MINING
DRA is a multi-disciplinary engineering group that delivers mining, minerals processing and infrastructure services from concept to commissioning, as well as comprehensive operations and maintenance services.

In 1984, we started design and construction management of minerals processing plants in South Africa. This soon expanded to include projects across Africa and the rest of the world. We have established ourselves as leaders in these areas in Africa and are rapidly expanding our business in other parts of the world. Our expertise covers a wide range of commodities including gold, platinum, coal, ferrous metals, diamonds, uranium, base metals, potash and rare earths.

DRA is a private company owned by our employees. We employ over 3,300 people globally. Our workforce includes 1,480 engineers and project managers from various disciplines, draughtspeople, operators and support staff. Our people are our most valued resource and many are recognised as leaders in their fields.

As part of our offering, we provide a comprehensive list of engineering services required to advance a mineral project from concept to commissioning. Our contract operations division operates and maintains numerous minerals processing plants around the world on behalf of our clients. In addition, DRA undertakes the design and construction management of surface and underground mining projects through its expertise in both hard and soft rock design and the use of specialised software. We also offer the design and implementation of associated infrastructure projects, such as ports, roads, bridges and accommodation.

Our headquarters in Johannesburg, South Africa, provides engineering support to our offices and operations in nine African countries. DRA TAGGART has an office in Pittsburgh, USA and Toronto, Canada, which employs approximately 350 people, to support our operations in South America. Additionally, DRA has offices in Australia (Perth and Brisbane), India and China, which support regional and global projects.

“I truly believe that engineering is fun, building things is fun. Whether it’s a toy steam engine, a Meccano bridge, a new substation, a 6 MW winder or a 600,000 tpm platinum concentrator, there’s something in building things that appeals to many kids and those kids often grow up to become engineers.”
- Brian Dowding, Founder
WINDER SYSTEMS

Since 1999, DRA has developed a unique capability in the design of winder systems. Our electrical, mechanical and civil engineers complete the design and we work with a number of manufacturers who fabricate the winders. In addition, we provide winder refurbishment services, and the sourcing of new and used winder parts for our clients.

This service cuts cost and implementation time significantly. We also provide staff training for our clients, which allows them to take care of much of the winder maintenance themselves. Finally, we conduct audits and do risk assessments of existing winders and shaft systems to enhance safety, reliability and functionality.

STUDIES

A good study is similar to a strong foundation. When it is done properly it sets up the entire project for success. Most of the studies we have completed have resulted in projects that we have successfully executed and operated on a contract basis for clients around the world. Our study services include conceptual/PEA, pre-feasibility and bankable feasibility studies for the full range of commodities and to the appropriate international standards.

MATERIALS HANDLING

DRA provides well-designed, custom-engineered materials handling systems that increase throughput, boost productivity and reduce operating costs. We have built and designed conveyor systems in a variety of climates, from frozen Arctic conditions to hot and dusty arid environments. This experience includes the design and construction of belt feeders, bins, silos, stockpiles, stackers/reclaimers and bulk transfer systems.

Over the past 30 years, we have designed and installed more than 300 km of conveyors, including overland conveyors of up to 5 km in length. At the start of 2013, we formed a new joint venture named ARDBEL which targets the development of large-scale bulk materials handling projects. We are encouraged by the market’s positive response to this new venture.

ELECTRICAL, CONTROL AND INSTRUMENTATION SERVICES

Our comprehensive electrical, control and instrumentation services offered to the mining industry include high, medium, low-voltage and light current electrical designs, surface and underground reticulation, as well as power supply systems for remote mines.

We design, procure, programme and commission complex systems for mining and broad industrial applications. DRA develops the instrumentation and control software for the systems we design. This enables us to streamline the design and eliminates errors and inefficiencies.
DRA has specialist capabilities in the design of mines for a wide range of mining methods and commodities.

