

Month end 30 April 2008

# Gautrain construction update

## **SOUTHERN SECTION** **Underground section** **Park Station**

Excavation of the single-track rail tunnel towards Emergency Shaft 2 in Houghton has reached approximately 310 m from the tunnel portal. Construction of the underground station box and multi-storey parkade foundation is making good progress.



Within the station box, waler beams and struts have been installed to provide temporary lateral support to the perimeter walls during station box excavation.

### **Emergency Shaft 1 (Hillbrow)**

The single-track rail tunnel between Park Station and Sandton Station will feature seven emergency access shafts. These shafts will provide emergency services personnel access to the tunnels below. At the bases of these shafts there will be safe havens where passengers can gather in case of an emergency.

The land required for Emergency Shaft 1 in Hillbrow is in the process of being expropriated. Site establishment and shaft excavation will start once this process has been completed.

### **Emergency Shaft 2 (The Wilds, Houghton)**

At Shaft E2, shaft lining was completed to the 38 m depth above the cavern and grouting ahead of the cavern excavation was in progress. Once this cavern is complete, an adit linking the bottom of the shaft to the tunnel alignment will be excavated, from where two rail tunnel sections will be excavated. The one tunnel will head south towards Park Station, while the other tunnel will head north towards Rosebank Station.

### **Emergency Shaft 3 (Riviera)**

Construction of this shaft will start soon. The construction site has been hoarded and site establishment has commenced.

### **Emergency Shaft 4 (Houghton)**

Excavation of this shaft has been completed to its 14,3 m final depth.

① Aerial view of Park Station

② Placing of the longitudinal braces for the station box, Park Station

### Rosebank Station

The giant Tunnel Boring Machine (TBM) has already installed approximately 460 tunnel lining segments rings in the single-track rail tunnel being bored towards Emergency Shaft E2. This equates to a distance of almost 690 m of tunnel bored below Oxford Road.

This moving factory uses latest international technology to bore a 3 km section of the tunnel from Rosebank Station southwards. The TBM has been purpose built to deal with the difficult geological conditions along this section of the route. The remainder of the single-track rail tunnel towards Park Station will be excavated using conventional drilling and blasting methods. The TBM, named *Imbokodo*, installs precast concrete tunnel lining segments behind it as it moves forward. It leaves behind a watertight and smooth lining to the 6,8 m diameter tunnel.

Tunnel lining segments are manufactured at an offsite facility and are delivered to site.

Excavation of the underground station box and its base slab is completed. Construction of the external walls within the station box is in progress. Excavation of the single-track rail tunnel towards Emergency Shaft 5 has reached 250 m.

### Emergency Shaft 5 (Dunkeld, Rosebank)

Tunnelling southwards towards Sandton Station – the only section of tunnelling being excavated from this shaft – has progressed to approximately 315 m. Excavation of the safe haven chamber is progressing simultaneously.

A head house structure is visible above the shaft, which houses the overhead gantry crane. It is used for hoisting excavated rock and lowering and lifting materials and equipment.



The crane is clad with sound absorbing panels to limit noise created by construction work. This is a temporary structure, which will be removed once tunnelling operations are completed.

**Sandton Station**

Construction of the cavern for the underground station is in progress. Excavation of the three level parking basement is complete and construction of the parkade foundations has commenced.

Excavation of caverns in both directions from the 45 m deep shaft at the southern end of the station continued, with the single-track rail tunnel cavern towards the south having progressed to approximately 45 m.

**Mushroom Farm Park**

Two sets of tunnels are being excavated towards Sandton. The single-track tunnel has reached Sandton Station and remained at 472 m, while the double tunnel towards Sandton continued, reaching approximately 280 m by month end.

The double tunnel towards Marlboro Portal reached approximately 650 m. Later this year, the tunnel being excavated from Mushroom Farm Park will meet with the tunnel being excavated from Marlboro Portal to form one continuous tunnel.

Mushroom Farm Park is a temporary shaft used to provide access for tunnel construction.

The community park will be fully reinstated once construction operations are complete.

**Marlboro Portal**

Excavation of the double-track tunnel towards Mushroom Farm Park approached 1 870 m from the portal. Inside the tunnel, the

final lining is being applied to the tunnel walls. Construction of the floor slab to support the railway tracks is in progress. Concrete walkways are being installed and construction of the dividing wall separating the two sets of tracks is in progress. Construction of the cut and cover structure adjoining the portal continued.

The portal at Marlboro is the point where the tunnel ‘day-lights’. It separates the underground and surface sections of the route.

