

WHO'S WHO ENGINEERING NAMIBIA

FOCUS ON WATER ENGINEERING



Namibia's only publication focusing on the engineering industry of Namibia.

IN THIS ISSUE

- Swakopmund's new swimming pool
- Namibia pioneers **marine** diamond mining
- Banking water for Windhoek's **survival**
- Strengthening Kavango River bridge eight-fold

ENGINEERING NAMIBIA
VOLUME 4, 2013 edition

N\$35.00 VAT inclusive

ISSN 2026-7460



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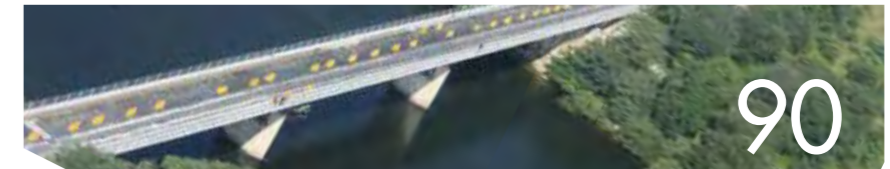
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EDITORIAL

In a dry country like Namibia, water will always be precious. The discovery of the massive Onhangwena II aquifer found in northern Namibia was certainly good news, and while it will bring relief for the northern regions in terms of water supply, the rest of the country continues to be subjected to periodic droughts, like the current one. In light of this, we focus in this edition on water engineering, with the clear message that efficient water usage has become vital for survival all over the world.

Namibia's engineering industry continues to grow from strength to strength with several mega projects on the drawing boards or far advance in planning. And it is a proud fact that Namibia is leading the way in several new engineering technologies that are being implemented.

One such example is City of Windhoek's innovative water management strategies that include water reuse and recharging of the aquifer. In fact, before the rest of the world ever heard of water reclamation, City of Windhoek built the world's first water plant that turned sewage effluent into drinking water, back in 1968. And the practice of water reuse is one of the prime reasons Namibia is gearing up to host this year's International Water Association's (IWA) conference on water reuse. Windhoek was chosen as the site for its prestigious biannual symposium, because of 'its outstanding achievements in wastewater treatment and recycling'. Indeed a proud achievement. We feature several water engineering related topics which we trust you will find interesting.



Thea Visser
Executive Editor

As always, I'd like to say a special big 'thank you' to our participating advertisers and supporters! It's always a challenge to publish a quality publication that is highly regarded and widely read. You made this one possible.

We are eager to receive feedback. Please share your views with us; we are always open to new ideas. Enjoy the reading!

Thea

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ISSN: 2026-7460

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ENGINEERING IN NAMIBIA: AN OVERVIEW

The engineering profession is growing in Namibia with more and larger projects coming on stream and even specialised sectors developing rapidly. And Namibia is leading the way in some of the technologies that is been implemented.

Sometimes, and increasingly more often than not, a project spans different engineering disciplines, necessitating firm to combine strength and share expertise. A project like the Neckertal Dam, for instance, would rely heavily on civil, water, and agriculture engineers, while the planned Husab uranium mine combines mechanical, electrical, civil and mining engineering.

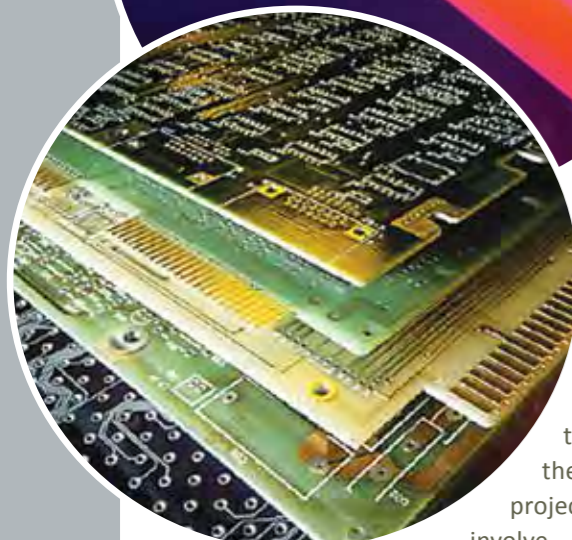
"Namibia is leading the way in some of the technologies that are implemented," says Chief Executive Officer of the Chamber of Mines Veston Malango. "Namibia is, for instance, a world leader in the offshore diamond mining industry. The technology used by Debmarine is unrivalled in the world of diamond mining. A N\$650 million vessel like the Mafuta with an on-board diamond processing factory made by Bateman Engineering is a miracle responsible for 30 per cent of production."

Engineers at Skorpion Zinc also have made Namibia an innovator in the world of base metals. "For the first time, mining and processing of zinc can take place onsite through a 150,000 metric tonne refinery that produces high grade zinc. Where normally zinc sulphite is produced, shipped and processed elsewhere, we mine zinc oxide and produce pure zinc."

Malango explains how for many base metals a solvent extraction electro winning process results in a high purity and is standard practice. "But for zinc oxide engineers never managed to do this. However, we cracked it, enabling us to fully develop the zinc ore body."

"Similarly, the development of the new Weatherly mine means that we will be producing pure copper, instead of smelting copper imported from Bulgaria or other places. That is a great leap forwards. Mining copper can give rise to a whole new industry making and exporting pipes and cables. A by-product of the copper production is sulphuric acid, which can be sold on to the uranium mines."





The mining sector and other upcoming industries such as the oil and gas sector have an impact on the engineering profession. "Just look at the fleet of vehicles the Husab mine will procure. Massive haul trucks of 200 tonnes, we didn't have that kind of equipment up till now. The production of Husab, scheduled to be 15 million pounds of yellow cake per year, will be bigger than the current combined production of Rössing Uranium mines and Langer Heinrich Mine and will make Namibia the second producer of uranium in the world."

The new B2Gold gold mine in the Otjikoto Region, which is a bigger project than the existing Navachab gold mine, will also bring new investments in technology and elevate engineering standards.

But it's not just the mining sector that is undertaken big projects. Marine engineering is becoming firmly established, as exhibited by specialised yards in the Walvis Bay port that deal with more and more oil rigs and ships that come in from the Atlantic Ocean for maintenance or outfitting.



Malango highlights the enormous investments in the mining industry such as the mega-project to construct the Husab mining project that will involve 8,000 people during construction and create 2,000 permanent jobs, a majority of which will be Namibian.

A new field of agri-engineering is emerging in Namibia as a result of the drive to make Namibia self-sufficient and substitute food import. Initiated by former president Sam Nujoma and revisited several times, the green schemes finally seem to kick off and require specialised engineering skills.

"Agricultural engineering, or more precisely, bio-resource engineering, is a separate albeit unknown discipline in the engineering profession," says Peter van der Merwe, who together with his wife Wanda runs Namibia engineering firm Integrated Biosystems.

"It is a mix between mechanical and civil engineering, with a crash course in agriculture thrown in. In Namibia 'agri engineers' focus a lot on water-related civil works," he adds.

Agri-engineers look at ways to get maximum yields from green schemes, while minimising on input costs and sticking to trusted and proven methods of working the land that are manageable by small scale farmers. Down the supply chain, the Government has set up fresh produce hubs to store and distribute the produce of the green schemes and other public private partnerships that entities like the Namibia Development Corporation (NDC) are setting up with private investors.

As the southern African region grows and gets more connected, infrastructure projects come increasingly to the fore with several large road and rail networks being mulled, as well as significant new projects that are unique to Namibia, such as an oil refinery in Walvis Bay.

Upgrade of the current rail network is also long overdue and would require significant investment. Water and power supply are becoming increasingly vital as consumption grows and sources are drying up.



In this edition of *Engineering Namibia*, a number of interesting developments in the water sector is featured, including new and innovative ways of treating and reusing water. Namibia's pioneering role in this field sees the country hosting the prestigious International Water Association's (IWA) Conference on water re-use later this year.

In the power sector, NamPower recently announced it is pushing ahead with the US\$1.2 billion Kudu power station. This project that will finally be exploited after almost two decades of political wrangling, will see a significant and concerted engineering effort both in the upstream and downstream sectors. The power station, says NamPower head of system development Rainer Jachau, will have two Class F gas turbines delivering between 850 and 1,050 Mw in what will be the country's biggest power project to date.

"With an investment of this size we didn't want to take risks, so we opted for technology that might not be the latest, but has a proven track record."

In addition, NamPower will get an equity partner on board that has experience with operating such plants in other parts of the world. The project will also need supporting infrastructure such as pipelines and a transmission setup to evacuate the power from the station

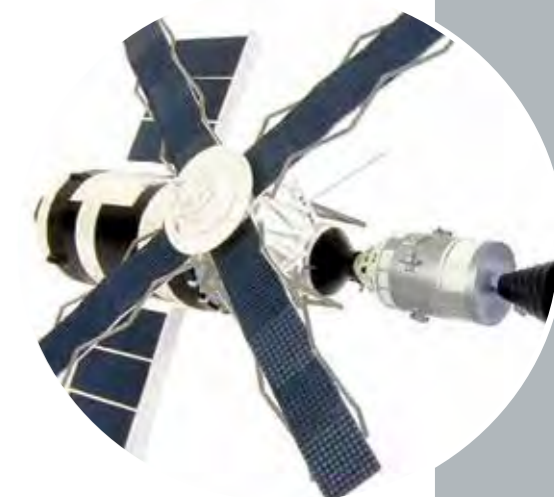


and wheel it to neighbouring countries upon completion in 2017.

Another huge project is the Baynes hydropower facility for which negotiations between Angola and Namibia are progressing well. NamPower expects the project to reach financial close by the end of 2014, after which construction will take several years to complete. The dam and related infrastructure will provide work and opportunity for Namibian engineering firms for years to come.

More and more Namibian companies are experimenting with chemicals that can improve performance in their field, in this case water. Trials are conducted at for instance some of the mines to develop resins and chemicals that if successful could be patented and manufactured locally.

In other fields such as electronics engineering, Namibian companies like Sat-Com, a subsidiary of August 26 Holdings, are reaching breakthroughs in military communications systems and hardware, setting the trend on the continent and attracting attention from large powers like Nigeria. ■



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STRUCTURE OF THE ENGINEERING FRATERNITY OF NAMIBIA

The Namibian Engineering fraternity has been formalised by the Engineering Profession Act, 1986 as amended in 1991, which is being administered by the Ministry of Works and Transport. The Act mainly sets the parameters for the registration of engineers and technicians. This is a statutory obligation which will assess the competency of the applicants and will allow them to do engineering work in the public and private sectors. Presently this Act is being reviewed with the aim to submit a draft Bill to the stakeholders later this year.

Three main bodies focus on different aspects of the Namibian engineering fraternity :

The **Engineering Council of Namibia (ECN)** is the regulatory body for the engineering profession in Namibia. All Professional Engineers, Incorporated Engineers and Engineer Technicians and their counterparts "in training" are legally obliged to register with the Council. Currently, there are 1,236 registered members of the ECN. The President is Mr Markus von Jeney; the Vice President is Ms Sophia Tekie and the Registrar is Ms Ronell Slabber. The ECN's annual newsletter to its members, the *Engineering Review*, is published on the flip-side. See also page 17.

The **Association of Consulting Engineers of Namibia (ACEN)** is a voluntary organisation of consulting engineering firms, presently the only representative body of consulting engineering firms. It has a membership of 44 and its objective is to promote the professional and business interests, rights and powers of its members. The President is Mr Mbingee Hindjou; the Vice President is Ms Chiedza Maxwell and the Executive Officer is Rico Viljoen. See also page 16 for more information on ACEN; a list of its members and their areas of expertise are provided from pages 19 to 24. Engineering firms who choose not to be members of ACEN are listed on page 25.

The **Engineering Professions Association of Namibia (EPA)** is a non-profit, voluntary membership association of the engineering and related professionals in Namibia. It has statutory representation on the Engineering Council of Namibia (ECN), and is a full member of the Commonwealth Engineers' Council and the South African Road Federation (SARF). It has a membership of 209 and aims to uphold excellence in the field of engineering and to promote the image of the engineering profession in Namibia. The President of the EPA is Ms Sophia Tekie; the Vice President is Mr Güther Leicher and Ms Tanja Bednarek is the Administrator.

Four year ago, the EPA, in conjunction with the publishers of the *Who's Who Namibia* annual reference publication, initiated this *Who's Who Engineering Namibia* publication to further its objectives, and to provide a high quality platform for Namibia's engineering industry. The next few pages provide an overview of EPA's activities during the past year. ■



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Message from the President of the Engineering Professions Association (EPA)



Sophia Tekie
EPA President

Dear Professionals of the engineering fraternity

During the year, the EPA has done its best to fulfil its mandate, more in particular, the activities as shown in the annual report. One of the major milestones of the Association is the "Role of Engineering Profession in Namibia" study which will cover the challenges and opportunities faced within the engineering fraternity. Technocrats seem to be buried in our own little world doing our technical work, and there seems to be an apathy towards the whole engineering sector. We are supposed to be innovators, creators, analysers, shapers, etc. On the other hand, we are also frustrated because when we give our advice, decisionmakers tend not to accept it and we get discouraged as we feel invisible.

Hopefully, this study will change that perception and create understanding on a national level of what our role is, and to advise Government, civil society and other institutions of our challenges and opportunities. Apart from aforesaid, the study shall lay a national strategy on issues related to professional engineering industry, which is a step toward building an economy of this country.

The South African study of Needs and Numbers was taken up at cabinet level and it is envisaged that the Namibian study will similarly be accepted on high level. In Namibia, we will not be publishing a book, but we have conducted the study that commenced in November 2012 will be hopefully shared in August 2013. The project is going well, but faces some challenges, such as the questionnaires that were prepared and e-mailed to all sectors, parastatals, some municipalities, young engineers in training, CEOs and their executives, have not been replied to or filled out as requested. Therefore, to all those reading this message, we are urging you to

participate in this questionnaire so that your needs are captured.

The second message I have for our EPA members, is that we need to be active and participate in our courses, team building exercises, and to get more membership. The EPA recognises that we are all busy, and we are short on technical staff in the country; we are over-worked, but we still need to see the bigger picture, such as why we are doing what we are doing. We need to reach out more to schools and career fairs, as pupils need to be inspired to study engineering. Our youngsters need good mentors.

When the Engineering Council of Namibia implements the continuous development programme in the new Act, we will get more participants and membership, as it will be EPA's responsibility to implement, but then it will not be on voluntary basis, but because it is a law.

Dear EPA members, we need your assistance to come along and participate and to bring new ideas to our Association during our Annual General meetings. Last year we were privileged that over 50 people participated, but we want active members of EPA to give innovative ideas, so that we may shape the engineering field in this beautiful country, Namibia.

Hence, my fellow engineers, incorporated engineers and technicians, let us put our hands together and move forward. When the announcement of the date for the study workshop is put in the media and your e-mails, we hope you will come forward and support it.

I thank all the members who showed enthusiasm and support during the year, and encourage other members to be active. And it is also the EPA's wish that through this study the voices of professionals will be heard.



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EPA: WHO AND WHAT IS THE ENGINEERING PROFESSIONS ASSOCIATION OF NAMIBIA

The Engineering Professions Association of Namibia (EPA) is a non-profit, voluntary membership association of the engineering and related professionals in Namibia, which aims to uphold excellence in the field of engineering and to promote the image of the engineering profession in Namibia. It has statutory representation on the Engineering Council of Namibia (ECN), and is a full member of the Commonwealth Engineers' Council and the South African Road Federation (SARF).

Annual Report 2012 of EPA

Membership categories:

- Corporate members: registration with ECN
- Associate members: active in engineering field
- Students members: university or college student

EPA membership

The EPA currently has 209 members (as at 1 November 2012) of which we have the following disciplines:

Agricultural	2	Industrial	1
Chemical	2	Mechanical	31
Civil	127	Geotechnical	1
Electrical	43	Other	2

The EPA has made a lot of strides to get more members, and will continue to do so. Once the Continuous Development Program (CPD) becomes obligatory by the Engineering Council Act the membership will increase.

It seems a lot of the engineers are very busy and overstressed with a lot of work, due to the shortage, and voluntary memberships and service to the engineering community is becoming a challenge by the day.

Continuous Professional Development – CPD

The EPA in cooperation with the South African Road Federation (SARF) facilitated the several presentations / courses during this period.

1. On 5-6 June 2012 the Bituminous Binders Course was presented
2. In September between 11-13 the Low Volume Roads Maintenance Course was presented. The EPA President opened the course and introduced the EPA as an organization to everyone. The idea is to bring experts from the region so that we facilitate courses in the country to reduce cost, and to make skills transfer accessible.

School projects to promote Engineering: EPA Young Engineers' Construction Project: Bridge Building Competition 2011

The EPA strives to promote an interest in a career in the engineering profession already at school level. The annual Bridge Building Competition for secondary



1st prize winners of the Bridge Building competition: Walvis Bay Private School, participants Loraine Brink, Eduardo Riobo and Anica Proffitt with judge Mr Gunther Leicher (Vice-president of the EPA), Mr Ako Al-Jaf (Council member of the EPA) Mr Theo du Toit of Windhoek Technical School, Mr Henock Ntinda of Roads Authority, Teacher, Deon van Zyl of Walvis Bay Private School and Mr Dirk Reed of the City of Windhoek.

Several EPA members attended a site visit to Okapuka Crushers.



The Namibian delegation to the SADC meeting: from left to right: Mrs Victoria Janson from the Women in Engineering Poly Tech Society; Mrs Angelique Philander from the Directorate of Research, Science and Technology; Mrs Sophia Tekie EPA President and ENC Representative.



schools is a big hit and will be hosted on 9 March 2013 for all secondary schools in Namibia. The winning team is to partake in the international bridge building competition hosted by SAICE on 2-4 September 2013 in Pretoria.

Site Visits – Bon Okapuka Crushers

Several of the EPA members visited Bon Okapuka Crushers in order to inform themselves on how crushers work and the operations of such a company.



5th Annual Women of Substance Conference, Gala and Exhibition – CULTIVATING PASSION IN LEADERSHIP 16-18 April 2012: "Equipping Women Leaders for Unique 21st Century Challenges: Personal, Corporate & National"

The EPA President as a woman and as an engineer was officially invited to speak on the

topic "The dynamics of women in leadership" and the presentation was well received. Topics covered were mainly to promote the EPA and the contribution of women to society as professionals.

EPA Fun Day – Team building

This event took place on Friday, 21 September 2012. Onyati Adventures was organized to host this event which was at the Windhoek Country Club Bowls Club and the photos of this event were copied to CD and sent to each company taking part. The aim of such activities is to create synergy among professionals, council members, and to have fun so that life is balanced.



Participants at the SADC meeting on women in Engineering, Science and Technology

The goal is to have the national women associations and to have a national charter. The Ministry of Education, Directorate Science and Technology, formed a national committee of which the Engineering Council of Namibia is a member to facilitate the achievement of this goal. The charter for Namibia is near completion and will be signed by the Ministers of member countries hopefully in the next SADC summit.

After this meeting Namibia through the EPA, and the support of the ECN established the study for needs and numbers. It is envisaged that this study will be linked with the SADC study so that the information collected will feed at a regional level. In this meeting Mrs Tekie gave a comprehensive presentation on the status of engineering in Namibia. Sadly to note there are only less than 5% women professional engineers in Namibia, and hopefully this forum will address how to change this situation, by bringing the various parties on one table. The details of the project are presented in on pages 8-9 in this publication.

EPA National Adjudicators List (NAL)

With the NAL the EPA aims to provide the Namibian construction industry with a low-cost, but high quality, alternative dispute resolution system to the traditional

systems of arbitration and litigation. The NAL has been established with the support of InWent – Capacity Building International, Germany, the Roads Authority and the City of Windhoek, which is also the NAL's first registered client.

At this stage the EPA through the NAL offers a procedural and impartial nomination service to assist employers in the construction industry with the appointment of adjudicators to the dispute adjudication boards. Mr Andreas Helmich is currently appointed as NAL coordinator and 57 adjudicator nominations have been made to date. There is one (1) senior adjudicator, eleven (11) adjudicators, seven (7) junior adjudicators, five (5) new registrations of which four (4) is trainees. The EPA is committed to developing capacity for adjudication services in Namibia, and the support of employer organizations is crucial towards achieving this end.

The Roads Authority Bursary Fund

A very successful project in facilitating young people to take up a career in engineering has been the EPA's management of bursary schemes for university and Polytechnic students in engineering, which have already made a significant contribution to alleviate the shortage of engineers and technicians in Namibia.

The Roads Authority Bursary Scheme, administered by the EPA, continued in 2012 with a total of 23 students, of which 19 students at the Polytechnic of Namibia, 3 at UNAM, 1 student at the University of Stellenbosch. 3 students were unfortunately cancelled in June 2012 as they failed their curriculum. A total expenditure of N\$1,678,000 has been paid in 2012 to date.

EPA Scholarship Fund

The EPA's own scholarship scheme has been established with the support of the Swedish International Development Cooperation Agency, Sida, and other donors, notably EPA members.

In January 2013 the EPA will be awarding scholarships each amounting to N\$25,000 to students for their studies towards a Bachelor's degree in engineering. Advertisements were placed in August and September and 12 students have been elected to receive a

Right: Dr Christina Swart-Opperman was the speaker at the 36th AGM.
Far right: EPA members attending the AGM.



scholarship: Francois C van Schalkwyk; Bernardt van Schalkwyk; John Brandt; Panduleni Angula; Silas lileka; Hanas Nenkavu; Monika Shapua; Fanuel Mathias; Emilia Amutenya; Evelina Amutenya; Lena Enkali and Sitali Lwendo.

Who's Who of Engineering in Namibia Publication

The high quality publication, the *Who's Who of Engineering in Namibia*, showcasing the engineering industry and projects in Namibia, will be published in 2013. The publication will be published in association with all the engineering bodies and associations, ie the Engineering Council of Namibia, ACEN and EPA, and in close cooperation with the Ministry of Works and Transport.

It will provide a picture of the engineering industry in the country. As such, it will be the leading reference guide for the engineering and building industries. Some engineering projects currently in progress in Namibia or recently completed will be featured, as well as various interesting articles on engineering trends locally and worldwide, the new adjudicators' list, the EPA's successful Bridge Building competition, interviews with engineering students, among others.

It is envisaged that the *Who's Who of Engineering* will be published annually or bi-annually and a minimum of 3,000 copies will be printed and personally hand-delivered or distributed via Nampost to professionals, the business community and the rest of the target audience.

36th Annual General Meeting

EPA's 36th AGM was held on the 8th of November 2012 at the Safari Court Conference Centre and attended by about 50 members. Dr Christina Swart-Opperman was the guest speaker. The President's Award was given to Ms Tanja Bednarek, EPA Administrator.

Financial Report 2010/2011

- The Surplus for the year 2010/2011 decreased to N\$92,976.00 from N\$167,515.00 (2009/2010).
- The Accumulated Funds at the end of the year 2010/2011 increased to N\$638,686 from N\$545,710 (2009/2010).

EPA Scholarship Fund Trust

- The Accumulated Funds at the end of the year 2010/2011 increased to N\$1 725 187 from N\$1 668 386 (2009/2010).

Council Nominations for 2012/2013

Nomination of EPA Council members for 2012/2013:

President:	Ms S Tekie
Vice-President:	Mr G Leicher
Immediate Past President:	Mr A Al-Jaf
Hon. Treasurer	Mr V Fischer-Buder
Hon. Secretary	Mr F Muketi
Member	Mr F Jacobs



The EPA awarded twelve scholarship were awarded to students for 2013: (back row from left) Monika Shapua; John Brandt; Hanas Nenkavu; Silas lileka; Lena Enkali; Fanuel Mathias; front row from left: Sitali Lwendo; Mrs Sophia Tekie (EPA President); Evelina Amutenya and Mr Fritz Jeske (EPA Scholarship Fund Trustee)



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Date: 19/02/2013

ENGINEERING PROFESSIONS ASSOCIATION OF NAMIBIA

THE ROLE OF THE ENGINEERING PROFESSION IN NAMIBIA

Project Background:

“A great deal has been said about the lack of capacity in relation to civil engineering professionals. The nation’s economy and the quality of life of its citizens depend heavily on the supply and efficient operation of infrastructure. Yet the civil engineering industry faces unprecedented challenges in attracting, recruiting and retaining the staff needed to design, manage and deliver this infrastructure. – Executive summary, Numbers and Needs, Addressing imbalances in the civil engineering profession, Allyson Lawless, SAICE 2005.”

The above quote comes from the book Numbers and Needs that was published by the South African Institute of Civil Engineering (SAICE) in 2005. The book contained the factual statistics for the civil engineering profession in South Africa and following initiatives from a recent Southern African Development Community (SADC) conference, it was decided to encourage all member countries to initiate a similar study regarding the engineering profession and the unique challenges they face in their relevant countries of origin. In the mean- time, until the terms of reference of SADC is completed, the Engineering Professions Association (EPA) initiated the project with the support from its partners in the sector and start with Phase I to determine where Namibia is with regard to the profession and to collectively bring the awareness to all stake holders so that a solution can be found for the challenges faced in the engineering fraternity.

Project objective:

The Engineering Professions Association (EPA) of Namibia, is supported by the Engineering Council of Namibia (ECN), Association of Consulting Engineers (ACEN), University of Namibia (UNAM), Polytechnic of Namibia (PON), and the German Development Cooperation (GIZ). The objective of the study is to gather information on the engineering fraternity in Namibia and to provide industry with numbers and data on what the current status regarding the Engineering Profession in Namibia is. The study will look at the challenges and opportunities faced by Engineers and Engineering institutions in Namibia including the academia. Results from this study will be used by various institutions in the country to assist with annual planning, economic development and capacity building. The EPA intends to have an open forum for stakeholders where the role of the Engineering fraternity in society will be explained and members of the public and private sector will be informed and educated on this important role.

Sponsors:

The project is being funded by the German Development Cooperation (GIZ) office in Windhoek. Additional funding will be required to undertake phase 2 of the study and to make it part of a National project for Namibia.

Progress:

To date initial inception meetings and workshop was held with stakeholders. At the workshop, stakeholders commented on the inception report which outlines areas that will be investigated as part of the study.

One of the main areas of focus for the study will be to look at the *numbers* – i.e. when government, parastatals or private sector state their dissatisfaction about the shortage of engineers, what exactly are the numbers of engineers required? What type of engineering professionals are required in the country? Why are we not attracting and retaining suitably qualified engineers? The study will look at what the different roles of the different type of engineering professionals are, and also how old they are, how

many years experience, male/female, black/white – the purpose will be to determine whether transformation has taken place in the engineering profession and if not, why not? What are the gaps between the older generation that is retiring and sometimes difficult to replace and our young professionals that need the skills, and the experience so that the quality of the infrastructure is maintained? What are the possible solutions? Are we producing sufficient professionals so that vision 2030, that stipulates 5000 engineers is achieved? The 5000 engineers, is that professional engineers? Incorporated? Or both?

