FEASIBILITY STUDY REPORT – FUEL CELLS
DEPARTMENT OF ECONOMIC DEVELOPMENT

CONTRACT NO. PS-RE 39-2016 - Technical Resource Team as-and-when Appointment

8 FEBRUARY 2019

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CLIENT REPRESENTATIVE NAME: ________________________________

SIGNATURE: ___________________________  DATE: ___________________________

REPORT STATUS

<table>
<thead>
<tr>
<th>Draft</th>
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<th>✓</th>
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</thead>
</table>

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1 EXECUTIVE SUMMARY

Black Jills JV was appointed by City of Ekurhuleni Department of Economic Development for the provision of consultant services required stages 1 and 2 for the proposed Fuel Cells Plant at Impala in Springs, under contract PS-RE 39-2016 dated 15th September 2017. The scope of services entailed developing a master plan, carrying-out specialist studies, needs and suitability analysis, feasibility study, concept design, and cost estimate. However, in addition studies such as dolomite stability investigation and capacity investigation for existing water and sewer infrastructure has to be undertaken.

According to Gauteng Growth and Development Agency (GGDA) Springs Platinum Group Metals (PGM) Special Economic Zone (SEZ) market assessment and feasibility report, the following are matters pertaining to town planning:

- Currently there is a single industrial use that is being used on the site; mining offices and the establishment of the proposed fuel cells plant will introduce various other industrial uses. Given that there will be various land uses that will be introduced on the site as part of the industrial development there will be a need for a Township Establishment application to be submitted, where the required development controls (zoning, height, coverage etc.) will be determined.
- Central to the township establishment application will be the; Environmental assessment, Geotechnical assessment, Traffic assessment, Outline Scheme Report and a general assessment of the availability of bulk infrastructure.
- A large portion of the site is covered by dolomite and this will necessitate thorough geotechnical investigations to be done prior to development.
- The title deed of the property explicitly states that the property is subject to mining rights and therefore the application will have to be circulated to the Department of Mineral Resources for comments.

The aim of the Fuel Cells Plant will be to have sectors and products that will be a part of a value chain from the beginning (i.e.: catalysts), the later end (i.e.: assembly or customisation of product) and potentially also move into the middle aspects of the value chain (i.e.: power systems). And thus create positive spin-offs in terms of job creation for the construction period of the project and the industrial activities thereafter. This economic opportunity is likely to establish long-term sustainable economic growth both in terms of skilled and unskilled labour and further in terms of the establishment of permanent business and economic growth opportunities in the Geduld, Springs area.

The proposed mixed industrial development will offer various employment opportunities in close proximity to residential neighbourhoods. It can be interpreted that the proposed development will assist in realising the vision of the National Development Plan by creating a development that is compact and that offers employment opportunities. Table 1 below summarises economic assessment of the proposed development as discussed in detail on the market assessment on annexure A. The key indicators used shows that Fuel Cells has an internal rate of return (IRR) of 13.08% in the base case and that it will generate approximately 850 to 1400 direct jobs and 2500 to 4200 indirect jobs.
## Table 1: Economic assessment

<table>
<thead>
<tr>
<th>COMMERCIAL VIABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario name and description</strong></td>
</tr>
<tr>
<td>Base case: Expected market take-up, phased infrastructure development.</td>
</tr>
<tr>
<td>High case: Rapid take up rate, phased infrastructure spend.</td>
</tr>
<tr>
<td>Low case: Up front infrastructure development costs, slow take up rate.</td>
</tr>
</tbody>
</table>

## SOCIO ECONOMIC IMPACT

Job estimates drawing on the layout and financial model.

