# CAPABILITY STATEMENT

ATT THE

# CREATING THE FUTURE OF LIFE



# OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE





# ABOUT US

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iX engineers is a proudly South African engineering design and consulting firm that focuses on six key market solutions. These are:



Our passion is to design and advise on infrastructure development projects that enable the creation of the future of life. Simply put; we get excited at carving out business-driven solutions that have a direct and positive impact on humanity. Our DNA, which is distinctly African, is harnessed by the concept of Ubuntu – an African proverb meaning "I am because you are." Ubuntu embraces the idea that humans cannot exist in isolation and that we depend on connections, community, and caring. We cannot be without each other.



At iX engineers, we fuse science and art to solve big problems. Our skilled professionals specialise in civil, structural, chemical, process, electrical and mechanical engineering as well as instrumentation and project management.

Our teams possess an intricate knowledge of the African continent's socio-political and socio- economic terrain; using their diverse experiences to deliver ground-breaking and significant projects on the continent. These projects are executed with the zero-harm tolerance in safety, health and risk for not only human life but also for assets and the environment under the guidance of the iX engineers' SHERQ support team.

# **OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE**

# PERSPECTIVE FROM THE CEO

# WE ARE OBSESSED ABOUT CREATING THE FUTURE OF LIFE

![](_page_3_Picture_2.jpeg)

The South African economy has been under pressure for some time resulting in a substantial increase in the unemployment rate and an increase in the number of jobless households.

The South African operating business landscape continues to be a huge challenge for most local businesses, who often have to wrestle with higher prices, power shortages and a generally depressed workforce. (The seventh World Happiness Report found that South Africans are some of the world's unhappiest people on the planet. Out of 156 countries, South Africa was placed 106th).

Just like the rest of the world, South Africa finds itself at an interesting intersection. The country needs to deliver economic and job growth while also supporting the country's most vulnerable citizens, who are on the social welfare programme. The tax base is shrinking, the gap between those who have and those who don't is widening, the levels of corruption are unprecedented and the truth of the matter is that the moral compass of South Africans has taken a beating and there is pessimism in the air.

When the country's moral compass is at its lowest point, the onus is on leaders (both in the private and public sectors) to step-up and give us some motivating words, followed by decisive actions, to encourage us all to move forward and achieve our next best standards. We are a vibrant and resilient nation and what keeps us going is the fact that for every challenge there is a uniquely South African solution. At iX engineers we remain optimistic about this place we call home, South Africa.

Leaders and people who learn from the past stay focused on the future. iX engineers is the face, the voice and the personality of the future of infrastructure solutions on the African continent. Our role is much deeper than just providing engineering solutions. We are obsessed with today because we desire the lessons that will prepare us for tomorrow.

Our tomorrow is very much technology-solutions driven.

We have a "hands-on" engineering methodology and style to deliver holistic infrastructure solutions that are both non-traditional and traditional as we continuously strive to add value to our customers, communities, businesses and stakeholders.

Our service offering is focused on six carefully identified market sectors to best bolster our customer's needs, the environment they operate in and the goals they wish to achieve.

Kind regards

Ms Lebo Leshabane

Chief Executive Officer iX engineers Pty Ltd

# **iX ENGINEERS LEADERSHIP**

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# **MS LEBO LESHABANE**

#### **CHIEF EXECUTIVE OFFICER**

- o BSc. Eng. Civil, Hons: Wits University
- 0 **Business Management: UNISA**
- GDE Civil Project Management, Property Law, Maintenance Engineering: Wits University 0
- Innovation is strategy Harvard School of Business 0
- Business Analytics : Wharton University of Pennsylvonia 0
- IOT Massachusetts Institution Technology 0

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# **MS AFRIKA MSIMANG**

#### **CHAIRPERSON OF THE BOARD**

- o Master of Public Administration: University of Cape Town
- Bachelor of Arts: Development Studies & Political Science: University of Johannesburg 0
- Bachelor of Arts, Honours: Political Science: University of Johannesburg 0

![](_page_4_Picture_16.jpeg)

#### **MR HANS KAREMAKER** DIRECTOR

- o MEng (Civil): University of Pretoria
- o BEng Hons (Civil): University of Stellenbosch

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#### **MR JANNIE VAN DER MESCHT**

DIRECTOR

- o BTech (Civil): Pretoria Technikon
- o National Higher Diploma (Civil): Pretoria Technikon
- o National Diploma (Civil): Pretoria Technikon

Our leaders embolden the characteristics of :

**ONE THRIVING AFRICAN** CONTINENT

**HUMAN CAPITAL & TALENT** 

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**INTEGRITY & TRUST** 

WEALTH IN KNOWLEDGE

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![](_page_4_Picture_35.jpeg)

![](_page_5_Picture_0.jpeg)

# **OUR VALUES**

![](_page_5_Picture_2.jpeg)

Futuristic

**Respect & Integrity** 

Playfulness

Participation

# SOCIO-ECONOMIC DEVELOPMENT

iX engineers believe in and supports Skills Development and Social Upliftment and therefore gives back to society and communities through programmes including:

Young engineers' initiative providing mentorship and training to graduates; social upliftment and development projects across various communities focusing on education; young talent and development.

Accreditations; Associations and Membership Development

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![](_page_5_Picture_12.jpeg)

![](_page_5_Picture_13.jpeg)

![](_page_6_Picture_0.jpeg)

![](_page_6_Picture_1.jpeg)

Eager to disrupt the engineering industry, iX engineers, is incorporating emerging technologies into everything we do.

From smart water management through the Internet of Things (IoT) to risk-free visual inspections powered by Drone Technology, we are digitally-led in our problem-solving approach allowing our clients to enjoy their assets for longer and ensuring our engineers are free to create the future of life.

Our cutting-edge Digital division is currently focusing on these core competencies that span Smart Cities, Transport, Mining, Energy, Water & Sanitation.

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#### Our Service Offerings include:

#### Virtual Reality

- Interactive Design Review
- Pipe System Analysis
- Immersive Training
  - (Maintenance, Disaster response, physical daming simple & complex tasks)

In addition, we provide our clients with interactive tours or virtual site inspections using 3D technology.