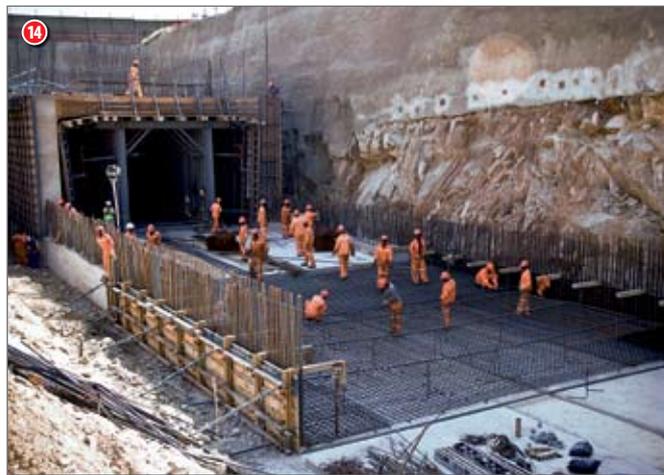
**Surface alignment  
Marlboro Station and N3 Underpass**

A continuous longspan elevated rail bridge is called a viaduct. Several viaducts are being built to cross rivers and roads on Gautrain’s route. The precast concrete deck segments for these viaducts are being manufactured at the precast yard.

At Viaducts 1a and 11, which cross the Jukskei River and East Bank Road in Alexander, the southern abutments – the last elements of substructure remaining – approached completion, ahead of the arrival of launching girder T1, which has completed

- 3 Aerial view of Rosebank Station
- 4 Inside of the TBM tunnel looking back to the entrance/shaft, Rosebank Station
- 5 Reinforced steel cage for the segment mould
- 6 TBM after the sides of the moulds have been removed the segment is vertically removed out of the mould with a vacuum-lifting device
- 7 The tunnel towards Sandton
- 8 Emergency Shaft 5
- 9 Aerial view of Sandton Station
- 10 Excavation of the shaft
- 11 Formwork, Marlboro Portal
- 12 Partition wall of the tunnel at 108 m





its work at Viaduct 3. Once the launching girder is assembled, deck erection will commence.

Earthworks, retaining walls and associated drainage structures are in progress between the Marlboro Portal and the N3 Crossing, including in the area of the Marlboro Station, where station construction has now started.

Construction of a series of underpasses, where the two pairs of railway lines cross below the N3 highway alongside the Marlboro Road bridge, continues.

### **NORTHERN SECTION (DEPOT TO HATFIELD STATION)**

#### ***Depot, precast yard and rail welding facility***

Construction of this section of the route between the N3 crossing and the depot is well advanced.

At Viaduct 2, over Modderfontein Spruit, Mbeam erection was completed, side panel installation is well advanced and casting of deck slabs on top of the Mbeams is in progress.

At the train depot, Gautrain's 24 train sets will be maintained, serviced cleaned, and securely stabled overnight. The adjacent bus depot will perform a similar function for Gautrain's dedicated fleet of 150 luxury buses. Construction of these facilities is well advanced, with the bus depot administration building already complete and the train depot offices and maintenance workshops targeted for completion within the next few months.

The welding of rails into 216 m long lengths has commenced at the temporary flash butt welding yard that has been set up ad-

acent to the train depot. This facility uses high-tech rail-welding methods which eliminate the need for jointed gaps between rail lengths. The laying of trackwork for the stabling sidings at the train depot has commenced.

The precast yard – also temporarily located at the depot – is equipped with twin concrete batching plants and several overhead gantries and tower cranes that are required to manufacture a variety of precast concrete elements. These include viaduct segments, bridge beams and parapets, tunnel walkway sections and noise barriers. From here, precast elements are transported to the various construction sites as needed. It is currently the largest precast facility in Africa.

#### ***Midrand area***

Construction is now well under way in the vicinity of Midrand Station and continuing towards Centurion.

Construction of Viaduct 3 over Allandale Road is making good progress. All thirteen of the deck spans have now been erected and this launching girder will now be dismantled and transported to Viaducts 1a and 11 at Marlboro.

Deck segments are erected using massive purposebuilt launching girders. These girders are launched across the supporting piers to rapidly assemble the precast deck segments. Segments are then glued and stressed together to form the deck spans. This international bridge deck assembly method enables construction to proceed with minimal disruption to existing infrastructure and traffic below. There are two of these underslung launching girders deployed on the project.



At Viaduct 4, which crosses Rietspruit and Olifantsfontein Road South, construction of the supporting piers and abutments is in progress.