<table>
<thead>
<tr>
<th>Type of job</th>
<th>Assumption</th>
<th>Condition</th>
<th>Size of development</th>
<th>No. of jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>Based on estimate for light industry of 45 to 75 m² to 1 direct job.</td>
<td>Fully tenanted</td>
<td>64 000 m²</td>
<td>~850 to 1400</td>
</tr>
<tr>
<td>Indirect</td>
<td>Sector is manufacturing with a multiplier of 3 no. of jobs in-line with employment multipliers of a R1 m investment.</td>
<td>Fully tenanted</td>
<td>64 000 m²</td>
<td>~2500 to 4200</td>
</tr>
</tbody>
</table>
This industrial development forms part of a bigger plan within the Ekurhuleni Industrial District. The approach to design needs to incorporate the macro and micro considerations of the surroundings and immediate site. The method for design will therefore be a multi-faceted approach, layering a notion of function, market responses and an integration of work and production. The major influence for design is sustainable design, function and space (at the micro level). At the macro level it’s a combination of functional needs and site constraints.

A site investigation of the proposed site of the development was conducted in June 2018. The purpose of the investigation was to establish: the general site conditions, site boundary and access, existing structures, existing infrastructure (i.e.: on site and adjacent to the site), constraints and concerns. And the following are matters regarding the capacity of the proposed infrastructure:

- The site requires two road entrances which can accommodate heavy vehicles. The proposed site layout positions these entrances to the south and the east of the site boundary, of which both positions are already serviced with hard surfaced access roads.
- Although it is known that the area around the development is serviced for industrial use, the exact available capacity of the existing water and sewer infrastructure, at this stage, is still unknown. Ekurhuleni’s standard procedure for all new developments requires that a water capacity investigation be done for the development, which will be commenced in the preliminary design phase in consultation with the consulting company, GLS. Despite the exact demand and capacity figure not known at this stage, it is safe to say that a light to medium industrial development in this area is feasible as the existing bulk infrastructure should accommodate the perceived demands.
- Although EMM’s philosophy is to neutralise the excess run-off from the site development with on-site retention strategies, it is anticipated to provide external site storm water discharge infrastructure as additional mitigation measures.

In addition, a review of the survey data subsequent to the site investigations revealed that not all the existing services were identified and surveyed. The outstanding services include the Rand Water pipeline, Sasol Gas pipeline, Hydrogen pipeline, stormwater infrastructure, etc. All servitude information also needs to be incorporated into the survey.

Also, in light of the fact that the site earmarked for proposed Fuel Cells Plant Development is dolomitic, the following should be noted:

- This implies and additional cost factor to the installation of bulk services in order to comply with dolomitic services specifications.
- Intensity grading must still be investigated and confirmed. Depending on the dolomitic severity level, expensive supporting earth platforms or engineered soil mattresses may need to be constructed.
- Another common mitigation measure in dolomite areas are dynamic compaction in order to collapse any existing cavities underground and to compact the in-situ material. However, on large building areas this may become a costly exercise.
• The floor design will need care-full consideration to serve the user's activities load requirements, as well as provide effective bridging of possible sink-hole formations below the covered area. Such dolomitic resistant floor design may escalate costs depending on the severity level of the possible dolomitic activities.

The proposed project is a listed activity of Regulation 982, 983, 984 and 985 of the EIA Regulations of 4 December 2014, promulgated in terms of Chapter 5 of the National Environmental Management Act (NEMA), Act 107 of 1998, as amended, and therefore requires environmental authorisation before commencement of the activity.

The environmental investigation will evaluate the environmental impacts of the proposed activity during the construction and operational phases of the project and make recommendation to enhance positive impacts and mitigate negative environmental impacts.

It should be stated that there are environmental uncertainties which still need more clarity. A full description of the project is needed in order to clarify which environmental process(es) need to be conducted for the project. The final environmental process(es) to be followed and the specialist studies required will be confirmed with the authorities once the final project scope has been fixed.
2 INTRODUCTION

2.1 PURPOSE

The purpose of this document is to present Black Jills JV’s Feasibility Study findings for the proposed Fuel Cells Plant Development at Impala in Springs. The document is prepared for the City of Ekurhuleni Department of Real Estate and outlines our understanding of the scope, design approach and fee proposal for the proposed Fuel Cells Plant Development. The document consists of the following sections:

- Section 1 - Executive summary,
- Section 2 - Introduction,
- Section 3 - Background information,
- Section 4 - The site town planning,
- Section 5 - Architectural,
- Section 6 - Engineering,
- Section 7 - Specialist studies,
- Section 8 - Costing,
- Section 9 - Programming,
- Section 10 - Conclusions and Recommendation, and
- Section 11 - References.