What are our parastatals challenged with, in relation to professional and incorporated engineers? What is the difference between them? Are they graded the same? If yes why, if not what are the reasons? If they are treated the same way in the industry, why should anyone study to get masters or doctorate in engineering? Is the sector encouraging engineering professionals to earn good remuneration compared with accountants, doctors and perhaps lawyers?

How about our education institutions, do we have enough in the country? Is the production of the engineers in the various disciplines of engineering sufficient? We have a huge gap in the market for technicians, they are shrinking by the day, do they have a place at government ministries, parastatals, or private sector? Are the BTechs replacing technicians? Should our university and Polytech start producing technicians more than what is currently being done? Do we have duplication of takes resources in the country, can that be streamlined? How about gender issues, do we have sufficient representation of women in the engineering fraternity? How does the number look like?

What are the roles of the various engineering institutions in the country? We have many donor agencies doing capacity building in the industry, are they streamlined? Can we do it better? How can the various institutions work together? The study will also look at the challenges that face individuals to become qualified engineers – matriculation requirements, years of study, years of practical experience, remuneration etc.

These are some of the questions that came up in the first workshop as well as from the various professionals in the industry that this study will try to tackle by getting input from the various stakeholders, and hence their assistance is crucial so that the correct information is reflected.

There will also be consultative sessions/meetings with CEO’s of parastatals with their technical divisions and human resources departments; Ministries of Works and Transport, Ministry of Education, Ministry of Local Government and Housing, some municipalities, etc collectively and individually, to introduce the project and to get the buy in from the top executives as this is a national project that will assist us to fulfil vision 2030 through capacity building. Questionnaires are being circulated to all relevant stakeholders for their filling so that conclusions can be drawn up based on facts.

The custodians of engineering in the country among others, from government are mainly the Education and Works and Transport Ministries, and hence their support is also requested to make this project a success.

Desired outcomes:

Once all the above questions have been asked and feedback received, the comments, answers and results will be put in a report which will provide the Namibian picture to stakeholders. Now as Namibians, we will be able to know whether we will be able to reach the goals set out in Vision 2030 for engineering professionals. We will know how our situation compares to our neighbouring countries and what needs to be done in Namibia to better the situation.

A lot has been said about the severe shortages of engineering professionals in this country. Unless Namibia measures what its demand and supply of engineering professionals are, decisions will continue to be made based on vague numbers. The purpose of this Phase 1 study will be to assist in getting a clearer picture of the Namibian situation.

 Mrs Sophia Tekie
 EPA President

ACEN: WHO AND WHAT IS THE ASSOCIATION OF CONSULTING ENGINEERS

The Association of Consulting Engineers of Namibia (ACEN) is a voluntary organisation of consulting engineering firms that was established 28 years ago. The membership has grown from a founding 6 firms to the current 44 with an employee count close to 500 professional and incorporated engineers, engineering technicians, technical and other administrative and supporting staff. ACEN is presently the only representative body of consulting engineering firms in Namibia.

The Council of ACEN is elected from member firms and it is responsible for the formal business of the Association. Formal Council meetings are held on a monthly basis and an Annual General Meeting once a year.

The current voluntary Council members are:

- President: Mbingee Hindjou
- Vice President: Chiedza Maxwell
- Treasurer: Günter Brettschneider
- Members: Lothar Redecker, Peter Forster, JA Celliers and J Swiegers

The Directorate works under Council and is responsible for the day-to-day administrative tasks and support functions of ACEN.

The staff work part time and consist of:

- Executive Officer: Rico Viljoen
- Secretary: Geriaan Louw

Mission:

In short, the mission of ACEN is to:

- Enhance the operation and business success of its members
- Assist with the provisioning of outstanding service to all clients
- Raise the status and awareness of engineering in Namibia, and
- Improve the quality of life for all Namibians.

Objectives:

The objectives of the Association are to:

- Promote the professional and business interests, rights and powers of members
- Promote excellence in serving the public in matters of technology based, intellectual services in the built, natural and human environment
- Promote the advancement of consulting engineers and allied professionals and ensure a high standard of conduct amongst these professionals
- Encourage members to serve clients with professional integrity, independent of judgement
- Provide a forum for members to co-operate and consult for mutual advantage
- Build influence in national and international affairs which affect members
- Enhance collective reputation and an economic viability of members, and
- To promote membership, ensuring that it is inclusive and representative of consulting engineers and allied professionals.



Tel. 061 227672
Fax 088 634920
Unit # 12, Auas Valley Shopping Centre,
Bessemer Street, Windhoek
PO Box 25837, Windhoek
acen@acen.org.na
www.acen.org.na

ECN: THE ENGINEERING COUNCIL OF NAMIBIA

Tel: 061 233264 Fax: 061 400821 E-Mail: ecnamibia@iway.na
Cnr Nelson Mandela and Hugo Hahn Streets, Unit 1, Urban Dynamics Complex, Klein Windhoek

The Engineering Council of Namibia (ECN) is the regulatory body for the engineering profession in Namibia. The council, which was established through the Engineering Profession Act, 1986 with the mandate enshrined in the title of the Act: *"To provide for the continuation of a council for the engineering profession in Namibia; for the registration of professional engineers and professional engineers in training, incorporated engineers and incorporated engineers in training, engineering technicians and engineering technicians in training; and to provide for incidental matters"*.

The Council can only effectively fulfil its mandate if all persons performing engineering work as Professional Engineers, Incorporated Engineers or Engineering Technicians, both in the private sector and the public sector,

are registered with the ECN — as they are legally obliged to do so. This is very important as the Engineering Profession Act and any Rules and Regulations published there under, including a Code of Conduct, will only bind and be enforceable against registered persons. It should, however, be emphasised that only persons with appropriate qualifications and engineering experience of sufficient variety and standard will qualify for registration.

It is therefore imperative that the Namibian government, parastatals, mines, municipalities, the private sector, as well as all educational institutions offering engineering qualifications, assist the Council to adhere to statutory obligations which will make the engineering profession in Namibia a profession to be truly proud of.

PHOTO COMPETITION

HERE IS YOUR CHANCE TO SEE YOUR ENGINEERING-RELATED PHOTOGRAPHS FEATURED IN THE NEXT EDITION!

The publishers of the Engineering Namibia invites all amateur and professional photographers a chance to feature their engineering-related photographs in the next ECN Review and the Engineering Namibia. The two best photographs selected will be featured on the FRONT PAGES and the two photographers will each win N\$1,000 cash.

Every year when the designers are doing the layout of the ECN Review and the Engineering Namibia, they face the challenge of finding Namibian engineering photographs to use. This, coupled with the fact that there are hundreds of people working in the engineering industry who have many opportunities to take engineering-related photographs, it was decided to invite everyone to provide the designers with Namibian engineering photographs to use in future publications.

The rules are simple: no cellphone photographs, please (the quality is not good enough for printing);

photographs must be in electronic format, preferably as jpg files; the size of the jpg file must be no less than 1MB (to be good enough quality for printing).

The jpg file name of each photograph must please reflect the engineering discipline and photographer, eg "Electrical_JanShivute_nr5". Captions of the submitted photographs will also greatly assist the designers. Photographs/jpgs on a memory stick can be delivered to the ECN office or emailed to ECN Registrar Ronell Slabber (ecnamibia@iway.na).

Please note: by submitting photograph(s), you agree that the publishers of Engineering Namibia may use any or all photographs in its publications at no monetary compensation to the photographer. The publishers agree that wherever a photograph is used, the photographer will be credited as the source.



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www.dmrail.com



AREAS OF EXPERTISE OF NAMIBIA'S ENGINEERS: ACEN MEMBERS

ABD Consulting Engineers

AB Dax
Tel. & Fax 061 236156
PO Box 40866, Windhoek
Engineering disciplines: Civil, Structural, Geotechnical, Project Management, Transportation

Aurecon Namibia (Pty) Ltd (See pp 100-101)

Lukie van Staden
Tel. 061 297 7000
Fax 061 297 7007
PO Box 5353, Windhoek
Engineering disciplines: Civil, Structural, Mechanical, Electrical, Transportation, Water
Capabilities/special focus/expertise: Apart from the usual engineering projects undertaken, Aurecon also boasts extensive involvement in the fields of Project Management, National Planning Studies, Development Projects, Bulk Water Supply Reports, Feasibility and Viability Studies, Water- and Sewer Purification Works and Legislative and Organisational Restructuring projects. Fully fledged soils and concrete laboratories.

Bicon Namibia (See pp 82-83)

F Jeske
Tel. 061 275120 Fax 061 224863
PO Box 2310, Windhoek
Engineering disciplines: Civil, Structural, Mechanical, Electrical, Transportation

B Cummings CE

B Cummings
Tel. 061 219129/ 081 274 4395
PO Box 11051, Windhoek
Engineering disciplines: Civil, Structural

Bührmann & Partners

PJ Roland
Tel. 061 226527/8 Fax 061 226580
PO Box 22006, Windhoek
Engineering disciplines: Civil, Structural

Burmeister & Partners (See pp 120-121)

Ronald Kubas
Tel. 061 379000 Fax 061 379001
PO Box 1496, Windhoek
Engineering disciplines: Civil, Structural, Transportation, Mechanical, Electrical

Capabilities/special focus/expertise: EPC Contract Specialists, Ports and Marine Engineering, Industrial and Mining Process Engineering, Water (clean and waste), Transportation, Building, Energy, Agriculture, Project Management

CEPM & Partners (See p 67)

Patrice Urayeneza, Dr.-Eng, Prof. Eng.
Tel. 061 259728
Cell 081 260 0753
Fax2mail 088 61 5975
PO Box 5891, Windhoek
Engineering disciplines: Civil, Structural, Transportation, Geomatics, Mechanical, Electrical
Capabilities/special focus/expertise: Surveying: confirm site boundaries, levels, service location; Structural Engineering: site drainage, paving and retaining walls; Mechanical Engineering: air conditioning & ventilation; Fire Engineering; Primary Commercial Projects; Geomatics & Geotechnics

CMB (Namibia)

Holger Rusch

Tel. 061 237253/4 Fax 061 235514

PO Box 3256, Windhoek

Engineering disciplines:

Mechanical, Electrical, Electronics

Capabilities/special focus/

expertise: Mechanical and Electrical

Building Services, Electrical and

Water Reticulations, Mechanical

and Electrical Services for Civil

Projects (pump stations), Industrial

Projects, Programming and

Software Development

Coastal CE

Marc Esselmann

Tel. & Fax 064 402709

PO Box 117, Swakopmund

Engineering disciplines: Civil,

Structural

Capabilities/special focus/expertise:

Project coordination, project

management & costing, labour-based

construction technique application,

application of advanced construction

technologies (ie vacuum dewatering

concreting & vacuum sewer disposal

systems), earthworks-, terrace &

pavement design, modeling and

computation, quantity surveying

and cash flow simulation, quality

assurance

Conenpro Inc**(See pp 58-59)**

Mbingee Hindjou

Tel. 061 301177 Fax 061 301188

PO Box 30798, Windhoek

Engineering disciplines: Civil,

Structural

Capabilities/special focus/expertise:

Project Management, Structural

Engineering Design & Supervision,

Design, Tender Documentation,

Supervision & Contract

Administration, Infrastructure

operations & Maintenance Systems

Conselect Engineering

WP Molatzi

Tel. 065 230140 Fax 065 232145

PO Box 184, Oshakati

Engineering disciplines: Electrical

Consulting Services Africa (CSA)**(See pp 68-69)**

Peter Forster

Tel. 061 237427 Fax 061 225704

PO Box 11757, Windhoek

Engineering disciplines: Civil,

Structural, Transportation,

Mechanical, Electrical,

Environmental

Capabilities/special focus/expertise:

Broad based multidisciplinary

consulting engineering including

traditional and labour based urban

and rural roads, transportation

infrastructure, urban development,

municipal services, water

and sewer reticulation, sewer

treatment, power distribution

and reticulation, buildings, pump

stations, project development,

environmental impact assessments,

scoping reports, community based

projects and social upliftment

projects inclusive of investigations,

reporting, management and co-

ordination services

Denchi Consulting Engineering

D Maxwell

Tel. 061 228183 Fax 061 252397

PO Box 80352, Windhoek

Engineering disciplines: Structural,

Electrical, Mechanical

Element CE**(See pp 74-75)**

Braam Cilliers

Tel. 061 309416 Fax 061 309412

PO Box 11598, Windhoek

Engineering disciplines:

Civil, Structural, Electrical,

Transportation, Water

Capabilities/special focus/

expertise: Road Construction and

Rehabilitation; Road Management

Systems and Planning/Feasibility

Studies; Bulk Water Supply and

Networks; Infrastructure for Large

Farming Developments; Town

and Housing Developments; Steel

frame and high rise buildings

Emcon CE

Glenn Howard

Tel. 061 224725 Fax 061 233207

PO Box 1900, Windhoek

Engineering disciplines: Electrical,

Mechanical, Industrial

Capabilities/special focus/

expertise: Building Services,

Electrical reticulation and

distribution, Electricity Supply

Industry, Renewable Energy, Energy

Efficiency, Energy Auditing, Project

Management

Engelbrecht CE

TJ Engelbrecht

Tel. 061 309901 Fax 061 309902

PO Box 40665, Windhoek

Engineering disciplines: Civil,

Structural

Environmental Engineering**Services**

Ben van der Merwe

Tel. 081 1282469

Fax 061 252959

PO Box 6373, Windhoek

Engineering disciplines: Civil (Water)

Capabilities/special focus/

expertise: Water related projects,

water master plans and policies

Fischer Seelenbinder & Associates**(See pp 67)**

H Seelenbinder

Tel. 061 301942 Fax 061 301958

PO Box 90558, Windhoek

Engineering disciplines: Civil,

Structural

Capabilities/special focus/expertise:

Project Management and Turnkey

Projects. Dispute Resolution:

Arbitration, Adjudication &

Mediation

G S Fainsinger & Associates

Jochen Roeber

Tel. 061 235165 Fax 061 235166

PO Box 2142, Windhoek

Engineering disciplines:

Mechanical, Electrical

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Mail: pvermeulen@whssnamibia.com
36 Hidipo Hamutenya St. • Swakopmund

Ingplan CE & Project Managers (Nam) (Pty) Ltd
CJ du Toit
Tel. 061 245334 Fax 061 301089
PO Box 90835, Windhoek
Engineering disciplines:
Mechanical, Electrical, Electronic

Juliohn Taylor CE
Juliohn Taylor
Tel. 061 224088 Fax 061 236038
PO Box 11385, Klein Windhoek
Engineering disciplines:
Mechanical, Electrical
Capabilities/expertise: All
mechanical, electrical and fire
control aspects of mainly building
projects

Knight Piésold Consulting (See pp 96-97)
Günther Leicher
Tel. 061 307297 Fax 061 307298
PO Box 86062, Windhoek
Engineering disciplines: Civil,
Structural, Transportation, Water,
Sewer, Environmental, Mining,
Geotechnical
Capabilities/special focus/expertise:
Labour-based construction
techniques, tunnelling, bridges,
wind and hydro power, raw and
portable treatment plants, dam
designs, bulk pipe design bigger
than 1 m diameter, irrigation and
heap leach and tailing dam designs.

Krenz Consulting Engineers (Pty) Ltd
F Krenz
Tel. 061 253470 Fax 061 247003
PO Box 11199, Windhoek
Engineering disciplines: Civil,
Structural

Kuchling CE
Felix Kuchling
Tel. 061 305420 Fax 061 305418
PO Box 801, Windhoek
Engineering disciplines: Civil,
Structural, Water
Capabilities/special focus/
expertise: hydraulic, structural and
geotechnical engineering

Le Roux CE
Francois le Roux
Tel. 061 306996 Fax 061 300994
PO Box 97154, Windhoek
Engineering disciplines: Civil,
Structural

Lithon Project Consultants (See pp 44-45)
Adriaan Grobler
Tel. 061 250278 Fax 061 250279
PO Box 40902, Windhoek
Engineering disciplines:
Civil, Structural, Electrical,
Transportation, Agriculture
Capabilities/special focus/expertise:
Project Management, feasibility
studies, township and municipal
services, housing developments,
water resources planning, bulk
water supply, rural water supply
and sanitation, water and waste
water treatment, services master
plans, shopping centres, multi-
storey buildings, bridges, highways,
urban and rural roads, railways,
airports, pavement engineering,
electrical transmission lines, MV
and LV reticulation, electrical
building services, solar systems,
energy management and
alternative energy systems.

Lood de Jager & Associates CE
Lood de Jager
Tel. 061 400704 Fax 061 400706
PO Box 2222, Windhoek
Engineering disciplines: Electrical,
Mechanical
Capabilities/special focus/expertise:
Mechanical: Water Treatment;
Filtration plants; Fire systems;
Boilers & solar heaters; Steam
reticulation; Air conditioning and
ventilation; Refrigeration; Oxygen,
compressed air & other; Lifts,
escalators, hoists, overhead cranes
etc.; Kitchen & Laundry equipment;
Incinerators & sterilisers; Sewage
plants. Electrical: Overhead/H.T.;
Buildings/distribution; Security;
Generators/UPS;Telephones/
communication; Motors & drives;
Controls

Lund CE/Pro-Services (See pp 64-65)
G Brettschneider
Tel. 061 234081 Fax 061 232478
PO Box 3106, Windhoek
Engineering disciplines: Civil,
Structural, Transportation,
Mechanical, Water & Waste Water
Capabilities/special focus/expertise:
Specialise in all forms of water
and waste water engineering,
general civil and structural
engineering and community-based
training programmes and project
management.

Martin Handl CE
Morne Coetzee
Tel. 081 363 5571
Fax 061 088 63 8715
PO Box 81294, Windhoek
Engineering disciplines: Civil,
Structural

Meyer CE
Henk Meyer
Tel. 061 258708 / 081 124 0939
Fax 061 259421
PO Box 30311, Windhoek
Engineering disciplines:
Mechanical, Electrical, Electronic

Multi Consult
AG du Toit
Tel. 061 221560 Fax 061 249487
PO Box 35056, Windhoek
Engineering disciplines: Civil,
Structural, Infrastructure, Electrical,
Mechanical, Electronic
Capabilities/special focus/expertise:
Water and Sewage Reticulation,
Energy, Water Reclamation &
Purification, Pump-stations, Aqua-
culture Farming, Building Services,
Re-inforced Concrete Foundations
and Structures, Steel and Timber
Structures, Urban Planning and
Township Development, High and
Low Voltage, Instrumentation and
Control Systems, Communication,
Air Conditioning and Ventilation,
Electrical Lift Installation, Hospital
Equipment, Laboratory Equipment,
Solar Systems, Abattoir Installations,
Food and Wine Industry , PID
Control Systems, Packing and
Palletising Installations.

Ongwediva CE
Wabomba Singoro
Tel. 065 230771
Fax 065 230772 / 088 625497
PO Box 90126, Ongwediva
Engineering disciplines: Civil,
Structural
Capabilities/special focus/expertise:
Structural Engineering, Roads
Engineering, Water Reticulation
and Waste Water Engineering,
Project Management, Bridge
Engineering

Seal Consulting Engineers
Pieter Greeff
Tel. 063 224263 Fax 063 224165
PO Box 1206, Keetmanshoop
Engineering disciplines: Civil,
Structural, Transportation, Water
Capabilities/special focus/
expertise: Reticulation Network
Designs (sewer, water and roads),
Bulk Liquid Fuel Storage Facilities,
Retail Fuel Outlets, Project and
Facilities Management, Feasibility
Studies, Pavement Management
Systems, Geometric Designs,
Rehabilitation Work to Surfaced
Roads, Concrete Structures and
Services, Supervision on Projects,
and Surveying

SCE (Seelenbinder Consulting Engineers) (See p 104)
G Diehl
Tel. 061 235000 Fax 061 235001
PO Box 922, Windhoek
Engineering disciplines: Civil,
Structural, Mechanical, Electrical,
Project Management
Capabilities/special focus/
expertise: Telecommunication
infrastructure, urban roads, sewage
treatment/disposal, storm water
systems, water retaining structures,
multi-storey buildings, steel
structures, building services, solar
voltaic power generation, power
reticulation, water reticulation,
air-conditioning/ventilation/
refrigeration, solar water heating,
river abstraction, pump stations

Steinbach Associates
RG Steinbach
Tel. 061 242920 Fax 061 241398
PO Box 30181, Windhoek
Engineering disciplines: Civil,
Structural

Strauss Consulting Services cc
Alwyn Strauss
Tel. 061 301107 / 081 284 8719
Fax 061 253485
PO Box 98674, Windhoek
Engineering disciplines: Civil,
Geotechnical, Environmental,
Transportation
Capabilities/special focus/
expertise: Geotechnical
investigation and design, in situ
soil & rock geotechnical testing,
drilling supervision and contract
management, slope stability
designs, erosion protection design,
reinforced earth design, pile design,
earth dam design & hydrology,
water balance projections for
tailings structures, pavement
design, geometric design for roads,
geo-software quality systems,
mine rehabilitation, installation
& interpretation of geotechnical
instrumentation & data systems,
forensic investigation for
foundation failures, quality systems
for laboratories (accreditation)

Uhrich Consulting Engineers CC
Volker Uhrich
Tel. 061 242373 Fax 061 242508
PO Box 90353, Windhoek
Engineering disciplines: Civil,
Structural, Water
Capabilities/special focus/
expertise: Concrete structures
(commerce, education, hospital),
commercial and industrial steel
structures, R.C. reservoirs, water
supply and distribution

V Fischer-Buder CE**(See pp 84-85)**

Volker Fischer-Buder
Tel. 061 228502
Fax 061 228490 / 088 61 3001
PO Box 423, Windhoek
Engineering disciplines:
Mechanical, Electrical
Capabilities/special focus/
expertise: Medium/low voltage
distribution, urban and rural
electrical and water reticulation,
mechanical and electrical building
services, sewer and water pump
stations

VKE Namibia CE**(See p 89)**

Ben Boshoff
Tel. 061 237642 Fax 061 233534
PO Box 45, Windhoek
Engineering disciplines: Civil,
Structural, Transportation
Capabilities/special focus/
expertise: Investigations, surveys,
master planning, feasibility and
traffic studies, planning, design,
tender/contract documentation,
construction management and site
supervision of highways, freeways,
streets, airports, concrete and
segmental paving, bridges, culverts,
sports fields, power lines, buildings
and services

WML CE (PTY) LTD

Nico Louw
Tel. 061 220285 Fax 061 220428
PO Box 2143, Windhoek
Engineering disciplines: Civil,
Structural, Mechanical, Electrical
Capabilities/special focus/expertise:
Concrete & Steel Structures, Bulk
Water, Township Services, Electrical
Reticulation, Building Services,
Pump Systems

WML CE Coast (PTY) LTD

J van den Berg
Tel. 064 206714 Fax 064 206907
PO Box 777, Walvis Bay
Engineering disciplines: Civil,
Structural, Water, Coastal, Harbour

Windhoek CE (WCE)**(See pp 14-15)**

Dirk van der Merwe
Tel. 061 370900 Fax 061 238880
PO Box 2484, Windhoek
Engineering disciplines: Civil,
Structural, Mechanical, Electrical,
Project management
Capabilities/special focus/expertise:
Railways, ports & harbours, roads
& transport, Multi-storey buildings
& all structural works, bulk water
supply, pipelines & canals, high-
and low voltage electrification, air
conditioning & ventilation.

WorleyParsons Services Namibia**(Pty) Ltd****(See pp 112-15)**

NC Tromp
Tel. 061 240909 Fax 061 240809
PO Box 23066, Windhoek
Engineering disciplines: Civil,
Structural, Mechanical, Electrical,
Project management

YESOD Engineering Consultants cc

M van der Merwe
Tel. & Fax 061 228505
PO Box 21322, Windhoek
Engineering disciplines: Civil,
Structural, Geotechnical,
Transportation, Project
management

AREAS OF EXPERTISE OF OTHER ENGINEERING FIRMS/PERSONS

*The following firms/persons
are not members of ACEN. This
list is the only contact details
of other engineering firms or
persons available at present —
please feel free to provide us
with your details for publication
in future.*

AF Schulz - Consultant

Attie Schulz
Tel. 061 257959/081 389 2760
Fax 061 257321
PO Box 80837, Olympia, Windhoek
Engineering disciplines: Electrical
Capabilities/areas of focus/expertise:
High, Medium & Low Voltage
Operations, auditing of lines &
equipment, training & evaluation
of competency of High Voltage Op-
erators (NESC) (Recommended by
the Electricity Control Board who
declared him qualified, skilled and
competent to act as responsible
official according to the NESC).

Koos Calitz

Tel. 081 149 0460
Fax 061 402 780
PO Box 80861, Windhoek
Capabilities/areas of focus/expertise:
Professional Mechanical
Engineer with 20 years experience
mostly in mining industry. Interest
in greenfield project management.

Von Jeney Consultancy

Markus von Jeney
Tel. 081 124 2929
Fax 061 305745
PO Box 80210, Windhoek
Engineering disciplines: Civil Engi-
neering
Capabilities/areas of focus/expertise:
Energy (Petroleum Retail Sec-
tor), Building Research & Inspec-
tions, Water plants (Pipelines &
Farm Dams), Project Management

Southern Engineering Consultants & Developers CC

Sarel P du Toit
Tel. & Fax 063 223127
PO Box 1290, Keetmanshoop
Engineering disciplines: All Muni-
cipal services
Capabilities/areas of focus/expertise:
Building Contractor, ENGEN
Service Stations, all municipal
services (26 years+ experience).

E-Power Consulting & Construction

VU Trübenbach
Tel. 061 254813 Fax 061 254812
PO Box 5688, Ausspannplatz,
Windhoek
Engineering disciplines: Electrical
Engineering
Capabilities/areas of focus/expertise:
Professional engineering, con-
struction and consultancy services
to the electricity industry; this
entails the building and installation

of generator plants, the build-
ing and rental to lodges of power
packs in containers, solar systems,
the design and creation of building
electrification plans.

