bonito Mine

**B**razil is one of the largest producers of iron ore in the world. The country has come a long way in developing the technology to explore, mine and concentrate its iron orebodies; today it is on the leading edge on iron ore technology. The recent demand – and prices – for iron were enormous and initiated a rush for iron ore deposits. Brazilian lower-grade itabirite deposits, once uneconomical, have become a boon for investors who want to profit from this craze.

Three main sources of iron exist in Brazil: archaean deposits, which are very poor and remain unexplored; proterozoic deposits, such as the banded iron formation of the Quadrilátero Ferrífero region; and iron of glacial origin, like the material found in Urucum and North of Minas Gerais state.

Iron exploration in Brazil started in São Paulo state in 1589, at Fazenda Ipanema. The region contained a very rich magnetite body, but with high levels of contaminants like phosphorous. In the 1800s, the Portuguese Royal Family founded the Real Fábrica de Ferro de Ipanema. Its iron was used to build canons for the war against Paraguay from 1864 to 1870.

Around 1910, exploitation began in Quadrilátero Ferrífero; it became the largest producer of iron ore in the country.

Only in the 1970s did the Brazilian mining industry start using technology to enrich iron ore. The first projects to use concentration technology were the Picarrão Mine, which used gravimetric concentration (Humphrey Spirals), the Samarco Project, which used reverse cationic flotation, and the Cauê Plant, which used wet, high-intensity magnetic separation.

Once the industry developed the capacity to concentrate iron ore, two economic factors became crucial: the costs, such as power, related to the preparation for concentration, and the costs of concentration itself. Developing lower-grade itabirite deposits was thus prohibitive, either due to their hard rock nature or to high concentration costs.

While the majority of the rich deposits in Brazil are already in the hands of larger companies like Vale or CSN, the recent market elevated prices to new levels, presenting new investment opportunities. SRK Brazil has been evaluating the economic potential of these options.

For two years, SRK Brazil and SRK UK have combined efforts to study areas within the northeast region and south of Bahia state for Bahia Mineração Ltda. (BML). With SRK Exploration Services, they are exploring iron ore areas in Rio Grande do Norte state for MHAG Serviços e Mineração S.A. In both cases, they are studying banded iron formations consisting mostly of hard, low-grade itabirite rocks.

In addition, much due diligence and certification work has been executed for various investors, with the help of SRK Denver, to pursue areas with lower-grade iron ore.

The Brazilian iron ore market is growing more important by the day and SRK Brazil has the right people and technology to help interested companies develop new and exciting projects.

Bruno Serra: bserra@srk.com.br  
Antonio Carlos Girodo: girodo@srk.com.br



# Mining Scheduling with Geopit

There are two methods for mining scheduling: the Maximizing Method and the Stationary Method.

## Maximizing Method

For a long time, mine planning emphasized the maximization of the enterprise's cash flow. This approach takes into account a preference for high grade ores (rich ore has more value) that results in mining high grades at the beginning, and low grades at the end of the mine life cycle. For ore types such as gold or copper, this is the best method to plan the mine sequence.

## Stationary Method

Industrial ore types, such as iron, manganese, phosphate, or limestone for cement, require a different approach, once they have been subjected to rigid quality specifications to determine constant grades. To take

these characteristics into account, it is necessary to change the mining scheduling method. In this new scenario, the grades must remain constant, so that the ore retains its commercial value.

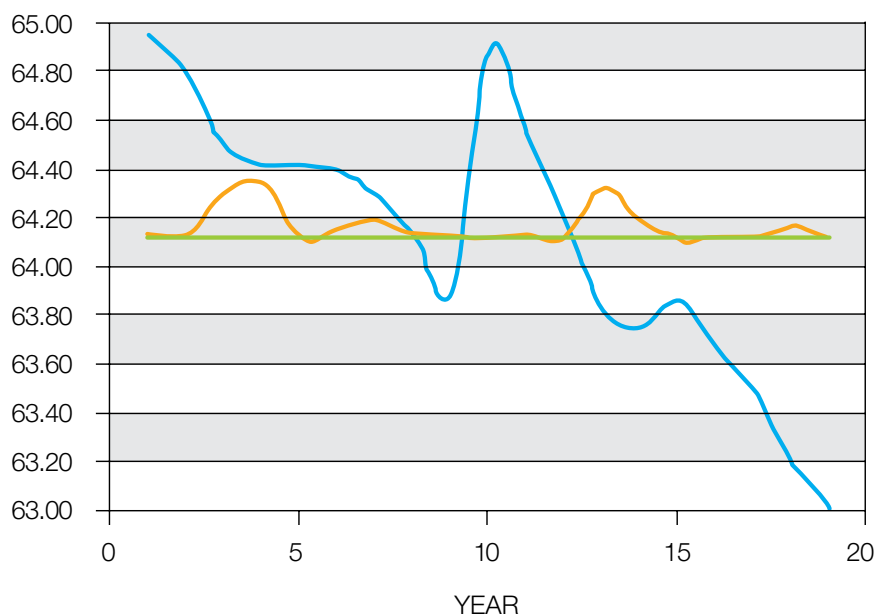
## Mining Scheduling with Geopit

Geopit is a software program used for mining scheduling through the stationary method. It is used by major companies, such as CVRD, Votorantim, Bunge Fertilizantes, Holcim, FMG (Australia). It was developed for mining scheduling that incorporates sophisticated mass and grade control (blending), along with many tools that give the user total control of the process.

SRK Consulting represents Geopit worldwide, except in Australia.

Domingos Lanna: [dlanna@srk.com.br](mailto:dlanna@srk.com.br)  
Bruno Serra: [bserra@srk.com.br](mailto:bserra@srk.com.br)

## Grade Control



■ Other Software ■ Geopit ■ Minimum Fe%

# Domingos Lanna

Domingos Lanna is a Mining Engineer with 31 years of experience. He spent 19 years working with mining companies, in roles ranging from mine planning to general manager. He was responsible for the management of teams of up to 800 professionals and budgets of up to US\$100 million/year, with full responsibility for operations involving mining, processing, metallurgy, maintenance and engineering. Domingos has worked with consulting companies in mine planning and equipment selection and more recently in project management. His commodities experience includes iron ore, phosphate, gold, copper, bauxite, potassium, limestone, uranium, granite, titanium, barite, diamond, tin ore, asbestos and nickel. Domingos' combined consulting and operational experience provides a solid base for the design, construction and operation of various projects.



Domingos Lanna

Domingos Lanna: [dlanna@srk.com.br](mailto:dlanna@srk.com.br)

# Bruce Sommerville

Bruce Sommerville has over 15 years' experience in the geosciences on projects involving the small to large underground mining of base metals and open pit mining of industrial minerals. This includes over 10 years carrying out the management, estimation, reconciliation, classification and reporting of mineral resources and ore reserves in operating mines and projects. Bruce's experience includes work with these commodities: lead, zinc, silver copper, phosphate, gold and iron ore.



Bruce Sommerville

Bruce Sommerville: [bsommerville@srk.com.au](mailto:bsommerville@srk.com.au)

## Dr. Yonglian Sun

**D**r. Yonglian Sun is a Principal Consultant and the managing director of SRK China. He has over 18 years of experience in geotechnical engineering, rock mechanics and mining engineering in five countries across four continents. His credentials include BEng, PhD, MAusIMM, MIEAust and CPEng. He also has considerable experience in project management and project evaluation in assisting mine operators with project financing and overseas stock listing. Recently, Yonglian coordinated and worked on a number of due diligence projects in China; most of them have been successfully listed on the Stock Exchange of Hong Kong Limited.

Dr. Yonglian Sun: [ysun@srk.cn](mailto:ysun@srk.cn)



**Dr. Yonglian Sun**

## Due Diligence Review on Iron Ore Projects

**D**ue to the continuing high demand in the iron and steel industry, iron ore projects have become increasingly hot these days in China. SRK China was commissioned by Hua Yi Copper Holdings Limited (Hua Yi), a company already listed on the Stock Exchange of Hong Kong Limited (HKSE), to conduct a full due diligence review of the Longxin project. Hua Yi was interested in acquiring the Longxin project, including the Beipuzi mine and Gushan exploration tenement, which is located in Chengde, Hebei Province. SRK China provided the Independent Expert Report that is required for major transactions on the HKSE. The Report needs to be in compliance with Chapter 18 of the Hong Kong Stock Listing Rules. The acquisition and transaction was successfully completed early this year.