#### Drone Technology is enabling our engineers to conduct

- AI Geographic Surveys
- Risk-free Visual Inspections
- Intelligent Asset Management / Condition Assessments

#### Internet of Things

- Smart Water Solutions
- Predictive Maintenance
- Energy Optimisation

#### Big Data & Analytics

- Geographic Information Systems
- Predictive Analytics
- Machine Learning

All of which are underpinned by the user-friendly design of interactive digital platforms.

# DIGITAL REFERENCES

#### **Examples**

#### Virtual Reality for General Electric (GE)

GE appointed iX engineers to assist in creating a Virtual Reality (VR) training module. The developed module was aimed at training technicians on how to install turbine blades into the rotor disk. The training module enabled technicians to learn procedures, receive tricks of the trade and hone their skills in the VR world, prior to real life practical work. The module consisted of three parts, an introduction on how to navigate the VR world, a step-by- step tutorial on the installation of turbine blades with the trainee performing the installations in the VR world and an assessment, consisting of a series of questions. The project highlighted the advantages of using the latest technology to increase training quality and reduce costs for our clients. This proof of concept was done in collaboration with STS3D.

#### Virtual Reality for Desalination Plant

iX engineers were appointed to improve various design and construction limitations for a complex desalination plant using Virtual Reality (VR). By using the tools developed by our engineers and the VR model, the client was able to walk around the desalination plant and experience the design from a first-person perspective allowing insight to many design aspects such as space constraints and accessibility. The integration of data into the VR model provided the various engineers and stakeholders with the ability to, simultaneously, analyse & troubleshoot the plant. Furthermore, the construction plans & documents were incorporated into the VR model to fast-track the review of pipe systems. In large complex plants, the VR software developed by our team proved to be a time and cost saving tool, which could then be used throughout the project cycle.

#### Drone Solutions for eThekwini Municipality (Kranskloof Hostel)

We had a challenge - our contract would be concluding in three weeks. It would have taken land surveyors five weeks for the procurement process as well as the site work and survey. With the use of our drones, our pilot was sent out to conduct the survey as well as a visual inspection of a hostel spanning the size of 31 hectares.

We were able to conduct the survey within a day and produce results that informed a multitude of engineering solutions. These included structural analyses, civil works & planning as well as storm water management at the site. 3D maps with an immense amount of data accompanied by high resolution photos were produced that could also enable further investigations without having to go back to the site. We were able to maximise value for the client in not only drastically limiting safety risk but also being able to provide a wealth of information within a very short amount of time. This meant the client was able to make well-informed decisions and be highly responsive to the needs of their community.

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![](_page_7_Picture_31.jpeg)

![](_page_7_Picture_32.jpeg)

# WATER & SANITATION

# SOUTH AFRICA IS A WATER SCARCE COUNTRY WITH FREQUENT SEVERE DROUGHTS

iX engineers is well equipped to provide solutions to the challenges of the present and future. Our skills and experience combine to deliver well planned and cost-effective infrastructure and environmentally sensitive solutions.

We apply our expertise in the fields of Water Resources, Water Quality and Water Treatment Processes to identify potential sources of water and match these with demands to develop reliable and sustainable solutions.

Imagine a future where we are able to proactively maintain all our water equipment using the (IOT) Internet of Things, reducing downtime of our most vital resources. Imagine a future where we are able to completely eradicate water shortages. This future is not that far away. INTERESTED? Come and chat to us.

iX engineers specialises in providing integrated solutions for the management of water treatment systems by incorporating the Internet of Things (IOT) which allows operators to monitor the functioning of the works real-time, resulting in early detection of problems.

![](_page_8_Figure_7.jpeg)

# **Ground Water**

We apply our expertise in the fields of Water Resources, Water Quality and Treatment Processes to identify potential sources of water and match these with demands to develop reliable and sustainable solutions.

#### Our Service Offerings Includes:

- Pre-Development Water Modelling
- Water Resource Studies (ground water, sea water and surface water)
- Water Transfer Feasibility Studies
- Hydrogeological Assessment
- Hydrological and Flood Risk Assessment
- Water Accounting and Valuation
- Water Quality and Disposal
- Integrated Water Management
- Water Use Efficiency
- Water Demand Management

- Master Planning
- Water Re-use & Recycling
- Regulatory Commitments
- Floodlines
- Asset Management
- Project Management
- Programme Management
- Environmental Compliance & Planning Studies
- Social Assessment, Planning, Needs & Impact Studies
- Social License to Operate and Permitting

#### WATER REFERENCE

# **Cape Flats Aquifer**

![](_page_9_Picture_25.jpeg)

CUSTOMER City of Cape Town

![](_page_9_Picture_27.jpeg)

LOCATION Cape Town Western Cape

Ground water is a key water resource and iX engineers, in conjunction with the support of specialised sub-contractors, has successfully developed numerous Well Fields with each consisting of exploration, monitoring, production and recharge boreholes with related conveyance systems and treatment plants.

The Managed Aquifer Recharge (MAR) strategy follows a master plan development in which iX engineers has professional experience. The MAR challenge is to ensure the Aquifer's sustainability during the implementation of further Well Field exploration and development. iX engineers has the capability and experience for the development and management of Well Fields.

# Assmang's Khumani Mine Water Resource Augmentation

![](_page_9_Picture_32.jpeg)

CUSTOMER Assmang Khumani Iron Ore **LOCATION** Kathu, Northern Cape, RSA

The Project included groundwater source development. The groundwater was required to augment Khumani Iron Ore Mine's (KIOM) existing water source from the Vaal Gamagara bulk water scheme (VGWS) operated by Sedibeng Water. The scope included option analysis, review of residual gravity data and structural information, dewatering abstraction from mines, geophysical surveys (gravity measurements by 2D resistivity imaging to identify optimal drilling sites), gravity survey traverses, assessing geophysical datasets to identify exploration drilling sites, cost analysis, detail design and phased implementation.

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![](_page_9_Picture_37.jpeg)

# Water and Waste Water Conveyancing

iX engineers has extensive specialist experience, skills and knowledge of water and waste water conveyancing systems involving all project stages namely; Inception, Concept and Viability (Preliminary Design), Design Development (Detail Design), Documentation and Procurement, Contract Administration and Inspection and Close-Out in urban, industrial, resources and rural environments.