2.2 TERMS OF REFERENCE

A request for proposal was issued by City of Ekurhuleni Department of Real Estate to Black Jills JV, under contract PS-RE 39-2016, on the 15th September 2017. The RFP called for the provision of consultant services required stages 1 and 2 of the Work Stage 1 – 2 Master Plan and Related Studies for Development of Fuel Cells Plant at Impala in Springs.

A briefing session was held with the Client Department, Economic Development Department, on the 15 September 2017 and no site visit was conducted.

The following were included as part of the terms of reference:

Scope of Services

- Develop a Master Plan
- Carry out all related Studies, which amongst other activities will include Geotechnical investigation, Traffic Impact Studies and Environmental Impact Assessment.
- A Needs and Suitability Analysis.
- Full Technical Feasibility including Business Case.
- Concept & Architectural Designs and Costing for Land Readiness (Bulk Services, Commodity Demands).
3 BACKGROUND INFORMATION

Guided by the terms of reference as highlighted on sub-section 2.2 above, Black Jills JV carried-out the following studies: market study, architectural concept design, existing infrastructure reporting (i.e.: civil, structural, and electrical engineering infrastructure), urban design, environmental screening, traffic Impact Assessment, topographical survey, and geotechnical investigation (refer to annexure A, B, C, D, E, F, G, & H for comprehensive reports of the studies).
4 THE SITETOWN PLANNING

4.1 INTRODUCTION

The Town Planning section provides insight into the physical and legal characteristics of the proposed Fuel Cells Plant in order to enable an informed assessment of the risks or deficiencies associated with the proposed development. It is noted that the legal, environmental, engineering and investment-related aspects of the proposed development have been considered by other specialists on behalf of the client. The technical aspects should be considered in the context of this bigger picture and may require further inter-advisory liaison.

4.2 SITE LOCALITY

On a regional scale, Portion 133 of the farm Geduld is located in Region D of City of Ekurhuleni.

The property is situated directly south of a railway station. The site is situated directly west of East Geduld Road, directly north of Cowles Street and Impala Refineries. At a regional level the site is surrounded by major road networks such as the N12 which situated 16km north of the site. The N17 is situated 8km south of the site and the R29 is situated 2,5km west of the site, as seen in Figure 1. The R59 is also situated 5km south of the site. Furthermore, the site is located 10km north of the Nuffield Industrial node and 1,5km of the Enstra Industrial area.

Figure 1: Site earmarked for Fuel Cells Plant Development at Impala in Spring.
4.3 LEGAL ASSESSMENT

4.3.1 PROPERTY DESCRIPTION

Below please find a table summarising the property descriptions, ownership and size of the subject erven:

Table 2: Summary of the property descriptions, ownership and size of the subject erven.

<table>
<thead>
<tr>
<th>ERF DESCRIPTION</th>
<th>REGISTERED OWNER</th>
<th>TITLE DEED DESCRIPTION</th>
<th>SIZE ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portion 133 Geduld 123 IR</td>
<td>Impala Platinum Limited</td>
<td>T67314/1993</td>
<td>29,1882ha</td>
</tr>
</tbody>
</table>

The land is registered vide the Transfer Title Deed 67314/1993 in favour of Impala Platinum Limited. However, it has since been handed over to the Gauteng Industrial Development Zone, however this does not yet reflect in the Deeds registry.

4.3.2 TITLE CONDITIONS

Portion 133 Geduld 123 IR has restrictive title conditions, mostly related to servitudes. These conditions; a) relating to historic mining rights, b) relating to coal mining rights, c) and d) relating to an Eskom Powerline servitude and e) relating to a water pipeline servitude are reflected in the Title Deed T67313/1993 and are stipulated as follows:

a) Subject to Mynpacht No. 481/1899

b) That portion being Mineral Area No.5 of the former Remaining Extent of the farm Geduld 123, Registration Division IR, Transvaal, measuring 3349,2912 hectares (whereof the property hereby transferred forms a portion) is subject to the following condition:

“Het eigendom hieronder gehouden is onderworpen en gerechtigd tot de termen van zeker Notariele Akte No. 51/1927S met aangehechte documenten met betrekking tot koolrechten, zoals meer ten volle zal blijken uit Notariele Akte No. 51/1927S op 26 Januarie 1927”

c) The former Remaining Extent of the farm Geduld 123, Registration Division IR, Transvaal, measuring 1994,5655 hectares (whereof the property hereby transferred forms a portion) is subject to a servitude to convey electricity in favour Eskom together with ancillary rights and subject to conditions as will more fully appear from Notarial Deed K3480/76S registered on 3 December 1976.

d) The former Remaining Extent of the farm Geduld 123, Registration Division IR, Transvaal, measuring 1965,4858 hectares (whereof the property hereby transferred forms a portion) is subject to a servitude to convey electricity in favour of Eskom together with ancillary rights and subject to conditions as will more fully appear from Notarial Deed K2874/1978S registered on 21 November 1978.

e) The former Remaining Extent of the farm Geduld 123, Registration Division IR, Transvaal, measuring 1965,8458 hectares (whereof the property hereby transferred
forms a portion is subject to a servitude for water pipe lines indicated by the figure ABCDEFGHKLM on diagram S.G No. A8919/70 in favour of Sappi Limited together with ancillary rights and subject to conditions, as will more fully appear from Notarial Deed K2874/1978S registered on 21 November 1978.

Furthermore, conditions; f, g, h, i, j, k, l, m, n and o, also relate to servitudes on the property. While the conditions relate to servitudes, these will not be a hindrance to the proposed mixed use industrial development and they will be incorporated in the township establishment based on the Land Surveyor certificate and conveyancer certificate.

4.4 TOWNSHIP REGISTRATION & PROCLAMATION

4.4.1 Analysis of Conditions of Establishment

A previous report that was done on the Gauteng Growth and Development Agency PGM Springs SEZ (by Kaiser EDP, Zimmerman Design and Moore Stephens) for an SEZ assessment as an input of an SEZ feasibility in 2017 highlighted the following in terms of town planning related issues with regards to the site.

- The site is a farm portion, with a zoning that allows for various industrial activities to occur. Currently there is a single industrial use that is being used on the site; mining offices and the establishment of the propose fuel cell plant will introduce various other industrial uses. Given that there will be various land uses that will be introduced on the site as part of the industrial development there will be a need for a Township Establishment application to be submitted, where the required development controls (zoning, height, coverage etc.) will be determined.

- Central to the township establishment application will be the; Environmental assessment, Geotechnical assessment, Traffic assessment, Outline Scheme Report and a general assessment of the availability of bulk infrastructure. These reports will all need to be consolidated in order to have a holistic approach towards the mixed used industrial development.

- A large portion of the site is covered by dolomite and this will necessitate thorough geotechnical investigations to be done prior to development.

- The title deed of the property explicitly states that the property is subject to mining rights and therefore the application will have to be circulated to the Department of Mineral Resources for comments.

The town planning process that will be followed for the township establishment of the mixed use industrial development (fuel cell plant), is detailed below:

a) A comprehensive application for Township Establishment in terms Section 96 of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) will be prepared and submitted to the Local Authority for internal and external circulation for a period of 60 days during which all stakeholders and service departments are afforded an opportunity to comment on the proposed townships.

b) The applications for Township Establishment will be advertised in the Gauteng Provincial Gazette, Beeld and Citizen Newspapers for two consecutive weeks (14 days) and a 28 day comment period for outside objections will be applicable.
c) After all comments are received and all objections or concerns are addressed and necessary amendments to the layouts are done, the applications will be referred to an Area Planner to prepare the recommendation report to the Agenda's Committee (Area Managers Meeting).

d) Thereafter, the application will have to be approved by the various Ekurhuleni Metropolitan Municipality committees, namely:

- The Development Facilitation Committee (DFC),
- City Manager’s Committee,
- Mayoral Cluster Committee,
- Mayoral Committee, and
- Council Meeting

e) After approval in principle by the various committees, the applications will be referred for draft conditions of establishment in order to reserve erf numbers.