The Longxin project is located about 3 hours driving distance from Beijing. It contains low grade ore where an average total iron (TFe) grade is 21.46% and average magnetite content is about 11.29%; that is about 53% of the average

total iron content. It is a typical magmatic deposit, a product of late stage magma segregation.

The Longxin project operates 4 open pits inside the mine boundary. During SRK's site visit, only 2 pits were operating. One hydraulic shovel with a capacity of 1.2 m<sup>3</sup> and one front-end-loader were assigned to each mining face. The truck fleet consisted of ten 20-tonne trucks and thirty-five 25-tonne trucks. In general, the operation runs on 12-hour day-shifts only. Each truck can travel 20 return trips from the mining area to the ore processing plant daily. The surrounding rocks are primarily feldspar or pyroxene diorite and the pit walls appeared to be moderately stable.

While SRK considers the current parameters proposed for the Beipuzi open pits to be appropriate, more work is needed to better understand the geotechnical conditions at the mine and to confirm that the pit wall design criteria meet those conditions. SRK noted that double benching would only be practical if rock conditions are good, and





attention has been given to forming final walls with minimum damage.

At the time of the SRK site visit, the mine operators had not worked out a detailed mine design by year for the next 5 years. The mine has measures in place to blend ores with various grades to optimize production. In addition, further geological exploration work is underway and ore resources are expected to increase to provide a basis for the mine's sustainable development. In SRK's view, that long-term planning should be completed as soon as possible.

Mine production primarily uses the contract mining and shallow-hole blasting technique. This is labour intensive and inefficient. Interim berms and benches inside mining areas have not been formed properly, which will have an adverse effect on long-term mining. SRK recommended that management of safe production as well as improved mine design should be conducted jointly. The photo below shows the current mining being conducted.

The process flow includes three stages; preliminary dry-magnetic processing, grinding and classifying, and coarse-

grinding magnetic processing. The plant is designed to process 1.50 Mt of raw ore per year and to produce around 200,000t of iron concentrates with TFe grades of more than 60%.

SRK's environmental technical review identified numerous environmental issues. The project needs to follow strictly the conditions for operation stated in government approvals. The operation also needs to improve its compliance with Chinese environmental laws and regulations, particularly related to water control, monitoring and management measures, as well as erosion control measures.

SRK has conducted several similar reviews on iron ore projects over the past few years. Additional services have also been provided as follows:

#### Resource Update

- provide site supervision on further drilling to upgrade the resources and to bring them into compliance with JORC code
- conduct resource estimation using either Surpac or Micromine software to update resources with the newly drilled data being considered

#### Geotechnical Review

- review the current geotechnical program and recommend a detailed program to obtain realistic parameters for mine design
- review the safety status on the existing tailings dam

#### Mine Design

- conduct the detailed mine design, including the yearly mine scheduling for the first 5 years and the design of the final pit
- estimate reserves that can be reported in the Independent Expert Report for transactions being conducted in the HKSE or for project finance

#### Environmental Review

- carry out a compliance review
- develop a site monitoring program to improve the status

SRK China will continue to review iron ore projects, either for geology only or for full due diligence, depending on the nature and status of the project. SRK China has its own qualified geologists, geotechnical, processing and environmental engineers and a pool of close associates who are mining engineers so that we can mobilize a team on short notice for any project site.

Dr. Yonglian Sun: [ysun@srk.cn](mailto:ysun@srk.cn)



*Mining in the East Area  
at Open Pit No.2*

## Howard Baker

**H**oward Baker is a Senior Consultant with over 12 years experience in exploration, mine geology and resource estimation. He holds a BSc in Applied Geology and an MSc in Mineral Resource Evaluation. Howard gained most of his early experience in mine site development exploration before furthering his career in a number of production-based roles in Western Australia. These included working at world class nickel laterite and mineral sand deposits.



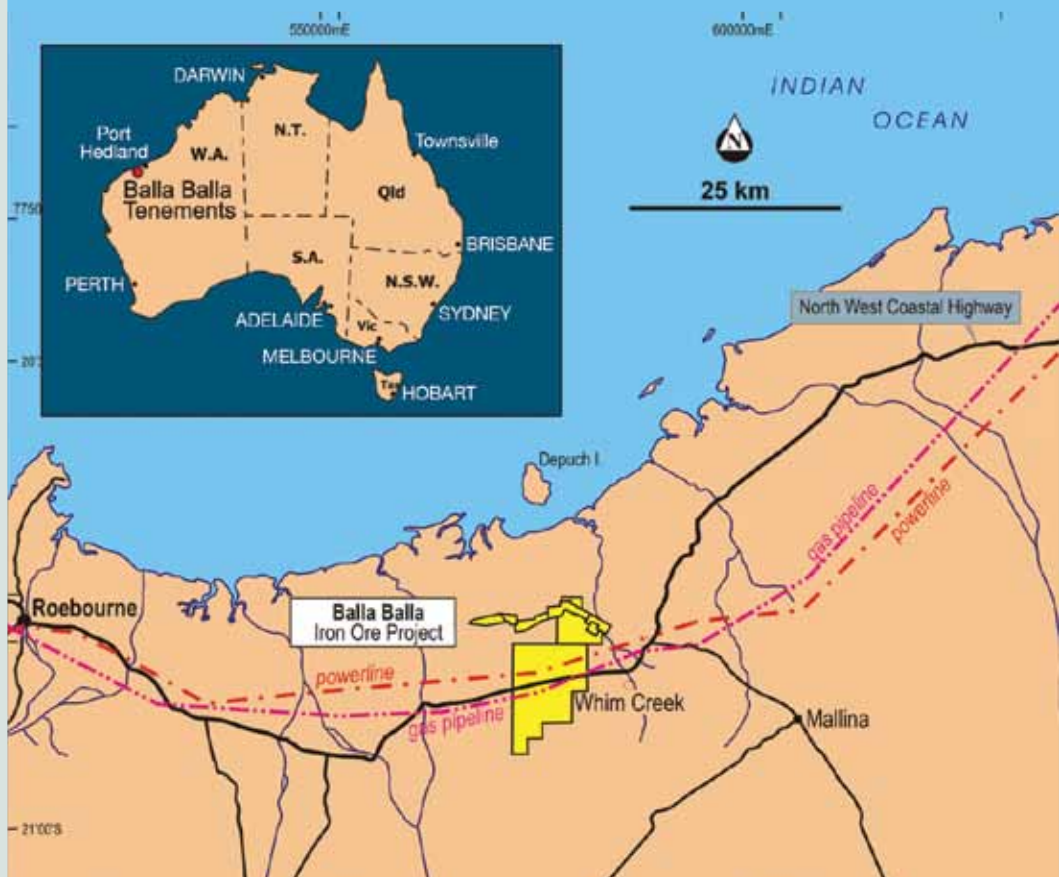
**Howard Baker**

Howard was first exposed to iron ore with BHP Billiton, where he worked as a Senior Mine Geologist at the Yarrie minesite in Western Australia. This was followed by a Senior Resource Geology role for Rio Tinto based out of Perth and the iron ore mining district of the Pilbara, which Rio Tinto services from the town of Tom Price.

Since joining SRK in January 2007, Howard has been involved in a grass-roots iron ore project in Liberia and has worked with Rio Tinto personnel on the resource estimation of the Simandou Iron Ore project in Guinea, West Africa.