Our experienced engineers plan, model and design bulk water supply and distribution systems using state-of-the-art computer software programs, 3D modelling and Virtual Reality application, as well as intelligent computing tools for both public, resources and industrial facilities.

iX engineers have completed numerous pre-feasibility and bankable feasibility studies in the water sector for both government and private clients.

#### WATER REFERENCES

#### New N2 Gateway Delft Bulk Sewer

![](_page_10_Picture_6.jpeg)

**CUSTOMER** Sobambisana Community Development

![](_page_10_Picture_8.jpeg)

LOCATION Delft Western Cape RSA

iX engineers were appointed as Lead Consultant for the design and construction monitoring on the Delft bulk sewer outfall servicing approximately 2.5 million users. The 11.4km bulk sewer pipeline ranged in diameter from 1200mm to 1900mm and included a pipe jacking section under a 6-lane wide highway with a 2400mm diameter concrete sleeve pipe. The connection to the existing Wastewater Treatment Works was done with a new inlet structure designed and constructed implementing the caisson structure method.

#### Our Service Offerings Include:

- Bulk Pipelines
- Network Reticulation
- Pump Stations
- Canals
- Diversion Tunnels, Streams & Rivers
- Storm Water Drainage
- Feasibility Studies
- Bulk Water Transfer Schemes

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# Mokolo and Crocodile River (West) Augmentation (Phase 1)

![](_page_10_Picture_22.jpeg)

Trans Caledon Tunnel Authority (TCTA) LOCATION Lephalale Limpopo RSA

The Crocodile River (West) Water Augmentation Project (MCWAP) is of strategic importance and transfers water to predominantly support energy and mining activities in the Limpopo province, especially for Eskom's Medupi coal-fired power station and various coal mines in the Lephalale area.

MCWAP Phase 1 consisted of a 1000mm ND suction steel pipeline, a 900 mm ND steel rising main of 4.6 km and long and steel gravity pipelines of 800mm - 1100mm ND (37 km long) as well as 75m pipe jack underneath the R510 road delivering a flow of 1258 l/s to end users.

![](_page_10_Picture_27.jpeg)

# Water and Waste Water Storage

iX engineers provides innovative, cost-effective and practical solutions to real world engineering challenges by combining advanced analytical techniques with sound engineering judgment.

Our service offerings include:

- Dams
- Water Storage Reservoirs & Towers
- Pollution Control Dams
- Storm Water Attenuation Dams

# WATER REFERENCES

# Lanseria 20 M& Reservoir and 1,2 M& Tower

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**CUSTOMER** Johannesburg Water SOC LOCATION Lanseria Gauteng RSA

The project entailed the design and construction of a new reservoir site serving the increased demand for water as a result of the expanding residential and commercial development in the area of Lanseria Airport. The reservoir has a capacity of 20MI and the tower of 1.2MI, serving different areas, whilst the site makes future provision for an additional 15 MI reservoir.

The tower's unique design resulted in an elevated and very flat top. The objective behind the elevated flat top design was two-fold. Firstly, the design incorporated restricted airspace requirements, taking into account the taking-off and landing of aircraft at the Lanseria Airport. Secondly, the design ensured the maximum volume of water at an elevated height to improve water pressure for End Users.

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# Water and Waste Water Treatment

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iX engineers has substantial experience, capability and knowledge of water and waste water treatment systems, involving all project cycles. We implement water and waste water systems through innovative design solutions, 3D modelling and Virtual Reality applications for optimised designs. These are for public resources and industrial facilities. We have a proven track-record in delivering technically outstanding, and cost-effective projects.

Our Service Offerings include:

- Water Treatment
- Waste Water Treatment
- Industrial Waste Water Treatment

#### WATER REFERENCES

# Upgrading of Zeekoegat Waste Water Treatment Works

![](_page_12_Picture_2.jpeg)

CUSTOMER City of Tshwane

![](_page_12_Picture_4.jpeg)

**LOCATION** Pretoria Gauteng RSA

This upgrade expansion project increased the capacity of the existing Zeekoegat Waste Water Treatment Works from 30 M $\ell$ /d to 85 M $\ell$ /d in four stages:

- Stage 1: Construction of a new 40 Mℓ/d activated sludge plant
- Stage 2: Construction of a new 85 Mℓ/d sludge handling facility
- Stage 3: Construction of a new 85 Mℓ/d tertiary treatment facility
- Stage 4: Increase the capacity of the existing 30 M $\ell$ /d plant to 45 M $\ell$ /d.

# Waste Water Re-Use

# Water Crisis Solution Waste Water Re-Use

iX engineers has significant experience in Waste Water Re-use technology, which includes the provision of consulting engineering, project management and business/ project services. Our in-house Professionals provide the best sustainable solutions to our customers and the environment over the full life cycle of the asset. iX engineers also has the capability and experience to provide solutions for Acid Mine Drainage.

#### WATER REFERENCES

# **De Doorns Water Re-Use Plant**

![](_page_12_Picture_16.jpeg)

**CUSTOMER** Hex Valley Water Users Association

![](_page_12_Picture_18.jpeg)

LOCATION De Doorns Western Cape RSA

iX engineers was appointed by Hex Valley Water Users Association to investigate and implement a strategy for augmenting their current irrigation water supply. This phase represented the implementation of a 1.5 MI/d plant while making allowance for a second phase to double the plant capacity. The plant is located at the existing De Doorns WWTW site. The plant is currently operating successfully regardless of variation in the feed water quality.

![](_page_12_Picture_22.jpeg)

# **Desalination**

iX engineers' knowledge of Sea Water Reverse Osmosis (SWRO) Desalination plants was demonstrated with the City of Cape Town's Emergency Water Resilience Project during the City's worst drought recorded in history. A major part of this project was to investigate and implement temporary Sea Water Reverse Osmosis (SWRO) Desalination plants as emergency measures, with a larger (long term) permanent SWRO plant to be planned for implementation at a later stage.