Our mine design and engineering team, consisting of integrated teams of mining, mechanical, electrical, control, instrumentation and winder specialists, offering engineering, procurement, construction and management (EPCM) as well as lump sum turnkey (LSTK) solutions.

The team’s engineering design work is supported by our drawing offices in Johannesburg, India and Canada, which produce high-quality 2D and 3D designs with the help of sophisticated software packages.

Complementing these capabilities, is our design and construction management of mining-related infrastructure for both surface and underground operations.

We recently delivered mining, underground and plant infrastructure as well as surrounding infrastructure for a number of major projects in the mining industry.

Our mining implementation consists of various customised solutions ranging from full management of mining contractors to assisting client teams in developing their own skills and procedures.

The scope of our infrastructure work is broad; we deliver standalone infrastructure such as bridges, roads, dams, schools, hospitals and offices and larger and more complex projects such as township development, complete ports and airports, railway lines and hydropower plants.

As the leading contract operator of mineral processing facilities in Africa, we specialise in the commissioning, operation and maintenance of mineral processing plants. Since our inception in Africa, we have developed the capabilities to operate plants across the globe in temperatures ranging from -50 °C to +50 °C.

Other operational services include a full suite of laboratory services, and the operation and maintenance of tailings deposition facilities and water treatment plants.

DRA recently acquired Walker Ahier Holzhausen (WAH) — adding highly-specialised capabilities in the design of mine headgear and shafts to our service offering. Our team at WAH has many decades of experience in this field, gained in South Africa’s deep underground mines.
INTRODUCTION

DRA has the proven capability to design and implement open-cast and underground mines for our clients across Africa and the world. We partner with our clients to deliver safe, sustainable, efficient and cost-effective solutions.

Our multi-disciplinary engineering services set us apart, as it allows us to provide total mine design and implementation solutions spanning from pit to port for all phases of the mining value chain from exploration to mine closure. Our team comprises professional engineers, some of whom have more than 30 years’ experience in the industry. Our engineering disciplines include mining, civil, infrastructure, mechanical, industrial, electrical, control and instrumentation. DRA’s large project services group consists of experienced staff specialising in project planning, cost control, safety, quality assurance, procurement, accounting, administration, document control, logistics and expediting. DRA is proud of our continuous improvement cycle achieved through the repeated design and build process that ultimately results in highly-competent teams delivering world-class projects.

EXPLORATION SERVICES

During the exploration phase, we offer an exploration management service, which provides our team with an in-depth understanding of the ore body and lays the foundation for mine and extraction design. This experience, together with our thorough analysis of the geologist’s block model of the ore body, helps us to complete mine and extraction designs in a manner that is economical and optimises ore bodies. To optimise safety and efficiency, our mining engineers work with consultant rock engineers throughout the process of designing open-cast or underground mines, using extraction methods such as conveyor belts, vertical shafts, decline shafts, trackless or rail-bound systems.

MINING SERVICES

Our mining services for underground and open-pit mining include the following:

- Project Scheduling
- Mine Implementation (EPCM & EPC)
- Due Diligence Reports and Studies to International Standards (NI 43-101 / JORC / SAMREC)
- Winder Systems
- Headgear and Shaft Systems
- Backfill Systems

COMPETITIVE ADVANTAGE

It is an advantage to use our multi-disciplinary, quality services, as we do not only design and build mines and associated underground and surface infrastructure, we also make sure that it operates efficiently. In the long run, this gives us the ability and imperative to continuously improve our work.

