

Emergency Repairs to Sani Pass

An aerial view of the completed Sani Pass emergency repairs project

FINALIST Technical Excellence Category

KEY PLAYERS

Client

KwaZulu-Natal Department of Transport

Professional team

Royal HaskoningDHV

Main contractor

Ubunye Plant Hire

Sub-contractor

Eire Contractors

INTRODUCTORY SUMMARY

Sani Pass is the only road linking KwaZulu-Natal to Lesotho. Over the years the pass had, however, deteriorated to such a degree that it was no longer safe for public use. Serious concern existed that sections of the road could be permanently lost due to catastrophic damage by heavy rains. The KwaZulu-Natal Department of Roads hence appointed Royal HaskoningDHV to undertake emergency construction measures. The emergency repairs were carried out on the switchback section between km 32.000 and km 32.437 on Main Road P318 between Himeville in KwaZulu-Natal and Mokhotlong in Lesotho. The resulting improved alignment and drainage have increased the safety of the pass and made it more accessible to the public again, all while having minimal impact on the environment.

DESIGN APPROACH

The design of the emergency repairs involved three separate but related elements:

- Drainage improvements on three of the Sani Pass switchbacks using materials available on site
- Realigning and re-grading two short sections of the Sani Pass switchbacks
- Repair and prevention of erosion dongas.

Drainage of Sani Pass switchbacks

Because the Sani Pass Road switchbacks are constructed from un-compacted talus material, they are at great risk to erosion and slippage. With the extreme weather conditions on the Sani Pass and heavy rainfall, it is critical to remove surface water off the road as quickly as possible in order to prevent erosion and scouring.

The design allowed the diversion of stormwater into the natural drainage gullies on the right-hand side of the pass by using stormwater pipe culverts and gabion basket barrier walls. It was also necessary to bed the pipe culverts and gabion basket barrier wall on the existing bedrock. This required trench blasting for both the pipe culverts and gabion basket barrier walls.

The existing earth drainage channels were repaired and maintained to prevent further scouring of the road.

It was a design requirement to discharge the stormwater directly onto bedrock or into multiple stilling basins so as to prevent the erosion of the *in situ* talus material. The multiple stilling basins reduced the velocity of the stormwater, preventing future erosion and scouring.

Realignment and re-grading of Sani Pass switchbacks

To ensure that there would be no risk of future collapse or slippage within the scope of work, it was necessary to realign the road horizontally in two places and move the road further into the mountain so that it was founded on bedrock. This involved restricted blasting and posed numerous technical challenges. Of particular concern was that the blasting on the pass could destabilise localised embankments, resulting in premature closure of the pass.

A further restriction was the ice waterfall at “Ice Corner”, a major tourist attraction on the Sani Pass, and in close proximity to the blast zone. To protect the ice waterfall, it was decided that small controlled blasts not exceeding 100 m³ per blast would be carried out. A further risk was that the back blast could destabilise the blast face. It was therefore necessary to control the back blast and remove all loose material.

Repair and prevention of erosion dongas

At km 32.22 three large dongas had formed due to extensive erosion over the years. Not only were they potentially a serious safety hazard to the public, it was also likely that the un-compacted talus material could slip in the immediate future, thus forcing the closure of the pass.

By diverting surface runoff and stormwater into side drains it was possible to stabilise the base of the dongas using gabion basket retaining walls constructed on the exposed bed rock. The boulders obtained from blasting were used to fill the dongas.

CONSTRUCTION CHALLENGES

As the Sani Pass falls within a world heritage site, no formal site camp could be established on the pass. All labour had to be established on a daily basis and, where possible, *in situ* materials were used for construction. Due to the rough terrain, it was necessary to use articulated dump trucks and tracked excavators. The supply of fuel to site had to be transported in diesel bowsers on the back of 4x4 vehicles.

After extensive consultation, it was agreed that the Pass would be accessible to the public during the construction period, but would be closed for four hours on a weekly basis to allow blasting. Many businesses rely completely on the Sani Pass for income generation, thus it was critical that the pass remained open to the public during the construction period.

Due to the risk of boulders rolling down the embankments, all construction activity had to be temporarily stopped to allow vehicles to pass the construction zone (public vehicles were given priority over the construction operations). To ensure the safety of site personnel, only one construction zone was worked at a time, as loose talus material would frequently roll down the pass.

Extreme climatic conditions – heavy snowfalls, freezing winds and flooding – contributed to the difficulties of working on the pass.

ENVIRONMENTAL CONSIDERATIONS

It was critical that the construction techniques used should have minimal impact on the environment. To achieve this, meetings were held with Ezemvelo Wildlife, the custodians of the uKhahlamba Drakensberg World Heritage Site, to ensure compliance. Where possible, material found on site was used and local business interests were given priority over the construction process.

CONCLUSION

The primary objectives of the Sani Pass Emergency Repairs Project were achieved. The improved alignment and drainage measures have increased the safety of the pass and have made it accessible to the public again. The risk of closure of the pass has therefore been averted. □



The gabion basket stilling basins



Stormwater control measures were installed along sections of the road