Chemical Engineering Consultancy CC

J Bierberg
Tel. 067 302700/081 128 2776
PO Box 152, Otjiwarongo
Engineering disciplines: Chemical
Engineering
Capabilities/areas of focus/expertise:
Metallurgical plants for
Uranium and Gold Extraction,
Pyrite and Graphite Flotation; 36
years experience in the operation
and maintenance of sulphuric acid
plants; sulphur, pyrite and metal-
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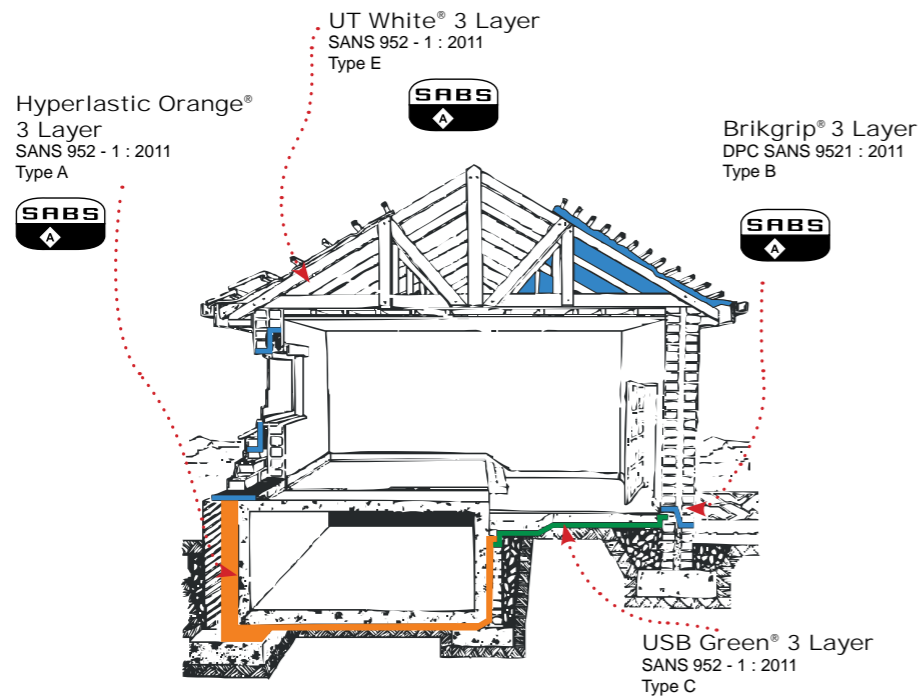
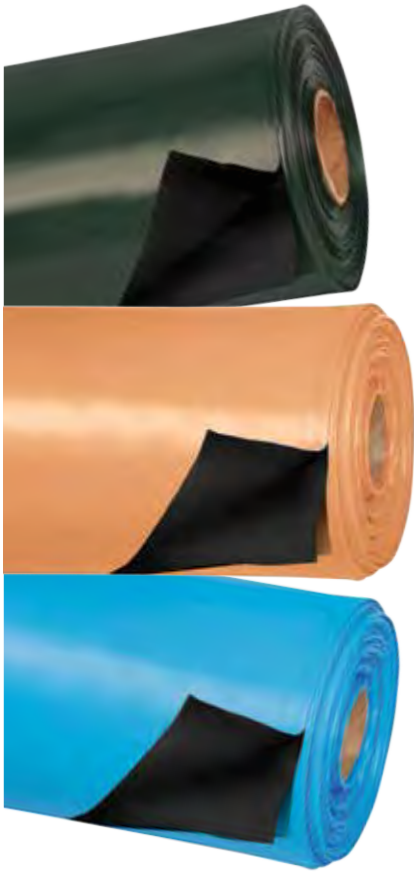
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PO Box 23809, Windhoek
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Structural
Capabilities/areas of focus/expertise:
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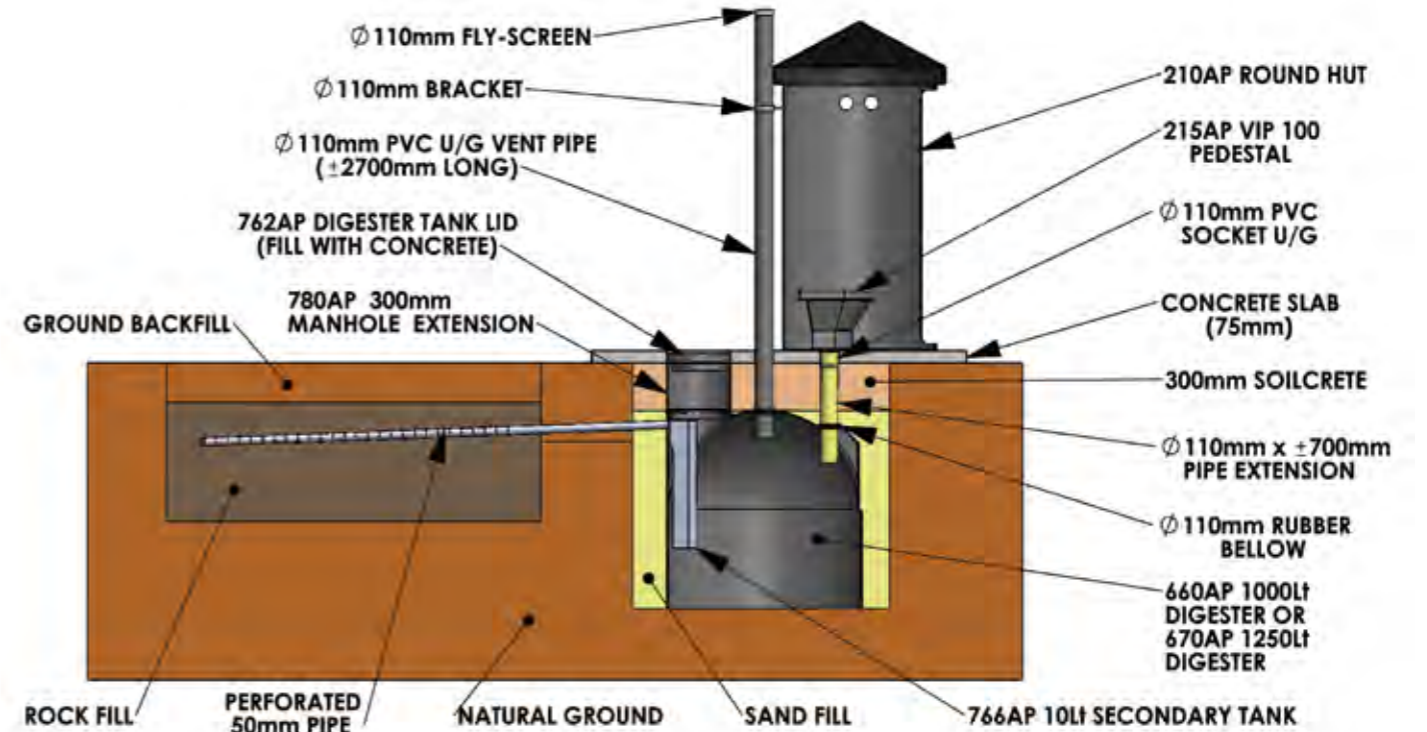
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One of Swakopmund's most recognisable landmarks, the jetty at sunset.

SWAKOPMUND: TAKING THE LONG-TERM VIEW

That first small step...

Economic and environmental pressures exert strain on municipalities the world over. In the developed world advanced sustainable environmental policies and technology are used to buffer against these pressures, but in developing countries, where a lack of education, available financing and infrastructure are commonplace, the concept of sustainability is still new, which means countering the economic and environmental challenges is a difficult process. But, as this article will show, one has to start somewhere, and even small shifts in thinking can make a meaningful difference.

A balancing act: reconciling people's needs versus what a municipal authority can afford

When one takes into consideration the many factors involved in the planning and development of an urban area, it becomes clear that municipal development is akin to the proverbial tightrope walk. To meet the needs of those living in a municipal area while at the same time fulfilling the municipal council's legal and administrative requirements and achieving successful service delivery within the council's budgetary limits,

it becomes clear that rigorous forward planning, fiscal discipline, innovative thinking and creative problemsolving are called for. Here in Namibia the Swakopmund Municipality is leading the way in terms of prudent, accountable and proactive development.

According to Eckart Demasius, CEO of the Swakopmund Municipality (and an engineer by profession), most municipal development involves some form of engineering. This might range from obvious large-scale,

multi-million dollar projects such as commissioning the construction of new sewage works or reservoirs to store purified and potable water, to smaller projects such as the resurfacing of the roads in the town, in which innovative approaches have been used.

With Swakopmund's Council having found itself in the exceedingly rare position of being able to self-finance the building of the town's new sewage works with a budget of N\$167 million (which we featured in the 2011/12 edition of the Engineering Namibia), Demasius is of the opinion that, given the increase in building costs due to the global economic slump, it is not going to be easy to undertake and finance a project of that magnitude again soon. However, in order to keep the municipal coffers lined in the event of a need arising, savings need to be made elsewhere. This is where rigorous financial planning and accountability comes in, as well as a readiness to look beyond obvious answers to come up with cost-effective yet appropriate solutions.

Swakopmund's unique challenges

This scenic coastal town is Namibia's second biggest urban settlement, and one of the country's top tourist destinations. With about 60,000 permanent residents

during non-peak seasons, this number is said to almost double during the December holiday period.

It is therefore imperative that existing municipal infrastructure is maintained to cope with the ongoing influx of people, and that the town's ever-changing needs are taken into account in future planning.

Another important factor driving the development of Swakopmund is its proximity to the uranium mines in the Erongo Region. Recent years have seen large numbers of people migrating to the town from all over Namibia in the hope of finding work at any one of the mines that have been established in the region. Many, if not most, of these new arrivals end up living in the DRC informal settlement to the east of the town, with the result being that there have been loud calls from this community for the formalisation of the settlement.

While simultaneously responding to existing circumstances as well as proactively planning and preparing for future developments, in February 2011 the Swakopmund Municipality compiled a Strategic Plan outlining its most pressing objectives for the next five years. Notable among these from an engineering perspective are:

- The formalisation of the DRC and creation of a new informal settlement area;
- The development of a new central business district area in north Mondesa;
- The release of affordable, serviced erven in the relevant areas at realistic prices;
- The surfacing of roads throughout town;
- The development of a SMME Industrial Park;
- The initiating and implementation of an Environmental Waste Management System, as well as the exploration and implementation, where possible, of alternative sources of energy for residential use;
- The improving of the town entrance;
- The management of the Swakopmund Airport as a Council-owned business; and
- The building of a new purified water reservoir.

The formalisation of the DRC and creation of a new informal settlement area is progressing well. Town planning and the appointment of consultants to put in bulk services such as water and sewage has already been completed. The next goal is the drawing up, releasing and selling of erven, but before services provisions can be made, a process of consultation with the community



Part of the new sewerage works.

needs to happen, as the existing inhabitants of the settlement will need to be moved to another location before the services can be put in place. This process of consultation is slated to begin this year.

The development of a new CBD area in north Mondesa is currently in the very early phases, while the release of affordable, serviced erven and the surfacing of roads throughout town are in full swing. Development of the Dunes estate east of Kramersdorf and the area north of Extension 9 is continuing unabated. Local contractor Strydo Construction is currently busy with the sizable job of clearing the site of the new SMME Industrial Park, and the new roundabout completed in September 2012 is the first salvo in improving the town entrance.

The management of the Swakopmund Airport as a Council-owned business has also been achieved. After a protracted legal wrangle in 2011 between the previous concessionaire and the tenants of the Swakopmund Airport over maintenance issues which resulted in the airport being closed by the DCA, the Municipality took over the management of the airport.

Fuel supplier Southern Energy Company is now supplying the airport with Jet A1 fuel, which should bring about an increase in air traffic. Southern Energy is also working closely with the Municipal Fire Services to ensure that all the necessary safety requirements are in place. The Municipality has also done some much needed maintenance to the runways at the facility, and both runways are now operational, to the great relief of the tenants whose tourism-based businesses operate from there.

According to Demasius, the thinking behind the strategic plan is to keep development on track, ensuring there is no great shortfall regards to services and infrastructure in future which may hamper the town economically, and where possible engage the local community and empower them in achieving the change that needs to happen.

Two important policy decisions taken in 2011 by the Swakopmund Town Council, are shaping how the strategic plan is being implemented:

- Preference would be given to locally-based companies with a 30 per cent labour force composition classified as 'youth' (the classification refers to workers who are under 35 years of age) when it came to awarding municipal tenders to contractors; and
- As far as possible, to engage labour-based contractors rather than large, multinational contractors.

The reasoning behind this policy decision was local job creation, and especially the engagement of younger members of society; to support existing local businesses; and to encourage the establishment of SMEs.

Resurfacing of roads

Of particular interest, from an engineering point of view, is the approach the Swakopmund Municipality has taken when it comes to surfacing the roads. Salt roads (which are augmented and hardened with gypsum) are characteristic of Swakopmund, and it requires regular maintenance to keep in good condition. However, environmental conditions typical at the coast and increased traffic volumes necessitated some rethinking on how to resurface the roads. Typical conditions such as shifting desert sand and occasional high wind conditions, extreme temperature differences, and precipitation with a high salt content, as well as uncommonly high rainfall in 2011 which damaged some existing roads, are all factors that had to be taken into consideration.

It was found that in instances where a road surface existed (that is, where salt roads needed maintenance), the most cost effective solution was to lay down interlocking bricks to create a new, more hard-wearing surface. The use of bricks also dovetails with the policy of using labour-based contractors: the contractor is paid for the distance completed, incentivising them to complete as much of the job as quickly as possible.

While labour-intensive (a truckload of interlocking bricks equals 13,000 bricks), this method of road surfacing is both economical and speedy, with one labourer capable

on average of laying 1,000 interlocks a day, or covering an area of 52m².

The interlocking bricks are also appropriate in Swakopmund's climatic conditions: condensation can seep between the bricks into the sand underneath without leading to salt collecting on the road surface, which potentially could lead to its rapid deterioration. The interlocks can also accommodate slight shifting of the sand that forms the base of the road, and cope with the sometimes fairly large temperature variations. In keeping with their policy decision, the bricks are sourced locally.

Where new roads have to be created, however, tarring remains the preferred option. An exception is the new roads being laid in the new Industrial Park near the entrance to Swakopmund. For maintaining tarred roads, labour-based contractors are once again preferred. A bitumen-slurry emulsion is used to surface the road. The Municipality provides the contractors with the necessary equipment and raw materials and also prescribes the mix of bitumen and 'dust' (crushed stone) that comprises the emulsion that will become the waterproof-wearing surface. After the road surface is cleaned, this emulsion is then spread by labourers and levelled by dragging a length of hessian cloth behind a vehicle driving at a constant speed over the surface, which evens out the emulsion.

Close cooperation between SME and labour-based contractors and the Municipality has resulted in innovative thinking and problem solving, which has



Interlocking bricks are used for resurfacing of some roads in Swakopmund.



Swakopmund Municipality ◆ Namibia ◆

Engineering Swakop's future growth



resulted in significant cost savings. To example, an interlocked road costs N\$250 per m², whereas a traditional single carriageway built by a large roads contractor costs N\$1,8 million per 100 m due to natural material resources becoming increasingly scarce and costly, as well as the cost of the bituminous sealants.

Given the distances that have been and still need to be resurfaced in Swakopmund, being able to choose between two appropriate options is of great benefit. In addition to the significant cost savings, a worthwhile transfer of skills is achieved. The contractors take pride in their work and by being so closely involved in the process, learn much and ultimately end up in a position to advise the Municipality on roads projects going forward. According to Alfeus Soroseb from Bucks Construction and Cleaning, one of the SME contractors currently doing road resurfacing for the Municipality, it's a win-win situation: "We have a good relationship with both the Municipality and the community. The nature of what we do may sometimes inconvenience road users, but so far we've had a very positive response from the community. We're doing really well."

A strong focus on sustainability: the 'Awareness Project'

In June 2008, following an initiative by Sweden's Association for Local Authorities and International Development (Sala-Ida), and the Association of Local Authorities of Namibia (ALAN), the Swakopmund Municipality and the City of Malmö in Sweden formed a partnership that came to be known as the 'Awareness Project'. The purpose of this three-year partnership was for Malmö to provide expertise on the use of sustainable energy to Swakopmund, thus creating awareness of new energy initiatives available and establishing a 'green' culture at the coast, as well as promote the city of Malmö.

The main intention was to address some of the challenges that Swakopmund faced, and through discussions it became clear that two viable initiatives — waste recycling and the use of solar energy — would be worth exploring. With inception phase funding secured, the two parties started working on a waste management programme, and an installation for the harvesting of solar energy.



The first part of the waste recycling initiative implemented is the introduction of a deep waste collection system in Swakopmund to deal with the city's ever-increasing waste problem. Deployed at specific sites around Swakopmund such as in the parking lot in front of the Jetty and at the Mole, these innovative deep collection containers are sunk vertically into the ground to a depth of five metres. Gravity helps to compress the waste, resulting in less frequent emptying and therefore less carbon emissions from the use of fuel in waste collection vehicles. The natural coolness below ground also minimise odours. Swakopmunders are being encouraged to sort and recycle their waste, and the chosen locations of the collection containers make recycling convenient. These containers have a smaller footprint than the familiar bulky recycling containers currently in use, and therefore also are less of an eyesore.

In terms of sustainable energy, the project team's assessment was that it would be beneficial to introduce the use of solar energy to Swakopmund, especially in the city's informal settlements. The aim was to reduce dependency on fossil fuels, such as the burning of wood and coal for the heating of hot water, and to introduce a more sustainable source of energy. Coupled with that was a desire to create employment by training informal settlement residents how to build solar collectors and ovens. A trial solar installation at the old sewage works generated enough hot water enabling the workers to have hot showers after their shifts.

Recycling initiatives include the introduction of deep waste collection containers sunk vertically into the ground to a depth of five metres. Gravity helps to compress the waste, resulting in the need for less frequent emptying of the containers.

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A more ambitious installation was then initiated at the Municipal Bungalows, with a decision made to mount solar collectors onto the bungalow roofs to work towards achieving self-sufficiency at the site.

The establishment of this installation was seen as the perfect opportunity for skills transfer. Students at the Namibian Institute of Mining and Technology volunteered to build the collectors, gaining of knowledge of solar thermal heating and the construction thereof, as well as training in solar collection. While this installation was successful and saw a 40 per cent reduction in conventional energy (that is, grid) usage, it became increasingly apparent to the project team that recreating solar installations for individual households in the informal settlements was not feasible, as the raw materials needed to construct the collectors were found to be too expensive. As a result, the envisaged business opportunities were not feasible.

After reassessment, and to reinforce the concept of solar sustainability, it was decided to introduce solar ovens into the community. Solar ovens were cheaper and easy to create, necessary in every household, and potential money-earners for their owners.

Despite this minor setback, the key to the Awareness Project's long-term success will be taking a flexible approach and exploring all options that ultimately reinforce its main goal, namely the promotion of sustainability.

The same is applicable to current and future projects relating to Swakopmund's development. By keeping ahead of the development needs curve, prioritising local labour and suppliers, and educating people about alternative energy sources, the town's future as a Regional Centre of Excellence is assured. ■

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SWAKOP'S WORLD CLASS WATER CUBE USES UNIQUE MATERIAL

An Olympic size swimming pool is the latest addition to Swakopmund's new sports park. With a design that is unique for Namibia, the N\$45 million "Water Cube" is not only a pool suited for serious competition, but also an engineering feat of note.



The new swimming pool complex in Swakopmund uses translucent polycarbonate sheeting that has never been used before in Namibia. With a span of 41 metres, the arch of the roof structure poses tough engineering challenges. Below, before the sheeting was applied and above, after.



Swakopmund's new swimming pool situated between the athletics track and the rugby field and next to the future sporting complex, came about as the result of a trade-off.

In return for a development at the Mole, which was the location of the old pool, the Swakopmund Town Council asked property developer Quinton Liebenberg of the Lighthouse Group in Swakopmund to build a new pool for the town. He joined forces with Etienne Weakley, and Sakkie van der Merwe, forming the Lighthouse Property Investment Trust. They took up the challenge and engaged architect Deidre de Waal, Windhoek

Consulting Engineers, QS Willem Buhr and Corona Consulting as mechanical and electrical engineers on the project that would cost a staggering N\$45 million and took 12 months to build.

"The old pool had reached the end of its lifespan," says Herman van der Merwe, one of the four directors of Windhoek Consulting Engineers (WCE). WCE is one of Namibia's largest engineering firms that has a long track record with landmark civil engineering projects such as the Sanlam building and the Windhoek Hilton, and is currently involved in FNB's new headquarters at Namundjebo Plaza.

"Tiles were broken and the pool leaked like a sieve," Van der Merwe continues. "This in turn meant that the concrete started breaking away and that all the steel was beginning to rust."

The engineers looked at a possible revamp, but it soon became apparent that this would involve so much rebuilding that it would be better to build a new pool from scratch.

The resulting pool is a short course competition pool that is up to the standards of the International Swimming Federation (FINA). The developers also

included a 15-metre kiddies pool where toddlers and children can learn how to swim, explains architect Deidre de Waal.

The indoor pool is fully heated and measures 25 metres by 25 metres and is 1.35 metres deep. The total water capacity is 800,000 litres of water. Adjacent to the pool in the same building is a brand new gym, which will be operated by Live It, a company run by Swakopmunder Charmaine Smit. The gym features special rooms for aerobics and has squash courts on the top floor.



The swimming pool being filled with water for the first time.

The architects went out of their way to make the Swakopmund pool an interesting development instead of an eye-sore.

“We wanted to give the new swimming pool an exciting and innovative design,” says De Waal about the Water Cube. “Hence the shape of the structure around the swimming pool. We did not want to have another boring shed with a pool inside, so we designed a modern looking building that we call the Water Cube.”

The name refers to an interesting feature of the structure: it “glows” in the dark because of the use of special sheeting to cover the outside.

Says De Waal: “We used materials never used before in Namibia. The translucent polycarbonate sheeting used as cladding around the entire pool structure lets in daylight to give the pool a wonderful sense of lightness during the day. At night, LED lights illuminate

the internal structure which means the entire Water Cube ‘glows’ due to the translucent nature of the cladding. The idea is that instead of lighting up the building from the outside at night, as is customary, we illuminate it from the inside.”

This sets the building apart from the surrounding structures that will house offices and shops and have a more traditional architecture.

From an engineering perspective the pool wasn’t a straightforward job, reveals WCE’s Herman van der Merwe. Because of the shallow bedrock the whole structure had to be built on top of the surface, instead of sinking the pool and building the structure up around it.

“But even more challenging was the top structure itself. A steel frame forms the basis for the roof and is in the shape of a big arc. This arch is 12 metres high and has a phenomenal 41 metre span from side to side.”



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The swimming pool complex includes a gym and several shops or office space.

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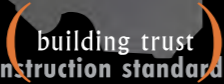


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Not less than eight portals of this size were needed to carry the roof, supported by steel purlins in between. The portals were pre-manufactured in South Africa and then shipped up to Swakopmund. They were then cut to size and the end plates were welded on in a local workshop.

“The main challenge was mounting these portals,” recalls Van der Merwe. “The plan was we would put up the two side columns and then we would put together the three pieces that constituted the roof beam.” However, this is where the difficulties began, says the engineer.

“Because the beams were so slender it was impossible to erect them one by one, they would just wobble and possibly get damaged, so we had to fit two together, attached them five metres apart with the steel purlins to lend solidity to the beam and then lift the whole seven tonne combination in place with cranes.”

A precision operation which wasn’t made any easier by the fact that the beams with a 120 metre diameter, couldn’t be bent all the way, so had to re-adjusted onsite by a bracing system.

Another interesting feature was the pool itself. Van der Merwe elaborates: “For this we used a concrete that was specifically designed to make a water retaining structure and then we covered it with a fibreglass lining.”

Under the pool, a leak detection system was installed by means of a system of perforated pipes with sensors. On the sides, an overflow system collects water spilling out of the pool in a tank where it is then recirculated through underground pumps supplied by LIC Pools. This way there is no rebound of waves from the sides in the pool itself, allowing competition swimmers a relatively smooth and undisturbed surface.

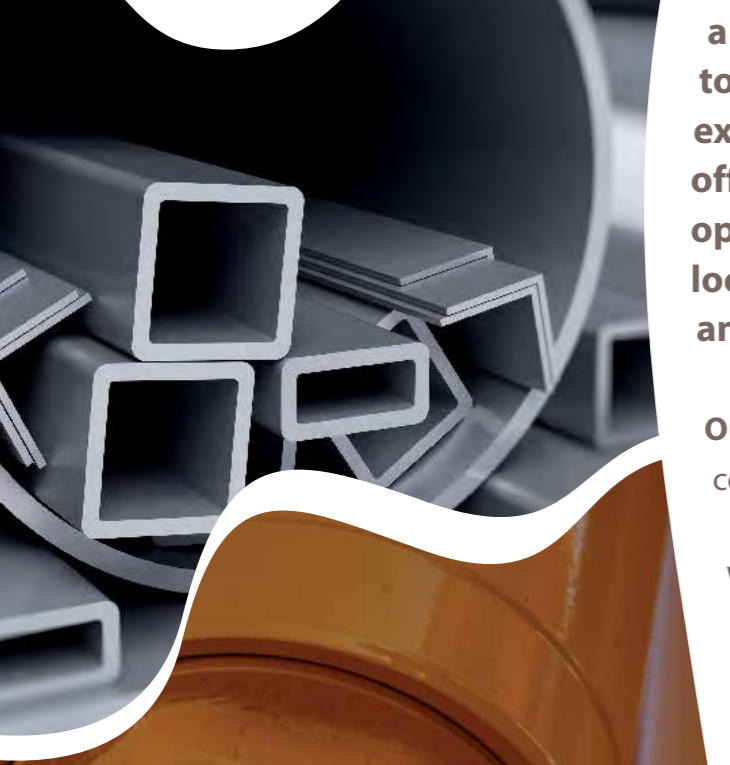
This should give visitors an unimpeded view of swimmers racing for gold in Swakopmund’s brand new Water Cube and thanks to the architects, engineers, contractors and developers, they can do so from a brand new coffee shop that is built at the south end of the pool and forms an integral part of the structure. ■



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SEVEN YEARS IN THE MAKING, HUSAB PROJECT TAKES OFF

After seven years in the making, emerging Chinese-backed uranium company Swakop Uranium has started development of the US\$2.5 billion (N\$21 billion) Husab Uranium Project in the Erongo Region of Namibia – the third-largest known primary uranium deposit on the planet – and will produce 15 million pounds per annum of the yellow metal from 2017.

Swakop Uranium Director: Communications and Stakeholder Involvement, Grant Marais, confirms that since receiving authority to proceed from its board of directors on the 18th of October 2012, the company has been working at full pace with preparations for construction and development. "I can truthfully say that now the wheels really are in motion," he says.