Construction of a number of smaller road-over-rail bridges in this area continues, including at Ridge Road, West Road, New Road and George Road.

### **Centurion area**

Viaduct 5 carries the elevated alignment through Centurion. It stretches over the John Vorster Interchange crossing the N1 in the south and then continues through Centurion to the Jean Avenue Interchange crossing the Ben Schoeman highway in the north.

The sinking of deep foundation shafts for Viaduct 5 at both of these interchanges continues, and construction of the supporting piers is in progress at the Jean Avenue section.

Several temporary steel pedestrian bridges have been erected over the N14 highway at the Jean Avenue Interchange and across the N1 at John Vorster Interchange to provide construction workers safe access across these busy highways.

Within Centurion itself, foundation construction – comprising excavation, preloading, grouting and piling – is under way at many of the viaduct pier locations, including those which will support the elevated platforms of Centurion Station. This station will be situated on the northern side of West Street close to Centurion Lake. Utility diversions throughout the Centurion area are ongoing.

### **Pretoria area**

Construction of an underpass where the Gautrain rail track will cross underneath the Ben Schoeman to the south of Salvokop is in progress.

Piling for the pier foundations has started at Viaduct 7, which will cross Nelson Mandela Boulevard at the entrance to the city.

At Pretoria Station, the existing staff parking area has now been vacated to enable construction of the Gautrain Station to proceed. Hoarding has been erected around the construction site.

### **Hatfield area**

Between Pretoria and Hatfield a number of bridges crossing the existing railway line require to be widened to accommodate the adjacent Gautrain tracks.



- 13 Aerial view of the N3 Crossing
- 14 Construction of the underpass
- 15 Aerial view of Viaduct 3 over Allandale Road
- 16 Viaduct 3
- 17 Aerial view of Viaduct 5, Centurion
- 18 A series of temporary steel pedestrian bridges have been erected over the N14 highway at the Jean Avenue Interchange and across the N1 at John Vorster Interchange to provide construction workers safe access across these busy highways
- 19 Aerial view of Pretoria Station
- 20 Vantage point overlooking the existing Pretoria Station and the new site for the Gautrain Pretoria Station



21

A short distance to the east, foundation and abutment construction continued at Viaduct 14, which will span Zuurfontein Road and the adjacent existing railway line

21 The launching girder at Viaduct 13

22 Viaduct 13

23 Aerial view of Viaduct 15 towards airport

24 Viaduct 15 pier construction at Rhodesfield



22

Abutment construction for the widening of the Lynnwood Road bridge continued, as did foundation work and piling at the Ridge Road bridge. This bridge will replace the existing bridge at Willow Road, which is to be demolished. Piling at the new Grosvenor Road bridge next to Hatfield Station and piling for the extension of Cilliers Street bridge commenced during April.

At Hatfield Station, piling for the parkade structure was in progress and construction of the base for the retaining wall along the adjacent SARCC alignment diversion got under way.

### EAST-WEST AIRPORT LINK

#### Airport Link (Marlboro Station to O R Tambo International Airport)

Deck erection at Viaduct 13 over Centenary Way in Modderfontein, using launching girder T2, is approaching completion.

A short distance to the east, foundation and abutment construction continued at Viaduct 14, which will span Zuurfontein Road and the adjacent existing railway line.

Several other bridges and culverts are also currently being built along this section of the route.



23

#### O R Tambo International Airport Station

By far the longest viaduct on the east-west section of the route is the 1,5 km long Viaduct 15, which will carry the double-track railway line over the R21/R24 road network to the elevated O R Tambo International Airport Station. Viaduct foundations have been completed and construction of the supporting piers is well advanced.

Construction of the station concourse is in progress and is visible above the elevated dropoff road. This is immediately adjacent to the new Central Terminal Building which is currently under construction at the airport.



24

### OVERALL PROGRESS

Construction started at the end of September 2006. Gautrain will be completed in two phases:

- The first phase has a duration of 45 months. It includes the network between O R Tambo International Airport and Sandton and includes the stations at O R Tambo, Rhodesfield, Marlboro and Sandton, together with the depot and operations control centre located near Allandale Road in Midrand
- The second phase, being constructed concurrently, will be completed in 54 months, towards 2011. It includes the remainder of the rail network and stations linking Sandton to Park Station in Johannesburg and the route from Midrand to Hatfield □

Source:

[http://www.saice.org.za/downloads/monthly\\_publications/2008/CivilMay08/#/0](http://www.saice.org.za/downloads/monthly_publications/2008/CivilMay08/#/0)