#### The following three temporary SWRO plants were constructed and successfully implemented for the City of Cape Town:

![](_page_13_Picture_4.jpeg)

![](_page_13_Picture_5.jpeg)

![](_page_13_Picture_6.jpeg)

# Water Conservation & Non-Revenue Water

Conservation and Water Demand Management (WC/WDM) measures to reduce non-revenue water and water losses for water distribution systems. Our staff have the necessary expertise and experience to advise clients on which interventions are the most appropriate to a specific area and how best to implement them.

The most common mistake made by many institutions/ municipalities throughout the world is to believe that water loss reduction is achieved through only leak detection and repair. In such cases, large budgets are often used to search for unreported leaks using the latest hi-tech and expensive equipment. If the water losses are due to inaccurate metering or even background leakage, the leak detection activities will yield little or no results.

# **Potential Savings:**

A breakdown of the 2015/16 water balance for Municipalities in South Africa indicates a potential real loss saving of 939 million m<sup>3</sup>/annum and a potential income of 197 million m<sup>3</sup>/annum which is currently unbilled.

Most WC/WDM activities will pay for themselves and financial institutions will fund these projects if a proper business case can be compiled. iX engineers also has the capacity and capability to assist in this regard, including revenue enhancement programmes. supply systems can be monitored and controlled via remote access using computers, mobile phones or tablets displaying real-time data of:

- Quality
- Flow Rates
- Reservoir Levels
- Pump Station Activities
- System Pressure
- Possible Leaks
- Water Consumption and Water Balance

![](_page_13_Figure_21.jpeg)

# TRANSPORT

#### iX engineers plays in the Airports, Rail, Road and Highway spheres.

![](_page_14_Picture_2.jpeg)

![](_page_14_Picture_3.jpeg)

![](_page_14_Picture_4.jpeg)

iX engineers has extensive engineering capabilities in roads stormwater infrastructure on international as well as local levels.

Our wealth of experience across all phases of road projects includes national roads and highways, provincial and municipality.

- Roads and highways
- Haul roads
- Major transport corridors
- Bridges
- Culvert structures
- Detailed optimisation
- Interface requirements
- Hydrology and hydraulic expertise
- Transport Master Planning
- for all transport infrastructure and site servicing solutions.

We provide services to the national roads agency (SANRAL), the provincial governments and local municipalities

### **ROAD REFERENCE**

# Upgrade of National Route N2 Murchison to Marburg Interchange

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CUSTOMER South African National Roads Agency SOC Ltd (SANRAL) LOCATION KwaZulu-Natal RSA

The project entailed the upgrading of the National Route 2 Section 22 from Murchison (km 18.6) to Marburg Interchange (km 29.3). We increased safety features on the road, which included the reduction of accidents due to the added lanes and median barriers over certain sections and adequate pedestrian accommodation using protected sidewalks.

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# Improvement of the N7 between Cederberg and Kransvleikloof

![](_page_15_Picture_8.jpeg)

South African National Roads Agency SOC Ltd (SANRAL)

![](_page_15_Picture_10.jpeg)

LOCATION Cederberg, Western Cape, RSA

The project entailed the improvement of National Route 7 Section 3 starting at km 102.66 at the Cederberg T-Junction and ending at Kransvleikloof at approximately km 120.88 between the towns of Citrusdal in the south and Clanwilliam in the north. The objective of the project was the improvement of the existing road asset by re-aligning and widening the existing road to be adequate for a period of approximately 20 years.

![](_page_15_Picture_13.jpeg)

# **Rehabilitation of Camps Bay Drive**

![](_page_15_Picture_15.jpeg)

South African National Roads Agency SOC Ltd (SANRAL) **LOCATION** Camps Bay, Western Cape, RSA

The project originally consisted of localised road widening to accommodate the proposed MyCiti buses. However due to the large number and sizes of the proposed buses, a geometric analysis resulted in the entire portion of the road being widened by 1,4m. The proposed pavement design involved a light rehabilitation with the widened area requiring full depth construction. This was a flagship project for the City of Cape Town because Reclaimed Asphalt (RA) materials had not previously been used as high quality road construction material in the City of Cape Town.

![](_page_15_Picture_19.jpeg)

# Airports

![](_page_16_Picture_1.jpeg)

iX engineers has extensive experience in airport design and have also participated in various design projects with a focus on modern international airport infrastructure development and project management.

We have a wide range of aviation experience and have successfully completed several airport projects successfully both in South Africa and abroad.

Our project experience, in collaboration with specialists, includes technical and economic feasibility studies for airports, traffic demand as well as forecasting and transaction advisory services to potential airport developers.

# AIRPORT REFERENCES

# **ST Helena Airport**

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#### CUSTOMER

 Basil Read/St Helena Government
 DfID Department for

International Development, British Government

![](_page_16_Picture_11.jpeg)

#### LOCATIO

The Island of St Helena (middle of Atlantic Ocean, 1950 km west of Luanda, Angola)

![](_page_16_Picture_14.jpeg)

![](_page_16_Picture_15.jpeg)

![](_page_16_Picture_16.jpeg)

![](_page_16_Picture_17.jpeg)

St Helena is one of the most geographically isolated islands in the world. It is located approximately 1950 km from the South-West Coast of Africa and 2900 km from South America.

The scope of work under Phase 1 of this greenfield project was the design, construction monitoring and certification of a new airport, plus appurtenant works on Prosperous Bay Plain to support operations of Code 4D aircraft, Boeing 737-800W or similar for passenger transport.

#### Our work included the following deliverables (but not limited to)

• Bulk earthworks

- PQC aircraft pavements with the geometric design to ICAO international standards and structural capacity to support Code 4D aircraft complying to UK Ministry of Defence and FAA standards
- Civil/structural engineering works, aeronautical ground lighting and navigational aids (Navaids)
  Surface water drainage, foul water drainage system including sewage treatment, water supply
- including separate fire-fighting facilities
- 14,5km Connector road from the airport across the island to Rupert's Bay, haul roads and parking facilities
- Terminal building of 2500m<sup>2</sup> incorporating cargo facilities, fire station, ATC tower
- Bulk fuel storage facilities of 6 million litres at Rupert's Bay
- Provision of communication systems, fencing and security systems
- Environmental mitigation; and certification of the aerodrome.