Construction of what will become the world's second largest uranium mine started in full earnest at the beginning of the year and by the end of May 2013, more than 20 per cent of the work had been completed.

Several contracts have been awarded, bulk earthworks have commenced, construction on the temporary road to the Husab mine is well under way, NamPower has approved guaranteed power supply of 50 MW for the mine and the first water from the temporary pipeline

was delivered from the Rössing reservoir into a newly-built pond on the Husab.

The project kicked off with the signing in Beijing of the engineering, procurement and construction management (EPCM) contract for the project.

The contract was awarded to the Husab Project Joint Venture (HPJV), comprising the international engineering and project management companies AMEC, and Tenova Bateman (Sub Saharan Africa). AMEC will act as lead on all HPJV activities and will hold specific responsibility for project management and engineering, with responsibilities for procurement and construction management to be shared with the joint venture partner.

History in the making: the EPCM contract for the Husab Project was signed in Beijing in November 2012.

In a transaction valued at nearly US\$216 million (N\$1.8 billion), Namibian state-owned Epangelo Mining Company has secured a 10 per cent stake in the Husab mine. The other 90 per cent of Swakop Uranium remains in Chinese hands through Taurus Minerals Limited. Taurus is owned by CGNPC-URC and the China-Africa Development Fund. CGNPC-URC is a wholly-owned subsidiary of China Guangdong Nuclear Power Holding Company Limited (CGNPC), a state-owned enterprise.

The Epangelo Mining Company acquired a non-dilutable, fully-funded and ring-fenced equity participation in Swakop Uranium, including board representation and support in other operational aspects. The Namibian Government owned mining company was given a loan at commercial interest rates to cover the acquisition, which will be paid back from its dividends. At the signing ceremony in November last year, Epangelo managing director Eliphaw Hawala said that the 10 per cent stake "marks a very significant chapter in the Namibian mining history".



Announcement in a local newspaper on the Namibian Government's acquisition of 10 per cent shareholding in the Husab Project.

At the Husab mine's official ground-breaking ceremony in April, the Minister of Mines and Energy, Mr Isak Katali, congratulated CGNPC on the massive investment and noted that it would assist in the growth and development of Namibia through job creation, export earnings and increased taxes.

Based on a definitive feasibility study (DFS) of the Husab project, Swakop Uranium plans to develop a large-scale, load-and-haul, open-pit mining operation, with ore from the mine feeding a conventional agitated acid leach process plant, at a rate of 15 million tonnes of ore per year. With anticipated annual production of about 15 million pounds of uranium per annum, the project will become the number two uranium mine in the world, second only to the McArthur River uranium operation in Canada.



Top left: Swakop Uranium contributed to Ellie's veggie garden in Arandis through the Swakop Uranium Foundation. With Ellie Nowases (right) is the CEO of the Arandis municipal council, Ms Florida Husselman.

Top right: Swakop Uranium geologists working in the core yard outside the company's Ida Camp near the Husab mine site.

Bottom: Cores from the diamond drill rigs (picture) and reverse RC drill rigs revealed a forecast grade of 518 ppm on Husab Zones 1 and 2.

It will produce more than the total current uranium output of Namibia and will elevate Namibia past Niger, Australia and Canada to the second rung on the world ladder of uranium producers.

- Rope shovels, hydraulic mining shovels and drills to Barloworld Namibia; and
- Construction camp accommodation to Swakopmund based Namspace.

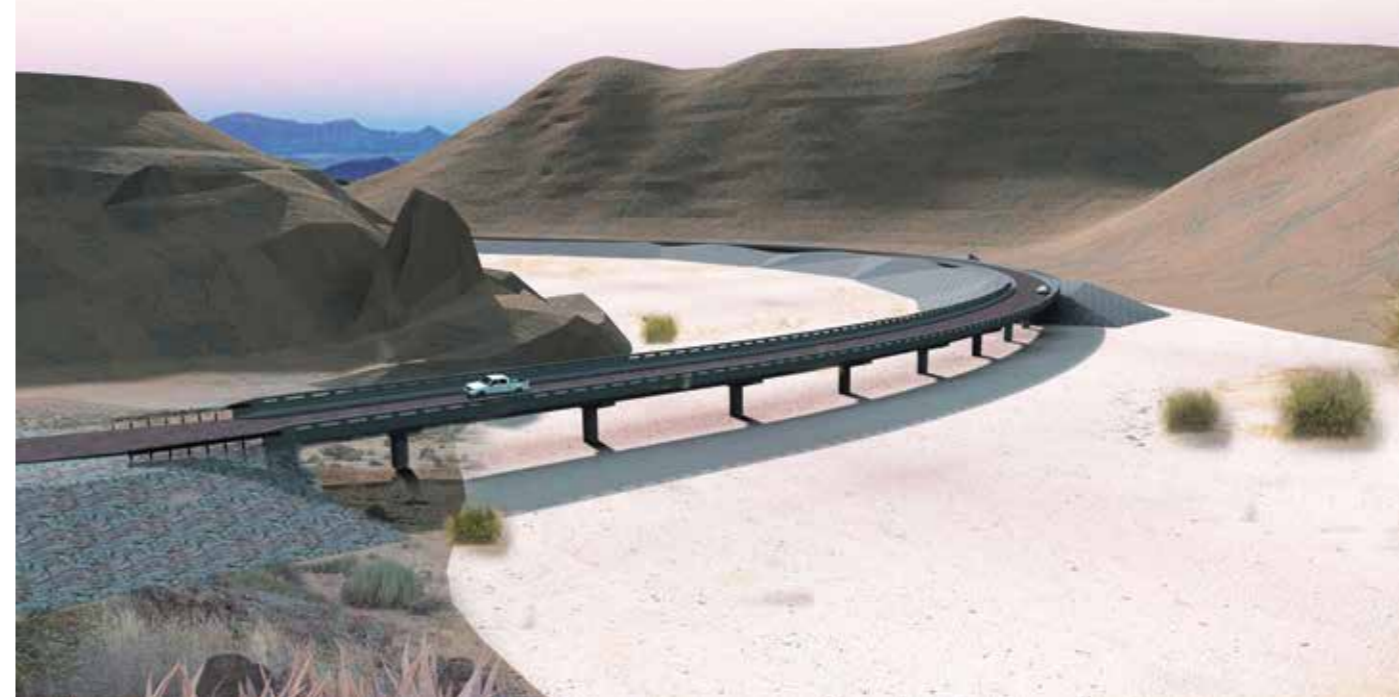
The 8-km uranium mineralisation has been confirmed as the highest-grade, granite-hosted uranium deposit in Namibia, and one of the world's most significant discoveries in decades. It is located around 70 km northeast of Namibia's main port, Walvis Bay, and within the Erongo Region – an area that holds several world-class uranium deposits and mines, including Rössing Uranium (primary granite-hosted uranium) and Langer Heinrich (secondary palaeo-channel hosted uranium).

According to Marais, all funding is through shareholder funds. "Essentially we are part of the Chinese government – they own us directly through their normal commercial subsidiaries, and they are committed to this project in order to ensure guaranteed supply of uranium for their nuclear reactors. CGNPC is a premier Chinese company that does power generation and construction of nuclear reactors, so it is critical that it sources this supply from Namibia, and it is committed to it 100 per cent. Hence funding has to be guaranteed," he emphasises. "We may or may not fund part of the project through some debt at a later stage, but that is a decision that will be made in terms of circumstances as we go along," he says.

Contracts that have been awarded so far include:

- The contract for the 35 km permanent access road that connects the mine to the main road went to Basil Read Namibia;
- The bulk earthworks for the entire plant was allocated to Wilson Bailey Homes;
- Haul trucks and support fleet, won by Komatsu South Africa;

Turning back to the project itself, he reveals that commissioning will be in 29 months from authority to proceed, which was 18 October last year, and it will be 34 months to hot commissioning.



A three-dimensional image of the impressive bridge that will form part of the permanent road to the Husab mine. Stretching over 160 m of the Khan river, it will be the longest bridge built in Namibia since the country's independence in 1990. The construction schedule for the permanent road will be shortened as much as possible by starting construction simultaneously from both ends of the road, being the Husab site and the intersection with the B2 (the main road from Swakopmund to Windhoek). The N\$182 million contract for the construction of the main road was awarded to Basil Read Namibia.

"That takes us to around August/September of 2015, and we are hoping for first production in the last quarter of that year," says Marais. "Nameplate production of 15 million pounds per annum of U_3O_8 at full ramp-up will take in the region of 18 months – so full production should be achieved by early to mid-2017."

transport terms," Marais declares. "Continuing with physical infrastructure, we are busy negotiating with NamPower, the Namibian power provider, and we will have more than the required 20 to 50 megawatts (MW) during the three to five years of the project phase. At full production power consumption will be about 120 MW at peak production," he adds.

The Husab Zone 1 and Zone 2 reserve currently stands at 320 million tonnes at a grade of 520 ppm (parts per million) and that will convert at the calculated throughput to 15 million pounds of U_3O_8 per annum over the life of mine. "As far as life of mine is concerned, I think we should be conservative – we are calling it at between 18 and 20 years with our current Zone 1 and Zone 2," he confirms.

"We have agreed that our water will be desalinated from an existing desalination plant, which means minimal impact on the environment. We are busy finalising negotiations with NamWater, however we have signed a firm commitment for 1.2 million cubes a year for the construction period, and the 30 km temporary pipeline is in place and already pumping water," Marais states.

The harbour of Walvis Bay is 70 km from the mine, and has the ability to handle uranium exports as they are currently doing for Langer Heinrich and Rössing. "The product is put in drums and the drums are in containers which are transported to the port. So it is a very smooth and clean operation, and only involves some 7,000 tonnes per annum of product, which is small in bulk

"There is no need at this stage, because of the size of the current Husab project in Zones 1 and 2, to actually move ahead towards mining the other zones. Those are purely value in the ground that we can use to extend the life of this mine in the future when the time is right," he explains.





Core trays ready for shipment at the core yard on the Swakop Uranium exclusive prospecting licence area.

Given the potential of the Husab site, Swakop Uranium is poised to become a substantial contributor to the Namibian economy and its local communities. At a spot price of US\$65 per pound, a production rate of 15 million pounds of uranium per annum and an exchange rate of N\$7.5 to the US dollar, Swakop Uranium would have an annual turnover of N\$7.5 billion.

The Husab project would furthermore

contribute 5 per cent to the Namibian Gross Domestic Product, and 20 per cent to the country's merchandise exports, as well as generating N\$1,700 million per year in government revenue. It will also create more than 6,000 temporary jobs during construction, and about 2,000 permanent operational job opportunities. This will increase the number of people employed in the mining sector by approximately 17 per cent.

And finally, according to a socioeconomic study done on the Husab project and the uranium rush, eight to ten spin-off jobs will be created per permanent employee, which means that up to 16,000 permanent jobs will be created by and as a result of the Husab Project. ■

Far left: The first of 50 tyres for the massive 27-tonne haul trucks that Swakop Uranium will be using at the Husab mine, arrived in January 2013, shipped from Bridgestone's factory in Japan. At peak Swakop Uranium will have 39 of these massive trucks, which will need more than 250 ultra large tyres per annum. Left: Engineers planning the temporary access road to the Husab mine. From left to right are Riaan de Witt, the Lithon Project Engineer; Koos Calitz, Swakop Uranium's Project Engineer: Mechanical; Adriaan Grobler, Lithon Chairman and Project Director; and Harris Cloete, Managing Director of Access Laboratory Services. The picture was taken at the famous Paddaklip (in the background) in the Khan river.

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Joint Venture partners, Tenova Bateman Sub-Saharan Africa and AMEC, celebrate the EPCM contract award for the metallurgical plant for Husab Uranium, with Swakop Uranium.

Congratulations to Swakop Uranium on Husab Uranium

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As a leading engineering and EPCM services provider to the mining and minerals industry, Tenova Bateman, part of the globally present Tenova Mining & Minerals, offers a complete range of customer-focused project services, that have been proven on some of the world's most challenging mining projects.

"Tenova Bateman's extensive track record of projects have played an important role in developing the global mining industry," says Tollie Nel, Managing Director of Tenova Bateman Sub-Saharan Africa.

"This is particularly true in Namibia, where we have enjoyed a close relationship with the mining industry, having been involved in such major projects as AngloBase Namibia's Skorpion Zinc, Areva Resources Namibia's Trekkopje Uranium project and our most recent contract award, in joint venture with AMEC, Swakop Uranium's Husab Uranium project."

Tenova Bateman's scope of work on Husab Uranium involves providing services related to engineering assistance, procurement, construction management and site supervision, with the project scheduled for handover in October 2015.

Nel notes that Tenova Bateman is honoured to be associated with a project of this significance. "The Husab project is regarded as the most important uranium discovery in recent years. It is the largest granite-hosted uranium deposit in Namibia and is currently the third-largest uranium-only deposit in the world," he states.

Elevating Namibia to second place in the world ranking of uranium producers, the project is also set to become the third-largest uranium mine in the world.

"Given the potential of the Husab project, Swakop Uranium is poised to become a substantial contributor to the Namibian economy and its local communities. The project will create more than 4 000 temporary jobs during construction and about 2 000 permanent operational job opportunities, including those of contractors," says Nel.

"The Husab project is regarded as the most important uranium discovery in recent years."

Other work in Namibia in recent years included providing EPCM services for the Trekkopje Midi project, which covered the establishment of a 3 million t/yr heap leach facility, and the engineering and procurement (EP) for the Maxi project, covering the front end, the heap leach facility and the interfaces with the back end of the plant.

"The innovative greenfields Trekkopje uranium project is the largest heap leach facility using an alkaline solution, to be constructed to date," says Nel.

In the award winning Skorpion Zinc project, Tenova Bateman (then known as Bateman) worked in joint venture with SNC-Lavalin, to establish the unique 150 000 t/yr process plant, and managed construction of all surface infrastructure.



Trekkopje Uranium Midi project.

"The process design featured an innovative combination of existing technologies, including leaching, solvent extraction (SX), electrowinning (EW), melting and cast-house techniques. This was the first time SX and EW had been used together on such a large scale for zinc processing," says Nel.

"With the country's rich mineral wealth including uranium, gold, copper, phosphates and recently discovered iron-ore deposits in the north of the country, we see a very exciting future for the mining sector in Namibia," concludes Nel. "As Tenova Bateman, we are focused on continuing our role as a major contributor to the development of this sector through our client-focused services and outstanding engineering, technical and project management expertise."

Tenova Bateman manages the complete project lifecycle from concept to commissioning, maximising the success and profitability of a project through state-of-the-art process engineering and design, and leading-edge project management systems. Comprehensive services for new process plants and brownfield upgrades, cover a wide range of commodities and are tailored to both large and small projects. Tenova Bateman's engineering and EPCM skills have been proven on some of the most exacting mineral resource projects, in the most difficult of terrains.

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Scientists took several days to relocate five of the more than 50,000 Welwitschia plants on the Swakop Uranium exclusive prospecting area. The plants had to be relocated because of the upgrading of the temporary access road to the Husab mine.

PIPING WATER ACROSS THE DESERT

The Husab mining project between Swakopmund and Usakos will be one of the biggest uranium mines in the world upon completion and the project naturally requires water — lots of water. Engineers will build a 65 km pipeline from the coast to the new mine, right across the harsh Namib Desert, taking care not to disturb the vulnerable ecosystem.

The pipeline, supplying bulk water from the Swakopmund South Water Supply Scheme, is being build for NamWater and was originally scheduled to bring water to no less than four uranium mines.

However, due to the Fukushima nuclear incident that saw world uranium prices plummet, Bannerman put its Etango project on hold, while Deep Yellow shelved its Omahola development. Paladin's Langer Heinrich Uranium Mine slowed down its development of a next phase that would have required more water. This left

only the massive Husab mine, a high grade deposit that will be viable despite the depressed demand.

The line will be 65 km long and 600 mm in diameter, explains associate civil engineer Jannie Burger of Seelenbinder Consulting Engineers (SCE) in Windhoek. Most of it, 44 km, will run above ground but for at least 20 kilometres the pipeline will run underground. Construction is scheduled to start in September 2013 for delivery in May 2015.

"The project will take about 18 months to complete and will go out on tender soon," reveals Burger.

With a capacity of 8 million m³ per annum, the pipeline will have a total of four pump stations, consisting of one base station and three booster stations to pump the water up to the Husab mine, which is situated higher than Swakopmund.

"The water needs to be pumped form 57m above sea level to a 507-metres height, a difference of 450m. However, the pressure is calculated at 580m, or 4 times 14.5 bar to compensate for the friction that comes into play."

One of the main challenges of the project is the vulnerable ecosystem of the Namib-Naukluft National Park that the pipeline has to cross. "It's not just the visibility aspect of pipeline crossing the desert, because

there is not much that can be done about that. Painting the pipeline for instance so it disappears against the backdrop of the landscape, is not economically viable as in the harsh climate the paint will not remain for long.

"More important is the presence of more than 50,000 *Welwitschia mirabilis* plants on the Husab site alone, a well-known endemic plant emblematic of Namibia. We have done the utmost to ensure the *Welwitschia* population remains undisturbed.

"Swakop Uranium conducted a survey on of all the *Welwitschias* and record each plant's GPS reference, so we know their location and figured out a way to protect them by adjusting the route. While we still retain a trajectory that is as straight as possible, we try to situate the supporting pedestals in such a way that the *Welwitschias* end up under the pipeline rather than being removed to make place for the foundations of a

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Laboratory Services (Pty) Ltd

is a Namibian registered company specialising in quality control services for the Civil Engineering and Construction Industries of Namibia. ACCESS has two commercial offices, one in Windhoek and one in Swakopmund. Quality systems incorporates policies, procedures and work instructions all Based on ISO 17025.

Our client base includes Architects, Contractors, Consulting Engineers, Developers, Mining Groups, Project Managers, Quantity Surveyors, State Departments, private individuals and various other enterprises.

Service lines of ACCESS Laboratory Services (Pty) Ltd includes:

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- **Staff Evaluation and Training:** Competency according to ISO 17025
- **Laboratory Software Development:** Construction material related
- **Materials Consultation Services**



pedestal. That is also why most of the project is above ground: it is better for the plants to let the pipeline run over them than having to dig a trench."

Burger says another major engineering challenge is the corrosivity at the coast. "The corrosion is extremely aggressive and we have to apply special materials such as stainless steel air valves anti-corrosive coating. We also use steel inside the concrete and a special thickness of cover to prevent rust."

Temperature differentials in the desert are another factor to take into account when designing the pipeline.

"The temperature drops from 40 degrees Celsius during the day to 5 degrees or less at night," says Burger. "That is a massive difference for the pipes to expand and contract. We use special straps to prevent the pipeline from starting to creep and eventually move over larger distances."

The N\$400 million-project even will cater for wildlife in the area. Burger: "We have constructed 20 animal crossing at the points where the pipe dives underground, so every animal from tortoise to ostrich can still roam freely in the area."



Construction of the 30 km temporary pipeline to Husab, which is now in place and already pumping water.

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OUR COMPANY

Conenpro Incorporated Consulting Engineers started operating in January 2006 to provide the following engineering consulting services:

- Project management
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- Design, tender documentation, supervision and contract administration of municipal infrastructure services such as roads, sewer and water reticulation networks.

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3. The firm has professional indemnity insurance to the value of N\$3.5 million with Santam.



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PG Diploma in Structural Engineering (Strathclyde University: 1995)
13 years post registration experience in design, supervision and contract administration of civil and structural engineering projects.



Uaapi Kandukira
BSc in Civil Engineering (University of Cape Town: 2008)
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Helena Uugwanga
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The digital two-way radio system enables companies to communicate cost-effectively, even over long distances.

COMMUNICATING ON THE GO WITH MotoTRBO

Mobile communications in Africa can be costly and ineffective. A new digital two-way radio system developed by Motorola and introduced on the local scene by telecommunications company Sat-Com, offers a viable alternative.

Sat-Com is a subsidiary of August 26 Holdings. Primarily a state-owned defence contractor, August 26 has diversified into the civil market as well. Its subsidiaries, August 26 Industries and August 26 Textile and Garments, produce combat boots and fatigues for the army, but also manufacture protective clothing and gumboots for industry, school uniforms and linen.

By 2003, the parastatal bought a 49 percent share in Sat-Com, a private telecommunications player that is involved in the manufacturing, installation and servicing of electronic and telecommunications equipment, including two-way radios satellite and radio transmitters, while also making inroads in the IT sector by developing communications equipment. In 2009, August 26 upped its stake in the company to a 74.5 percent majority shareholding in the military sector by developing rugged radios from component level upwards.

Sat-Com has two main divisions. The commercial services division focuses on the civil market, providing mobile radio, broadcasting or data networks. The Research and Development division, on the other hand, engages in the in-house design and development of military communications solutions.

The engineers in the R&D division lead the way in Africa in the development and manufacturing of wideband software defined military communication radios with ancillary equipment. Recent successes include the Cheetah and Leopard software and radios that can operate on any frequency and still offer stability and reliability to armed forces or emergency services.

The company heavily invests in bursaries to remedy the shortage in radio frequency (RF) engineers in Namibia and keep its leading competitive edge. One of the latest additions to the Sat-Com arsenal is a new digital



A wide range of industries, such as the mining industry, can benefit from the new digital two-way radio system provided by Namibian telecoms company Sat-Com.

two-way radio system that greatly enhances efficient communication within companies, as well as lowers the cost of communication dramatically.

The system, developed by market leader Motorola, is called MotoTRBO and is based on Time-Division-Multiple-Access (TDMA) technology, rather than the existing analogue Frequency-Division-Multiple-Access standard. The digital two-way radio system has major advantages over existing analogue radio systems, explains Sat-Com engineer Reinhold Rothkegel.

“Key advantages of the digital radio system over its predecessor is that it increases the coverage area by up to 30 per cent and that the user experiences clear audio communication. But the really cool thing is that the signal can be relayed via IP, therefore creating wide area networks,” explains Rothkegel. “This means that a company in Windhoek can talk with its staff in Oshakati.”

The repeaters, little square boxes, which can be placed on the existing masts owned by NBC, Telecom or MTC, establish a IP based network using ADSL, Wimax or 3G, through which the digital radio traffic is routed. Apart from the improved coverage and audio quality, the capacity is doubled due to the TDMA standard. Space on the repeaters is leased out by independent operators to a spectrum of clients that want to communicate over larger distances.

An additional advantage of digital two-way radio use is that it is cost-effective. After the initial purchase costs of



the system, radio frequency fees and possibly a rental fee for repeaters, communication is essentially free.

This not only makes a huge difference in a company's phone bill and cell phone allowance, but also increases the operational efficiency. The MotoTRBO system offers a cost effective alternative compared to its predecessor, the Terrestrial Trunked Radio Network (TETRA), as hereto used by Police services.

“ The signal can be relayed via IP, therefore creating wide area networks, which means a company in Windhoek can talk with its staff in Oshakati. ”

Rothkegel: “A TETRA network for a small organisation easily costs N\$40 million, while you can have a digital MotoTRBO network for a fraction of that price.”

According to Sat-Com, one of the most attractive features of the MotoTRBO is that the system is easily scalable. It can be used simply in a shop between the person at the counter and the security guard in front, or in office environments. But the applications can be much wider. Hotels can use it to track and communicate with their maintenance, cleaning and booking staff. It can be used in hospitals or deep underground in mines. Because it is possible to communicate through a network of repeaters, a transport company in Windhoek can for instance effortlessly communicate with its trucks in Oshakati, or an airport shuttle can be quickly diverted to pick up some passengers. Communication can be conducted between groups, but also between individuals, which is an improvement on the old analogue system.

Because of the additional security features and benefits, Sat-Com has so far implemented MotoTRBO amongst several government departments, mines and wildlife



The new radio system can be tailored for various needs and comes in different shapes, from small, unobtrusive to robust radios, making it ideal for a wide range of applications and industries.



resorts. The system lives up to its promises and offers an complete reliable mobile communication solution. Apart from delivering the MotoTRBO to customer's doorstep, Sat-Com implements, tests the infrastructure and trains the end-users on the functionalities of the system.

"The Motorola Radios come in various shapes," says Rothkegel. "There is, for instance, the small, unobtrusive radio for 'shirts and skirts' that can be used in office environments or while visiting clients. And then we have the more robust radios for use on construction sites or mines."



Functionalities and prices also greatly differ. "The basic license free model for short distance two-way traffic sells for as little as N\$300. This you will find used by families while camping, dads talk to their kids on the beach, or a plumber fixing a geyser communicates with his mate downstairs."

The next level are the medium priced radios that is available for around N\$2,000 per handset. "These are basic communication devices that have a large reach, are sturdy but don't have the additional functionalities," explains Rothkegel. "The high-end level, which retails for around N\$6,000 has colour screen, GPS and texting functionalities."



"With a range of application integrating to the MotoTRBO network, a vast solution offering opens up for companies. For example, companies can track the whereabouts of staff and vehicles. They can establish a control room where operators can contact individuals and groups through the audio or text messaging, while tracking their position. Job ticketing can be done via the device, telling for instance an IT specialist where to for the next assignment, while informing head office how many jobs have been ticked off. The telemetry features can greatly help a company to enhance its operational efficiency."

Rothkegel expects that, because of the advantages and low cost, in the next five years 80 per cent of analogue systems will be replaced by digital solutions such as the MotoTRBO.



"No matter what the application, the MotoTRBO system offers a complete mobile communication platform. A total and end to end solution that is fully scalable as the requirements change." ■

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Since establishment in Windhoek in 1966, Lund Consulting Engineers CC (LCE) offers a variety of engineering consulting services as well as project management in the core fields of:

- Water Engineering
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- Roads and Transportation
- Community Based Management Training
- General Civil Engineering
- Mechanical Engineering
- Project Management



Reservoirs

A few notable projects include:

- The Ruacana Hydropower Project on the Kunene River
- Pre-feasibility and feasibility study investigations into a possible dam on the lower Fish River at Brukkaros
- Pre-feasibility study into hydropower generation at Popa Falls on the Okavango River
- Design and construction of the Etunda Canal
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INDUCTION SEMINARS ON STRUCTURAL LOADING CODE

The new Structural Loading Code SANS 10160 Basis of Structural Design and Actions for Buildings and Industrial Structures was published in 2010, with an edited version published in 2011. This series of eight parts replaced SABS 0160:1989.