Howard Baker: [hbaker@srk.co.uk](mailto:hbaker@srk.co.uk)

## The Balla Balla Iron Ore Project



**Balla Balla Tenement Location**

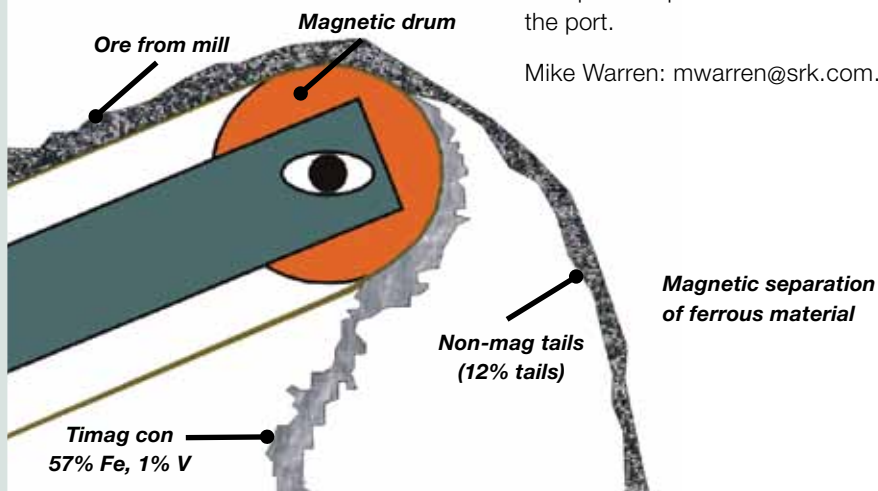
**A**urox Resources Limited has commissioned SRK to produce an Independent Technical Report regarding the Balla Balla project, which is located in Western Australia. Aurox plans to provide a copy of the SRK report to potential financiers for the project.

Ore from Balla Balla will be treated by magnetic separation, as shown in the following diagram.

The Balla Balla deposit extends over 18.3km.

In 2008, SRK is working with a number of associates to review the technical aspects of the project, including geology and resource estimates, mining engineering, geotechnical engineering, hydrology, processing and infrastructure, including the construction of a production pipeline over 100km long, which will transport the product from the mine to the port.

Mike Warren: [mwarren@srk.com.au](mailto:mwarren@srk.com.au)





# SRK's Involvement in Simandou

**SRK** is working in collaboration with Rio Tinto on preparing a Mineral Resource Estimate of the Simandou Iron Ore project in Guinea, West Africa. The Simandou project, located in the southeast of Guinea, is widely believed to be one of the largest undeveloped iron ore projects in the world. The Simandou range stretches approximately 110km long and is the site of a number of exploration targets, the most advanced of which are the Pic de Fon and Oueleba projects. Pic de Fon and Oueleba are the current focus of the resource estimation, which is part of a pre-feasibility study due to be completed by Rio Tinto later in 2008.

Senior Consultant Howard Baker and Principal Consultant Bill Hatton visited the Simandou site in January 2008. They familiarized themselves with the geology and mineralization of Simandou and met with key personnel involved in the project. Following the site visit, five key members of the Rio Tinto geology and resource estimation team relocated to Cardiff to begin the estimation work at the SRK office.

An intense workload of interpretation and 3-dimensional modeling was split amongst the SRK/Rio Tinto team so that the estimation works, validation and reporting could be completed within a strict deadline.

The Pic de Fon and Oueleba projects have an approximate strike length of 7km each. The projects are separated by a 3km topographic low, believed to be fault related. Both Pic de Fon and Oueleba consist of an altered itabarite with a central and dominant altered core in excess of 65% Fe. The two projects are low in associated contaminants and potentially represent a relatively small portion of a potentially very large iron ore producing region.

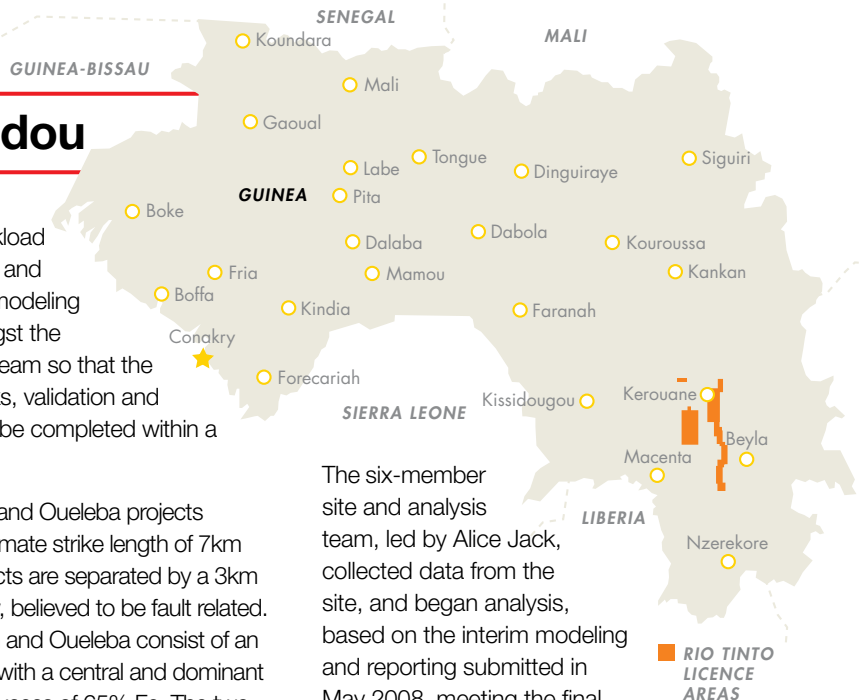
In addition to the resource estimation work at Simandou, SRK (UK) is undertaking the geotechnical design of the open pits and waste dumps for the pre-feasibility study, following on from work carried out by SRK (Perth) at the conceptual study stage in 2006.

The six-member site and analysis team, led by Alice Jack, collected data from the site, and began analysis, based on the interim modeling and reporting submitted in May 2008, meeting the final deadline of July 2008.

The site is challenging with steep natural slopes, old landslips, major shears and everything from uncohesive ore through friable materials and sheared talc phyllites to massive banded hard rock.

Howard Baker: [hbaker@srk.co.uk](mailto:hbaker@srk.co.uk)  
Alice Jack: [ajack@srk.co.uk](mailto:ajack@srk.co.uk)

*The top of Pic de Fon looking north*



---

## Johan Boshoff

---

**J**ohan Boshoff is currently a Partner with SRK Consulting in Johannesburg. He has a Masters Degree in Geotechnical Engineering which he obtained from the University of Pretoria in 1998.



**Johan Boshoff**

His expertise includes detailed design review of geotechnical aspects, monitoring and project management of tailings dams, mine residue stockpiles and waste disposal facilities. He is also involved with paste and thickened tailings schemes, as well as various trade-off studies and aspects of value engineering.

Johan Boshoff: [jboshoff@srk.co.za](mailto:jboshoff@srk.co.za)

---

## Alice Jack

---

**A**lice Jack is a Geotechnical Engineer with four years experience in the mining industry. She holds a BSc in Exploration Geology and an MSc in Engineering Geology. Prior to joining SRK, she gained experience in the civil Geotechnics industry whilst working for Mott MacDonald on a number of site investigation and foundation design projects.



