**PRESS RELEASE**

Innovative spillway design put to the test as Garden Route Dam overflows

**Ingenious duckbill design by Zutari significantly increases the discharge capacity of the spillway to boost dam safety by preventing overtopping**

**14 December 2021:** A unique spillway project undertaken by leading consulting engineering and infrastructure advisory firm [Zutari](http://www.zutari.com) to raise the Garden Route Dam, the main supply for George in the Western Cape, was finally put to the test towards the end of November when it began spilling following torrential rains in the area.

“I am happy to report that the spillway is behaving as expected,” reports **Dr. Frank Denys**, Associate and Expertise Leader: Dams. “The clever duckbill-shaped spillway significantly increased both the storage capacity of the dam and the discharge capacity of the spillway so as to boost the dam’s water supplies without compromising its safety by preventing overtopping,” comments Denys. The project won an award for technical excellence in the SAICE Southern Cape Branch Regional Awards 2020.

George Municipality states on its website that while the heavy rainfall and flash floods on 22 November had “understandably overshadowed” the dam’s overflowing on the same day, it remained a celebration of innovative engineering and a significant milestone in the city’s long-term water security.

“The design is relatively new in the engineering world, and as far as we know is not being used in this way in South Africa,” says Civil Engineering Services Acting Director **Lionel Daniels**. It was extensively researched by Zutari and tested by the Department of Water and Sanitation’s Hydraulic Laboratory in Pretoria, with its shape designed to slow down water flow using basic physics principles. “The design is brilliant in its simplicity, and it was a real victory to see the dam overflow and the spillway working so effectively,” highlights Daniels.

“The project showcased how relatively small, well-engineered and optimised adjustments can provide a more resilient water supply system without compromising on dam safety. Furthermore, the expansion of existing water supply resources is preferable to the development of new sites, as it limits the environmental impact to an already impacted site. Despite the novel nature of the engineered solution, this unique and innovative project had a low capital cost and also has a small estimated maintenance cost,” explains Dr. Denys.

The project increased the existing storage capacity of the Garden Route Dam by raising its full supply level by 2.5 m via the installation of a new spillway, enlarging the storage volume by 2,5 million m³. The solution centred on a sophisticated hydraulic design in the form of a novel, state-of-the-art, non-linear spillway in the shape of a duckbill. Although duckbill or bathtub spillways are not unique, they are rare worldwide.

The Zutari team used its industry expertise to amend the hydraulic design to ensure that the weir would behave in a safe and predictable manner. The shape of the duckbill causes flow on opposite ends of the overflow flow to collide within the duckbill, causing an upwelling, also known as flow bulking, which breaks the flow’s momentum and causes it to lose its energy. The flow from the rounded upstream end of the spillway is not so opposed and causes this upwelling of flow to move toward the exit of the spillway at rapid velocity. This increase in velocity reduces the water level to a lower elevation such that it can safely pass under the bridge over the spillway.

The final duckbill spillway design resulted in a total spillway length of 80 m, with a maximum discharge capacity of 570 m³/s at a freeboard of 4.1 m. The flood event on 22 November 2021 was the first time the new spillway overflowed since its completion in December 2019. Prior to the flood event, the water level in the dam was roughly 1 m below the crest of the spillway. This volume was rapidly filled up in the course of the early morning and the spillway started overflowing at roughly 08:30. The peak of the flood occurred at 13:00 according, to the Department of Water and Sanitation’s water level-data record.

The water level recorder logged a maximum overflow depth of 0.509 m over the crest, which equates to about 50 m³/s in discharge. This thus appears to have been a relatively minor event, with the dam designed to cater for much higher flows. That said, the incoming flood was partially attenuated or absorbed by the storage volume in the dam basin. The flows at the nearby flow logger on the Malgas River likewise recorded a minor flood.

**Reference**: ‘Innovative engineering wins the day as Garden Route Dam overflows’ <https://www.george.gov.za/13820-2/>

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**Notes to the Editor**To download hi-res images for this release, please visit <http://media.ngage.co.za> and click the Zutari link to view the company’s press office.

**About Zutari**

As engineering consultants and trusted advisors, Zutari co-creates an engineered impact that enables environments, communities and economies to thrive. Few others can match our local capacity, long-standing presence and understanding of the challenges required to operate successfully across various regions in Africa.

We have created an impact across Africa for the past 89 years (1932 to 2021) and remain committed to this continent, making us the perfect partner to those less familiar with working in Africa. We are experienced in international projects and our Global Design Centres allow us to bring world-class solutions to our clients.

As a private management-owned company, our commitment is true and we have vested interest in our clients’ success. Our strong relationships allow us to connect the right expertise, processes and resources to match client’s needs and bring stakeholders that have shared interests together.

We blend the old and the new. We have moved beyond traditional engineering and work collaboratively to integrate technical and creative thinking. This process of co-creation allows us to unearth new opportunities with our clients and partners.

Zutari’s broad collective of in-house, industry-recognised engineering consultants and trusted advisors provide seamless and integrated delivery. This unique ability to offer scaled engagement allows Zutari to solve complex challenges more efficiently.

Grounded in digital engineering, we continuously deliver better results.

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