f) Thereafter the Town Planner will assist the Land Surveyor in lodging the General Plans at the Surveyor General for approval in terms of Section 101 of the Ordinance.

g) After approval of the General Plans and after all pre-registration requirements of the Local Authority have been met including approval of ETOPS Annexures, a Section 101 certificate will be issued by the Local Authority authorizing the project Attorney to open a township register.

h) After a notice in terms of Section 103 of the Ordinance has been issued by the Registrar of Deeds as proof that the township registers were opened, the townships will be proclaimed in the Gauteng Provincial Gazette.

i) We also wish to confirm that an Environmental Specialist has been appointed for this development and that there has been some work done to date. As such, the process for environmental authorization will run separately but concurrent with the Town Planning process as set out below.

The abovementioned process with reasonable timeframes for township establishment applications, are set out in the table below:
### Table 3: The town planning process that will be followed for the township establishment of the mixed use industrial development (fuel cell plant)

<table>
<thead>
<tr>
<th>Action Necessary</th>
<th>Number of days</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREPARATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultation and preparation of applications (depending on availability of specialist reports)</td>
<td>28 days</td>
<td>1 MONTH</td>
</tr>
<tr>
<td>Submission of applications for township establishment</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td><strong>CIRCULATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advertisements</td>
<td>14 days</td>
<td>Concurrent</td>
</tr>
<tr>
<td>Objection Period</td>
<td>28 days</td>
<td>3 MONTHS</td>
</tr>
<tr>
<td>Internal and External Circulation</td>
<td>60 days</td>
<td></td>
</tr>
<tr>
<td>Reply to Objections</td>
<td>30 days</td>
<td></td>
</tr>
<tr>
<td><strong>APPROVAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocation to Planner at council</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td>Possible waiting period</td>
<td>90 days</td>
<td>6 MONTHS</td>
</tr>
<tr>
<td>Preparation of Approval (Report)</td>
<td>60 days</td>
<td></td>
</tr>
<tr>
<td>Approval (Signature)</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td><strong>POST APPROVAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft and pre-proclamation conditions of establishment</td>
<td>30 days</td>
<td></td>
</tr>
<tr>
<td>Erf numbers</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td>Final pre-proclamation conditions of establishment</td>
<td>21 days</td>
<td></td>
</tr>
<tr>
<td>Preparation and Approval of General Plans</td>
<td>45 days</td>
<td>6 MONTHS</td>
</tr>
<tr>
<td>Preparation of ETOPS Annexure’s</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td>Section 101 Certificates</td>
<td>21 days</td>
<td></td>
</tr>
<tr>
<td>Opening of Township Registers</td>
<td>28 days</td>
<td></td>
</tr>
<tr>
<td>Proclamation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 103 certificate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.5 DEVELOPMENT RIGHTS

#### 4.5.1 ANALYSIS OF ZONING PROVISIONS

The land is currently zoned Use Zone 8: “Industrial 1”. The purposes for which the land may be used include: Industries, Offices, Commercial Purposes, Showrooms, Motor Dealers, Panel Beaters, Builder’s. Portion 133 of the farm Geduld 123 IR has a formal development status on the southern part of the portion. The site is partially developed with mining offices, a football pitch, golf driving range and treatment pond. The northern part of the portion is vacant and undeveloped yards, Service Industries, Fitment centres, Motor Workshops, Light Industries and Auctioneers.
4.5.2 DEVELOPMENT CONTROLS

The development controls for the property are currently as follows in terms of the Ekurhuleni Town Planning Scheme, 2014 (refer to table 2):

**Table 4: Development controls**

<table>
<thead>
<tr>
<th>USE ZONE</th>
<th>“Industrial 1”</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY RIGHTS</td>
<td>Industries, Offices, Commercial Purposes, Showrooms, Motor Dealers, Panel Beaters, Builder’s Yards, Service Industries, Fitment centres, Motor Workshops, Light Industries and Auctioneers</td>
</tr>
<tr>
<td>HEIGHT</td>
<td>2 storeys</td>
</tr>
<tr>
<td>COVERAGE</td>
<td>70%</td>
</tr>
<tr>
<td>FAR</td>
<td>As per scheme</td>
</tr>
<tr>
<td>PARKING</td>
<td>1 bay per first 1000m² floor area, or part thereof and 2 bays per every 1000m² floor area hereafter</td>
</tr>
<tr>
<td>DENSITY</td>
<td>n/a</td>
</tr>
<tr>
<td>BUILDING LINE</td>
<td>As per scheme</td>
</tr>
</tbody>
</table>

The zoning of the site as “Industrial 1” is beneficial because it allows a wide scope of land use rights and an opportunity for consent use of more heavier/noxious industrial activities as well as ancillary uses.