# Upington International Airport – New Terminal, Upington, Northern Cape, RSA

The project entailed the design and construction of the new terminal building for departing and arriving international and domestic passengers, replacing the very old terminal building. The project also includes the design of a new domestic water supply to the terminal building. New water supplies for irrigation and fire protection was also part of the scope. The terminal building was completed in three phases during construction, as a section needed to remain operational to serve all arriving and departing passengers.

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![](_page_17_Picture_1.jpeg)

iX engineers' integrated design capability for rail infrastructure ensures optimisation and coordination through the Concept, Definition, Detailed Design and Construction Management stages.

We provide services to both the public and private sectors creating and delivering solutions for specific rail requirements in urban metropolitan and metro systems, long haul intermodal railway networks, heavy haul minerals railways, specialised rail transport for the rail industry and logistics providers.

# **RAIL REFERENCE**

# Gautrain - Rapid Rail Link

![](_page_17_Picture_6.jpeg)

Bombela Civils Joint Venture

![](_page_17_Picture_8.jpeg)

LOCATION Johannesburg, Gauteng RSA

iX engineers in association with WS Atkins International were appointed by the Bombela Civil Joint Venture (BCJV) for preliminary, as well as detailed design of the South-North Section.

As part of the ongoing National Transport Development and preparation of the 2010 International World Cup, a total of 55 km high-speed rail on the standard gauge was constructed including both above and below ground sections.

iX engineers provided structural engineering services related to the construction of temporary pedestrian and pipe bridges to facilitate the relocation of utilities and the construction of the below-ground elements of the rail network, including the implementation of tunnel ventilation.

# Nacala-A-Velha Workshops

CLN / Vale

![](_page_17_Picture_14.jpeg)

LOCATION Nacala-a-Velha, Nampula Province, Mozambique

Detail Design and construction management of the Railway Maintenance and Provisioning Yard for the Moatize to Nacala Corridor, located at Nacala-a-Velha in Mozambique. The maintenance facility included the marshalling yard lines, complete with cross overs, building for locomotive fuel refilling and sand refill, light maintenance building for light locomotive maintenance, wash bay, paint facility, wagon maintenance workshop, wagon storage yard, effluent and sewerage treatment plant, power supply, Gas store, Lubrication farm, wheel house facility, water supply, access road and bus terminal.

# **Kusile Power Station northern rail access**

![](_page_17_Picture_19.jpeg)

Eskom

![](_page_17_Picture_21.jpeg)

Mpumalanga Province South Africa

iX engineers' scope included the route determination and design of the new private siding to connect the new Kusile Power Station to the Transnet Freight Rail Lines. The 36 km new rail line included a viaduct bridge with a deck of 350 meter in length, crossing the N4 toll-road with bridges underneath both carriageways. The optimised design further included earthworks and drainage, concrete structures, perway, signalling and overhead electrical traction equipment designs (OHTE).

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![](_page_17_Picture_25.jpeg)

![](_page_17_Picture_26.jpeg)

# Smart Roads

![](_page_18_Picture_1.jpeg)

Smart Road technologies and applications will shape the future of transportation in this Fourth Industrial Revolution. There cannot be a Smart City without a smart road and together a Smart City with smart roads can provide citizens with smart mobility.

The road infrastructure and mobility sectors face major challenges for the next century and a new paradigm that makes Smart Roads a reality is what is required to ensure that Smart Roads are integrated into the future

iX engineers is currently developing and testing technology through our Digital Solutions team to find ways of making South African roads smarter and safer for all users through the use of IOT (Internet of Things).

#### The smart Roads concept is much more than just sensors and feedback loops. Smart roads include:

- Smart pavements with sensors and feedback loops
- Smart electronic asset management systems
- ECO friendly roads (recycled materials)
- Climate change resilient roads
- Integrated systems adapted for future travel demand
- Green roads sustainable and low-cost (use of recycled materials)
- Self healing roads (concrete and asphalt)
- Solar panel road surfaces, inductive charging roads and innovative load bearing blocks.

# OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE

# SNART CITES

![](_page_19_Picture_1.jpeg)

iX engineers has significant experience in building and infrastructure development projects, which includes the provision of consulting, engineering, project management and business/project services. Our in-house Accredited Green Building Professionals and Certified Energy Managers work within the design team providing the best sustainable solutions to customers and the environment over the full lifecycle of the asset.

#### The delivery of Smart Cities is complex and not solely limited to innovation and technology.

Urban design principles, which respond to the local context, should be integrated and shouldered by a concrete business case. iX engineers takes on the role of connecting applied technology, infrastructure, city planning and design solutions when crafting Smart City methodologies.

#### iX engineers offer the following Smart City solutions:

- Smart demand management and water conversation
- · Smart bulk water and ground water management
- Smart water distribution and metering
- Smart stormwater management
- Smart energy and smart grids
- Smart roads
- Smart solid waste
- Smart buildings
- Smart hospitals and schools
- Housing and land development

![](_page_19_Figure_16.jpeg)

The Buildings & Services Division offers a 'one-stop-shop' solution to our customers.

# Green Building Design

![](_page_20_Picture_2.jpeg)

iX engineers is registered with the Green Building Council of South Africa (GBCSA) and has a number of Green Star SA Accredited Professionals with many years of experience in design of energy efficiency infrastructure.

iX engineers provides specialist services in the building infrastructure field which includes industrial and business park developments, (light and heavy) industrial plants, warehouses, service stations, abattoirs, telecom towers, commercial and mixed use developments (offices, hotels and shopping centres), institutional facilities (schools, hospitals, clinics, prisons, airports, police stations, community halls, etc.), sport and recreational facilities (stadiums and indoor facilities) and residential buildings.

We also provide specialist services in the electrical distribution and reticulation fields which include sub-stations, switching-stations, distribution networks (underground and overhead), electrification, master planning, telemetry and SCADA systems.

The various Engineering disciplines of the Buildings & Services Division, which are discussed separately, specialises in all the technical aspects of building & services projects.