The capability to design and build vertical shafts complete with headgear and winders is a highly-specialised skill that differentiates DRA from its competitors. We have honed these skills on South Africa’s deep-level underground mines over the past 30 years. DRA also specialise in the design and installation of back-fill plants. This rare and specialised capability enables our clients to extract the maximum from the ore body safely. In this case, the availability of our multi-disciplinary engineers also means we can design and construct the complete plant.
DRA utilises the latest mining software and along with our highly-experienced users we deliver world-class mining solutions to the industry. Software currently being utilised by DRA includes Studio 3, XPAC, TALPAC and Whittle. Refer to the table below for a summary:

<table>
<thead>
<tr>
<th>VENDOR</th>
<th>SOFTWARE</th>
<th>FUNCTION</th>
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<tbody>
<tr>
<td>Datamine</td>
<td>• Studio 3</td>
<td>• Blockmodel Interrogation and Manipulation</td>
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<td></td>
<td>• Studio 5D Planner</td>
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<td>• XPAC Destination Scheduler</td>
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<td>• TALPAC</td>
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<td>• Surpac</td>
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<td>Evorelution</td>
<td>• Evorelution Open-pit Scheduling Software</td>
<td>• Open-pit Scheduling - Cut-off Grade Optimisation, Tactical level open-pit scheduling, optimised blending strategies, haulage optimisation and waste dump optimisation</td>
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**WHITTLE OPTIMISATION APPROACH**

- **Cut-off**
- **Stockpile**
- **Blend**
- **Simultaneous Optimisation**
- **Schedule**
Our African projects and operations are primarily directed from our offices in Sunninghill, Johannesburg, where most of our engineering and support staff are based. In addition, we have offices in 13 different locations throughout Africa.

We serve the Americas from our offices in Toronto and Lima (Peru). Our offices in Brisbane, Perth and Beijing enable us to extend our total solution offering to clients throughout the Pacific Rim, while we have offices in Kazakhstan and a base in India that is expanding.

Our ability to draw on our engineering and support staff in Johannesburg, to assist with the execution of large projects, makes us cost effective.
DRA has proven capability in project execution, from the extreme cold in northern Canada, to the high altitudes of South America. Working in these remote, largely inaccessible parts of the world under extreme conditions, requires specialised logistical planning, specific design and project execution skills.

Our extensive experience in Africa has made us the frontrunner in project delivery on the continent. We are able to reduce the risk involved in projects significantly and complete these to the specifications of our clients. We serve both local and international tenement holders in Africa.

Our office in India supplies the Indian mining industry with process engineering plant technology and engineering services.

DRA has operated in Australasia since 2004. Our Mandarin office in Beijing, supports global procurement and the offices in Perth and Brisbane support the local Australian mining industry and Australian clients with African tenements.
PROJECT PORTFOLIO
The engineering, procurement and construction management (EPCM) of the Booysendal UG2 North Mine, a greenfields platinum mine on the eastern limb of the Bushveld Complex, has been successfully executed by DRA. The project delivers 187,500 ktpm via a trackless decline shaft. Mining operation, bulk services, surface infrastructure and a concentrator plant were completed on schedule in 2013.

In 2014, we are continuing with the mine’s underground development and construction – four of the ultimate 14 strike-belt stoping sections were commissioned in 2013. Meanwhile, Northam Platinum continues to ramp up to full production.

The Booysendal resource totals 103 million ounces of platinum group metal (PGM) resources spread across 15,170 hectares of land with a strike length of 14.5 km.
Client: Impala Platinum (Afplats)  
Location: North West Province  
Scope: Feasibility study, Leeuwkop shaft project  
Value: US$ 1 billion

DRA completed a project feasibility study for Impala Platinum’s Leeuwkop Shaft Project between March and September 2011. The study comprised a base case for a multi-level mine design and a capital budget estimate within a 10% accuracy range.

We selected the mining method based on the layouts of other Impala fourth-generation mine projects as well as proven mining technology. With our in-depth knowledge of the resource geology, we determined the best method of accessing the ore body and maintaining an optimal, sustainable production output. Capital and operating costs were based on the costs of similar projects and by obtaining quotations from OEM suppliers.

Our project execution schedule consists of a 104-month construction programme, which kicked off in February 2012. In terms of the schedule, the hot commissioning of the main and ventilation shafts started in February 2012. This was followed by a 59-month ramp-up to full production of 180,000 tonnes per month in August 2025.