A series of Induction Seminars was presented around South Africa during 2011; repeated in 2011 and also presented in Windhoek on the 4th of October 2012. The seminar covered the main Parts of the Standard (Parts 1 to 5) covering the general basis of limit states design, self-weight and imposed loads, wind loading, seismic loading and resistance and the basis of geotechnical design and actions for buildings. The presenters at the seminar were mostly closely involved in the development of the Standard.

The intention of the seminar was to familiarise practitioners with the main features of the Standard to be able to apply it effectively. Although the emphasis was mainly on aspects relevant to standard practice, such as proper combination of actions and the typical classes of loading on a building structure, updated and some innovations were indicated, such as reliability classes for structures; an extended range of imposed loads; similarly an extensive set of wind pressure coefficients; completely revised procedures for seismic

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design; the newly introduced provision for technical design related to buildings.

Due to time constraints topics such as actions induced by cranes, machinery, thermal conditions and consideration of actions during construction or execution, were not covered.

The main features of SANS 10160 are that continuity with the 1989 version has been maintained in terms of the general scope of application and performance levels. The new Standard can consequently be used with the present generation of materials based standards for the design of concrete, steel, timber and masonry structures based on the principles of Limit States Design.

However, the extended scope of procedures allows for easier application for specific design situations. Another important feature of the Standard is that it is closely reference to Eurocode, to such an extent that it could be considered to be fully compatible with Eurocode, although adjusted to local conditions and reduced in scope of application to buildings and similar industrial structures.

As a further development, a series of Advanced Seminars during which a full day is spent on each of the main topics of SANS 10160 is planned for the second part of the year. The first announcement of the series of seminars can be expected within a few weeks. Provision is made for a seminar on Parts 1 & 2 on 26 and 28 August 2013 in Stellenbosch and Midrand respectively, Part 3 on wind loading on 26 September 2013 in Midrand; Part 4 on seismic design on 29 and 31 October 2013 again in Stellenbosch and Midrand; Part 5 on geotechnical design late in November 2013.

The intention with the advanced seminars is to treat the general topics more extensively, including demonstration of application in practice. In addition refined design to improve performance and/or economy or applications under difficult conditions will be presented.

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NAMIBIA PIONEERS MARINE DIAMOND MINING

Namibia's marine diamond deposits are the richest in the world, producing some of the best quality diamonds, and Debmarine Namibia is the world leader in extracting them sustainably from the seafloor onto your engagement ring.

Its engineering team sets the global standard on innovation, safety and efficiency when it comes to extracting diamonds from the seafloor.

Marine diamond mining started as far back as the 1960s when Texas oilman Sammy Collins formed the Marine Diamond Corporation and proceeded to mine 1.5 million carats from under 20 metres of water. Currently diamonds can be mined up to depths of 140 metres beneath the surface. Since the start of diamond mining over 12 million carats have been recovered from the seafloor out of a total of 95 million carats from various sources. The share of marine diamonds in the overall production is set to increase, however, as land-based deposits are getting depleted and the emphasis shifts to inner-shelf and deep marine mining.

In the early 2000s the Namibian Government, building on its existing public private partnership with the world largest diamond company De Beers, started an offshore diamond company called Debmarine Namibia.

The company, working from claims off the coast of southwest Namibia, became active in 2001. In 2011 the Government upped its direct shareholding in the venture from 15 per cent to 50 per cent, with De Beers holding the other half of the shares.

Debmarine Namibia employs 780 people, of which more than 75 per cent are Namibians, up from 18 per cent in 2002.

Namibia's marine diamond deposit is estimated at 80 million carats, which is more than 90 per cent of the available total reserves in the country. At the current rate of extraction, this would see diamond mining in Namibia continue until well after 2050. Up to date, only 74 square km in the 6,000 km³ mining license area has been mined since marine mining started on a serious scale in the 1990s.

In 2012, Debmarine Namibia recovered 1.1 million carats, an increase from 990,000 carats recovered in 2011.

The company's fleet is operating at full capacity and with prices for certain carat sizes up by 30 per cent since the global financial crisis, the future indeed looks sparkling.

"The strong production performance by Debmarine Namibia was mainly due to efficiency improvements, new mining tools, and the early commissioning and ramp-up of the Grand Banks vessel, which was remobilised during the year following an extended layup," commented De Beers in its annual report.

The sampling vessel, Coral Sea, continued to identify resources that will fulfil the marine mining plan for at least two years. Coral Sea will continue sampling in 2013 to ensure sustainable growth in reserves and mine plan levels. The chartered vessel, Explorer, successfully tested a new sampling tool for use in coarse gravel and will again be chartered for 150 days in 2013 to conduct exploration sampling across Atlantic 1.

In total, the company uses several large mining vessels which are in effect floating mines. These vessels are the MV Debmar Atlantic, MV Debmar Pacific, MV !Gariep and the MV Grand Banks. In April this year, Debmarine Namibia commissioned the MV Mafuta, formerly known as the Peace in Africa. This vessel was bought at a cost of N\$640 million from De Beers, is the largest mining vessel in the world, measuring 174 metres long with a beam of 24 metres.

It can mine to depths of 160 metres, covering between 200 and 500 square metres per hour in 100 hour stints. The vessel will produce 350,000 carats per year, a whopping 30 per cent of total marine production, announced Chief Executive Officer Otto Shikongo.

Debmarine Namibia also charters the MV Coral Sea from De Beers Marine South Africa for sampling and, occasionally, for production. An Autonomous Under Water Vehicle (AUV) is chartered for geophysical data work. Offshore logistical support services are provided from Oranjemund by means of fixed and rotor wing aeroplanes and by means of a tug service from Port Nolloth.

Capacity enhancements to the mining vessels Mafuta and the Debmar Atlantic will be implemented during 2013 to target currently un-mineable areas within Atlantic 1. The revision of the fleet maintenance strategy is in progress, in line with industry best practice asset management principles.

In the coming year, the company will look to increase operational efficiencies through the advancement of exploration sampling and the implementation of new resource models and technological improvements to mining tools and technical systems.

At the core of Debmarine Namibia's existence are its mining vessels which are high tech floating mines incorporating the pinnacle of marine mining engineering. The process follows distinctive steps which all require the professional input of specialised mining engineers.

First the seafloor is scanned using geophysical mapping. This is followed by sampling to determine the reserve inventory. The inventory, together with other parameters, is then processed into a mine plan, which is aimed at ensuring the sustainable use of the resource for the longer term.

The mining vessels then mine the diamonds off the ocean floor at depths of between 70 and 140 metres, using airlift drill technology that is highly advanced and supported with sophisticated tracking, positioning and surveying equipment. The extraction process is automated and remotely operated, with no visual contact of the sea floor. The diamond gravel is then treated in the plant on board, before being transported for further sorting at the Namibian Diamond Trading Company.

Debmarmine Namibia takes its social corporate responsibility seriously and has heavily invested in both environmentally sustainable mining and skills development.

“Debmarmine Namibia is ISO 14001, ISM and OHSAS 18001 certified, in line with its commitment to safety and environmental management,” says the company in a statement. This is in addition to a NOSA – 5 star, International Safety Management (ISM) rating.

“The company’s environmental management system focuses on the effects of marine mining and the research

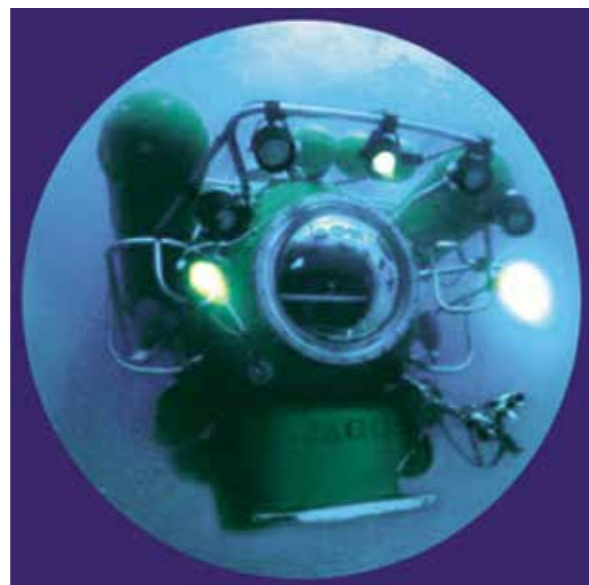
findings are used to mitigate impacts when possible and build knowledge on the marine environment. The company is a front-runner in the usage of the most advanced marine diamond mining technology in the world,” it adds.

“Our environmental team oversees strict guidelines for the vessels, covering everything from how we mine, to how we dispose of every single piece of waste produced on a vessel. By monitoring changes to the environment over time, we’re able to build-up a greater knowledge of the natural variability of the environment and the impact of marine mining.”

Over the past ten years, the company invested more than N\$183 million on trainee programmes benefitting 322 young Namibians. They were trained and developed based on the company’s long-term trainee programmes in the disciplines of Leadership, Coaching, Navigation, Marine Engineering and Accelerated Rating, Artisans, Crawler Pilots, Drillers, Safety Journey to Resilience, Mandatory Marine Training and Understudy Development programmes. ■



Mining vessels Debmarine Atlantic (top) and MV Mafuta, the largest mining vessel in the world.



A manned submersible, the JAGO, an autonomous underwater vehicle, used for marine diamond mining and environmental monitoring.

FAST FACTS

Name of mine	Debmarmine Namibia (DBMN)
Location	Windhoek (location of the DBMN office) Atlantic 1 mining area (location of the DBMN mining vessels)
Operations commenced	January 2001
Chief Executive Officer	Otto Shikongo
Type of mining	Offshore marine diamond mining
Mining vessels	mv. Debmar Atlantic, mv. Debmar, mv. Pacific, mv. !Gariep, mv. Grand Banks and the mv. Mafuta
Production output in 2011	990,000 carats
Production output in 2012	1.1m carats
Number of employees 2012	780
Safety ratings	NOSA – 5 star, International Safety Management (ISM) and OHSAS 18001 Certification

100% Pure Namibian

Debmarmine Namibia is a joint venture marine diamond prospecting and mining company, owned in equal shares by the Government of the Republic of Namibia and De Beers. Our mission is to prospect for and mine marine diamonds in a sustainable manner to the benefit of all our shareholders and stakeholders. This is what makes our vision of being the global benchmark in marine mining – forever.

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- Clients: To provide a professional service of the highest standard that meets the client's requirements with regard to costs, duration and management.
- Community: To undertake projects in cooperation with communities in order to meet their needs and aspirations, to provide employment opportunities which contribute towards the overall benefit of the country.
- Environment: To design and manage the implementation of projects in such a manner as to minimise any pollution, harm to the environment, or ecological disturbance; furthermore, to strictly adhere to the regulations of relevant authorities.
- Staff: To maintain a well-qualified and efficient staff complement through the provision of good remuneration packages, pleasant working conditions,

recognition, excellent resources, efficient leadership and a friendly working environment.

Long Term Objective

To continually meet the objectives listed above and to maintain growth, but yet to remain small enough to still manage, at management level, each project in all its phases: reporting, design, documentation, project management and administration.

In essence therefore, we strive to ensure that at the completion of a project, all parties involved will be satisfied with the service and the end product, which was produced on time and within budget.

Element Consulting Engineers is 100% owned by Namibians and is passionate about mentoring young engineers to become professionally qualified. Our mentorship program established in 2008 has delivered 9 young engineers who are busy gaining the relevant experience to register as professional engineers. Our bursary programme offers financial assistance to students studying towards a degree in engineering.



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Namdeb, the PRIDE of Namibia's mining industry – to 2050 and Beyond

Namdeb is a wholly owned subsidiary of Namdeb Holdings (Proprietary) Limited Holdings which is owned in equal shares (50:50) by the Government of the Republic of Namibia and De Beers. Namdeb performs land-based prospecting (exploration), mining and rehabilitation operation and services for Namdeb Holdings.

The heart of the operations is along the southwest coast of Namibia with the main land-based operations in Oranjemund and satellite mines near Lüderitz and along the Orange River. Several types of innovative mining techniques are employed to extract diamonds from alluvial deposits of ore bodies. Mining techniques using specialised equipment such as, vacuum extractors, dredgers, floating treatment plants and probe drilling platforms are used to extract the resource.

Safety is a value and the number one priority for Namdeb. Zero Harm forms the foundation of all aspects and this care is extended to all stakeholders and the environment in which Namdeb operates. Namdeb is therefore proud to have continuously retained its Occupational Health and Safety Audit Standard (OHSAS 18001:2007) and ISO 14001:2004 certification.

As Namdeb continues to treat challenges as opportunities there is certainly a future that lies ahead. Over the last few years Namdeb has been investigating new technologies to mine profitably the wetter areas in the inshore and innershelf part of our onshore licences. Through this

project 2050 which was launched in 2010, Namdeb's Strategic Project team continues to investigate and accelerate critical stay in business projects which have the potential to extend the life of mine.

All the projects incorporate milestones set up by the Namdeb Environmental Rehabilitation plan and therefore currently active areas and associated infrastructure will be rehabilitated when it becomes redundant in the future. Although the Namdeb mining licence areas have been mined for decades, this world-class deposit still has much potential to provide long-term benefits to the Namibian economy.

Namdeb took a bold step in 2010 with the development and launch of the Probe Drilling Platform (PDP). The PDP is a jacking-walking 8-legged platform which is fitted with a probe drill to delineate the shallow water resource in the Inshore to the -7 metre isobaths. Access to and from the platform is via aerial ropeway.

With the focus to sustain mining operations to 2050 and beyond, Namdeb remains committed to being the pride of Namibia's Mining.



Some of Namdeb's female employees



Namdeb diamonds

Namdeb's Proud History at a Glance

- 1908 A railway worker, Zacharia Lewala, stumbles on a shiny treasure near Lüderitz. The sparkling discovery leads to a major diamond rush.
- 1908 Diamond mining regulations are introduced and the Sperrgebiet or (forbidden territory) is declared.
- 1920 Sir Ernest Oppenheimer forms Consolidated Diamond Mines of South West Africa (CDM).
- 1923 CDM concludes the Halbscheid Agreement with the South West African Administration, granting CDM the mining rights for the Sperrgebiet.
- 1930 Diamond mining operations cease at Kolmanskop
- 1936 Oranjemund town is established, which adopted its name from its geographical position at the mouth of the Orange River, the national boundary between the Republic of Namibia and South Africa.
- 1943 CDM Head Office moves from Kolmanskop to Oranjemund.
- 1951 Oppenheimer Bridge linking Namibia with South Africa is opened. Another higher, wider bridge is built two years later to withstand floods better.
- 1961 First offshore mining concession granted.
- 1977 CDM Head Office moves from Kimberley to Windhoek.
- 1994 An agreement between CDM and the Government of the Republic of Namibia results in the formation of Namdeb Diamond Corporation (Pty) Limited. All De Beers Group existing Namibian mining licences and related rights are replaced by a consolidated and rationalised mineral agreement.
- 2004 Namdeb turns 10
- 2010 Project 2050 is initiated
- 2011 The Government of the Republic of Namibia and De Beers sign the new structure agreement which rearranges and equalises the shareholding structure of Namdeb and De Beers Marine Namibia.



Zacharia Lewala



Namdeb's Probe Drilling Platform (PDP)



Outline of Namdeb's 2050 Projects

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EFFICIENT USE OF WATER VITAL FOR SURVIVAL

Efficiency is the new buzzword in the water sector, say engineers. This is especially true in a water-stressed environment like Namibia, where financial resources are also limited.

One of the pillars in the multi-faceted water sector is treating rainwater, groundwater or effluent to levels that can be used for human consumption or industrial use.

Water purification has come a long way in Namibia. Supported by technological advances, the trend at the moment is towards efficiency and simplicity, says Leonhard Eins, projects director at Aqua Services and Engineering.

"Across the board we see a trend to become more responsible in the way water is used," comments Eins. "That extends to various areas," he adds. "One trend is to create as little waste as possible and that also goes for water, where the aim is to use it as sustainable as possible."

There is also a big demand for simplicity of water treatment and management systems, reveals Eins.

"This is especially true in the public sector where municipalities are already under stress and don't have huge staff complements to maintain and manage complicated water treatment systems.

"Water treatment also has to be energy efficient," explains Eins. "Although we are on average three years behind developments in Europe in some technologies, the trends are catching up fast. In the old days the client would tell us to install a pump and it could be the biggest most inefficient pump for that matter. Those days are over; pumps now need to reduce energy usage and waste."

The demand for energy efficiency is the most important driver for innovation in the water sector at the moment. "Look at the reverse osmosis process that is used for desalination plants. That requires huge amount of energy. Now we see a surge in smaller plants focussed on energy recovery by reusing the pressure in a closed loop system," says Eins.

In Namibia, it has grown quiet around a second desalination plant that was on the cards as NamWater entered into talks with mining giant Areva to secure the excess water supply of its

Wlotwatsbaken desalination plant which will not be used for the time being, as a result of the down-scaling of Trekkopje mine.

Through its parent Veolia, Aqua Services and Engineering has access to the latest innovative treatment procedures, such as multi-flow technology, allowing for high rate clarifiers that have a small footprint and thus take up much less space in already crowded cities.

“The chemistry of water also continues to develop. Remember that water is seldom just H₂O. It has other elements mixed in, some of which need to be removed through treatment with chemicals. So, we witness a constant improvement in chemicals, resins and carbons.”

Apart from input from manufacturers all over the world, Aqua Services conducts its own trials such as at the Langer Heinrich Uranium Mine.

“It is important for us to know the water in the place where the client is, because conditions differ all the time,” comments Eins.

He adds that with Namibia’s dry conditions resulting in a severely limited water supply, re-use of water is the logical solution. “Re-use can be simply treated wastewater that is used for irrigation purposes. This can happen on a small scale, there are even lodges that re-use their water and treat it for irrigation of crops.

At the coast, Swakopmund and Walvis Bay already run on a dual water supply system with grey water being used for irrigation and where the potential for reuse is limited, desalination, while costly, can provide the solution.

With the advent of climate change, water could become scarcer, although research in this area is still in a very early stage. Old plans to pipe water all the way from the

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Kavango River to the area of the coun-try central have been revived, ensuring that the Khomas Region will have enough water for the future. But such endeavours are expensive and also hinge on as extraction rates in the upper regions of the river in Angola.

The newly discovered underground water resource in the Ohangwena Region, holding up to 20 billion cubic metres of water, could also be a potential renewable resource for years to come, but to extract the 10,000-year old water will be an engineering feat in itself, requiring carefully drilling around another salty aquifer that is sitting on top of the water resource.

All this is good news for the engineering profession that will be involved in the design, renovation and construction of canals, dams, sewage plants, pipelines, pump stations and treatment facilities.

The challenge will be to do this in an affordable and efficient way to keep the costs for the end-user to a minimum. ■

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Bicon Namibia was established in 1957 and has since been operating in Namibia and neighbouring countries. It is active in many engineering and related disciplines. The office operates in close collaboration with the other Bicon offices in the SADC region (Zambia, Swaziland and Angola).

Bicon Namibia's main office is located in Windhoek with branch offices in Oshana and Swakopmund. We have been established in Namibia for almost 50 years, today we are one of the largest consulting practices in Namibia. Since the early days of the firm's existence, the policy has been to employ and train as many local staff members as possible and therefore provide an effective base of local expertise. Our permanent staff complement is 42 consulting engineers of all disciplines and supporting staff.

Bicon Namibia has the capacity, knowledge and experience to handle big projects with ease and on time. The offices have state of the art computer-aided design and draughting facilities. Services rendered by Bicon include preliminary studies, feasibility and economic studies, master plans, preliminary and final design, tender and contract documentation, construction supervision, project management, and quality control, training and technical assistance.

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Ministry of Works, Transport & Communications



Auas Blick Sub-station



Areva Trekropje Desalination Project

Gürther J. NOLTING || Joint Managing Director



Pr.Eng. (Namibia & RSA), B. Sc. (Civil Engineering), UCT, Honors Degree (Business Administration), (USA)
Has 33 years of professional experience as consulting engineer in the field of civil engineering, covering structures, municipal infrastructure and roads in design, contract documentation, site supervision and contract management. He has been the project leader of several major feasibility studies, master planning studies and multidisciplinary infrastructure projects. He joined Bicon Namibia in 1981 and was appointed shareholding director in 1984 and Joint Managing Director in 2003.

Fritz U. JESKE || Joint Managing Director



Pr.Eng. (Namibia), Electrical
39 years of professional experience in electrical engineering, design specification and tender, contract supervision and multi-disciplinary project coordination. His fields of experience covers high, medium and low tension supply and distribution systems as well as building electrifications, data and communication networks, security protection and emergency power systems. He serves since 32 years with Bicon and has been appointed Joint Managing Director in 2003.

Jürgen R. KAPLAN || Director



Eng. (Austria), Electronics & Telecommunication
38 years of professional experience in electrical engineering, design specification and tender, contract supervision and multi-disciplinary project coordination. His fields of experience covers low tension distribution, building electrifications, data and communication networks, audio-visual conference systems, security protection, CCTV and access control as well as emergency power systems. He serves since 26 years with Bicon and was appointed associate in 1995 and shareholding director in 2005. Jürgen is also one of the founders of the Waldorf School Windhoek. Since the founding of the school in the year 2000 he acted as chairperson of the executive committee.

Daniel T. MTAMBALIKA || Director



Pr.Eng. (Namibia), Civil, M.Eng. (Stellenbosch University); BSc Engineering (Civil)
18 years work experience in civil engineering majoring in roads, airports and project management. His fields of experience covers geometric, pavement and materials design for roads and airports; tender documentation, site supervision and multi-disciplinary project management. He has international experience gained in Namibia, South Africa, Malawi and Angola. He has been with Bicon since beginning 2001 and as a shareholding director since 2005. Daniel has been actively involved in transferring his knowledge to local Namibians through "SME Contractors Training" programmes and lecturing of civil engineering students at the Polytechnic of Namibia.

Holger VON LEIPZIG || Director



Pr.Eng. (Namibia), B.Sc. Mech. Engineering, M.Sc. Industrial Engineering
20 years of professional experience in Namibia and Germany. His fields of experience includes the design and tender, contract supervision and multi-disciplinary project management in a variety of fields. Practical experience has been obtained in water supply systems with specialised knowledge of pumps, transport and logistic solutions, including satellite tracking and fleet management control systems, maintenance systems and technical building systems, specifically in the hospital environment. Of special interest if the use of renewable energy. He joined Bicon in 2006 and was appointed shareholding director in 2007.

Grant A. R. KLOPPERS || Engineer: Mechanical



Bachelor of Technology (CPUT)
4 years experience as Laboratory Manager at the Polytechnic of Namibia; duties included the development of Laboratory facilities, staff and Machinery. 7 years professional experience at Bicon Namibia as a Consulting Engineer. His experience includes Design, Supervision and Commissioning of Mechanical Building Services, including Air Conditioning, Ventilation, Lifts, Water Reticulation, Fire Protection, Kitchen Equipment, etc.



Michael J. LOREK || Engineer: Structural



Dipl. Ing. (Germany)
7 years of site experience in constructions, supervision and site management. He joined Bicon 3 and a half years ago and focuses on the fields of structural design and coordination. Additional vocational training as electro-technical assistant.

Musekiwa MATEMATEMA || Senior Engineer: Civil/Structural



B.Sc. Engineering (Civil) (UZ)
21 years work experience in civil engineering, majoring in structural engineering. Musekiwa has experience in the design of concrete, steel, timber and masonry structures, as well as extensive experience in site supervision, administration and project management. He joined Bicon 4 years ago.

Angula G. NASHANDI || Director



B.Tech: Engineering: Electrical (Cape Peninsula University of Technology); ND: Power Engineering (Polytechnic of Namibia)
5 years work experience in electrical engineering design, supervision, administration and project management of infrastructure and building projects. His field of experience covers high, medium and low tension supply and distribution systems as well as building electrifications, data & communication networks, security protection, emergency power systems and photovoltaic power systems. He has been with Bicon since July 2007.

Kai NOLTE || Engineering Consultant: Electrical



27 years work experience in electrical engineering and 17 years especially as a professional consulting engineering in the design, supervision, administration and project management of infrastructure and building projects. His field of experience covers low tension distribution systems, building electrification, data & communication networks, security protection and emergency power systems, building management systems and photovoltaic power generation systems for grid as well as stand alone applications.

Peter A.H. THIEMANN || Senior Engineer: Roads



Pr. Eng. (Namibia), Dipl Ing (Germany): Civil
33 years of professional experience in transport and infrastructure projects. Extensively involved in the field of project and contract management. Implementation of Master Plans, feasibility studies, detail design, tender documentation and site supervision for rural roads and aerodromes. He joined Bicon 7 years ago.

WATER A **CLEAN** **POWER** RESOURCE

Even though Namibia is an arid country, for a large part of the year almost half of Namibia's electricity is generated through hydropower and this percentage is set to rise.



The Ruacana Falls in the Kunene River.



Above: The Ruacana Falls in the Kunene River with the Ruacana hydro power facility in the foreground.
Left: Upstream from the planned Baynes hydropower project in the Kunene River.

After the fourth turbine was installed at the Ruacana hydro power facility last year, installed capacity grew from 240 to 332 Megawatts. This means that Ruacana supplies the lion's share of the total installed capacity in Namibia which stands at 498.5 MW. With a total demand of 2,300 gigawatt hours (Gwh), Ruacana supplies 1,050 Gwh, or some 46 per cent of total demand.

In a few years the prominence of water in the electricity mix might increase radically with the coming on stream of the Baynes hydropower project in the Kunene region. According to John Langford, specialist strategic planning at NamPower's Generation Unit, Baynes will add an additional 600 MW to the grid. This capacity, however, has to be shared equally between Angola and Namibia with each country's total installed capacity to be boosted with 300 MW.

"Baynes is part of an integrated plan for Namibia's power supply that targets a capacity to deliver 100 per cent of the maximum demand and 75 per cent of all energy to come from internal sources," says Langford. "Other thermal and renewable projects are also in the pipeline for consideration."

Baynes is a long-term project and before it can become operational, much still needs to happen. "The technical studies are complete, but now we are waiting for the

bilateral agreement between Namibia and Angola that will govern the operation of the power plant," says Langford. This includes the structure of the venture, for instance a public private partnership, and a consumptive water use agreement for the upstream Kunene.

The next step, which is currently on the table, is to finalise environmental studies for the associated infrastructure, culminating in a strategic environmental assessment (SEA) of the whole project. "Apart from the dam and the dam wall, this includes access roads, airstrips, transmission lines and other structures," explains Langford. He adds that NamPower expects that the earliest the project will reach financial close is by the end of 2014, meaning all the contracts are signed and financing has been obtained for the US\$1.3 billion endeavour.