# **Electrical and Electronic Engineering:**

![](_page_20_Picture_8.jpeg)

- Building Electrical Systems
- Building Electronic Systems
- Lighting
- Power Generation ( PVI Gas, Energy Storage, Co- generation, Tri-generation )
- Transmission lines and Networks
- Substations and Switching Station
- Reticulation and Distribution
- Analysis of Electrical Networks & Systems
- Energy efficiency

# Mechanical Engineering

![](_page_20_Picture_19.jpeg)

- Heating, ventilation, and air conditioning [HVAC]
- Fire Protection detection
- Wet services
- Vertical Transportation
- Gas and Compressed Air Installations
- Refrigeration Installations
- Steam generation
- Medical gas
- Medical infrastructure

# Civil Engineering

![](_page_20_Picture_30.jpeg)

- Bulk Earthworks Designs, where our approach is always to firstly, optimize cost by balancing cut and fill volumes as far as possible but taking cognisance of ground conditions.
- Roads and Stormwater Designs for building projects are always done in conjunction with the appointed Architects, Landscape Architects and Green building Consultants.
- Water and Sewer Designs which make provision for both internal (on-site) as well as external (bulk off-site), with good cooperation and coordination with the Architects being of vital importance. On-site solutions and re-use of effluent water are critical considerations at the planning stage of a project.

# Structural Engineering

![](_page_21_Picture_1.jpeg)

#### High Rise Buildings

- Offices
- Apartment blocks
- Hospitals

#### Low Rise Buildings

- Schools
- Correctional Facilities
- Apartments

#### Industrial

- Factories and manufacturing areas
- Dedicated Industrial Structures
- Sport and Recreational Facilities
- Indoor
- Outdoor

#### Revitalising the Built Environment

- Investigation and reporting on structural integrity of damaged buildings
- Restoration, reinstatement or alteration of existing building structures for alternative use

# **BUILDING REFERENCE**

# Nelson Mandela Stadium

![](_page_21_Picture_21.jpeg)

CUSTOMER Nelson Mandela Bay Municipality LOCATION Port Elizabeth, Eastern Cape RSA

The five-tier, R2 billion (approximately \$159 million) Nelson Mandela Bay Stadium was built overlooking the North End Lake, at the heart of the city. It is one of three new coastal stadiums built for the 2010 FIFA World Cup. It regularly hosts large scale football (soccer) and rugby union matches. The stadium is also used as a concert venue.

The stadium seats 45 000 in addition to 4,000 extra seats, temporarily installed for the 2010 FIFA World Cup. There are also two conference rooms, which are able to accommodate 200 people, situated on the 5th level. WorleyParsons PI BU (now iX engineers) was the lead consultant in the JV appointed to carry out the Structural Detail Design. In addition to the structural design, iX engineers was significantly responsible for the construction management of the reinforced concrete structure.

![](_page_21_Picture_26.jpeg)

# **Menlyn Maine**

![](_page_21_Picture_28.jpeg)

CUSTOMER Menlyn Maine Investment Holdings

![](_page_21_Picture_30.jpeg)

**LOCATION** Pretoria, Gauteng, RSA

iX engineers provided the management services together with civil and electrical services to establish all engineering infrastructure for the precinct. This included roads, water and sewer reticulation, stormwater and electrical <u>networks</u>.

![](_page_21_Picture_33.jpeg)

# **Cape Town International Airport**

![](_page_22_Picture_1.jpeg)

#### CUSTOMER Airports Company of South Africa

![](_page_22_Picture_3.jpeg)

LOCATION Cape Town, Western Cape, RSA

The project comprised of the re-development of the old terminals to a new integrated world class terminal for the processing of all departing and arriving, domestic and international passenger traffic. It was planned to provide for the increased traffic volumes of the World Cup 2010 and exceeded all expectations. For design approval a 3D model was created to calculate and present illumination levels, including the shadowing effects of various aircraft structures. The electrical services included substations with redundant capacity to cater for plant failure, standby power generation, bulk supplies to HVAC and baggage processing systems and UPS systems to dedicated users.

![](_page_22_Picture_6.jpeg)

# **Corobay Corner Office**

![](_page_22_Picture_8.jpeg)

Eris/Emira

![](_page_22_Picture_10.jpeg)

**LOCATION** Menlyn, Pretoria South Africa

Design and construction of a new 4-storey high-spec office building of approx. 15 000 m2 office space and 3 000 m2 basement parking area. The design incorporated Green features. The iX engineers' design scope included hot water generation via heat pumps with high COP, thermal heat recovery wheels for fresh air, heat recovery 4-pipe high efficiency type chillers, energy efficient light fittings and effective lighting controls, variable volume chilled water and heating water pumping with pressure independent valves to accurately match the building load and reduce energy wastage, individual control of HVAC units for high comfort levels, a full BMS system with features such as the reading of utility meters, historic logging, internal temperature adjustment, fault-finding, alarms and many more, a flexible design to allow for easy adaptation to suit tenant's requirements. Civil infrastructure, structural design and three levels of underground parking were also included.

![](_page_22_Picture_13.jpeg)

# **Hibernian Towers**

![](_page_22_Figure_15.jpeg)

CUSTOMER Quaypower Properties

![](_page_22_Picture_17.jpeg)

**LOCATION** Strand, Western Cape, RSA

The 22-storey building's shape illustrates how effectively concrete can be used to bring to life an architect's vision, with the curved lines being key features of the architect. This theme is carried through to the inside of the building. This luxury multi-storey apartment building also has office and retail space. The podium has a 3840m footprint, above which are two individual towers and an atrium.

![](_page_22_Picture_20.jpeg)

# The Edge Office Development

![](_page_22_Picture_22.jpeg)

CUSTOMER Cubimanzi Investments (Pty) Ltd

![](_page_22_Picture_24.jpeg)

LOCATION Tyger Waterfront, Bellville Western Cape, RSA

The building design criteria used included the "Green Building Council Guidelines for Offices" to achieve a 5-star Green Building rating. The building consisted of four levels of covered parking, five levels of offices as well as retail space on the ground floor. The building has three lifts and is also equipped with a 400 kVA emergency generator which provides power for lighting and power for all the office computers.

![](_page_22_Picture_27.jpeg)

ENERGY

# CREATING A SUSTAINABLE WORLD FOR OUR FUTURE GENERATIONS

Increasing droughts and cyclone activities expose Africa's vulnerability to the intensifying consequences of climate change.

Considering that about 60% of people who lack access to electricity live in Africa, it is our moral imperative to uplift these struggling communities.