**Alice Jack**

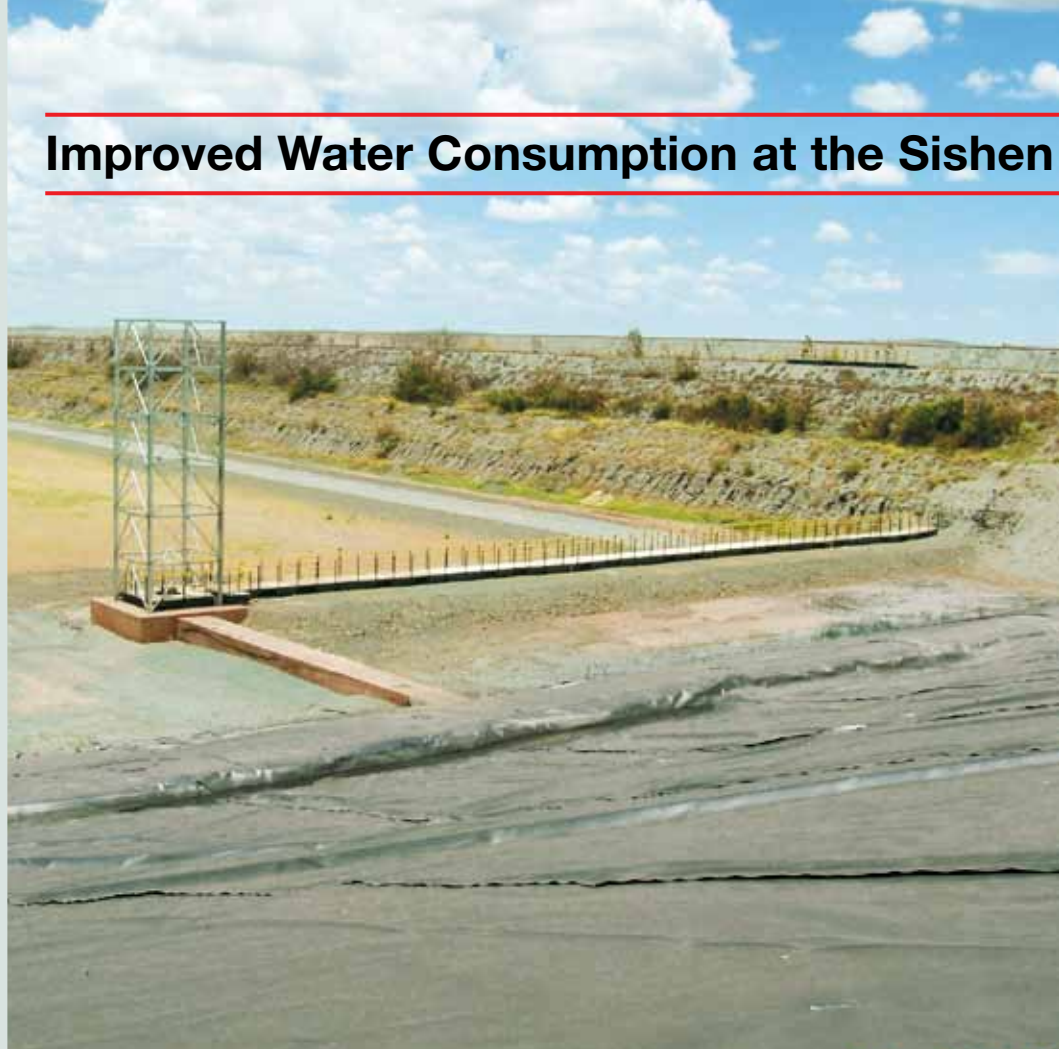
She has worked in a diverse variety of environments and locations, being involved with a number of Geotechnical design projects in both open pit and underground situations whilst with SRK. Alice is currently managing the site work and field team for the Pre-Feasibility Geotechnical Slope Investigation and Design at Rio Tinto's Simandou deposit in Guinea, as well as maintaining an involvement in the subsequent analysis and design work.

Alice Jack: [ajack@srk.co.uk](mailto:ajack@srk.co.uk)

---

## Improved Water Consumption at the Sishen

---



**Leg 1 closed with waste rock walls**

**T**he Sishen Iron Ore Mine is located approximately 50km southwest of Kuruman in the Northern Cape Province, in South Africa. This is an open pit mine and it is impractical for the tailings to be deposited in the workings. The existing Sishen tailings dam complex was built in the 1970s and is located to the north of the plant.

Currently, tailings material is being deposited on four individual tailings dams. Decant water from each tailings dam is transferred into two seepage sumps via gravity penstock decant systems and returned back to the Sishen plant. The water balance and water recovery system is not optimized and the dams are used only randomly to store storm rainfall and excess process water.

As part of the Sishen Expansion Project (SEP), a separate process plant will be established and the water recovery system will be improved. Tailings material

will be disposed of in the cross area, in between the current four individual tailings dams. One leg of the cross area will be closed off at a time and filled with SEP tailings materials. The four legs of the cross area will be filled over approximately 10 to 12 years.

Once the cross area is filled to the level of the four individual tailings dams, the dams and filled area will be consolidated into one single dam with four operating paddocks as a means to improve water recovery. The method of tailings disposal and dam operation remains the same.

A return water dam will be constructed as part of the SEP. It will consist of an operating compartment capable of containing 5 days' operational storage. Any runoff water from an extreme rainfall event (1:50-year 24-hour rainfall) will be contained on top of the tailings dams and decanted in the shortest period possible.



# TSF Complex

**Weather Data:** The mean annual precipitation for the Sishen area is approximately 354 mm, which is extremely low. The majority of rainfall occurs during the summer months of January, February and March, whilst the lowest rainfall occurs during June, July and August.

**Modified Deposition Strategy:**

The deposition strategy will focus on two distinct phases: namely, dam development before consolidation, which will involve the operation of five individual dams, and dam development after consolidation, with a consolidated dam divided into four paddocks.

During pre-consolidation, the four individual dams and the legs of the cross area will undergo partial consolidation in

phases. Since the current four individual dams will necessarily increase in height as the cross area is filled up, the waste rock containment walls to be installed will also increase in height.

During post consolidation, both the Sishen and SEP plants will deposit tailings on the consolidated dam.

**Improved Water Recovery:** During future tailings dam operations, the emphasis will be on the recovery and return of water back to the plant, with these considerations:

- The pool on any leg of the cross area should not exceed 5 to 7% of the facility's surface area. This will help reduce evaporation losses

- The return water dam has been designed to operate only as a water holding facility for operational purposes. No standby compartment to contain runoff from an extreme storm has been allowed for. The runoff on top of the tailings dams will be decanted in the shortest time possible. At all times, freeboard on the tailings dams should conform to legal requirements

After optimization measures and additions to the SEP plant are completed, water consumption at the complex should be reduced significantly.

Johan Boshoff: [jboshoff@srk.co.za](mailto:jboshoff@srk.co.za)



Sishen TSF Complex



## SRK China

**SRK** Consulting China Ltd. was established in 2005. Now, together with other SRK consulting practices, it plays an important role in providing professional services, including exploration project management, resource estimation, technical assessments, feasibility study and mining design, and independent technical reports for public listing on the Stock Exchange of Hong Kong (SEHK) and the Toronto Stock Exchange (TSX) and transactions for projects in China and other Asian countries. SRK China has a very strong geology team, with three principal geologists and seven senior and junior geologists.

## Dr. Yiefei Jia

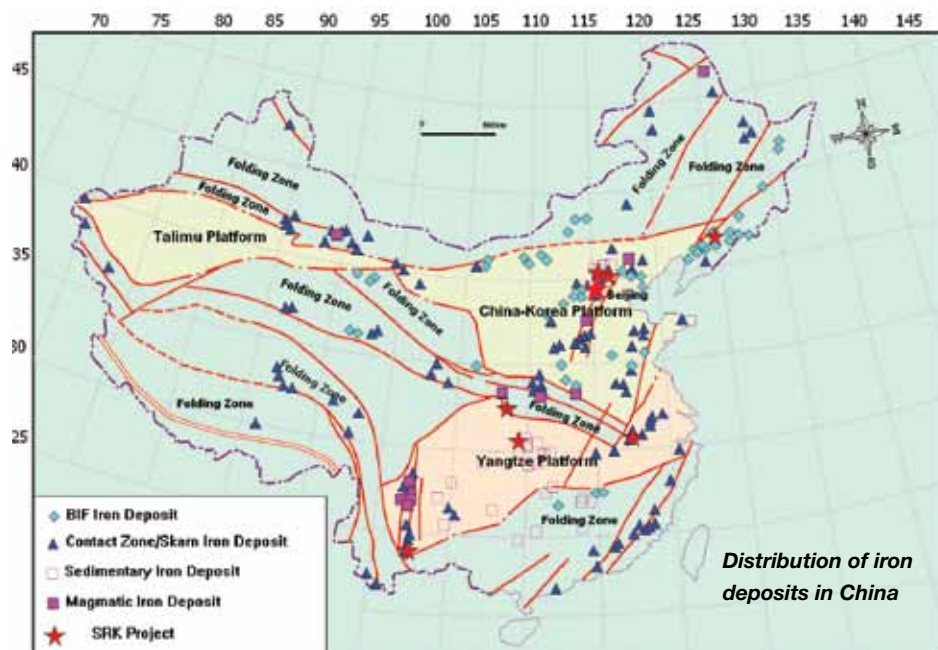
**Dr.** Yiefei Jia is a Principal Consultant (Geology) with a specialty in the exploration of mineral deposits. He graduated from Jinlin University, China with B.S. and M.S. degrees, and from the University of Saskatchewan, Canada. With a PhD, MAusIMM, he has more than 18 years of experience in the field of exploration, development, and resources estimation of precious metals (gold, silver, and PGE) and base metals (lead, zinc, copper, vanadium, titanium, and iron), as well as other metal ore deposits in different geological settings in China, Australia, and North America. His other essential skills include exploration project management and design; petrological and geochemical analysis; lithological and geotechnical logging; and scientific research. Recently, he completed several technical review projects, including technical reports for the Stock Exchange of Hong Kong (HKSE).

