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Boitekong WWTW gets an upgrade

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BOITEKONG WWTW GETS AN UPGRADE

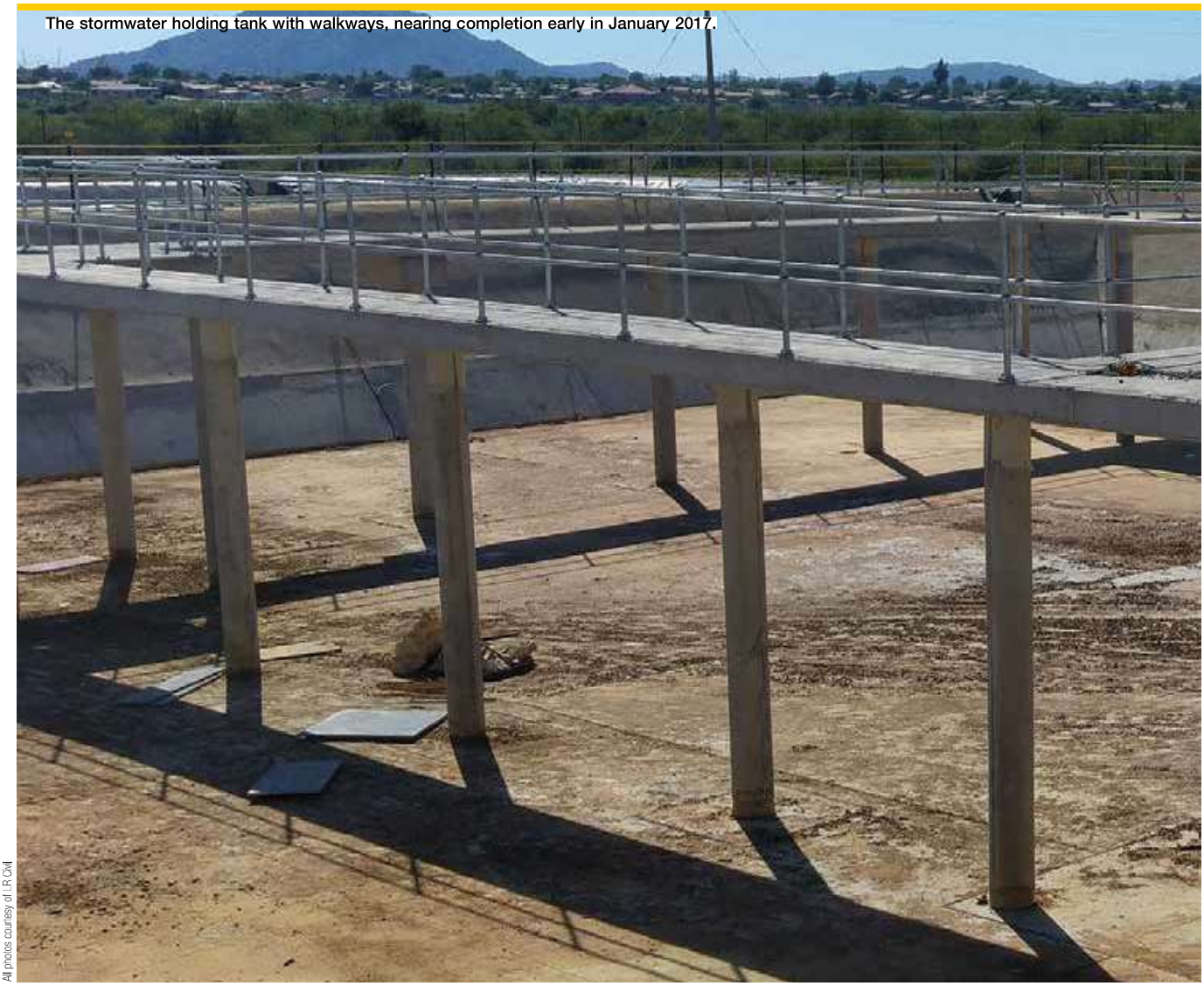
Efficiency, teamwork, and communication were key to the successful upgrading of the Boitekong Wastewater Treatment Works (WWTW) near Rustenburg, showcasing the capacity and the versatility of the LR Civil team.

Formerly known as the Paardekraal WWTW, the Boitekong facility was last upgraded in 2004. With the rapid growth of the city and the rising population in the surrounding area, the plant was overloaded and needed expanding to a treatment capacity of 24 million litres per day (Ml/d).

LR Civil, a member of the Raubex Group, specialises in bulk services and has a track record of almost 30 years in pipelines, service infrastructure, and contract management.

The company's site agent at Boitekong, Devilliers de Jager, says it has been a challenging, but rewarding job.