Especially in view of Africa's vast solar resource, Sustainable Energy is the solution to both mitigating climate change and providing access to clean electricity in remote rural areas.

To enable a planet powered by renewable resources with its intermittent supply, energy storage must be at the forefront of technological innovation.

The industry must expand and advance its creativity and development to enable the complete replacement of fossil fuel generation with renewable energy.

In response to the need for cost- effective storage solutions, we have identified innovative energy storage technologies, which will enable further deployment of renewable energy Imagine a future where all energy supplied matches demand in real time or where every solar farm is monitored ensuring optimal energy capture thus significantly reducing dependence on other energy sources. This future is not that far away. INTERESTED? Come and chat to us.

#### The bGen

This technology is particularly interesting for industry, where electricity meets waste heat, steam and process heating & cooling. The bGen system uses South African rocks for thermal energy storage. Energy can easily be transferred from one form to another, whilst being stored in high-exergy heat. The system is modular and space-efficient.

![](_page_23_Figure_11.jpeg)

#### The Evie Tower

The technology was inspired by the integral use of gravity and kinetic energy relied upon to move water and generate power in pumped storage hydro plants but replaces water with innovative 35ton bricks made from low-cost waste materials. Using the fundamental principles of science, a storage solution that is as compassionate to the planet as it can be built anywhere, whilst cleaning up the environment

#### Our key energy solutions include:

- Energy storage (kinetic, thermal, chemical)
- Renewable Energy
- Solar PVSolar Thermal (including CSP)
- Wind
- Co-/Tri-/Quad-generation
- Energy Efficiency

![](_page_24_Picture_9.jpeg)

#### **ENERGY REFERENCES**

# LOERIESFONTEIN/KHOBAB 2\* 140MW WIND FARMS

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Murray & Roberts (Mainstream)

#### LOCATION

Hantam Municipality area 60km north of Loeriesfontein Northern Cape.

The project entailed the construction of two 140MW Wind Farms, consisting of 61 wind turbines each and generating a combined 1,127,000 MWh/year of clean renewable energy per year.

Each turbine had a height of 100m above the ground (excluding the blades). Every component had to be delivered and assembled on site. This meant that a route analysis had to be done to determine the optimal route by which the turbine components could be delivered. Each turbine had to have a hardstand constructed with enough storage space for all the components, with sufficient space for all the cranes required for assembly and while still limiting the environmental impact of the hardstands.

The bases of the turbines had to be founded on suitable foundation material and have the required strength and durability in order to counteract all static and dynamic loads applied to the turbine.

![](_page_24_Picture_19.jpeg)

# **KAXU SOLAR ONE 100MW SOLAR THERMAL PLANT**

![](_page_24_Picture_21.jpeg)

CUSTOMER Kaxu Solar One 100 MW Solar Thermal Plant

![](_page_24_Picture_23.jpeg)

LOCATION Pofadder, Northern Cape RSA

EPCM Contract for a 100 MW Concentrated Solar Power (CSP) plant, with parabolic trough collector (PTC) technology with molten salts thermal energy storage (TES) system. The plant is located approximately 50 km North East of Pofadder in the Northern Cape province of South Africa. The plant uses PTC technology and works by tracking the sun from east to west, concentrating the direct irradiance and converting it into thermal energy.

The thermal energy is transferred through a closed Heat Transfer Fluid (HTF) circuit to produce steam, which drives a 100 MW steam turbine. The electricity generated is transmitted through a high voltage substation and exported to the grid. The plant includes a thermal energy storage system that allows extending the electricity generation after sunset, the equivalent of 2.5 hours at nominal capacity.

![](_page_24_Picture_27.jpeg)

![](_page_25_Picture_0.jpeg)

![](_page_25_Picture_1.jpeg)

# Water in mining

iX engineers traditionally provides an engineering service to the public and private sector and has now extended its service offering to the mining sector. iX engineers' services in the mining industry include the following:

- Water
- Energy
- Resettlements
- Roads and underground ramps
- Storm waterBulk earthworks
- Buildings and process plants
  - Condition assessments
  - And all the other supporting engineering disciplines

![](_page_25_Picture_12.jpeg)

#### Water Solutions in Mining

As water is one of the scarcest resources in South Africa, iX engineers has identified water as a priority area that requires innovative thinking and solutions. In mining, water plays a major role in operations and processing of minerals, therefore iX engineers has set itself a target to assist and support the mining industry to save water consumption by up to 50%. This will be achieved by offering an orchestrated mix of solutions, systems and technology that will be integrated to deliver the desired target.

![](_page_26_Picture_0.jpeg)

#### Water Solutions in Mining

- Water supply options
- Water balance
- Water resource development
- Conveyance systems and pump stations
- Water storage systems
- Water treatment
- Water distribution systems
- Internal water and sewer reticulation
- Storm water management
- Demineralised water
- Acid mine drain solutions
- Desalination

# Water Conservation & Demand Management

- Water monitoring system using "Internet of Things" (IOT) and smart water systems
- Reduced environmental impact
- Reduced operations and maintenance costs
- Reduced plant capacity requirements
- Improved level of service end efficiency
- Reduced water losses and NRW
- Reduced return flows
- Possibilities for re-use and recycle
- Pressure management

Energy in mining

![](_page_26_Picture_25.jpeg)

iX engineers' electrical services department provides specialist services in the electrical distribution and reticulation industry. iX engineers is an affiliated member of the Association of Municipal Electrical Utilities (AMEU) and International Council on Large Electric Systems (CIGRE).

iX engineers' diverse experience and exposure is evident through our success in the electrical transmission and distribution industry, which includes but is not limited to services such as the following:

- Sub-stations & switching-stations up to 132 kV (indoor and outdoor)
- Distribution and transmission networks up to 132kV (underground and overhead)
- · Electrification of townships, low cost housing, up market residential and resort developments
- Master planning and analysis of High, Medium and Low Voltage Networks
- Telemetry & SCADA systems
- · Refurbishment, upgrades and maintenance of all electrical infrastructures
- Emergency Power Generation
- · Lighting of streets, roads, stadiums and sports fields
- Renewable Energy
- Solar PV & Thermal (including CSP)
- Wind
- Energy storage
- Energy efficiency

# Resettlement in mining

![](_page_26_Picture_42.jpeg)

iX engineers' resettlement solutions in the mining sector minimise risks for both the mining company and the community, with the aim of developing a long-term partnership that leads to improved community stability and a diversified local economy. We follow the World Bank's IFC Standard 5 guidelines, as well as local and national legislation to manage resettlement.

