



# Gautrain: taking Gauteng forward

Gautrain is Africa's first state-of-the-art rapid rail network in the Gauteng province of South Africa. For *European Railway Review*, **Jack van der Merwe**, CEO of the Gautrain Management Agency, provides information about this network, detailing the construction methods involved, the project partners, and what the future holds for the network.

Gauteng is South Africa's economic powerhouse accounting 34% of the country's gross domestic product (GDP) and 10% of Africa's GDP. Although Gauteng is the smallest of the nine provinces in South Africa, it is also the fastest growing province with over 50% of South Africa's working population living in it. The province was experiencing traffic congestion especially between the cities of Pretoria in Tshwane and Johannesburg – 300,000 vehicles were travelling on this corridor per day with traffic volumes set to grow at an estimated 7% per year. Detailed studies were conducted and the investment in rail proved to be a viable option for addressing traffic congestion so that the role of Gauteng in South Africa's economy was not going to be undermined by its traffic congestion.

Gautrain is primarily aimed at alleviating traffic congestion between the Pretoria and Johannesburg corridor while improving economic growth, creating jobs and improving and sustaining a new culture of public transport use in Gauteng.

The Gautrain rail connection consists of two links – one between

Gauteng's cities of Pretoria in Tshwane and Johannesburg and the other is a dedicated Airport link between the OR Tambo International Airport in the east of Johannesburg and Sandton in Johannesburg, the new business district of Johannesburg. Phase one of the project linking Sandton and the OR Tambo International Airport was completed just prior to the 2010 FIFA World Cup held in South Africa in June 2010, while the second phase – the Park Station in Johannesburg to Pretoria in Tshwane link – was completed in mid-2012. Apart from the four terminus stations on these two links, six other stations are linked by 80km of rail along the completed route.

## Project partners

The Gautrain project was developed as a Public Private Partnership (PPP) which was manifested in a Concession Agreement concluded between the Gauteng Provincial Government and a private sector company, the Bombela Concession Company Pty Ltd, in September 2006. The Bombela Concession Company holds a 19-year and 6-month

concession to design, build, partly finance and operate Gautrain. The construction phase of Gautrain commenced on 28 September 2006 and the operational phase of the system started in June 2010. In the initial stages of the Gautrain project, on the Government side all decisions were undertaken by full Provincial cabinet and a team of independent experts referred to as the Province Support Team. They were accountable to the Provincial cabinet and were led by Mr Jack van der Merwe.

A 'management needs analysis' from the government was completed to determine how best to manage a project as massive as Gautrain. The Gautrain Management Agency (GMA) was then established as a Provincial Public Entity in terms of the Gautrain Management Agency Act to monitor the implementation of the project and the relationship with the Concessionaire.

### Construction overview

The Gautrain project is a flagship transportation project in Gauteng and consists of 80km of track route and 10 stations. Three of the 10 stations are underground – Johannesburg Park Station, Rosebank Station and Sandton Station – and the rest are above ground on viaducts. Approximately 15km of underground tunnelling was constructed and 75% of these tunnel excavations were completed using the drill and blast methods. A tunnel boring machine (TBM) was used for the remaining 25% of tunnel excavations. The reason for its use was that the ground condition included varied conditions such as soft rock and waterlogged soil. This was the first time in South Africa that a TBM was used. The Gautrain Sandton Station is the deepest station in Southern Africa.

In Johannesburg, four buildings were demolished to make way for the new Gautrain Park Station. The method of demolition was an



Three of the 10 Gautrain stations are underground

implosion that caused a controlled and gradual collapse of the buildings. Several special engineering methods were used in construction of Gautrain. They include the launching girder approach which is able to lift precast viaduct segments and assemble viaduct deck spans rapidly on site with minimal disruption to traffic below. The other method was the Boom Jumbo drill which is a computerised machine designed to drill blast holes. Nearly six million cubic metres of earth were shifted during the construction of Gautrain. The balanced cantilever construction method was used for the construction of long spans in difficult geographical or congested areas such as busy highways.

The entire system consists of 180 track kilometres. Much of this was laid using specialised on-track equipment including shunting locomotives for tunnel works, a ballast regulator, a flash butt welding machine and track stabilisers.