"Our focus is always to work as efficiently as possible, and our team understands that," says De Jager. "We ensure good teamwork by communicating the work programme well to everyone, and ensuring that all staff has clear instructions as the plan unfolds. The respect between everyone on site ensures a positive attitude towards the work, and solving of any problems as they arise."



The stormwater holding tank with walkways, nearing completion early in January 2017.

All photos courtesy of LR Civil

The original series of oxidation ponds were upgraded in 1992 to an 8Ml/d biological nutrient removal (BNR) operation, and again in 1994 with the construction of an 8 300m^3 activated sludge basin and two 22m diameter secondary sedimentation tanks (SSTs). An inlet works and return activated sludge (RAS) pump station were also added, as well as a chlorine dosing plant and contact basin.

The current contract, which began in mid-2015, includes the civil works for a new 3 600m^3 pre-fermentation tank, a new 7 000m^3 aeration tank, three new 22m diameter SSTs, scum and RAS pump stations, and modifications to the existing storm water balancing tank and other structures.

Project work included temporary connections to bypass certain old infrastructure due for demolition, as the plant needed to continue operating while the upgrade was in progress. A 1 000mm diameter Weholite pipeline between the aeration tank and the SST splitter box was installed, as well as 500mm diameter HDPE lines connecting to existing SSTs.

New chlorine contact channels were built, and interconnecting pipework from the SSTs were installed.

LR Civil also constructed a new sludge dewatering building and a 3 250m^2 concrete drying slab.

To do the concrete structures, LR Civil subcontracted to EMPA Structures, a sister company in the Raubex Group. This work comprised casting more than 6 000m^3 of concrete, with over 1 500 tonnes of steel as well as some 24 000m^2 of formwork and shuttering.

"EMPA's highly experienced team of foremen and skilled labourers made LR Civil's role as overall project supervisor much easier, allowing us to concentrate on other important obligations on site, and ensure the job could be handed over on time," says De Jager.

Extensive earthworks were undertaken on site — work that had to deal with quite a high water table. Excavating the SSTs, for instance, required going about two metres deeper than the water table.

One of the solutions that LR Civil developed to deal with this issue was to create a sump between the SSTs, fitted with a submersible pump, which would drain groundwater from below each SST whenever the water table rose


Deepening of the stormwater holding tank by another metre (February 2016).


LR Civil site agent, Devilliers de Jager, at the Boitekong WWTW near Rustenburg.

too high. The pump would then be activated automatically and would relieve the water pressure build-up below the SST structures. Relief valves were also installed in the floor of the SSTs to cater for ingress during construction.

"We see our role on site as not only to implement the client's plans, but also to address any challenges that arise in a cost effective and sustainable way," De Jager says. "Our team is encouraged to come to the foreman and managers not with problems but with solutions; we can then consider the options and make the best decision in conjunction with the engineer and/or the client."

He says a key player in the success of this project was the site supervisor, David Nobela, who oversaw most of the construction, pipe laying, and excavation work.

While the ground conditions on site were generally unproblematic down to about three metres, a high clay content in the soil was encountered below that level. The structures that were to be founded below three metres deep, such as the PSTs, the SSTs, and the aeration tank, therefore required a working platform. Clayey soil had to be removed to about 1.5 metres below the floor structures, and replaced with G6 backfill material.

An important aspect of the upgraded plant was the modification to the existing stormwater holding tank, so that it could function as an in-line load balancing tank, to ensure that a


Early work on the new aeration tank in March 2016.


Pipework on one of the two new secondary sedimentation tanks (March 2016).


The aeration tank in January 2017.

near-constant organic loading was routed to the activated sludge system.

De Jager explains that the tank was made about a metre deeper, requiring the demolition and removal of the concrete surface bed. Further excavations allowed the construction of a new surface bed with a 300mm fall towards the new low-lift pump station. De Jager also highlighted the new aeration plant as being a significant energy-saving improvement on the existing surface mixers.

An interesting challenge was that the local economic participation requirement on the contract stipulated that a minimum of 35% of the project cost had to be spent locally in Rustenburg — a feat which LR Civil managed to exceed by more than 3%.

The contract also stipulated that all building work and roadworks had to be executed by a nominated local subcontractor. LR Civil extended this even further and subcontracted some earthworks to this local subcontractor.

De Jager says LR Civil is involved in several other water projects in the Rustenburg area, having also completed the construction of a new dissolved air flotation (DAF) plant at the Rustenburg WWTW, as well as a contract at Kloof Dam. The company is also busy rezoning pipelines in the town to help ensure fewer pipe bursts and an uninterrupted water supply to residents. ■■

Our focus is always to work as efficiently as possible, and our team understands that.

Final stages of completion on a secondary sedimentation tank (January 2017). It can now function as an in-line load balancing tank.