Our alliance with world known specialists enables us to deal with stakeholder relations management comprehensively while handling the social side of resettlement projects with dignity and care. We provide mining companies with specialised skills to effectively manage resettlement projects through the different project phases to get final project approval for implementation while embedding the social-economics, training and well-being of the community throughout the process.

iX engineers offer the following resettlement solutions and benefits in the mining sector:

- Project management through the different project phases
- Experience in managing the full scope of a typical resettlement project from inception till final close out
- Compilation of resettlement action plans (RAP)
- Stakeholder management (Engineering vs Community)
- Managing community acceptance (No risk for Government)
- Risk management
- · Upliftment, training and establishing of SMME's of the affected communities
- Job creation
- Multidisciplinary engineering services to do the design of all typical bulk and internal infrastructure, town planning, houses and other buildings
- Construction management
- \*And all the other supporting engineering disciplines.

#### MINING REFERENCES

# **Shondoni Mine Early Works**

![](_page_27_Figure_2.jpeg)

Sasol VALUE R285 million

CUSTOMER

![](_page_27_Picture_5.jpeg)

LOCATION Secunda Mpumalanga Province RSA

The project entailed the construction of a 4km long by 400mm NB steel potable water pipeline, a 5km long by 350mm NB HDPE service water pipeline, an elevated 392kl pressed steel tank and a raft pump station.

The proposed potable water pipeline connects to Rand Water Board's existing N1/N4/ N6 pipeline and the pipeline route follows the route of an existing 230mm NB Rand Water pipeline. The pipeline route has a highway road crossing that required pipe jacking. The proposed service water pipeline conveys water from Ithembalethu mine to an elevated tank at Shondoni mine. The project had the following phases:

- Feasibility study
- Tender documentation
- Preliminary design
- Construction
- Detailed design
- Close out

half

# **Dingleton Resettlement Project**

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of Anglo America
VALUE
P11 hillion

![](_page_27_Picture_19.jpeg)

LOCATION **Dingleton Host Site** Kathu Northern Cape RSA

iX engineers was appointed civil and structural engineers on the Dingleton township resettlement project for Anglo American in Kathu. iX engineers completed the project following the acquisition of the Public Infrastructure (PI) Business unit of WorleyParsons RSA.

The appointment entailed construction of 504 houses with outbuildings and servicing of 820 new stands to accommodate the relocation of residents from land earmarked for open pit mining. Deliverables achieved was investigating of bulk services availability, design of residential roads and provincial road intersections, gravitational sewer networks and a water reticulation, preparation of construction drawings, specifications an quantities, apply a quality management system during construction and assist the client, project managers, quantity surveyors, architects and other engineering disciplines from feasibility phase to close out.

![](_page_27_Picture_23.jpeg)

# Northern Access Road, Wafi-Golpu Mine

![](_page_27_Picture_25.jpeg)

CUSTOMER Wafi-Golpu Joint Venture VALUE R1.1 billion

![](_page_27_Picture_27.jpeg)

LOCATION Morobe Province, Papua New Guinea

![](_page_27_Picture_29.jpeg)

A new access road of a 26km with 5 new river bridge crossings in the mountainous area of Papua New Guinea to the new Wafi-Golpu mine. The road travels through forest areas and flood plains making it a challenging design in terms of road alignment, safe driving conditions, reduced travelling time and cost, ensuring sustainable material and equipment supplies and exports to and from site.

![](_page_28_Picture_0.jpeg)

# **OUR FOOTPRINT**

# LOCATIONS IN SOUTH AFRICA

#### MAIN OFFICES

#### Pretoria

270 Lynnwood Services Road, Lynnwood Pretoria

Jannie van der Mescht

🔀 Jannie.vdm@ixengineers.co.za +27 (0) 12 745 2000

#### **OUR REGIONAL OFFICES**

Genius Loci Office Park, Building No 4, 6 CP Hoogenhout St, Langenhoven Park Lukie van Staden:

![](_page_29_Figure_10.jpeg)

2 Steenbok Avenue Upington Herman Schmidt

![](_page_29_Picture_12.jpeg)

Herman.s@ixengineers.co.za **•** +27 (0)54 332 4943

George St John's Place,8 St John's Street, George,6530 Schalk van der Merwe

![](_page_29_Picture_15.jpeg)

🔀 Schalk.vdm@ixengineers.co.za **4** +27 (0) 44 050 3626

31 Allen Drive, Loevenstein Cape Town Adrian Coetzee

![](_page_29_Picture_19.jpeg)

🔀 Adrian.c@ixengineers.co.za

+27 (0) 21 912 3000

# Rajeev Maharaj

🔀 Rajeev.m@ixengineers.co.za +27 (0) 31 254 5700

21 The Boulevard, Westside Office Park,

Westville, 3630, Durban Westville

Montrio Corporate Park, Block 3, 1st Floor North Wing, 10 Oliver Road, Monument Heights, Kimberley Ambrose Khumalo

![](_page_29_Picture_26.jpeg)

# 317 Bulwer Street

Pietermaritzburg, 3201 Shanir Ramjathan

> 🔀 Shanir.r@ixenginee<u>rs.co.za</u> **4** +27 (0) 82 808 2401

#### Port Elizabeth

Kings Court, Cnr Buffelsfontein & Titian Road Walmer Heights, Port Elizabeth Willem Hofmeyr

> 🔀 Willem.h@ixengineers.co.za 27 (0)41 391 8811

#### **Project Offices**

#### eMalahleni:

Office Manager: Ogopoleng Modise **6** 072 294 8869 Mahikeng:

Office Manager: Keabetswe Pholo **6**071 395 8167

Polokwane:

Office Manager: Brendan van Schoor **6**082 611 9775

Rustenburg: Office Manager: Jonathan Royston **6** 072 279 9886

# OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE

![](_page_30_Figure_1.jpeg)

![](_page_31_Picture_0.jpeg)