Dr. Yiefei Jia: [yjia@srk.cn](mailto:yjia@srk.cn)



**Dr. Yiefei Jia**

## Iron Mineral Deposits and Projects in People's



**W**ith rapid economic growth in China, the demand for iron ore is becoming increasingly strong. The exploration and development of Chinese domestic iron ore projects are gaining more attention, and SRK is assisting various clients with exploration design and management and with securing financing from the overseas market.

In general, the major types of iron ore mineralization in China include:

- Proterozoic-Achaean banded iron formation (BIF) type
- Paleozoic-Mesozoic contact zone/skarn type
- Paleozoic sedimentary type
- magmatic type

1. BIF type is the most important deposit type in China. The BIF iron ore deposits are mainly found along the north margin of the





# Republic of China

Northern China Platform. Although they possess similar geological features to those in other countries, the deposits are characterized by relatively low grades since there was little secondary enrichment. SRK recently reviewed some BIF iron projects in Hebei and Shandong provinces, and the grades of the projects are usually less than 30% TFe; some of them are even less than 20% TFe. Each deposit usually possesses a few tens to a few hundred million tonnes of mineral resources. Due to the fact that many BIF iron deposits can be developed by open-pit mining, iron concentrate currently has a high price, and since labor is cheap in China, the exploration and development of this type of deposit is increasing.

2. Contact Zone/Skarn type is most important for hosting high grade (>50% TFe) iron resources in China. Iron ore deposits of this type occur in the contact zones between intermediated to acidic magmatic rocks and carbonate/calcic tuff. Deposits of mainly magnetite with different other elements may be formed in the contact zones of different types of mainly Paleozoic-Mesozoic magmatic rocks. The type is widespread over China, while middle and southern China has more mines of the type in operation. The grade of the mineralized material is relatively high, and some of the projects SRK reviewed have average grades of 45% TFe. The resource base of each deposit ranges from a few

to a few tens of million tonnes. SRK completed some projects of this type in Anhui province, which are basically in the development and operation stages.

3. Sedimentary type contributes about 8% of overall iron resources in China. The deposits of this type are mainly distributed in the Yangtze Platform and Southern China Folding Zone. The mineralization occurs in shallow marine sedimentary rocks mainly in the Devonian System. Oolitic siderite and hematite are the main ore minerals. Siderite ore has a grade of about 25% TFe and the hematite ore has grades of 35-47% TFe. The resource of the deposit is a few tens of million tonnes. Because the ore usually contains high phosphorus content, many of the iron deposits of the type have yet to be developed. SRK reviewed and valued some deposits of this type in Hubei province.

4. Magmatic type is the iron ore deposit related to mafic-ultramafic magmatic rocks, and may be formed within rock bodies in the late stage of differentiation by ore magma. This deposit type accounts for about 14% of total iron ore deposits in China. Ores normally contain 25-45% TFe with 5-15% TiO<sub>2</sub>, and 0.2-0.5% V<sub>2</sub>O<sub>5</sub>, as well as other useful elements, such as Cr, Cu, Co, Ni, and Platinum group elements. SRK reviewed some projects of this type in Yunnan province.

Anson Xu: axu@srk.cn

# Dr. Anson Xu

**D**r. Anson Xu is a Principal Geologist, MAusIMM, with a BSc (Geology) degrees from Nanjing University and Chengdu University of Technology in China and a PhD (Geology) from the University of Nebraska-Lincoln, USA. His 20 years of international experience in geological exploration and economic geology cover various types of mineral deposits. He is experienced in mineral resource and reserves estimation and economic assessment. Dr. Xu participated in, and has been responsible for, many independent technical reviews and reports for BIF, skarn and sedimentary types of iron projects, and for other projects in China affecting clients' internal decision-making and public listings/transactions on the TSX and SEHK.

Dr. Anson Xu: axu@srk.cn



Dr. Anson Xu

# Richard Kosacz

**R**ichard Kosacz is a Principal Consultant (Geology) with over thirty years of geological experience, including mine geological and explorational services, scientific research, university teaching, X-ray laboratory management and international consulting on mineral deposits world wide. His credentials include M.Sc.Eng., P.Geo. MAusIMM and he specializes in planning, managing and conducting regional, and targeted mineral exploration from the grassroots stage to definition drillings, also property evaluation. He exhibits strong organizational and management skills across cultural environments. Recently, Richard has carried out technical review/assessments for projects in Mongolia and mid-Asian countries as well as in Australia.

Richard Kosacz: rkosacz@srk.cn



Richard Kosacz



An open pit iron mine  
in Anhui province, China

---

## Mike Cunningham

---

**M**ichael Cunningham is a geology consultant with over 10 years of experience, including 4 years in marine geology. He completed a PhD on Cainozoic tectonics onshore and offshore in Ireland, before carrying out his post-doctoral research, which was an academic collaboration with the telecommunications industry; evaluating active down slope processes along the continental margin of NW Europe. He used GIS for both his PhD and post-doctoral research. Michael has also worked in the oil industry, on various geoscientific consultancies, and as a geoscientist in both the Irish and British Civil Service.



**Mike Cunningham**

mcunningham@srk.com.au

---

## Owen Herod

---

**O**wen Herod is a geologist with over seven years of practical experience in consultancy, exploration and open pit mining. He has a strong numerical background and key skills in deposit and regional geology, 3D geology and ore body modelling, data management and exploration targeting. Since joining SRK, Owen has worked on exploration, open pit and underground mine and resource geology projects in a range of deposit configurations in Australia and globally.



**Owen Herod**

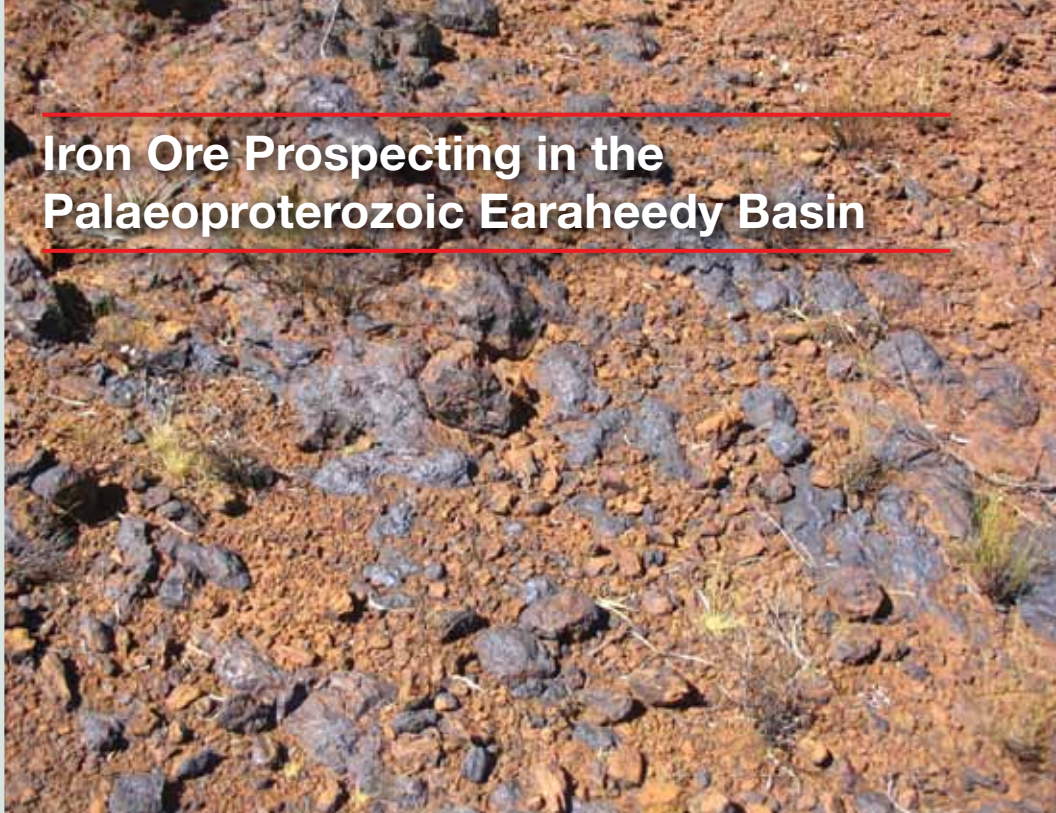
One recent focus of Owen's work has been the development of innovative approaches to rapid modelling, using software products such as Leapfrog™, Geomodeller™ and GoCAD™. These packages have been applied in a number of large iron ore projects at the deposit, tenement and regional scale. He has also been involved in a number of iron ore prospective reviews and due diligence studies.