### The rolling stock

Gautrain is a new, modern, state-of-the-art rapid rail system with some of the latest technology in its rolling stock, signalling, communications, ticketing systems, and safety systems. The Concessionaire (Bombela) had to comply to specifications based on the latest international standards when developing Gautrain.

The trains used on the Gautrain are the Bombardier Electrostar design which boasts of an enviable safety record. There are 24 train sets and each consisting of four cars designed to run an operational speed of 160km/h. Of the 96 rail cars, 10 are customised for use on the Airport link and contain features such as extra luggage space and wider seats. The other 86 rail cars are designed for commuter services. The final design was completed at a Bombardier plant in Derby, UK. Fifteen were manufactured in Derby and the remaining were completed at a Union Carriage Works in Nigel, South Africa.

The Gautrain system has a dedicated feeder bus system comprising of 125 buses which travels at a 10km radius to transport users to and from the stations. Their entire system comprises of 10,000 parking bays.

### Operational overview

Various objectives have been met on the Gautrain systems and since its operation started in June 2010, the overall system (train, buses and parking) has performed extremely well.

### Construction milestones

The Gautrain Project has gone through many successful achievements since its inception. The following are arguably some of the many significant achievements on the project:

- On 15 February 2006, it was announced that R7, 1 billion is set aside as a national contribution to the Gautrain project. Then on 28 September 2006, construction started on the Gautrain project.
- In October 2008, the meeting of Gautrain's two twin-track tunnels which were excavated simultaneously towards each other from Mushroom Farm Park and from Marlboro Portal was celebrated.
- The then Premier of Gauteng province, Mbhazima Shilowa visited Bombardier's Derby factory in the UK on July 2008 to witness the unveiling of the first electric multiple-unit for the Gautrain commuter line and in December 2008 the first Gautrain car arrived in Gauteng.
- In 2009 excavation of Gautrain's 15km tunnel was completed and also the spot where Gautrain's tunnel boring machine performed its work was completed.
- Trackwork installation and overhead catenary wires for phase 1 (Sandton, Marlboro, Rhodesfield and OR Tambo International Airport) were installed in January 2010.
- The Gautrain opened between Sandton, Marlboro, Rhodesfield and OR Tambo International Airport on 8 June 2010, completion having been accelerated so it would be ready for the start of the FIFA World Cup on 11 June 2010. The Gautrain experienced unexpectedly high passenger demands and on 16 September 2010, the system had the One Millionth Passenger.
- On 2 August Gautrain started operating between Rosebank and Hatfield Stations.
- In 7 June 2012, the Gautrain started operating from Park station in Johannesburg.