"These are the overnight costs, without any escalations or price increases," says Langford. "After that Baynes will take seven years to build," he adds, putting the expected completion date of the project in 2022.

Baynes is not necessarily the last hydropower scheme in the lower Kunene. In total the river can supply 2,000 MW divided over eight different sites, of which only Ruacana is developed and Baynes is on the cards. Elsewhere in Angola the potential is even larger, Langford reveals.



The Inga Falls in the Congo River near Matadi in the Democratic Republic of the Congo are said to be the most powerful waterfall in the world. Although only 96m high and with no measurement of its width currently available, the rapids boast the highest volume of water at an average of 1.5 million cubic feet per second. The falls are currently incorporated into the Inga I and Inga II hydroelectric facilities, but with most of the potential for hydropower generation still untapped.

On the Kwanza River the Angolans have completed the Kapaanda Hydropower Project that generates 500 MW of electricity. Two other sites on the Kwanza River, each having a capacity of 2,000 MW, are also under consideration.

Africa's hydropower is largely untapped and could be an answer to providing the continent with clean sustainable energy. The continent has the potential to generate 1,750 Terrawatt hours (Twh), but the installed capacity is only 7 per cent. In the Democratic Republic of Congo (DRC), for instance, the hydropower potential is a staggering 100,000 MW, but the installed capacity is less than 2,500 MW.

Much of this untapped potential is situated in the Western Congo where the Congo River drops 96 meters, providing an excellent site for hydropower generation. Two small hydropower dams (Inga I and Inga II) with a combined capacity of 1,175 MW were installed in the early 1980s, but an extension (Inga III) that could add as much as 4,500 MW to the southern African power supply at a cost of US\$800 million, has still not materialised. A full development of hydro power potential at Inga, also dubbed the Grand Inga project with 39,000 MW could generate enough power for sub-Saharan Africa. But the

price tag of US\$80 billion for a dam in a politically unstable region of Africa is a daunting prospect for investors.

Closer to home, the Zambia Electricity Supply Corporation (ZESCO) is adding 750 MW to its existing 990 MW Kafue Gorge hydro power scheme. The project is scheduled to be completed in 2017 and will add more capacity to the Southern African Power Pool (SAPP) that regulates the buying and selling of electricity between member states in the region.

The Zambezi River Authority (ZRA), a partnership between Zimbabwe and Zambia, is planning to build a hydropower facility in the Batoka Gorge, some 50 km downstream from Victoria Falls. The project is controversial, because it would obliterate one of the world's premier spots for white water rafting. However, if realised, the facility would generate 1,650 MW while adding a further 300 MW to the downstream Kariba hydropower station.

It is clear that the potential for hydro power in sub-Saharan Africa is huge, but at the same time, several high-profile projects have been on the cards for years, with investors being reluctant.

V Fischer-Buder CONSULTING ENGINEERS

COMPANY PROFILE

V Fischer-Buder Consulting Engineers (VFBCE) is a new firm founded in 2008 by its owner who has practiced as a consulting engineer in Namibia since 1987. The firm employs engineers and technicians with experience in the mechanical and electrical engineering disciplines.

We offer a one-stop service including feasibility studies, negotiations with authorities, planning, design, construction supervision and commissioning of electrical and mechanical projects, and planning and management of post-construction maintenance. Good project management skills and a strong commitment to integrated environmental management principles for all projects, irrespective of size and value, are important facets of our engineering capabilities.



ENGINEERING CAPABILITIES

The following engineering capabilities are offered by the firm:

Mechanical Services

The provision of the full consulting engineering service from pre-feasibility study stage to completion of the project including preliminary and detailed planning, design and contract administration, and planning and management of plant/system maintenance. Specific services covered are: air conditioning, industrial ventilation, industrial cold rooms and freezers, hospitals and laboratory installations, fire protection and other building services, water and waste water pumping stations, and installations for the petro-chemical industry.

Electrical Services

The provision of the full consulting service from pre-feasibility stage to project completion of medium voltage (66kV), overhead lines, substations, distribution stations and low voltage electrical supply infrastructure – both MV and LV systems, building electrical reticulation, building lighting, communication, security and data networking services. This includes surveys, preliminary and detailed design as well contract administration and project management.

STAFF

VFBCE has a staff compliment of twelve. This includes eight technical staff and four administrative staff members. The majority of staff members are Namibians, females and from previously disadvantaged background. The firm is headed by a registered professional engineer with experience in the mechanical and electrical services as detailed above. Technical staff includes a senior mechanical engineer with 30 years experience, a senior electrical engineer with 8 years experience, two electrical technicians and three mechanical technicians.

The firm has the policy of making a real effort towards addressing past imbalances by allowing previously disadvantaged individuals to benefit. In support of the firm's policy of complying with national affirmative action development plans, technical and administrative staff members are encouraged to pursue further formal training and education and are financially supported in this. The firm currently has two technicians-in training who receive practical on the job training.



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STRENGTHENING KAVANGO RIVER BRIDGE EIGHT-FOLD

Substantial increase in trade activities between Namibia and Zambia during the past decade necessitated the strengthening and widening of the Okavango River Bridge at Divundu from the original design load of one 60 tonne military tank to a super load of around 500 tonnes. The design load was subject to enough axles being used to distribute the load so as not to over-stress the new deck. The “one-tank-design” in terms of width literally meant only one crossing at a time, which had to be widened to accommodate two-way traffic.

The strengthening and widening of the Okavango River Bridge at Divundu posed several engineering challenges to the design and construction team.

The original 150m long three-span structure which was opened to traffic in 1978 was the first incrementally launched prestressed concrete bridge in Africa, and is still the only vehicle crossing point over this river for hundreds of kilometres. However, it was constructed for single lane traffic and in the past the restricted width and limited load carrying capacity necessitated the lengthy diversion of some abnormal loads through Botswana.

The widened structure can now accommodate two-way traffic in 3.4m lanes, and there are also 900mm wide pedestrian walkways on either side, separated from vehicle traffic by New Jersey-type concrete barriers.

Pedestrians are cautioned to walk on the right hand side, that is, facing oncoming traffic, in case of overhanging loads.

VKE Namibia Consulting Engineers were appointed by the Roads Authority to complete the investigation, design and tender process for the works contract, and also the updating of the contract documents which, together with the design, had been prepared, and shelved, in 1998 due to no funding being available for the bridge. The bridge work at the time was planned to be constructed as part of the road between Divundu and Mohembo at the Botswana border.



Above: Widening of the bridge was achieved by constructing cantilever panels anchored to the existing structure with dowels.

Right and far right: To strengthen the bridge, 105 wires were used in the bigger prestressing cables and tensioned to 283 tons, which is equal to about 140 two-ton light delivery vehicles hanging onto each cable.

Bottom right: The bridge seen from below, showing the overhang panels to widen it, making provision for two-way traffic and a pedestrian walkway.



The upgrading of the bridge required strengthening to carry heavier traffic loads as well as the additional dead loads of the widened deck. This was achieved by constructing an external prestressing system on the inside of the hollow box girder of the original structure.



A total of 105 wires were used in the bigger prestressing cables, which were anchored to the deck making use of reinforced concrete diaphragms stressed to the bottom and sides of the box girder. The cables were tensioned to 283 tons. For comparison, says Project Engineer Ben Boshoff, this is equal to 141 two-ton light delivery vehicles hanging onto each cable.

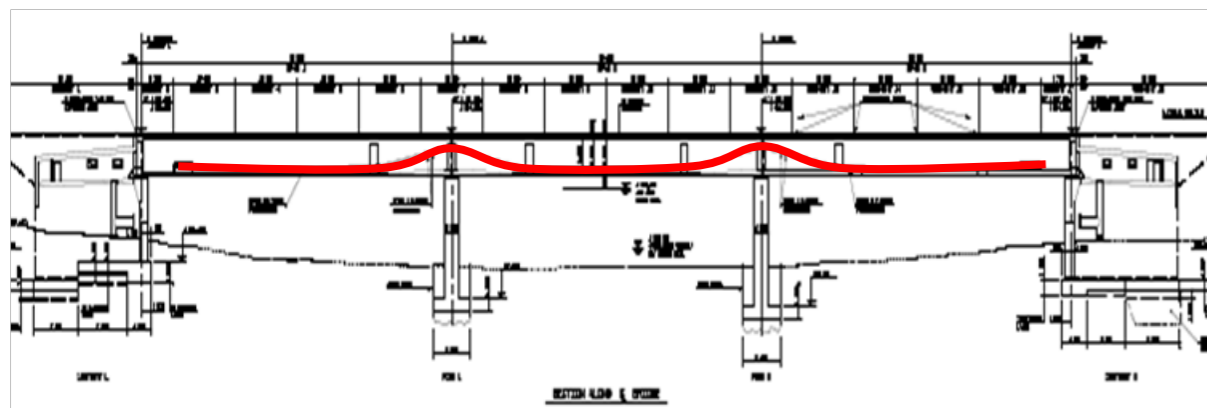


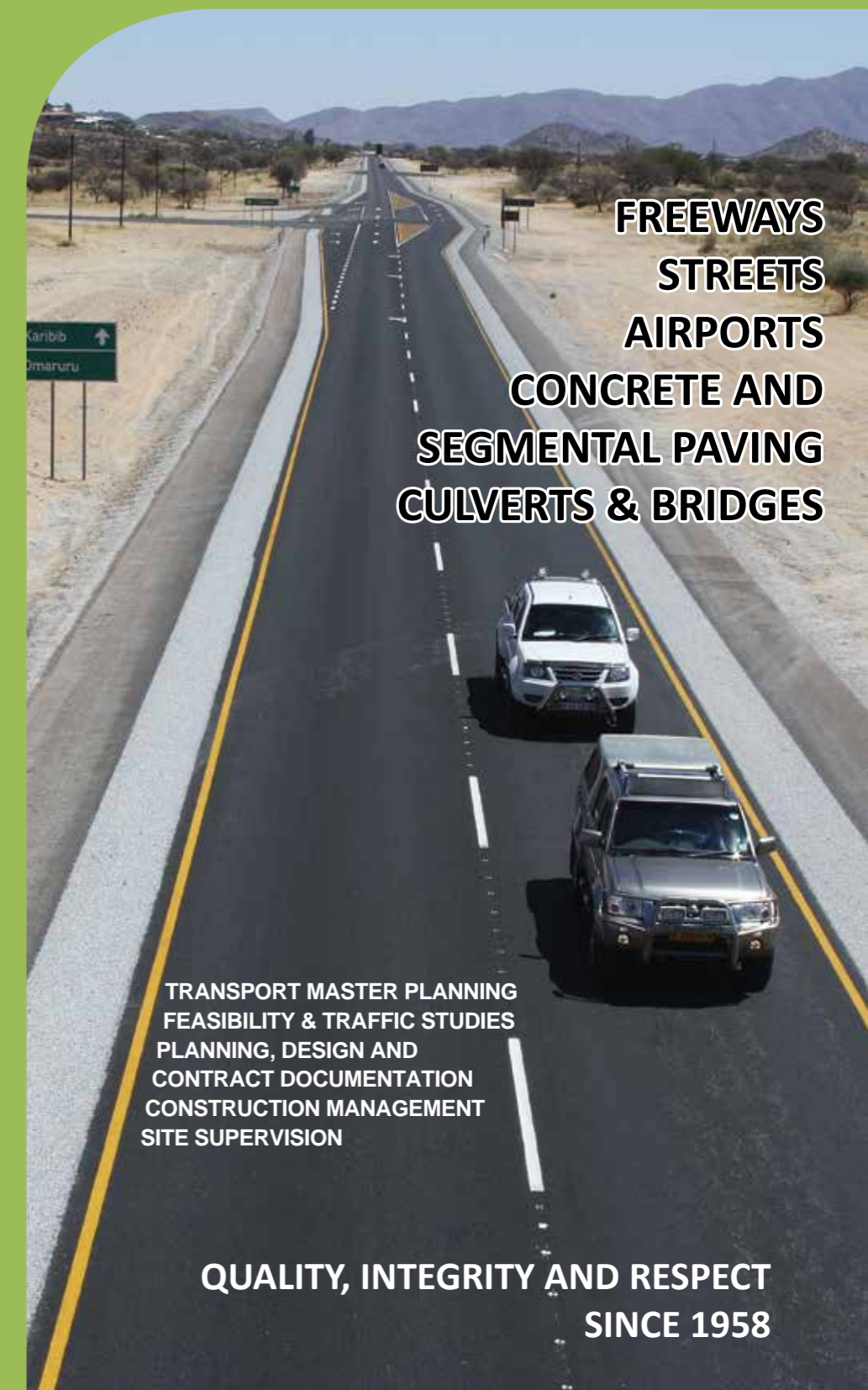
Diagram showing the position of the prestressing cable system inside the hollow box girder of the original structure.



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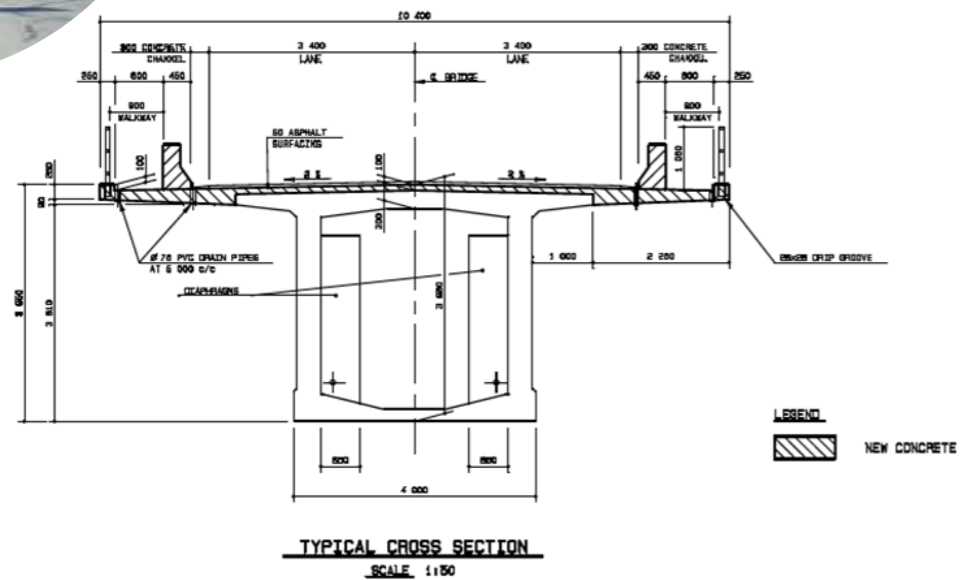
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Above and insert: The Okavango Bridge before and after completion of the widening and strengthening. Below: Diagram showing a cross section of the bridge.



The widening was achieved by constructing cantilever panels anchored to the existing structure with dowels. The original bridge bearings were replaced, new expansion joints were added and provision was made to accommodate future services such as Telecom cables

One technical difficulty that was encountered during construction was, that for military safety reasons, the original bridge bearings were sealed in concrete, and thus could not be accessed to assess the available space for jacks required in the bearing replacement process, and contingency methods had to be devised. Military

considerations in 1978 were a design priority, and even the bridge abutments were actually designed and built as bunkers, and on the inside had specially shaped gun ports that could accommodate the firing arc of a mounted heavy machine gun.

Another difficulty was the vertical alignment on the bridge deck. The existing deck spans had been sagging as a result of creep and span length. This had to be corrected to some extent, without increasing the dead weight of the bridge too much. Sagging during construction had to be allowed for as a result of the



The bridge could not be closed for traffic during construction, posing a constant challenge for the project team.



Above: The Okavango River Bridge at Divudu, widened and strengthened. Right: Minister of Works and Transport, Hon. Erkki Nghimtina at the inauguration of the upgraded Okavango River Bridge.

approximately 1,100 tonnes of reinforced concrete which were applied in 36 panels at thicknesses varying between 100 and 170 mm over the length of the bridge.

A constant change in stiffness of the deck resulted as new deck panels were added, also between the left and right side of the bridge. Inter-dependant sagging of newly cast panels was consequently difficult to predict, and to plan and allow for the necessary pre-cambering of cantilever shutters over the length of the bridge. Nevertheless, the final aesthetics and riding quality are considered a major improvement to the old structure.

The completed strengthening and widening means that the bridge, and by extension the whole Trans Caprivi Highway which serves land-locked countries like Zambia and Malawi, can now carry NA, NB-36 and NC-30x5x40 traffic loading.

The construction work was successfully carried out by Botes and Kennedy Civils (Namibia) under guidance of the Contracts Manager Andrew Ibbotson, for the tender amount of N\$19.093 million between October 2010 and April 2012.

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KNIGHT PIÉSOLD CONSULTING

Knight Piésold Consulting is a consulting civil engineering company forming part of the International Knight Piésold group, which was established in 1921 and now operates in more than 15 countries across the globe. As a specialised international company, Knight Piésold offers comprehensive consulting engineering, environmental and project management services to the Mining, Water, Sanitation, Structural, Power and Transportation Sectors. It is complemented by extensive geotechnical, hydrogeological and GIS expertise.

The Namibian arm of Knight Piésold Consulting was established in 2008 and has offices in Windhoek (Head Office), Ondangwa (Branch Office) and Ongwediva (Site Office).

KNIGHT PIÉSOLD CONSULTING SERVICES:

Knight Piésold undertakes all stages of project development, including:

- Project identification and concept development
- Engineering pre-feasibility and feasibility studies
- Project planning, scheduling and cost estimating
- Environmental and social baseline studies
- Social environmental impact assessments
- Geotechnical and hydrogeological investigations
- Detailed engineering designs and specifications
- Tender documentation and evaluation
- Contract administration and site supervision
- Quality control, quality assurance and inspections
- Project management

KNIGHT PIÉSOLD CONSULTING AREAS OF EXPERTISE:

- Dam and River Engineering
- Water Supply and Sanitation
- Transportation Engineering
- Road Rehabilitation
- Stormwater Management
- Structural Engineering
- Mining Waste Management
- Heap Leach Pad Design
- Mine Closure and Reclamation
- Geotechnical Engineering
- Environmental Services
- Hydrogeology
- Geographic Information Systems



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IWA BRINGS THE WORLD'S WATER REUSE EXPERTS TO WINDHOEK

October 2013 will see Windhoek host the 9th International Conference on Water Reuse. This biannual gathering will not only bring together the world's leading experts on the sustainable use of water, but also celebrate Namibia's pioneering role in concepts as water recycling, artificial recharge and other innovative ways of water reuse.

Organised by the International Water Association (IWA) based in The Hague in The Netherlands and the City of Windhoek the conference will gather 400 water reuse specialists from all over the globe to talk about the latest developments in reuse and visit Windhoek's world famous reclamation plant.

The conference will focus on a variety of topics such as reuse in water resource management, the role of energy in water affairs and the impact of climate change. Scientists will also debate issues of finance, regulation and governance of reuse, as well focus on questions of the viability of groundwater replenishment and desalination. The use of bulk schemes for industry and mining is a topic on the agenda and the conference will take a look at new technologies and share information on hitherto unknown pollutants that can threaten the water supply.

That Namibia is a bright star on the reuse firmament, was confirmed at the last gathering in Barcelona in 2011, where Windhoek won a bid to host the conference against the metropolis of Denver, Colorado.

Conference chairperson Piet du Pisani (top) and Secretary to the Organising Committee, Jürgen Menge (above)

One of the big attractions is Windhoek's reclamation plant which is the oldest and still one of the few in the world. "Back in 1969 when the city fathers commissioned a plant that reclaimed potable water from sewage effluent, it was anticipated that this would become the standard way of providing safe and clean water to a growing world populations," says conference organiser Jürgen Menge.

But while there are other places such as Beaufort West in South Africa that reclaim water, this usually happens in an indirect way through a dam, lake, river or barrier unlike in Windhoek where the effluent comes directly from the sewage works. In Windhoek on the other hand the water system is closed and four days after entering the sewage plant the water is in the drinking system. The quantities are also incomparable. Menge: "A wellknown example of water reclamation is the Changi plant in Singapore. However, this plant only delivers 1.9 per cent of the total drinking water supply mix. In Windhoek this is 25 percent and can be stretched to over 30 percent if the need arises."

There are different explanations for why reclamation has so far not conquered the world by storm, explains Menge. "In the Middle East, which is at least as water stressed as Namibia, religious motivations play a role, in other places the need is simply not high enough to embark on this controversial and costly method.

Prejudice also plays a role. Some of the water in Windhoek has passed the body already seventeen times. In other parts of the world this conjures up images of water borne diseases, when in fact Windhoek's water



is of superior quality and a lot better than the water coming out of 'normal' treatment plants in many parts or the world.

"People are uninformed and scared for the wrong reasons," clarifies Menge. "Picture the Ganges in India where thousands of people are washing themselves, doing laundry and so on in heavily polluted water, but that is accepted as normal."

Water experts call this resistance the 'yuk-factor', the idea firmly lodged in people's mind that recycled is unsafe and "yucky". And unfortunately if the consumer doesn't want to use it, investing in recycled water is pointless. "We have gone a long way in Windhoek to ensure our people that we do care and we do everything possible to ensure that the water is safe. There are a lot of safety mechanisms that have been built in," comments Menge.

While popular and damaging myths that water can transfer diseases like HIV are utterly flawed, around the world more and more chemicals enter the water supply cycle. Some of these affect the body's hormones, while other pollutants such as metals can mimic actions of hormones in the body. Such over-reagents trigger reaction in the body. Around the world there are examples of fish and even crocodiles who change sex living in polluted water. There are also examples of areas where the sperm count of men has gone down as a result of polluted water.

Menge: "The City of Windhoek has a rigorous and very expensive testing programme running that operates independently from the consortium that operates the reclamation plant. And we send samples to laboratories that can test for the presence of minute, smaller than nanograms, quantities of pollutants. We constantly improve the analysis and up till now our treatment processes have been adequate and up to global standards."

But in recent years interest in reuse of water has been rekindled, says Menge. "It is now again advocated as the solution for water stressed areas. Cities worldwide are bankrupt. They simply cannot afford to put in place new, expensive infrastructure or do maintenance. One of the big advantages of water reuse is that your potable supply network is already in place. Hence the interest in Windhoek, the experts want to come and see with their own eyes if we are really doing what we say we are doing and how much difference it actually makes for the end-result; clean drinking water."

Around the world the City of Windhoek is invited to be part of processes that rethink use and regulations of water.

"There is a lot of regulation around water and some of it has no scientific basis. In Australia for instance there is a rule that water should have been in an aquifer for at least 90 days, but under pressure to find new solutions, Australia is revisiting a lot of these barriers caused by environmental regulations, the City of Windhoek is approached to be part of that. This gives us an injection of new knowledge and when you are involved in such a process it easier to benchmark your own systems."

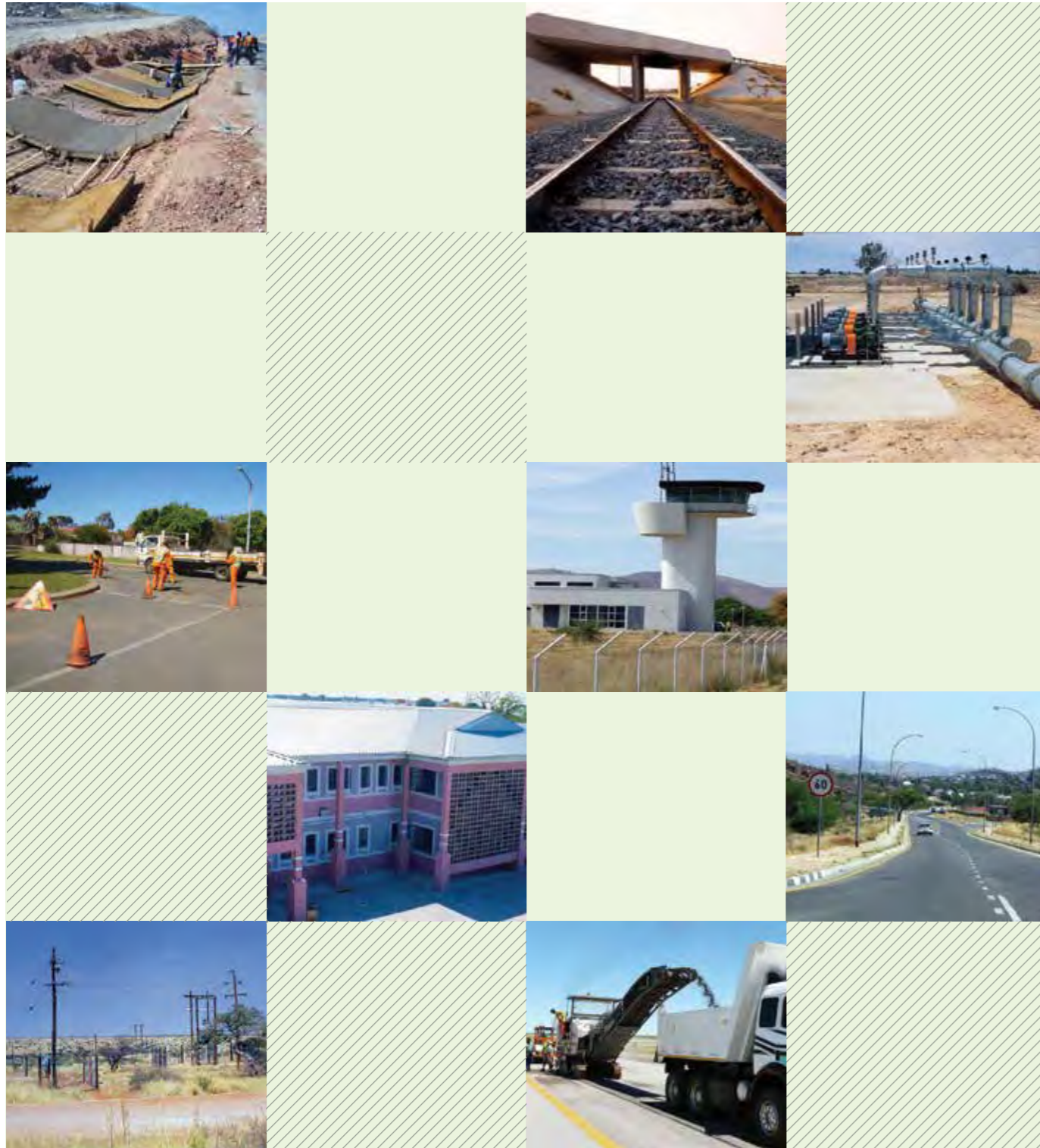
"For a long time Windhoek was disregarded, because the perception was that we give sewage effluent to our poor, now the realisation has dawned that we are actually on the frontier of water reuse," says Menge.