Owen Herod: oherod@srk.com.au

---

## Iron Ore Prospecting in the Palaeoproterozoic Earraheedy Basin

---



**High grade hematite outcrop, Miss Fairbairn Hills**

**G**iralia Resources NL is targeting iron ore in the Miss Fairbairn Hills, Earraheedy Basin, Australia. Having conducted some preliminary fieldwork, and acquired high-resolution aeromagnetic data, Giralia commissioned SRK to produce a report on potential structural controls of iron ore deposits, and a series of 1:100,000 structural maps.

The Miss Fairbairn Hills is located on the northern margin of the Earraheedy Basin, 200km south of Newman and 1,000km NE of Perth.

The present day exposure of the Earraheedy Basin covers an area of about 30,000km<sup>2</sup>; however, evidence is present to show that the Basin was once much larger than current exposure, extending farther SW where erosional remnants still occur, and north where it is concealed by the overlying Collier (Bangemall) and Officer Basins. The basin fill is a 5km thick, coastal to near shore sedimentary succession, known as the Earraheedy Group, and is interpreted to have accumulated at a passive continental margin along the northeast edge of the Yilgarn Craton.

The Miss Fairbairn Hills region, located on the north side of the Basin, is thought to be the second largest accumulation of iron formations in Australia and is reported

to contain a total of over 500 strike km of iron formations, up to 500m thick, in the Frere Formation of the Earraheedy Group. Previous exploration in the late 1970s resulted in locating widespread areas of hematite enrichment with surface grades up to 66% Fe (see the photo above). This includes zones, reported by Amax Iron in the 1970s to be up to 75m (true thickness) grading to 62% Fe. Giralia's tenements cover 130 strike km of the most prospective areas defined by past exploration, including the Miss Fairbairn Hills (covering an area of 5,070km<sup>2</sup>).

Beds of the Frere Formation are mostly shallow dipping, providing the opportunity for mining large tonnages of resources. Giralia's exploration target in the Miss Fairbairn Hills is very large, comprising > 1 billion tonnes within their tenements.

After SRK conducted an extensive structural and geological review of previous exploration, including Giralia's own findings, high resolution aeromagnetic grid, and other datasets, Giralia are now using these results to help focus the targeting of outcropping zones of massive hematite. Prior to drilling, the next phase is likely to result in further fieldwork to verify the ground truth potential of identified targets.

Mike Cunningham:  
mcunningham@srk.com.au



---

# Cerro Nahuatl Iron Ore Mine in Colima, Mexico – A Conceptual Closure Plan

---

**SRK** has been developing mine closure plans for different mining companies in Mexico, mainly focused on gold and silver ore projects. Ternium, a leading iron and steel company in Latin America with operations in Argentina, Mexico, United States and Guatemala, commissioned SRK to generate a mine closure plan for its mining operations at Cerro Nahuatl, in the Mexican state of Colima. According to Mexican mining records, this is the first time an iron ore mine company has conducted a closure plan in this country.

The Cerro Nahuatl mine is completing its operation this year and will begin closure activities by the last quarter of 2008. Operations at the mine site are compact, since the ore body was located in a single hill isolated in a small valley. The major challenge at Cerro Nahuatl is the geographic location, which is characterized by hurricanes and earthquakes. As well, a river passes close to areas where the tailings dam and part of the waste rock dump are placed, adding

another factor to be considered in the long-term physical stability of the site.

Fortunately, chemical stability is assured, since the iron ore is processed by magnetic separation. No reagents are added to the concentration process, and the ore and waste rock have shown no potential to generate acid drainage.

Operations at the Cerro Nahuatl mine include a processing plant where the iron ore is concentrated by magnetic separation. Then the concentrate is sent through a pipeline to the small town of Jala, where the concentrate is loaded into rail cars and shipped to Estación Alzada for pelletizing.

Our participation at Cerro Nahuatl is evidence of the leading role SRK has taken in mine closure planning in other countries, and now in Mexico.

Dante Ramirez: [dramirez@srk.com](mailto:dramirez@srk.com)  
Terry Braun: [tbraun@srk.com](mailto:tbraun@srk.com)

---

## Dante Ramirez

---

**D**ante Ramirez, a mining engineer, has over 22 years of experience in the mining industry, with strong experience in mine design and mine closure. Dante obtained his Bachelor's degree at the Mining Engineering School of Mines, in Zacatecas, Mexico, and his Master's and Doctoral degrees at the Colorado School of Mines, in the United States.



His experience includes environmental and sustainable life-cycle analysis and management. As a mining engineer, Dante has worked on new projects both for mine design and the definition of closure plans, mainly in the Americas. He currently works as a Principal Engineer in Denver, Colorado.

Dante Ramirez: [dramirez@srk.com](mailto:dramirez@srk.com)

---

## Terry Braun

---

**T**erry Braun has more than 20 years of professional experience in mining and environmental projects. His practice incorporates various elements of environmental compliance activities as well as engineered solutions to potential environmental liabilities for mining and other industrial operations. Terry develops and often engages in projects that require negotiations with regulatory agencies and other stakeholders to achieve client objectives. He leads multi-disciplinary project teams to address the unique technical issues associated with mining operations.



Terry Braun: [tbraun@srk.com](mailto:tbraun@srk.com)

*From the top of the Cerro Nahuatl pit, looking towards the plant site and tailing dams*



## Souvik Banerjee

**S**ouvik is a Geologist with over 6 years of industrial and research experience in applied geology, structural geology and GPS application in tectonics.

He is skilled in geological mapping, interpretation and modeling of structural data, exploration planning and resource estimation. Souvik has considerable experience working on Datamine, Surpac and Mapinfo GIS.



**Souvik Banerjee**

Since joining SRK in early 2008, Souvik has worked on multiple iron ore projects. Previously, he worked for Adi Gold, a subsidiary of Pebble Creek, Canada, on exploring and managing the exploration program for a base metal property in Northern India. Souvik is presently completing a resource report for a potential underground copper-lead-zinc property to meet the requirements of the Canadian NI-43-101 code. He is also managing a large iron ore exploration project involving multiple properties in South India.

Souvik Banerjee: [sbanerjee@srk.co.in](mailto:sbanerjee@srk.co.in)

## Iron Ore exploration in South India



**Diamond core drilling in the northern tenement of TMPL**

**I**n line with global trends, the Indian iron and steel industry is witnessing a resurgence of modernization, expansion and consolidation.

While five years ago, the sector faced a worldwide slump in steel prices, the industry has emerged vibrant over the past two years. Domestic steel companies, both public and private, are surging ahead on the strength of unprecedented buoyancy in the economy and the boom in real estate and infrastructure sectors, such as roads and highways, ports and airports.

Powered by an increased demand for steel from neighboring China, where construction projects grew at 15% annually in

preparation for the Olympics, the steel industry in India has grown by about 10% in the past two years, compared with the global growth rate of about 6% a year.