The project will make a significant contribution to the future economic viability of the group operations of Implats and Afplats on the western limb of the Bushveld Complex.

Client: Aquarius Platinum  
Location: Rustenburg  
Scope: EPCM of the mine, surface infrastructure, underground infrastructure and development  
Value: US$ 52 million

DRA undertook the development and work associated with the sinking of a triple decline system from the surface to the UG2 reef intersection at 150 m below surface. This included drilling, blasting, support and cleaning of all excavations, resource enabling and effective and efficient operation and temporary work, such as the provision of compressed air, services and potable water.

Furthermore, we delivered the underground electricity and ventilation systems to regulatory requirements, connected laterals and loading cubbies and conducted special excavations. DRA also completed the on-reef development of the first two strike sections.

The surface infrastructure supplied by DRA included access roads, services such as potable water, service water, air, power and sewerage, and offices, change rooms, security facilities, parking areas, workshops and warehouses. Further infrastructure included: an explosives yard, ore conveyance and stockpile storage, a box-cut, brake-test ramp, stormwater management, waste facilities, oil, paint and fuel facilities, a lamp room, a medical station, a chair lift, a fuel bay and a wash bay, a compressor bank station and a vent shaft.

The construction of the project started on 26 July 2010 and was completed on 3 April 2014. The mine has a life expectancy of 10 years and it is expected to produce 16,000 tons of platinum per month.
Client: Lesego Platinum
Location: Polokwane, South Africa
Project: Pre-feasibility study and Definitive feasibility study
Value: US$ 1.7 billion

DRA completed the pre-feasibility study and definitive feasibility study for a new vertical shaft system and processing plant able to mine and process 300 ktpm of combined UG2 and Merensky reef at the Lesego Platinum Phosiri Project.

The studies encompassed the surface complex, main shaft and ventilation shafts, a processing plant, sinking and permanent surface infrastructure as well as underground development and infrastructure.

Client: BHP Billiton Energy Coal
Location: Ogies District, Mpumalanga, South Africa
Scope: Pre-feasibility study
Value: US$ 2.2 billion

DRA conducted a pre-feasibility study for the design of a technical solution to extract the virgin coal resource of the Khutala open-cast mine. The mine supplies the Kendal Power Station with coal.

The study covered the mine design, planning, modelling, resource classification and equipment selection to mine coal volumes of up to 16.8 mt per year. This included the removal of topsoils, inter-burden and over-burden volumes totalling an average of 70 bcm per year. It also dealt with the mineral processing methodology and wash-plant design for the beneficiation of the coal.

DRA delivered a solution that presents the best low-risk business case.
Project: Irenedale Shaft

Client: Sasol Mining
Location: Secunda, South Africa
Scope: Design and supply of hoisting solution
Value: ZAR 50 million

Irenedale was a replacement shaft project for Sasol mining rather than an expansion project. The project encompassed the establishment of an all-inclusive main service shaft system in the Bosjesspruit Irenedale reserves with related support infrastructure to mine 8 Mtpa. Our requirement was for the complete specification, design, supply of two winders, main and service including the auxiliary equipment such as cages and ropes. Associated with this was the inclusion for the design and detailing work for the headgear. The larger of the two winder installations was designed to hoist a 60t load in a cage weighing 60t.
The DRA Group provides the full range of engineering and project services. We tailor our services to meet the needs of our clients, offering both total engineering solutions and customised project solutions.

Our services include:

- conceptual design and feasibility studies
- detailed design and engineering
- customised design of processing plants
- large-scale mining infrastructure design
- specialised winding system and shaft headgear design
- project and construction management
- commissioning
- contract operations of mineral processing plants

DRA has a contract operations division that operates and maintains mineral processing plants on behalf of clients. These integrated services provide a feedback loop to our design engineers regarding what works well and where improvements can be made.

**EXPERTISE**

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