

Planning and preliminary design completed for massive N3 upgrade



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The Hatch Goba/RHDHV Joint Venture has completed the planning process and preliminary design for a section of the Durban Gauteng Corridor upgrade project, stretching from Paradise Valley, just west of Durban, to Cedara, north of Pietermaritzburg, for client SANRAL. Seen as the most important freight corridor in the country, the project has a design window up to 2047.

ASTONISHING GROWTH

Durban ranks within the top 50 destinations for container traffic internationally. In the ten-year period from 1999 to 2009, the volume of containers routed through the Port of Durban grew by an astonishing 134%.

The critical importance of the Durban Gauteng Corridor is underlined by the fact that there are few alternatives, with Maputo in Mozambique facing both border crossing and harbour congestion challenges, while Richards Bay is mainly a break-bulk harbour. For this reason the development of this corridor has been identified by the South African government as a Strategic Integrated Project and forms part of the SIP2 programme.

A uniqueness of South Africa is that Durban is the biggest port in Africa, located on the east coast of the KwaZulu-Natal Province, while the centre of economic activity lies in the Gauteng Province, some 600 kilometres inland. This makes the N3 that connects these two provinces the busiest freight route in South Africa.

HOLISTIC PLANNING

The N3 planning has been undertaken holistically as part of the SIP2 programme. Engagement with Transnet took place in terms of the current and future impact of freight on the national road network, as well as Transnet's road-to-rail strategy.

A major focus of the programme is the portion of the N3 between Durban and Pietermaritzburg, which has come under intense pressure due to safety concerns and heavy vehicle accidents. The section between Pietermaritzburg and Hilton is particularly problematic, due to the steep descent at Town

Hill, the added lack of capacity and the curvilinear alignment. Likewise, the Key Ridge section between Shongweni and Hammarsdale poses a threat to freight vehicles, due to a combination of steep gradients and sharp curves.

Hatch Goba as lead consultant, in consultation with the South African National Roads Agency (SANRAL), undertook the planning and preliminary design of the section from Paradise Valley, just west of Durban, to Cedara, north of Pietermaritzburg, in conjunction with Royal HaskoningDHV as joint venture partner. Acer (Africa) was the lead environmental practitioner, while Stratecon was the economic assessment specialist.

SCOPE OF WORK

The JV's scope of work focused initially on the compilation of a preliminary design report that took into account all existing data, from traffic analysis to Lidar surveys, bridge scans and materials data. The upgrade proposals contained in this report then had to be refined further by means of micro-simulation modelling.

The big driver for completing the preliminary design was to identify where SANRAL needed to acquire more land. Where possible, development has to take place towards the inside of the median, but it does exceed the current road reserve in certain places. All these areas were identified, and the land acquisition process is currently under way.

The existing pavement also had to be evaluated and, together with the outcomes of the traffic analysis, a pavement strategy to sustain current and future traffic loadings had to be indicated – the required capacity upgrades to the N3 main line have to provide a Level of Service D in 2047.

An important part of the brief was not just to provide capacity, but also to look at safety upgrades in terms of the road alignment. This entailed evaluating the existing alignments, both horizontally and vertically, and then proposing upgrades to mitigate any unsafe conditions.

The current planning represents what can be termed “the ultimate development of the N3” and is the result of a long process. The JV's original appointment was for an upgrade from four to six lanes, but the traffic analysis showed that, even then, sections of the road would reach capacity pretty soon, i.e. around 2020 to 2025, at which point more lanes would again need to be added.

SANRAL then revised the project's scope of work to consider a 30-year design period with implementation estimated to commence in 2017. This planning was done in consultation with other stakeholders as part of the SIP2 programme, and, in particular, Transnet's Freight Demand Model. In order to have sufficient capacity up until and including 2047, the road would need to be upgraded to an eight-lane facility, with four lanes in each direction. Climbing and crawler lanes are also required, so in certain places it would even become ten lanes. It is a recognised principle that an authority cannot build itself out of capacity and, while the plan is for an eight-lane freeway (ten lanes for steep areas), SANRAL's current network already has such lanes in other high-traffic areas.

The proposed solution is a massive upgrade of the N3 between the Candella Road Overpass, just east of the EB Cloete Interchange at Durban, and Cedara, just north of Pietermaritzburg. Most of the construction work is estimated to begin in 2017.

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CAPITAL OUTLAY

One of the key challenges facing SANRAL with the upgrade is the high capital outlay required. The construction phase is unfunded at this stage, but is being discussed at a national level through the Presidential Infrastructure Coordinating Commission (PICC), which coordinates all government's infrastructure projects.

The total construction works (in 2014 prices, including design and supervision fees) for the 2017 portion of the project equate to R17.9 billion, while the 2027 portion will cost R4 billion. SANRAL has broken the project down into ten packages for the detail design and construction stages, and the tender process for the appointment of consulting engineers for these stages is under way. Some of these have already been awarded.

THE TOWN HILL CHALLENGE

Perhaps the most notorious section of the Durban Gauteng Corridor is the Town Hill section near Pietermaritzburg, as this is the section with the highest accident record due to its steep gradient and sharp curves. As a result of the severe geotechnical constraints and alignment problems it may not be desirable to add additional lanes to the existing road.

Various options for ring roads around Pietermaritzburg were therefore investigated. These have in fact been on the cards for many years in an attempt to get rid of the hazards posed by the current alignment, but they turn out to be very expensive, as long sections of road will need to be built. Also, because these alternatives are so much longer, they are not considered economically viable options for road users.

This specific part of the project is therefore still ongoing. A possible alternative alignment for the Town Hill section has been identified, which promises to address the safety-related problems while still being economically viable. This includes a possible route up the opposite side of the valley and would be used in conjunction with the existing route.

Another option is the construction of a road tunnel from the Cascades area of Pietermaritzburg to the Rotunda area of Hilton. A total of eleven options are being considered, and these will go through an environmental screening process before routes are shortlisted and taken forward.

CONCLUSION

The success of the project to date can be attributed to the close working relationship between all the professional participants in the JV, and the interaction with SANRAL as the main client. This is indeed a flagship project for all involved, and is testament to the expertise and experience of all the JV members and SANRAL. □

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