4.5.3 LAYOUT PLAN ANALYSIS

The proposed Fuel Cells Plant concept will be an exploration of a mixed industrial development which would include PGM value add and other related manufacturing activities such as: power systems, transport, mining equipment and assembly/customisation etc. The aim of the Fuel Cells will be to have sectors and products that will be a part of a value chain from the beginning (i.e. catalysts), the later end (i.e.: assembly or customisation of product) and potentially also move into the middle aspects of the value chain (i.e.: power systems). The proposed layout, which can be implemented in phases, is depicted in figure 2 below.
The proposed layout for the mixed use industrial development can be motivated in terms of all existing policy guidelines and legal frameworks in mind. It is motivated that the proposed development (layout) takes into consideration the following factors and principles:

**Locational Advantage**

The Ekurhuleni RSDF states that as a priority, infill residential development should be promoted in all strategically located vacant areas that are suitable for development. The subject land is ideally located and is identified for densification and industrial development on the RSDF Plan, furthermore; the subject land falls well within the demarcated urban edge for the Ekurhuleni Metropolitan Municipality.

**Focused Public and Private Investment**

The Gauteng Spatial Development Framework (GSDF) limits development to areas located within a provincial urban edge. This development area falls within this urban edge and can be considered a strategic infill opportunity to focus public and private investment in an accountable and suitable manner. The site benefits from the fact that it is prioritised by the GGDA for PGM SEZ implementation and can therefore give private investors and incentive to invest in the project.

**Economic Upliftment**

A project like this will create positive spin-offs in terms of job creation for the construction period of the project and the industrial activities thereafter. This economic opportunity is likely to establish long-term sustainable economic growth both in terms of skilled and unskilled
labour and further in terms of the establishment of permanent business and economic growth opportunities in the Geduld, Springs area.

Localisation Economies

The site is located directly adjacent to the Impala Refineries Industrial area as well as in close proximity to the Nuffield Industrial node (10km) and 1.5km of the Enstra Industrial area (1.5km). The site will therefore stand to benefit from having the same type of industries (especially the Impala platinum refinery) within its vicinity in terms of infrastructure, labor pooling and knowledge spill overs. Localisation of economies is also beneficial for security in the area.

Road Network/ Access

The proposed development is served by an existing tarred road network with convenient access to major road networks. The site is situated 16km north of the site. The N17 is situated 8km south of the site and the R29 is situated 2.5km west of the site. The R59 is also situated 5km south of the site. These major road networks serves as linkages that connect the site to other parts of Ekurhuleni (Benoni, Boksburg, Springs, OR Tambo airport), Johannesburg and Gauteng as a whole. There is an existing access to the southern developed part of the site that is taken of Cowles Street, which can potentially be linked to the internal road network on the proposed layout. The access to the proposed mixed use industrial development is proposed from East Geduld Road, on the eastern boundary of the site (as seen in Figure 4).

Rail Freight System

There is a railway line that is situated on the northern boundary of the site. The railway line is a big advantage for the site because it means that the proposed industrial development will be able to make use of freight rail to transport goods to and from the site and this can be done incorporating railway sidings into the more detailed design of the development. This will lessen the pressure of having to transport goods by trucks and will in turn reduce road maintenance. A rail system is viewed as a cheaper means of transporting goods to ports and this will benefit the investor and/or manufacturing/industrial company.

Stand sizes

Due to the fact that the proposed development is of a mixed use industry, the erf sizes are made big enough to accommodate the big building structures that industrial land uses often require. The erf sizes range from a minimum of 0.77ha to 1.5ha. This will also ensure that a variety of industries are included in the development because depending on the type of industry, the erf size requirement will differ.