"The conference also comes at a time when the generation of engineers that built the original water reclamation plant is starting to pass on. With this conference we want to honour them and give them recognition for their pioneering work. It is like one of water pioneers Lucas van Vuuren said: 'Judge water by its quality and not by its history'".



Aurecon - engineering your success

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Aurecon provides engineering, management and specialist technical services for public and private sector clients globally. With an office network extending across 25 countries, Aurecon has been involved in projects in over 80 countries across Africa, Asia Pacific, the Middle East and the Americas and employs around 7 500 people throughout 11 industry groups. We seek to foster human achievement in all aspects of our work.

Aurecon in Namibia

Aurecon, with offices in Windhoek and Ongwediva, has been active in Namibia since 1978. Since then, Aurecon has accumulated much local experience in all branches of civil and structural engineering as a result of completing numerous projects of varying complexity and economic scales. We are fully conversant with the geo-technical, climatic and sociological conditions prevalent throughout the entire country and have conducted work for all major Namibian state, parastatal and municipal bodies.

Noteworthy projects include the rehabilitation of Hosea Kutaku International Airport and a pre-feasibility study for the export of coal from the Mmamabula coal fields to a port in Namibia by means of a Trans-Kalahari Railway. The group also has engineering materials laboratories situated in both Windhoek and in Ongwediva which provide commercial and site laboratory testing services for engineering and infrastructure-related developments. In addition, the laboratories offer a dedicated surveillance unit specialising in the collection of road management system data, video and GPS logging, as well as the supply of laboratory equipment for hire or purchase.



Engineering project success

We understand success means different things to different clients and to different communities. Our business model focuses on establishing our client's definition of success and tailoring the best Aurecon team across industries, expertise and geographies to engineer that success. This approach ensures clients receive market-leading customised solutions that deliver business advantage. We are focused on adding significant value to our clients' businesses and ensuring reliable, effective project delivery. With a global presence and an unrivalled breadth of technical expertise, our client-centric approach means our business is structured to support agile, rapid response to client needs and to deliver consistent, high quality outcomes.



Market involvement

Markets in which we provide our comprehensive range of services and solutions include:

- Construction
- Data & Telecommunications
- Defence
- Energy
- Government
- International Development Assistance
- Manufacturing
- Property
- Resources
- Transport
- Water



What Aurecon values

Aurecon is committed to upholding excellence in the following areas:

Innovation

Innovation is a core value for Aurecon and is integral to the way we do business. We provide added value at every stage of the project cycle by finding novel solutions to our clients' most pressing challenges. To help clients respond effectively to business opportunity and risk, our world-class teams apply expertise from more than 70 specialist service lines to create innovative and leading solutions.

Health and Safety

We understand that fostering a robust and responsive Health and Safety culture is a critical part of our obligation to our employees, our clients and the communities in which we operate. Our strong culture of Health and Safety is underpinned by a detailed, targeted and responsive safety governance framework and management system.

Quality

Aurecon is governed by a comprehensive management system, which includes sub-systems for health and safety, environment, quality management and laboratory quality management. This quality management system is applicable to all of Aurecon's activities in the concept, feasibility and planning phases, as well as the design, construction, operation and maintenance phases of each project.

Sustainability

Aurecon is committed to the principles of sustainable development – meeting the needs of the present without compromising the ability of future generations to meet their own needs. We have embedded sustainability as an integral part of Aurecon's culture, skills and deliverables.

Building a better world for all

Aurecon's values form the foundation of our commitment to our client relationships, our promise to our people, and the contribution we make to the communities in which we live and work. We aim to set the benchmark in engineering, management and specialist technical services which benefit communities and make a significant contribution throughout the developed and developing world.

We look forward to partnering with you on your next project.

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BANKING WATER FOR WINDHOEK'S SURVIVAL

The indigenous San people stored water in ostrich eggs for a sure-to-come dry season. In recent years, City of Windhoek's water engineering team have come up with an ingenious plan to do something similar: recharging the Windhoek aquifer — thus, in fact, “bank” water for the city's survival.

The first settlers inhabited Windhoek because of its hot springs that provided an abundance of water, but as Windhoek's population grew in numbers, its groundwater supplies dried up because of over extraction. Water stress in the driest capital south of the Sahara can be sudden and imminent.

Recurring drought, combined with supply constraints from the dams north of Windhoek, saw the City engineers scratching their heads on how to provide water for the city's growing population.

“Currently, after a series of extraordinary rainy seasons, we had excess water, but although we had the water, the supply system was inadequate to take full advantage of the excess water,” explains City of Windhoek head of water infrastructure Piet du Pisani. The current drought situation after a poor 2012/2013 rainy season has taken away the opportunity to meaningfully recharge the aquifer until at least after the next rainy season. N\$300

million additional investment is needed to complete the infrastructure required to store and abstract water from the aquifer. Once in place water supply to the City could be managed from the aquifer for drought periods of two to three years.

This makes Windhoek's aquifer that lies at the foothills of the Auas Mountains a vital lifeline for a city that needs 25 million kilolitres (Mm³) of potable water per annum to supply in the demand of our customers. This equals up to 300 litres per person per day. The dams that currently supply the majority of the water (see factbox) have evaporation rates of 3.4 metre per year and could completely dry up within two years of severe drought without inflow and correct management.

Faced with this scenario, the city engineers in the late nineties started mulling the idea of artificial recharge of the aquifer through the existing borehole infrastructure. In years of good rains, excess water from the three dams supplying Windhoek would be pumped into the aquifer.

Once fully recharged, the aquifer could in emergency situations supply in the water demand of the City for periods up to two years, by over utilising the aquifer, with the proviso that it again be artificially recharged as soon as the dams have excess water again.

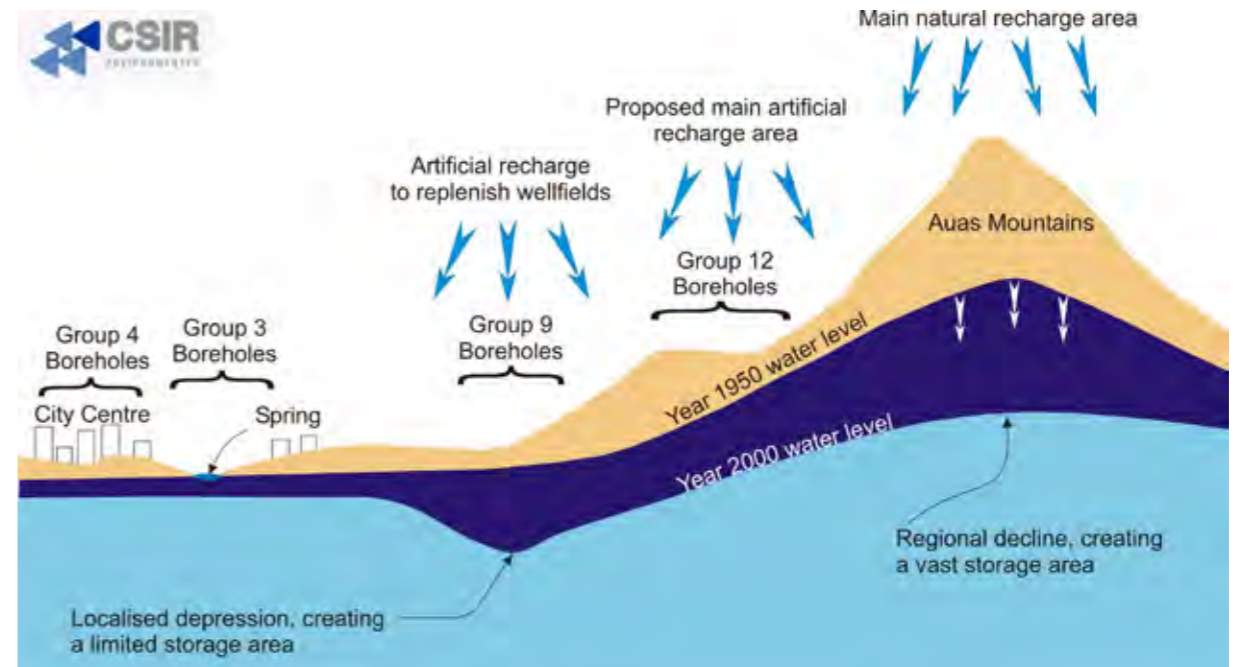
This project is unique and another feather in the cap of Windhoek's innovative water management team.

The project of recharging into a fractured hard rock aquifer is fairly unique and another feather in the cap of Windhoek's innovative water management (see also article on water re-use). The practice of banking water underground actually dates back to prehistoric times when the San people conserved water in ostrich eggs buried in the sand to see them through a dry season.

According to estimates by engineers, Namibia loses up to 25 million m³ of water through dam evaporation every year, of which 8 million m³ could be saved through artificial borehole recharge.

The Windhoek Managed Aquifer Recharge Scheme (WMARS) started in 1998 when, over a period of about eight months, 60 m³/hour was injected in Borehole 9/8a, reveals Ben van der Merwe of engineering firm ENVES and erstwhile City Water Engineer.

“In various studies since 2000, managed aquifer recharge was identified as the best supply augmentation option for water supply until 2020.



The drawing illustrates the aquifer recharge potential. An estimated 66 million m³ storage reservoir is provided by nature due to the difference in water levels of 1950 and 2000 underneath the Auas Mountains. This vast storage area provides the ideal opportunity to replenish Windhoek's underground water table. (Display by Dr Ricky Murray, CSIR)

“During 2004, the drilling of deep boreholes to increase the yield from the underground storage from about 33 Mm³ to 66 Mm³ was selected as the best option for implementation. This underground aquifer is approximately 37 per cent larger than the Von Bach Dam with very little losses, estimated to be in the order of 3 per cent per annum. The annual evaporation in the three dams — the Swakoppoort Dam, Von Bach Dam and Omatako Dam — is on average much higher than the annual abstraction for water usage in the central area of Namibia,” explains Van der Merwe.

The safe yield of the Windhoek aquifer is about 1.73 Mm³ per annum compared to the installed borehole capacity of 5.5 Mm³ per annum. With the implementation of the WMARS, the abstraction capacity will increase to more than 20 Mm³ per annum with total recharge or injection capacity of about 11 Mm³ per annum.

According to Van der Merwe, the surplus water injected into the aquifer for storage is blended water at a ratio of three parts treated surface water from Von Bach Dam with one part reclaimed water from the reclamation plant. The reason behind injecting relatively expensive treated water into the aquifer is to prevent pollution of the water bank, which would render it unusable. This

is for instance the case in the Zambian capital Lusaka, which is situated on vast reserves of water that cannot be used because it is polluted.

As a further measure, a special water conservation zone has been established. A yellow line appears on urban planning maps, south of which no development is allowed in order to not jeopardise the aquifer. This means that about 10,000 plots cannot be developed, constituting a potential N\$2-3 billion loss for the city, or an investment in clean water, depending on how one looks at it.

Then there is the cost of boreholes and overhaul of pipelines. The city has 64 production boreholes, of which ten large diameter deep holes were recently drilled, says Du Pisani. “The water level in the boreholes is on average between 70 and 90 metres deep, but the deepest borehole reaches a depth of 473 metre.”

The drilling operation is not an easy one from an engineering perspective, explains Du Pisani. “Banking water in a hard rock aquifer is much more complicated than in a sand aquifer. In the Windhoek case, a geological structure acts as a dam wall that prevents water from leaving the aquifer.



PROJECT MANAGEMENT, CIVIL, STRUCTURAL, WATER, MECHANICAL & ELECTRICAL ENGINEERING



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The drilling in major fault zones with a lot of broken rock brings with it the risk of collapse and the vast quantities of water in these systems makes drilling operations very difficult and costly.

Du Pisani: "Thus, we cannot make use of the normal percussion drilling, because it doesn't work in this environment. That makes the engineering of the scheme tough and requires specialised drilling techniques." An additional challenge is that production boreholes cannot easily be used for recharge. "Instead we have separate injection wells that are not as big and deep as the production boreholes," says Du Pisani.

Initially some injection boreholes made use of uniquely designed recharge valves, developed by local water engineering supplier, Elwiwa, that offered an affordable alternative to imported valves which come at a cost of N\$600,000 each. Recharge stations are equipped with additional water treatment facilities of carbon filtration and chlorination before it is injected into the borehole.

"On completion, water will be injected into about 30 boreholes, explains Van der Merwe. "This will increase the security of supply significantly and reduce the magnitude of the shortfalls that might be encountered during drought situations. The injection volume into say two boreholes for one year is more than the average natural recharge of the aquifer."

The scheme will make use of nine pump stations to operate the boreholes. As these pumps rely on electricity, security of power supply is at least as important as the water itself. The engineer adds that one of the benefits is that the project can be developed in phases according to supply and demand. Furthermore, the City is not developing a completely new resource, but making efficiency improvement of an existing source.

"This also means that the size of future remote augmentation schemes can be downsized significantly. For instance, the planned Okavango River abstraction can be downsized from 15 million m³ per annum



Loading of Granular Activated Carbon through the roof into a carbon filter inside the building.



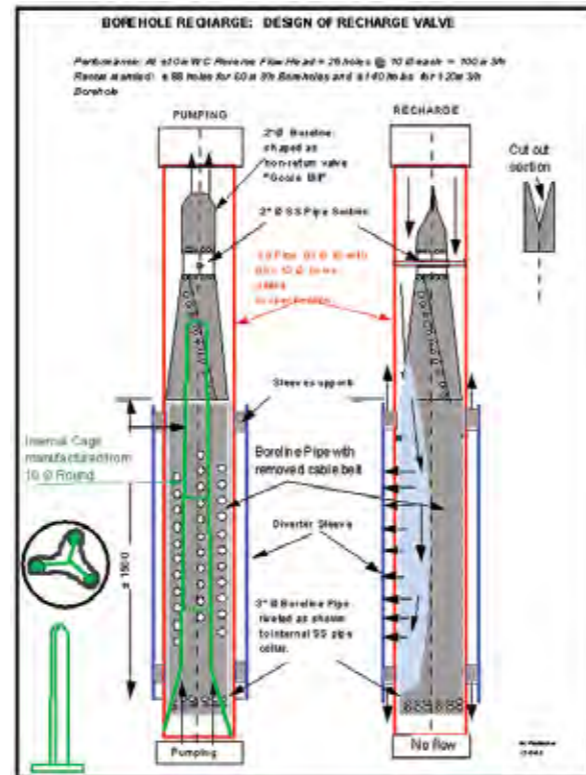
Above: View of part of treatment plant. Carbon filter on the left side and Contact tank on right side.
 Left: Installation of submersible pump with the recharge valve on top.

to 2 million m³ per annum. An additional benefit is that expensive water infrastructure investments and upgrades can be postponed or cancelled altogether.”

What is more, the recharge promotes efficiency because even relatively small savings of water through demand management will free up water for recharge of the aquifer, which has minimal environmental impacts compared to the other alternatives.

After an investment of N\$57 million in the project up to date, a further N\$240 million is required to complete the project. However, once done and the capital expenses have been repaid, the remaining costs are merely operational, while water that otherwise would have evaporated in the dams, can be sold commercially. ■

Locally designed and manufactured recharge valve. The valve automatically diverts the flow from recharge mode to pumping mode.



Windhoek's water supply through the decades

“Groundwater remained the sole source of water for Windhoek until 1933 when the Avis Dam, with a capacity of 2.4 Mm³, was constructed,” says Ben van der Merwe of engineering firm ENVES.

“The Goreangab Dam (3.6 Mm³) in a river near the City of Windhoek was completed in 1959, but the 95 per cent assured safe yield of the dam is only 1.1 Mm³ per annum.” Currently the dam is not being used for water supply due to pollution and the recovery costs are not economically viable.

“In 1968 the Goreangab Water Reclamation plant was built to reclaim water directly from domestic sewage effluent. The process was improved and the plant extended at various occasions over the past 30 years to a capacity of 2.9 Mm³ per annum. The new Goreangab Water Reclamation Plant (NGWRP) was completed in September 2002 with a capacity 7.6 Mm³ per annum. It supplies up to one third of the City's water,” says Van der Merwe.

After various extensions to the well field there are now about 60 municipal production boreholes in Windhoek area with a combined safe yield of 1.73 Mm³ per annum, which equals the one per cent of rainfall that trickles down to the aquifer. Except from some augmentation from the Avis Dam, Windhoek relied almost solely on groundwater until 1960.

In 1969 the Government started to create bulk infrastructure in ephemeral rivers further from Windhoek to provide water to the city. The Von Bach Dam (48.6 Mm³) was added in 1970, the Swakoppoort Dam (63.5 Mm³) was completed in 1977, while the Omatako Dam (43.5 Mm³) was completed in 1982. The distances from these three dams to Windhoek are 70, 100 and 200 km respectively. The safe yield, based on 95 per cent assurance of supply of the three dams is approximately 20 Mm³. Of this volume, about 17 Mm³ is available for supply to Windhoek as the largest consumer.

Aquifer Recharge: Project consultants

**Engineers on the Project:
Lothar Redecker and Elton Heyman**

Seelenbinder Consulting Engineers cc is a completely Namibian owned multi-disciplinary consulting engineering firm based in Windhoek. With company roots dating back to 1968 and a current staff compliment of 42, this firm with its vast knowledge and extensive experience is specifically structured to undertake projects of any scale but yet remains small enough for its members to maintain “hands-on” involvement in all projects. SCE's specific responsibilities in this project include:

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CITY OF WINDHOEK

Department of Infrastructure, Water and Technical Services
THE WATER TEAM



our work



Construction of Ujams Wastewater Reclamation Plant commences



Managed aquifer recharge station



Balancing reservoir

City of Windhoek: Department Infrastructure, Water and Technical Services

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SERVICING THE WATER INDUSTRY – SINCE 1913

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A century of knowledge in rural, domestic and government water supply, is one of Elwiwa's most valuable assets in the water industry.

Elwiwa's involvement in water industry projects has taken them to all corners of Southern Africa. Angola, Botswana, South Africa, Zambia, Zimbabwe and Namibia. From mine dewatering, river pump stations in the Kavango and Caprivi, government water schemes along the Kongo river to water storage and supply in the Northern sector of Namibia.

In Botswana the trek route was equipped with boreholes from Ghanzi to Lobatze and alternative water supply stations were erected and powered by wind and sun energy.

Elwiwa supplied and maintained the dewatering equipment for Phase 1 of the Coega Harbour project in Port Elizabeth, South Africa. In Zambia and DRC, Open Pit dewatering was designed and constructed for high profile mining organisations.

A turn-key project for the company was the planning, designing and installation of Berg Aukas Mine dewatering station, which Elwiwa equipped with four submersible deep well pumps (465kW 6.6kV of 100 l/s at 310 mwh).

All of the companies products, components/elements are driven by either electric-, diesel-, photo voltaic or wind- energy.

Elwiwa is proud to put it's name and reputation to the test, by taking on strategic projects in the water industry.

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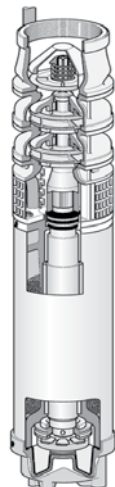
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NEW WATER REUSE FACILITY ON THE CARDS

Windhoek will soon replace its outdated Ujams Wastewater Treatment Plant. A high-tech wastewater facility in Ujams will treat biologically and chemically polluted water from the Northern Industrial area and turn it into water fit to be used for irrigation and industrial reuse.

Ujams Wastewater Reclamation Plant is a "Build-Own-Operate-Transfer" (BOOT) type project between Ujams Waste Water Treatment Company (UWTC), a consortium related to the company currently operating the Goreangab reclamation plant, and the City of Windhoek.

"The plant will be developed at a cost of around N\$100 million," says John Esterhuizen, General Manager of UWTC, and will be constructed between March 2013 and October 2014.

"The plant will be able to treat the same amount of wastewater than the old Goreangab reclamation plant,

which can currently treat 5 million litres per day for general irrigation. This treated water will not be for households, but for irrigation and industrial use. This is due the raw wastewater source which is polluted water from the northern industrial area in Windhoek. The Ujams plant will be a high tech water treatment facility making use of membrane bio-reactor technology," says Esterhuizen.

With the contracts signed and the loans in place, the civil engineering work commenced in March 2013. The plant will be owned and operated for a period of 21 years by the UWTC consortium. Ujams will be the third reclamation plant in Windhoek, alongside the old

and the new Goreangab reclamation plants. The practice of water reuse is one of the prime reasons Namibia is gearing up to host this year's International Water Association's (IWA) conference on water reuse. IWA, a network of water experts spanning 10,000 individuals and 400 companies in 130 countries, has chosen Windhoek as the site for its prestigious biannual symposium, because of 'its outstanding achievements in wastewater treatment and recycling'.

Before the rest of the world ever heard of water reclamation, the Windhoek City fathers, back in 1968, built the world's first water plant that turned treated domestic sewage effluent into drinking water. Ten years ago the outdated Goreangab plant was replaced with a brand new state-of-the-art water treatment facility that delivers up to 21,000 m³ of potable water a day from treated domestic effluent and is a model for water reuse around the world. Necessitated by the dry climate – Windhoek receives about 370 mm of rainfall annually – and faced with drying up natural springs and boreholes, the inhabitants of the growing city were forced to come up with a solution or perish,



said Windhoek's then mayor Elaine Trepper at a press conference in July 2012 where the IWA conference was announced.

"Windhoek's water reclamation plant became the pioneer in direct potable reuse water from treated sewage effluent and until recently, remained the only commercial direct potable reclamation plant in the world. Reclamation is, however, gaining ground worldwide," she stated.

The plant, owned by the City of Windhoek, is operated by a consortium consisting of French firm Veolia, German Berlin Wasser and Austrian VA Tech Wabag. The involvement of global players demonstrates how producing water has increasingly become big business.

"The world is growing at a rate of almost one million people per week," IWA's chief executive officer Paul Reiter added. "With this explosion of especially urban populations, growing demand and climate change, water resources will be completely taxed. We have to use traditional water sources way more efficiently and make the re-use of water a standard practice. Luckily with the population growth, we are also witnessing an explosion of technology that makes reclamation possible and we see a dramatic increase of water re-use

worldwide and we are creating markets for this 'new' water."

According to Reiter, the world will see revolution in the re-use of wastewater in the next three decades until the method becomes standard practice. Through an impressive eight step process (see factbox below) sewage effluent is cleaned and treated until it becomes potable water.

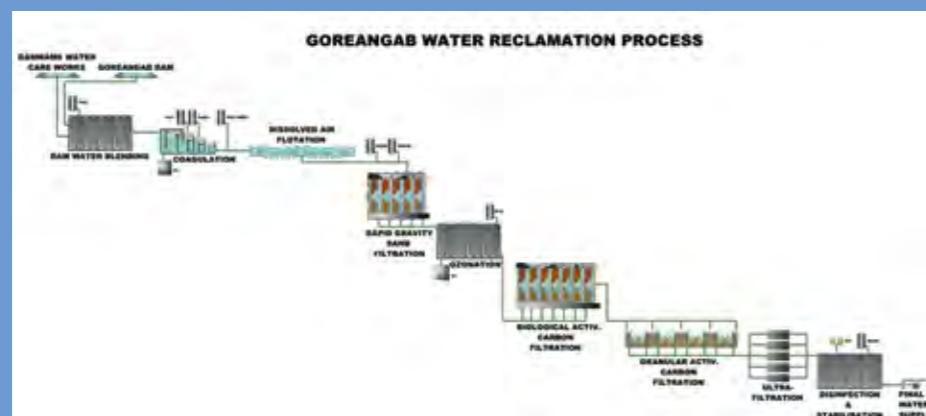
"This is mixed with treated surface water from NamWater and directly fed into the city's domestic drinking water system," explains Esterhuizen.

The facility can produce up to a third of Windhoek's daily demand of 68,000 m³.

"This is the daily demand for over 300,000 people, which works out at over 200 litres per person per day on average, which is quite a lot for a dry country, but the demand is lopsided. There are residents that have a first world view of using water, attempting to keep lush gardens compared to extreme poverty users who uses 10 times less water. Almost 50 per cent of the water goes to consumptive use and remainder becomes effluent," concludes Esterhuizen. ■

Direct Water Reclamation

Successful direct reclamation as practiced in Windhoek is based on the practice of diverting industrial and other potentially toxic waste water from the main domestic waste water stream. The domestic waste water is treated to produce an effluent of adequate and consistent quality which is further treated to produce safe potable water. In addition, it is important to continuously maintain a multiple-barrier treatment sequence as a safeguard against pathogens and other potentially harmful and unwanted contaminants. Intensive bio-monitoring programs and other tests are carried out on reclaimed water, and no negative health effects have been detected as a result of the use of reclaimed water since 1968. In order to ensure successful direct reclamation, the multiple-barrier approach ensures that at least two (in many cases three and more) effective removal processes are in place for each crucial contaminant that could be harmful to human health or aesthetically objectionable.



The Windhoek Goreangab Operating Company

Namibia is the most arid country in Southern Africa. Windhoek, the capital of Namibia, has an average annual rainfall of around 370mm, while the average evaporation rate is 3,400mm. The nearest perennial river, the Okavango, is 700km from the city on the north-eastern border of the country. Windhoek is therefore continuously facing serious water challenges.

In 1968 the Goreangab Water Reclamation plant was built to reclaim water directly from treated domestic sewage effluent. Over 30 years, the treatment process was improved and the plant capacity extended to 2.9 Mm³ per annum up to 1996. Due to the fact that all naturally available water sources in around Windhoek have been developed, the New Goreangab Reclamation Plant was completed in 2002 and comprises the latest available proven water treatment technology. This was done in order to ensure that the total utilisation of available effluent from treated domestic wastewater to ensure the security of water supply for the City. The new plant has been designed on the extensive experience (30 years), research and on input from international experts to assure the compliance to the strictest water quality guidelines applied internationally.

The City entered into an Operation and Maintenance contract with WINGOC for a 20 year period. WINGOC was chosen as its shareholders and are well known internationally for water and wastewater treatment. The contract between WINGOC and the City is a performance based agreement. Further to the performance agreement is a cooperation agreement which focuses on research, development and training of City employees in water related subjects at the shareholders directed institutions to build local engineering/scientific capacity.

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CONFERENCE ON HYDROPOWER IN AFRICA

Hydropower development in Africa is a key topic that was recently discussed in detail at the Water Storage and Hydropower Development for Africa conference held at the Africa Union Congress Centre in Addis Ababa, Ethiopia in April 2013.