Not surprisingly, the four iron ore-rich states of Jharkhand, Orissa, Chhattisgarh and Karnataka are witnessing immense activities. The boom is most evident in Karnataka, which boasts nearly 40% of the India's ore reserves, mostly in the eastern Bellary-Hospet area.

The India, Australia and UK offices of SRK are involved in more than 12 mining projects, from scoping studies and due diligence audits to brown field exploration

and expansion. The India office just finished a 3-mine due diligence report to provide an independent technical base for an intended financial investment of \$700 million US. The Cardiff office is also working on a multi-mine project, reviewing resources for an intended IPO listing; the India office is assisting UK with data compilation and resource auditing.

One important brown field exploration project comes from Tungabhadra Minerals Pvt. Ltd. (TMPL). The key objective of SRK's engagement is to design a detailed exploration program and manage its implementation. TMPL aims to conduct the study and present results according to the requirements of JORC and the guidelines provided by the Australasian Code for the Reporting of Exploration Results, Mineral Resource and Ore Reserves. Dr. Louis Bucci from SRK's Melbourne office is the JORC Qualified Person for this project.

Mining at some of these tenements dates from 1960. In the first phase three northern tenements were targeted. After the geological mapping, an initial drilling plan was executed. The mineralized bodies dip steeply and are tabular in nature. An initial drilling plan incorporates inclined holes at a grid of 100 x 100 meters to reach the indicated level of the resource. The drilling plan combines both diamond core and reverse circulation holes. SRK is currently supervising the drilling, with logging, sampling and database management work, planned to follow JORC guidelines.

Souvik Banerjee: [sbanerjee@srk.co.in](mailto:sbanerjee@srk.co.in)  
Subrato K. Ghosh: [sghosh@srk.com](mailto:sghosh@srk.com)

**3D model of the mineralized bodies interpreted from surface mapping**



---

## Ferrexpo Poltava GOK

---

**F**errexpo Poltava GOK (Poltava Mining) mines and processes iron ore near the town of Komsomolsk in the Poltava region of Ukraine.

Gorishne-Plavninskoe/Lavrikovskoe (GPL) is the open pit iron ore mine that currently mines approximately 27 million tonnes per annum (Mtpa) to a depth of approximately 300m below the surface; Poltava Mining has been operating GPL for nearly 40 years. The current business plan includes mining this pit until 2022. To sustain mining in the long term, Poltava must exploit the extension of the orebody into the Yeristovskoe deposit some 3km to the north.

To carry out the plan, SRK has undertaken geotechnical and hydro-geological studies of the rock and soft overburden slopes of the pit and waste dump design. The design team includes the local Institute for the hydro-geological and dewatering of the 70m-thick sand and clayey superficial overburden. The French earthmoving specialist company, DTP, is being considered for contract mining the Yeristovskoe Pit and providing technical input. The projected start date

for overburden mining is the last quarter of 2008, with production mining initially targeted in 2011.

SRK has been asked to address a number of issues, including using steeper rock slope angles in order to deepen the GPL open pit and defer the development of the Yeristovskoe Pit, and to verify these changes with monitoring and specific analysis. These steeper angles may be included in the design of the new Yeristovskoe Pit, subject to verification that appropriate conditions exist. A risk-based approach to slope design may allow the optimization of the slope angles, which could be acceptable to the Institute and mining authorities. In addition, for stability and safe operating conditions the slopes in the high, very moist, low strength overburden and the dumps storing large quantities of these materials will need specific design.

SRK's input to the project involves multi-disciplinary cooperation with the mine planners, hydrologists, local institutes and specialist earthmoving contractors.

Kris Czajewski: [kczajewski@srk.co.uk](mailto:kczajewski@srk.co.uk)

*Open pit mine in Poltava, Ukraine*



---

## Kris Czajewski

---

**K**ris Czajewski, P.Eng, is a Principal Consultant with over 20 years experience in geotechnical/tailings issues, including the review, design, construction and remediation of tailings structures at all project stages.

After working for 18 years in Canada, Kris joined SRK (UK) in 2007.

Kris manages due diligence related to tailings facilities in Europe, South America, Asia and Africa. He uses the experience he gained in world-class projects, emphasizing the feasibility and constructability of facilities. Currently, he is involved in designing waste storage facilities for two iron ore projects: for Ferro-expo in Ukraine and the Caetite project in Brazil.

Kris Czajewski: [kczajewski@srk.co.uk](mailto:kczajewski@srk.co.uk)



**Kris Czajewski**

---

## Rick Skelton

---

**R**ick Skelton is a Corporate Consultant (Mining) with SRK. He has over 35 years of experience in open pit mine planning projects, developing and using state-of-the-art software for mine planning, and project evaluation.

His project experience has included iron, gold, diamonds, copper, heavy minerals, coal and industrial minerals.

Recently, he has worked on iron ore projects located in Brazil, Ukraine, Kazakhstan, Sweden and South Africa. Specifically, he led the first SRK due diligence teams that reviewed two major iron ore operations in Ukraine; managed the SRK team that reported Kryvorizstal resources and reserves; and was SRK project manager for two greenfield iron ore projects in Brazil.

Rick Skelton: [rskelton@srk.co.uk](mailto:rskelton@srk.co.uk)



**Rick Skelton**

## Mike Warren

**M**ike Warren, Principal Consultant, Project Evaluations, is a mining engineer with over 30 years of experience, including on-site and head office roles and five years in investment banking. His credentials include BSc (Mining Eng), MBA, MAusIMM, FAICD. Mike has led SRK review teams on mining projects in Australia, New Zealand, Papua New Guinea, Canada, Brazil, Argentina, Russia, Mongolia and China. His experience in China has included preparing the Independent Technical Reports (ITR) for the Fujian Zijin Mining Industry Co, Ltd., the Initial Public Offering (IPO) on the Hong Kong stock exchange (HKEx), the ITR for the Aluminium Corporation of China (Chalco), the IPO on both Hong Kong and New York stock exchanges, the IPO for Lingbao Gold, the IPO for Xinjiang Xinxin Mining Company Limited and the ITR for the Sino Gold dual listing on HKEx. Mike is a Director of SRK, based in Sydney. He is a member of the Australasian Institute of Mining and Metallurgy and Fellow of the Australian Institute of Company Directors.

Mike Warren: mwarren@srk.com.au



## Evaluating MHAG Brazil's Mina do Bonito Operation for Noble



*The Mina do Bonito plant*

**M**HAG Serviços E Mineração S/A (MHAG) operates the Mina do Bonito iron ore mine in Northern Brazil. MHAG proposes to expand the production capacity of the mine and has entered into discussions with the Noble Group Limited (Noble). Noble commissioned SRK to provide an independent technical review of the current operations at Mina do Bonito and to review and report on the expansion plans proposed by MHAG.

The Mina do Bonito project is located in Rio Grande do Norte province in Northern Brazil. The Mina do Bonito minesite is located approximately 170km

west of Natal and 26km from Jucurutu, as shown in the map below.

The Mina do Bonito is an open pit mine, situated on a hillside. The mining operations started on the magnetite body and are currently proceeding onto the itabirite body. The magnetite processing plant is shown in the photo above.

After SRK submitted its technical report on the Mina de Bonito project and Noble reviewed it, on 18 July 2007 Noble announced that it had acquired 30% of MHAG for US\$60 million. The Noble press release went on to say "MHAG is becoming a substantial producer of iron ore for export, using Noble through its global network as its marketing agent. Noble has considerable expertise in iron ore, logistics and freight, together with a deep knowledge of emerging markets."

Mike Warren: mwarren@srk.com.au



*General Location Map, Rio Grande do Norte province, Brazil*



---

## Ferrexpo

---

**F**errexpo plc commissioned SRK to produce a Minerals Expert Report (MER) as part of a prospectus for a global offering of shares and admission of ordinary shares for listing on the London Stock Exchange. Ferrexpo plc successfully listed in June 2007.

Located near the town of Komsomolsk, 25km southeast of the town of Kremenchug and 320km southeast of Kiev, Ferrexpo's mining assets consist of a series of nine iron ore deposits, two of which – namely, Gorishne-Plavinskoe and Lavrikovskoe – have been exploited from a single open pit.