Phasing of Township

Due to the nature of the proposed mixed use industrial development, it can be developed in phases, which means that portions can be subdivided or consolidated and be given rights to occupy and use to different owners or investors. This will be beneficial because it will enable different stakeholders to invest in the development and have control over what they want to do on their respective portions. The phasing of the development will also allow the installation
of services to be done in stages according to which phases of the site is proclaimed and developed first. This will also provide an option for the developer to pay bulk contributions, rates and taxes to the relevant municipality according to the proclaimed phases of the township instead of the entire township. The phasing will also allow for the township register and proclamation to happen as and when investors buy into the development.

Security

Security plays a major role in industrial developments especially because of the size of the structures and magnitude of equipment that is housed there. It is therefore proposed that there are stringent security measures implemented with the proposed development. Having the entire development bounded off, with one proposed access is one measure to control how and by who the site is accessed. Further steps to take for security will have to be incorporated in the systems that will be operational on site. Security measures will have to be physical and through networks.

Sasol Gas Pipeline Network

The sasol gas pipeline network runs on the eastern boundary of the site. Taking into consideration that the proposed development is for industry, having a connection to get gas onto the site would be a valuable contribution to the industrial activities that would be on site. This is an existing infrastructure opportunity that can be optimised on and potentially save costs.

The proposed layout has sought to maximise on the existing site attributes of Portion 133 Geduld 123 IR in order to demonstrate the viability of the proposed mixed use industrial development in this. The proposed Fuel Cell plant is feasible for investment and implementation because of its many location, infrastructural and legislative advantages.

4.6 SPATIAL PLANNING POLICIES

4.6.1 NATIONAL DEVELOPMENT PLAN

The National Development Plan (NDP) offers a long-term perspective for the development of South Africa aimed at eliminating poverty and reducing inequality by 2030. The importance of creating sustainable human settlements is emphasised by the NDP. The key target for human settlements as described by the plan includes:

- More people living closer to their places of work.
- Better quality public transport.
- More jobs in or close to dense urban townships.
- Clear strategy for densification of cities through land use planning and focused strategy on the housing gap.

The proposed mixed industrial development will offer various employment opportunities in close proximity to residential neighbourhoods. It can be interpreted that the proposed development will assist in realising the vision of the National Development Plan by creating a development that is compact and that offers employment opportunities.
4.6.2 SPATIAL LAND USE MANAGEMENT ACT

The Spatial Planning Land Use Management (SPLUMA) Act intends to provide a uniform framework for spatial planning and land use management in the republic. It seeks to promote consistency and uniformity in procedures and decision-making in spatial planning. The objectives of the Act are:

- Provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic;
- Ensure that the system of spatial planning and land use management promotes social and economic inclusion;
- Provide for development principles and norms and standards;
- Provide for the sustainable and efficient use of land;
- Provide for cooperative government and intergovernmental relations amongst the national, provincial and local spheres of government; and
- Redress the imbalances of the past and to ensure that there is equity.

Given that the proposed Fuel Cell is implemented, a Township Establishment application would need to be submitted and will adhere to the SPLUMA principles in the following manner.

Implications of the Act on the Proposed Development

The application of the SPLUMA principles applies to all organs of state and other authorities responsible for implementation of legislation regulating the use and development of land. The following principles, with relevant sub principles, apply to spatial planning, land development and land use management. These principles are discussed below:

(i) Consider all current and future costs to all parties for the provision of infrastructure and social services in land developments

The application will be circulated both internally and externally to different government departments, Municipal Owned Entities (MOE) and parastatals (Eskom, Telkom, Transnet etc.) for technical coordination and consultation.