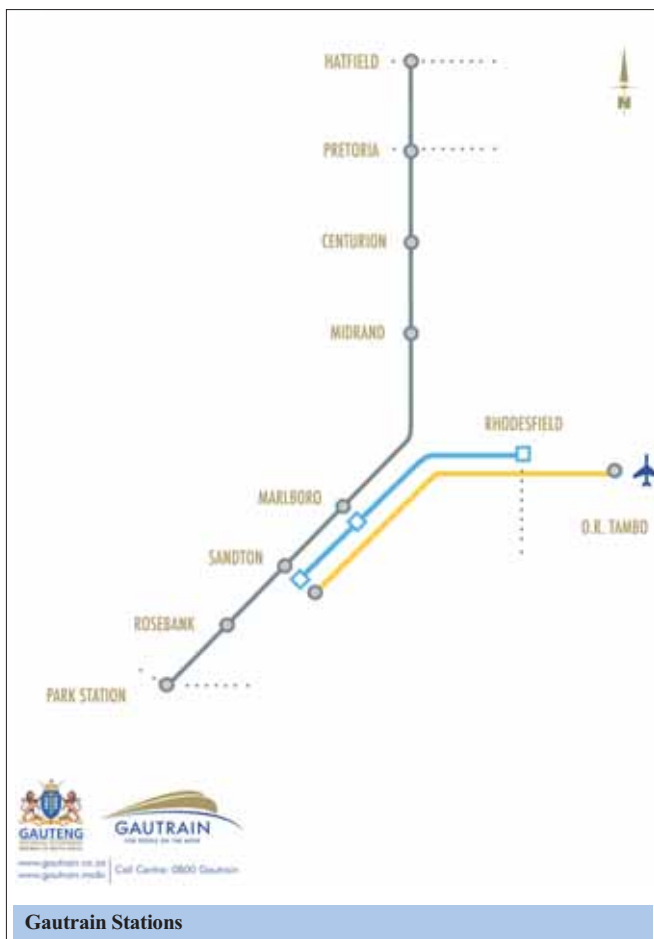
## INTERNATIONAL FOCUS: SOUTH AFRICA

The Gautrain service continues to receive very high customer satisfaction ratings of 95% overall performance as reflected in the monthly customer satisfaction surveys. The system has exhibited an increase of 27% in train passengers and over 50% in bus passengers in 2013. Currently, over 60,000 train passengers and over 23,000 bus passengers utilise the service on a typical weekday. This growth in passenger demand can be ascribed to the Gautrain's relentless focus on key customer satisfaction criteria including safety, reliability and cost effectiveness.

The Socio-Economic Development (SED) objectives were achieved through commitment and support for Black Business Enterprises and Small, Micro and Medium Enterprises (SMMEs). The commitment also extended to the usage of mostly South African materials, services and products. Lastly, Gautrain contributed to economic growth through strategic procurement and contracting. A total of R 3.7 million was spent on training in 2013.

The youth represented 58% of the total employment created or sustained in 2013. The following direct local jobs were created or sustained by the Concessionaire in each quarter of 2013:

- An average of 460 direct local jobs, compared to an obligation of 330 per quarter
- An average 420 jobs for Historical Disadvantaged Individuals (HDIs), compared to an obligation of 234 per quarter
- An average of 125 jobs for women, compared to an obligation of 84 per quarter.
- Five jobs for people with disabilities, which equals the obligation of five.



Comprehensive underground construction work was performed on the underground sections of the Gautrain, including tunnel boring machines and drill and blast methods

### Future facts

A detailed assessment and analysis of the current transport network in Gauteng was performed as part of the provinces proposed 25-year Integrated Transport Master Plan (ITMP25). The ITMP25 has been approved and the request for tenders is in preparation to carry out feasibility studies for the extensions. The following are the proposed route extensions for the Gautrain:

- A link from the existing Gautrain Park Station to Westgate in the Johannesburg CBD
- A link from the existing Rhodesfield Station to Boksburg
- A rapid rail link from Naledi in Soweto to Mamelodi via either the proposed Gautrain Samrand Station or the existing Gautrain Midrand Station. This extension will include stations inter alia at Blue Hills, Sunninghill, Fourways, Cosmo City and Ruimsig
- A link from the existing Gautrain Sandton Station to Randburg and Honeydew.

Gautrain is the transport flagship project in Gauteng that continues to bring people to jobs and jobs to people and most importantly, it is a convenient, fast and efficient means of travel that has become the backbone of a more integrated transport system for the people of Gauteng.



**Jack van der Merwe** obtained the degrees B.Sc. (Eng.) Civil and B.Sc. (Eng.) (Hons) Civil from the University of Pretoria and is also a graduate of the Harvard Business School's SED Programme. He has been providing distinguished services to the public transport sector for 41 years of which some of the highlights were his appointment in 1994 as the Team Leader of the Strategic Management Team tasked with developing, structuring and establishing the new Department of Public Transport and Roads in Gauteng that he headed until 2004. During that period he represented the Department on various national forums and professional bodies such as the Ministerial Conference of Ministries of Transport, the Committee of Transport Officials and the Chairperson of the Gauteng Urban Transport Board. Jack was appointed as the Project Leader of the Gautrain Rapid Rail Link Project, and he is currently the CEO of the Gautrain Management Agency. Jack is President of the African Association of Public Transport (UATP), Vice President, Executive Board Member and Policy Board Member of the International Association of Public Transport (UITP), Chairperson of the Steering Committee of the Gauteng Transport Integration Plan, Project Director of Aerotropolis in Gauteng, and is a member of the Institute of Directors in Southern Africa (IoDSA).