The current size of the open pit is approximately 5.5km (north-south) by 1.5km (east-west) and it has now reached a depth below surface of some 300m. Ore is processed in two streams with a capacity of 10Mtpa by primary and secondary crushers, grinding mills and dry and wet magnetic separators. The ore is further processed by flotation and re-grinding through to a pelletizing plant operated in four streams with a capacity of 2.5 Mtpa each.

In valuing the Ferrexpo mining assets for the report, SRK undertook a full due diligence review, which included several site visits by experts in geology, mining, processing, tailings, infrastructure and environmental and social sciences. SRK also reviewed Ferrexpo's 30-year business plan and produced a discounted cash flow valuation of current and future operations.

As a key component of the work, SRK reviewed the Soviet-era polygonal resource and reserve estimates produced by the Company and reported these using the reporting terminology of the JORC Code. SRK has significant experience in reviewing such Soviet-era estimates and interpreting them in terms of more internationally-recognized reporting codes. In fact SRK is now working with relevant authorities in Moscow and institutions internationally to bridge the gap between these reporting methods so that resource and reserve estimates produced in Russia can be better understood elsewhere in the world.

Mike Armitage: [marmitage@srk.co.uk](mailto:marmitage@srk.co.uk)

---

## Mike Armitage

---

**D**r Mike Armitage is the Managing Director of SRK (UK) and a Principal Mining Geologist with twenty-five years of experience in the industry. Prior to joining SRK he worked on gold mines in South Africa and completed a Ph.D. degree while at Renco Gold Mine in Zimbabwe.



At SRK he is responsible for managing feasibility studies and competent persons reports for stock exchanges on behalf of mining companies, as well as audits and due diligence studies on behalf of investment institutions or in support of mergers and acquisitions.

He has written several papers on resource and reserve estimation methodology and classification and is currently the external examiner for an MSc course titled "Metals and Energy Finance" at Imperial College, London.

Mike has gained a significant amount of experience in Russia and the former Soviet Union, having managed the preparation of several due diligence studies and competent persons reports for companies with projects there and for investment institutions seeking to finance projects in those countries.

Mike Armitage: [marmitage@srk.co.uk](mailto:marmitage@srk.co.uk)

*Mining activity at Poltava*



---

## Leah Mach

---

**L**eah Mach is based in the Denver office and has 20 years of experience in geologic modeling, geostatistics, resource/reserve estimations, mining operations, and project management. Her experience includes mining and project development of precious and base metals, iron ore, and PGE properties in North and South America and Central Asia. She has an extensive background in geologic and grade modeling in both mine settings and for property evaluation and feasibility studies. Leah is experienced in Vulcan, AutoCAD, and ArcMap. She meets the definition for a qualified person in terms of Canadian NI 43-101.

Leah Mach: [lmach@srk.com](mailto:lmach@srk.com)



---

## Technical Reports for Corumbá 43-101

---

**M**MX Mineração e Metálicos S.A. (MMX) commissioned the SRK US office to prepare a Technical Report meeting the terms of a Canadian Securities Administrators National Instrument 43-101 for the Corumbá Iron Ore Project in the state of Mato Grosso do Sul, Brazil. The mine is located near the city of Corumbá, and consists of an operating mine, Mina 63, and an exploration property, Urucum NE. SRK completed NI43-101 reports for five different iron ore deposits for MMX, including Corumbá.

The Corumbá project area has been mined intermittently since 1958 by various operators. MMX acquired the mining concessions and plant in 2005 and began mining in January 2006. Exploration at Urucum NE began in 2007.

Mine 63 and Urucum NE are located on the east and west flanks of Urucum Mountain. The project is somewhat unusual in that it contains colluvial and eluvial deposits with a jaspilite source. The rock fragments have been upgraded by leaching of the silica, resulting in higher iron grades than the source rock. The eluvium averages about 15m in thickness and the colluvium about 13m. Both are easily mineable and require little blasting.



Block models were built for the eluvial and colluvial areas in the mine and a single model was built for the colluvium at Urucum NE. Variography was done for each area, and they were estimated using Ordinary Kriging. The total Measured and Indicated resources at Mine 63 as of September 30, 2007 were 45.6Mt at an average grade of 53.1% Fe and for Urucum NE were 37.2Mt at an average grade of 53.2% Fe.

Ore Reserves calculated for Mine 63 based upon a Lerchs Grossman pit optimization were 29.4 Mt at an average grade of 55.7% Fe, and the mine life was projected to be 8 years at a production rate of 4,101 ktpy.

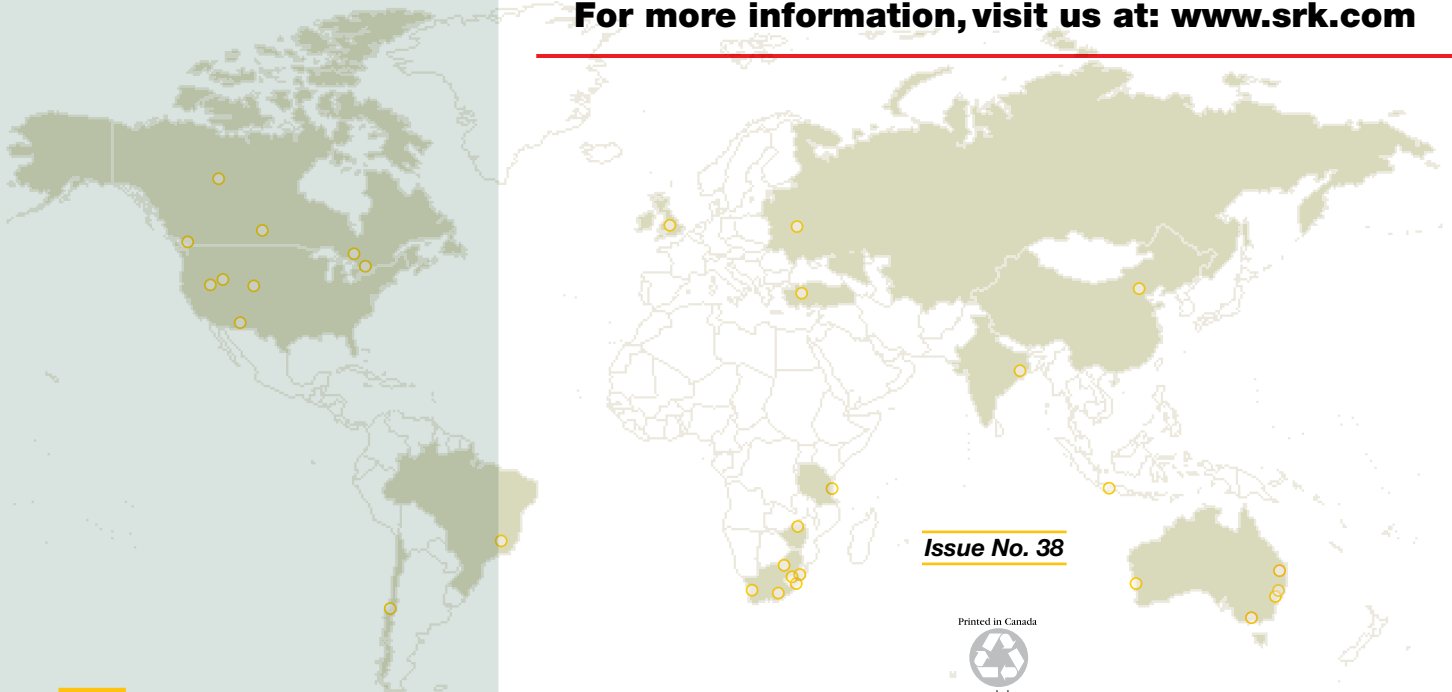
Processing consists of crushing, screening and classification with spirals to produce lump and sinter feed products. The products are transported either to a pig iron plant operated by MMX Metálicos near Corumbá or to a port on the Paraguay River.

Leah Mach: [lmach@srk.com](mailto:lmach@srk.com)

---

**For more information, visit us at: [www.srk.com](http://www.srk.com)**

---



**Issue No. 38**