This conference is considered as the most important and international event of the year for the African region. The conference was attended by approximately 610 delegates from 66 different countries of which 30 are African states. Delegates from other countries come from all parts of Asia, Europe, the Americas and Australasia.

The African Union declared the conference a contribution to the Programme for Infrastructure Development in Africa (PIDA) initiative. PIDA is mainly based on nine large-scale hydropower schemes, which could represent a total investment of more than US\$40 billion and the initiative is providing a major boost to some important regional projects.

The conference was co-organised by Aqua~Media International with the International Commission on Large Dams (ICOLD) and the Ethiopian national power utility EEPCo, under the auspices of the African Union, and with the patronage of Ethiopia's Minister of Water and Energy, H.E. Iemayehu Tegenu. Other supporting organisations

making a major contribution to the programme include UNECA, the International Energy Agency (IEA) and the European Small Hydropower Association (ESHA).

The programme focussed on all aspects of water storage and hydropower development of special relevance to the African region. The event was co-hosted by Hydropower and Dams, by the International Commission on Large Dams, and by the Ethiopian Electric Power Corporation.

During the three days of presentations and discussion, the world's most eminent experts in dam safety; flood discharge works; climate change; Roller Compacted Concrete (RCC) technology; sedimentation management; project finance; risk management; hydropower machinery; small hydro; hydraulic research; environment and, capacity building. Dam and energy specialists from The World Bank, African Development Bank, European Investment Bank and others will lead discussions and panels on financial and economic issues. A total of 136 papers were presented. Many of these were presented concurrently during three parallel sessions. A pre-conference workshop on Dam Safety was also presented. The conference was held at a key time for African hydropower development. World experts on the most important aspects of implementing and operating water infrastructure were present, working to contribute to the PIDA initiative.

For many of those countries embarking on the construction of major water resources schemes, it will be useful to exchange experience with the experts attending from countries such as China, Brazil, Russia and others, who have experience of comparable large-scale schemes in other parts of the world.

This article was compiled from information extracted from correspondence with the organisers prior to the conference. Anyone interested to get electronic copies of the 136 papers presented, please enquire at the EPA offices in Windhoek. This also includes the presentations at the pre-conference dam safety workshop, as well as the attendance list of all delegates.



Top and above: Delegates to the conference on hydropower, recently held in Addis Ababa, Ethiopia.

SECURING THE CAPITAL'S WATER SUPPLY

As Windhoek grows, the water demand rises. Clean drinking water is provided from the reclamation plant in Goreangab and the aquifer beneath the city, but most of the water still reaches the capital through a single 70 kilometer pipeline between Windhoek and Von Bach Dam. The artery is due for an upgrade.

The first phase of the project is an upgrade of the pump stations, followed in perhaps five years by replacing the pipeline itself.

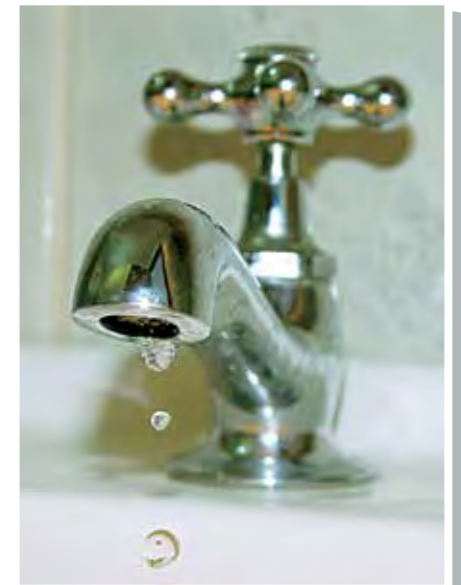
"The reason behind the upgrade is that the existing pump stations have limited capacity," explains project engineer Elton Heyman who is an associate mechanical engineer at Seelenbinder Consulting Engineers. "The new pump stations will be able to follow a more flexible pumping system with a higher transfer capacity from Von Bach Dam."

The new pump stations, three in total, will double the capacity of the existing scheme from 2,700 m³ per hour to 5,400 m³. "The capacity of the pump stations will actually be 7,200 m³ per hour, but the limiting factor is the pipeline," comments Heyman who foresees that an upgrade of the pipeline is only on the cards four or five years from now.

Meanwhile the current capacity of 2,700 m³ per hour is well below the future demand of the growing city of Windhoek. "That is why new pump stations were necessary," clarifies Heyman. "We looked at upgrading the existing system, but then we would have to get the exact pump sets and motors that were installed thirty years ago and it still wouldn't bring us much further in terms of capacity. Besides, getting spare parts is an enormous problem."

The novelty of the new is that the pumps and motors are driven by variable speeds drives. "Whereas the current system works on a fixed speed, the new sets can work on low-flow starting at 900 m³ per hour to high-flow which equals the maximum capacity of 5,400 m³. This makes the system much more flexible and efficient. It also means that we can use both pipelines — a 600mm steel one and a 1,100mm concrete one — at the same or each separately."

An additional advantage is that the old pump stations will not be removed so that there is redundancy on



the pipeline and a back-up system is in place in case of breakdown or maintenance.

"The challenge with the variable speed drives (VSD) systems," Heyman clarifies, "is that it needs harmonic mitigation equipment because it creates harmonic effects on the powerline and may effect consumers downstream." As a result, the pump system will be the very first system in Namibia meeting the supply standard NRS 048 in terms of harmonic mitigation.

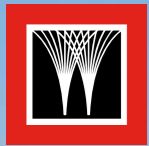
The cost of the project, including the three new pump stations, all equipment and upgrading of the powerline, will be around N\$200 million. NamPower will simultaneously upgrade its supply transformers from 2.55 mva to 5 or 10 mva.

Another advantage of the upgrade is that the whole system is fully automated and can be remotely operated at NamWater's facility near Von Bach Dam.

The main challenge of the project is not to interrupt the lives of Windhoekers too much, says Heyman.

"We have to cut into the existing waterline and upgrade power supply, which therefore will be interrupted. The most important part of the project is thus proper planning to ensure that all work in the four legs of the project is done in time."





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EcoNomics

DESALINATION: REALLY A VIABLE SOLUTION?

Water is the most important resource for the existence of human kind and in recent times scarcity, increased competition for available resources, environmental pressures, floods, drought and climate change uncertainty have combined to pose real risks to businesses and the community at large.

Less than 1 per cent of all fresh water is readily accessible for human use, and more than 1.1 billion people globally lack adequate access to drinking water. Over the past ten years, as the world's population has increased, infrastructure has degraded and water supplies have dwindled. The water supply/demand equation has shifted dramatically, resulting in a profound impact on municipal water rates.

In response to these challenges new technologies such as desalination are being developed and applied to help meet water needs in an environmentally friendly and affordable manner.

In recent year's seawater reverse osmosis (SWRO) desalination, the process of extracting fresh water from seawater using semi-permeable membrane technology, has emerged as a long term affordable solution for private and public sectors.

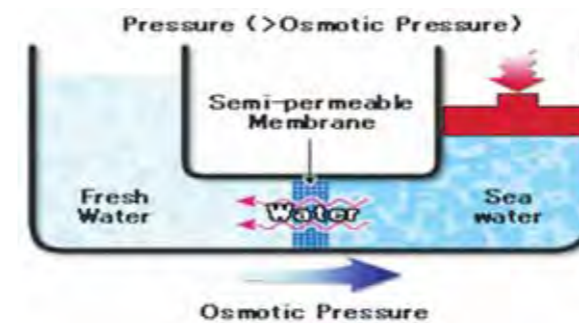
Osmotic pressure is the pressure for two solutions to become the same concentration. By applying pressure in the opposite direction greater than the osmotic pressure the freshwater is extracted from the seawater, hence the term Reverse Osmosis (RO).

The practicality and cost of desalinating water is directly proportional to the concentration of dissolved solids and the availability of alternative water sources eg as salt concentrations increase, so do desalination costs. It is therefore important to consider all available sources of water to minimise costs. The total dissolved solids (TDS) concentration of seawater ranges from about 35,000 mg/L on average to more than 46,000 mg/L in the Arabian Gulf. About 99 per cent of these salts must be removed to produce water acceptable for human consumption.

All desalination processes produce the following two streams:

- A product water stream that is essentially pure; and
- A concentrate stream (brine) which includes the salt removed from the product water.

In a seawater desalination facility the salt concentration of the brine stream may be twice that of the seawater which means only about 50 per cent of the seawater is changed into potable water under ideal conditions. One of the biggest issues with brine from a brackish desalination facility inland is to dispose of the brine stream without harm to the environment.



Above: Reverse Osmosis Schematic



The MF system

With a seawater desalination facility the brine can usually safely be discharged back to the sea where it is almost immediately diluted by the large volume of available water.

Roughly 67 per cent of the world's surface is covered with seawater, making it an attractive solution for coastal areas in relatively dry countries such as Australia and Southern Africa, to provide a reliable freshwater source. Australia's major cities currently have one or more seawater desalination plants to augment the freshwater sources obtained from dams and aquifers, which are heavily dependent on rainfall.

South Africa who also has large coastal cities such as, Durban, Port Elizabeth and Cape Town, are investigating the possibility of constructing large seawater desalination plants to augment the ever dwindling available freshwater sources as they begin to feel the effects of global warming, reduced rainfall and ever increasing coastal populations.

Design engineering firm WorleyParsons has conducted a number of studies around this technology and found that in many cases seawater desalination can be the

most cost-effective solution, as the costs of transferring freshwater over long distances from remote sources to a major city can be much greater than constructing and operating a seawater desalination plant.

The firm had some form of involvement in most of the large SWRO desalination plants that had been constructed in Australia for the Gold Coast, Sydney, Melbourne and Perth. The firm is currently part of an alliance doubling the capacity of the second Perth SWRO desalination plant.

Construction of new dams, obtaining water from aquifers, construction of pipelines in environmentally sensitive areas, and the transfer of water from one catchment to another in the past have raised community concerns, limits options and promotes desalination as one of the most viable alternatives for water supply.

Recently it was estimated that the total installed desalination capacity is approximately 60 million m³/d of which 70 per cent is attributable to seawater desalination. Improvements in desalination economics are occurring and at the same time the cost of producing water from traditional sources are increasing.



The Reverse Osmosis rack system

Fresh groundwater sources have been depleted or are unavailable due to subsidence concerns, while degradation of rivers and lakes are dramatically increasing the cost of conventional surface water treatment plants.

An increasing number of domestic and industrial water projects now consider desalination an economically competitive, drought proof water management option. In some cases it is the only option. The supply of desalinated water is possibly one of the only water resources that do not depend on climate patterns. It stops dependence on transferring water from long distance water sources and even prevents traditional water sources from being overexploited.

From a global perspective, desalination technology is applied for several purposes such as:

- Providing water for industrial sectors;
- Supplying high quality potable water for the Domestic and public sectors; and
- Acquiring water for emergency situations, such as army and refugee operations.

WorleyParsons is also currently involved in the following SWRO desalination plants in Southern Africa:

- Detailed design and documentation for the 25,5 ML/d SWRO plant at Saldanha Bay for the West Coast Municipal District; and
- A feasibility study for three 150 ML/d SWRO plants for the City of Cape Town.

SWRO desalination plants have become more popular because of their sustainability, cost effectiveness and simplicity, achieved by technology improvements.

In future, the number of desalination plants is likely to increase dramatically, especially in areas where traditional water sources struggle to meet the ever increasing demand for fresh water. ■



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COASTAL TOWNS SET TREND IN SEWAGE WORKS

For the first time in Namibia the fixed film trickling filter technology has been used to upgrade the Walvis Bay sewage works, while Swakopmund constructed a new conventional activated sludge sewage treatment plant with biological nutrient removal. The mechanical work was done by Namibian engineering firm Aqua Services, a subsidiary of world renowned French water giant Veolia.

Walvis Bay is one of a series of towns in Namibia to kick-start the Government's initiative for a large scale water and sanitation infrastructure upgrade. Other domestic wastewater projects where advanced biological treatment plants were considered for towns here in Namibia and are currently being implemented, include the new Swakopmund sewage treatment plant (STP), the Warmbad and Aus STP. On the potable water side, the upgrade to the Katima Mulilo River Water Filtration Plant that will feed drinking water into the Caprivi pipe system, needs mentioning.

The Namibian subsidiary of Veolia Water Solutions & Technologies, Aqua Services & Engineering (ASE) is closely involved with the overhaul of water infrastructure in Walvis Bay, implementing some of their

latest inventions. To boost the town's sewage treatment capacity, the Walvis Bay Municipality recently awarded a contract to ASE to upgrade the existing sewage treatment work's stone-media biofilters by replacing latter with special plastic media, thereby upgrading the plant to the company's flagship new-generation trickling filter technology.

This upgrade, costing N\$15 million, will significantly increase the plant's daily capacity from 2.5 mega litres per day (Ml/d) to roughly 6.5 Ml/d and will use the plant's existing civil works to house a more efficient biological treatment process.

"It's the first time in Namibia that trickling filter technology, incorporating new polypropylene media

Walvis Bay's sewerage works are being upgraded, using trickling filter technology that has never been used previously in Namibia.



Part of upgrade of Walvis Bay's sewerage works that will significantly increase the plant's daily capacity from 2 mega litres to roughly 6.5 mega litres per day.

is used to replace stone-media filters," says ASE's managing director Christian Stöck. "Trickling filters using the new fixed film media give far fewer operational problems, and, with regards to blockages and ponding, are decades more advanced."

Once operational, the fixed film media will host the micro-organisms that, in stage one, remove carbonaceous material reducing the chemical oxygen demand and biochemical oxygen demand," he adds. In stage two, the micro-organisms will perform nitrification.

The effluent is continuously recirculated through the media at a high rate, increasing the biofilters' aeration by three times, which in turn, multiplies the biological treatment's efficacy three-fold.

"ASE is upgrading two of the three existing biofilters by packing the larger, 45-metre diameter biofilter with new polypropylene media, designed specifically for stage one processing. The smaller 30-metre biofilter will be packed with polypropylene media suitable for stage two processing, requiring a total of 6 500 m³ of polypropylene attachment media," says Stöck.

ASE imports the media as individual sheets and, once in place, welds them together using a specially-imported (from Germany) fusion welding machine.

The assembled blocks are self-supporting, and avoid creating unnecessary pressures on the biofilters' side walls, making them ideal for use in older plants.

As part of the upgrade, ASE was responsible for installing the plant's new recycle pump station. Specified for construction three metres below the surface, ASE faced a unique challenge to accommodate the groundwater's high salinity. "Normally, we find groundwater to be relatively fresh, but because Walvis Bay is a coastal town, the groundwater level is very shallow, high subsurface inflow is experienced and the water very salty," says Stöck. This required piling to build the recycle sump, which reached approximately 3 m below ground level, with the groundwater table already at 500 mm below ground level.

The Swakopmund Wastewater Treatment Works project constituted treating up to 12 Ml/d, with construction completed early 2013. The plant will replace the town's old wastewater works, which are overloaded and no longer comply with legislated discharge standards. ASE was also successful in obtaining the tender for the supply and installation of the mechanical works for the new plant.

Originally built in 1957, the town's wastewater treatment plant was situated just outside of predicted



Above and below right: Swakopmund's Wastewater Treatment Works project is on track to begin treating up to 12 million litre per day of sewage by early 2013.

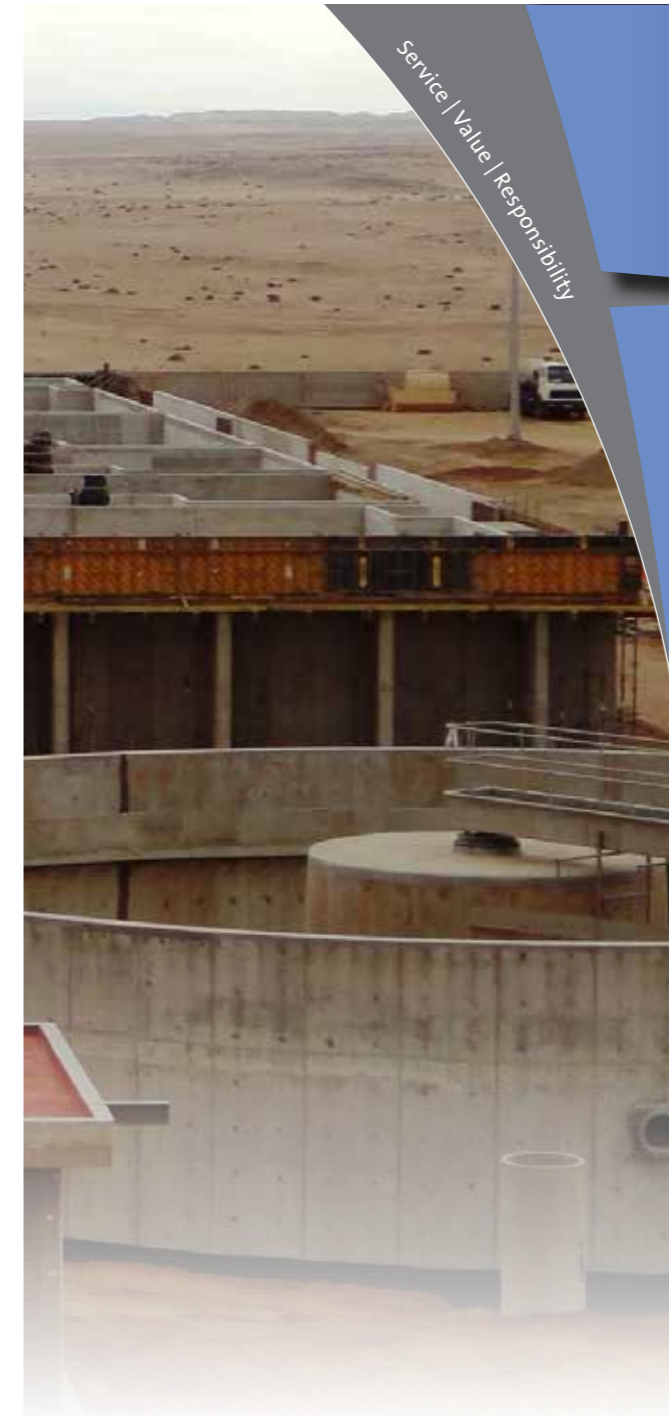
boundary limits, but unexpected growth has resulted in residential areas expanding to within intolerable proximity to the plant, where outdoor fly and odour problems pose health risks to residents.

"Swakopmund's sewage reticulation system will still drain and pump wastewater from various stations into a balancing tank at the existing works in town. The sewage is then pumped 9.8 km in a pipeline to the new plant, where it is treated. The plant consists of two train in parallel, each designed to treat a flow of 6 Ml/d. Currently, one train is already fully functional, treating 6 Ml/d," says Stöck.



The new plant is designed for biological treatment by means of the activated sludge process and includes nutrient removal, viz biological nitrogen and phosphate removal, he adds. Final water treatment processes include gravity sand filtration and disinfection with chlorine. "The new plant's discharge water is of high quality for re-use in gardening and irrigation throughout the town," states Stöck. ASE considered the odour and vector-related problems, especially in the collection pump station still located in the centre of the town, and employed specific technologies to ensure smells are eliminated.

All the plant's mechanical equipment has been installed by ASE, including the inlet works, biological reactors (with mixers and surface aerators), clarifiers, rapid gravity sand filters, chlorination and ferric chloride dosing equipment, sludge thickening, and the anaerobic digester equipment. ASE started installing the mechanical equipment for the plant's activated sludge system in June 2012. "The civil works were about 80 percent complete, which meant for us to meet deadlines, we needed to begin our installation, despite the civil works not having completed. Once the civil works were completed, the plant was virtually ready to start-up, which assisted the Municipality to have the plant earlier ready than would normally be the case," explains Stöck.



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WATER FOR DEVELOPMENT

In an arid country like Namibia, remote communities struggle to fulfil their water needs. This is even poignant in areas where the Government wants to promote agriculture. Engineers try to find ways to make the scarce resource last in the many irrigation schemes.

Agricultural engineering, or more precisely, bio-resource engineering is a separate albeit unknown discipline in the engineering profession. It is a mix between mechanical and civil engineering with a crash course in agriculture thrown in. In Namibia, "agri engineers" focus a lot on water-related civil works reveals Peter van der Merwe of Namibia Integrated Biosystems, a company he runs together with his wife Wanda.

The company is heavily involved with transforming remote rural outposts into productive areas that can substitute fruit and vegetable imports from South Africa under the so-called green schemes. "Most of these projects have to be developed from scratch," says Van der Merwe. "This means we have to put in the irrigations facilities, the houses, reticulation and pump stations and boosters."

A green scheme the couple recently worked on is the Sikondo irrigation project near Rundu in the Kavango Region. More than 600 hectares a converted into a 'breadbasket' for the country, using water from the Okavango River that meanders from Angola on its long trek to the delta in Botswana. The green scheme initially will produce mostly maize and wheat and will consist of a commercial part measuring 344 hectares and nine small scale farms of 30 hectares each, totalling 270 hectares.

"These square plots are irrigated by pivots, while in the corners we have put in mini sprinklers, so the farmers can grow vegetables in order to have a cash crop yearround and generate income outside the normal growing season," says Wanda Van der Merwe.

Bringing water to rural areas is not an easy task and it will be a growing challenge in the future. The Van der Merwe's who have worked closely with the Ministry of Lands and Resettlement speak from experience. "Resettlement farms need to be converted or rehabilitated before they can be productive. The farm is mostly set up as one unit with maybe a couple of main boreholes and if you are lucky, some additional smaller boreholes," says Peter.

"When the farm is designated for resettlement, it is divided into smaller parts, usually measuring between a 1,000 and 1,500 hectares. By default at least some of the sections will have poor or no water supply."

In addition, many farms that are offered for sale under the willing selling, willing buyer policy are on the market because they have a poor water situation and or carrying capacity to begin with. All this means is that the land actually doesn't have the carrying capacity to be productive, a situation that is aggravated by massive overstocking as more and more families move onto the plot and bring their cattle. New boreholes have to be surveyed and drilled. The only solution is that new boreholes have to be surveyed and drilled.

And water has to be stored. "We are currently building earth dams on 36 farms, of which 20 are completed," says Wanda. "Storing water is a challenge and so is the sustainable use. The risk of over-pumping a borehole on resettlement farms is huge, so when it comes to rural water supply, education of the end users is an important issue."

Similarly, in rural communities where a water point (borehole) is the only source of fresh water supply for many kilometres, water can be used more sparingly to avoid wastage. "For instance, the Namibia Nature Foundation has experimented with drip systems in communities, so that people can grow their vegetables without using large quantities of water by using water more efficiently," enthuses Wanda. However, drip lines are not suitable for widespread application, because they clog up easily and they need to be removed before machines can work the fields.

"Generally in Namibia, we are not at the forefront of introducing new technology, because we don't have a long tradition of commercial crop production," says Peter. "Therefore, the decisionmakers prefer to play it safe with the setting up of the green schemes and always request the engineers to use tried and tested methods, especially when it is a N\$150 million dollar project like Sikondo. This is the reason why the engineers usually plan for the worst scenario, to cater for harsh Namibian conditions and unavailability of supplies and spare parts."

This is the reason why the engineers usually plan for the worst scenario, to cater for harsh Namibian conditions and unavailability of supplies and spare parts. "The trend is increasingly to go for efficiency. While we used 60 mm pivots at Etunda, now at Sikondo we have brought this back to 10 mm with the same results. This way water is being conserved," says Peter. The same applies in the greenhouses that are being built on the project and that make use of irrigation through misting, rather than direct watering the crops.

Efficiency also extends to electricity use, the cost of which can be substantial because of the pump station that are used to pump water from the river into schemes. In places like Ndonga Linnea, electricity costs exceeded N\$300,000 per month, eating away fifty percent of the profits.

"Often these costs can be reduced dramatically by simply reorganising the metering in consultation with NamPower and installing one single metre instead of three or four," says Peter.

Overseas technology has further progressed with innovative soil mapping, indicating moisture content and other variable that can influence the irrigation regime. Pivots and implements now can work a variable application, meaning they can be programmed to irrigate a certain amount in certain areas and less in others, while at the same time distributing fertiliser or other essentials to produce an abundant crop. Such precision agriculture is still lacking in Namibia, but should be applicable to the country that has a shortage of rainfall and has to use every drop of water sparingly. ■



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Introduction

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Our offices are situated in Swakopmund and Ongwediwa .

We wish to express our gratitude towards our clients for their support and give our commitment towards continued service excellence. We are committed to the development of the people and respect the rich cultural heritage of this country .

Preservation of the fauna and flora of this vast and beautiful land will always be our priority.

Current Water Related Projects In Namibia

Swakopmund 16ML Reservoir - Design & Build

The Tender was done in consortium with Worley Parsons and involved the complete design and build of a 16 ML reservoir on the Northern outskirts of Swakopmund. On a fixed budget the combination of a maximum capacity reservoir with well-planned programme gave the team the edge and we are proud to say the project is currently progressing as planned.

Client: Swakopmund Municipality

Contract Manager: Paul Zietsman



Swakopmund Waste Water Treatment Works and HDPE Pipeline

The WWTW project for the Municipality of Swakopmund was one of the largest and most challenging projects B&K has done to date in Namibia. The project consisted of a new 12ML/Day waste water treatment works and a 19.8km 400mm Class 10 HDPE pipeline and the work involved earthworks, blasting, brickwork and major concrete works (11000m3). We can proudly say that the project was handed over successfully to the client who has started the commissioning procedure.

Client: Swakopmund Municipality

Contract Manager: Paul Zietsman



Strengthening And Widening of the Okavango River Bridge

The strengthening and widening of the one lane bridge over the Kavango River at Divundu was a showcase of the diversity B&K Civils pride themselves in. The works involved strengthening of the existing structure through post tensioned cables, removing and replacing the existing bearings, widening of the bridge deck as well as minor earthworks and road surfacing all whilst having live traffic over the bridge.

Client: Namibia Roads Authority

Contract Manager: Andrew Ibbotson & Jaco Meyer



Husab Temporary Access Road , Pipeline & Water Pond

B&K Civils is proud to be a part of the start-up team of one of the largest Uranium Mines in the world. We worked in close relation with the environmental team from Swakop Uranium. The works involved the construction of a new 6.5km temporary gravel access road, 5000m3 HDPE lined water pond at the new Husab Mine and the dismantle of the existing Areva pipeline and construction of a new 27km 250mm diameter steel pipeline to the Husab Mine. Works had to be completed within the limited timeframe to assure temporary access and water on site for construction.

Client: Swakop Uranium

Contract Manager: WD van Dyk



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