(ii) Promote land development in locations that are sustainable and limit urban sprawl

In many instances, the legacy of Apartheid planning practices have resulted in sprawling urban areas characterized as being uneconomical and offering one-dimensional opportunities to residents. The proposed development is partly classified as infill development in terms of the Gauteng Spatial Development Framework on vacant land within the urban environment. The proposed development therefore will contribute to the re-engineering of the existing urban form, the establishment of a more compact city and also contribute to the optimization of the use of existing infrastructure such as bulk sewer lines, bulk roads and water.
a) Principle of Efficiency, whereby

(i) Land development optimises the use of existing resources and infrastructure

This principle calls for the optimization of investment already made in terms of existing development of services infrastructure. Due to the fact that the site is partially developed, there area some basic services that are already available on the site and in surrounding townships and this development will seek to optimize on the infrastructure already provided in the area but will also necessitate upgrading the bulk services and infrastructure in the area. The fact that it partly represents infill land development in an urban setting will ensure that the existing resources are optimized.

e) Principle of good administration

(i) All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act;

The development builds upon the principles and legislative framework governing development in the Gauteng Province and Ekurhuleni Metropolitan Municipality, such as the: National Development Plan; Breaking New Grounds: Comprehensive Plan for Development of Sustainable Human Settlements; Gauteng Spatial Development Framework (GSDF) 2011 and the Municipal Spatial Development Framework.

The above legislations are aimed at promoting human settlements that are integrated, offering employment opportunities to previously disadvantaged individuals in order to address the distorted apartheid cities. The proposed development is in line with the spatial planning and land use management systems of the Ekurhuleni Metropolitan Municipality and promotes the development objective of the Gauteng Province as it will be providing employment opportunities to the surrounding residential neighbourhoods.

(iii) The requirements of any law relating to land development and land use are met timeously;

The application for the Township Establishment of Portion 133 Geduld 123 IR will be made in terms of Section 96 of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986), as read together with the Ekurhuleni Town Planning Scheme, 2014 and the Spatial Planning and Land Use Management Act, 2013.

(iv) The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them; and

Particulars of the application would lie for inspection during normal office hours at the office of the Area Manager: Land Use Management, 3rd Floor, Boksburg Civic Care Area, Trichardts Road, Boksburg, from the date of submission.
(v) Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.

The above principles call for a transparent and clear public participation process with all parties adhering to allocated timeframes. The public would be given a chance to object, make representations and comment on the development. The proposed development would be advertised in the Bleed, Citizen Newspapers and Provincial Gazette, informing the public of the development and relevant contact person to acquire information. Site notices would also be visibly placed around the site, to ensure all members of the public have sufficient resources to make informative decisions.

4.6.3 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK

Gauteng Spatial Development Framework (GSDF) aims to achieve an equitable and sustainable urban system and structure the urban form. The GSDF does not replace municipalities SDF but enables the creation of a coherent framework, which forms the basis for future development and decision-making processes (e.g. policy, resources and socioeconomic profiles).

The framework aims to achieve the following for the province:

- Functional efficiency (so that individual elements work together as a whole);
- Environmental harmony; (creating development processes and forms that are environmentally sustainable);
- A sense of place (creating a place that is recognisably distinct, strengthens local identity, and simultaneously plays its role within the wider urban system); and
- Socio-economically sustainable (is viable, enabling economic growth and expansion and supports all social activities and the development of its communities).

The proposed mixed use industrial development will encourage the above mentioned principles as it will take a holistic approach towards delivering a development that is efficient and socio-economically sustainable.

4.6.4 EKURHULENI REGIONAL SPATIAL DEVELOPMENT FRAMEWORK

The development site is situated within the demarcated Urban Edge of Ekurhuleni Metropolitan Municipality and is part of the “Industrial” footprint of Region D in terms of the approved RSDF for Region D, (2015). The Ekurhuleni RSDF states that as a priority, infill residential development should be promoted in all strategically located vacant areas that are suitable for development. The subject land is ideally located and is identified for densification and industrial development on the RSDF Plan, furthermore; the subject land falls well within the demarcated urban edge for the Ekurhuleni Metropolitan Municipality.

The RSDF seeks to protect the existing Industrial area given that the industrial areas of Ekurhuleni generate the bulk of employment and economic activity in Ekurhuleni. These areas should therefore be protected from potential negative influences such as informal settlements established in close proximity to the industrial areas and potential illegal land invasion. The site is located within an area with a high number industrial activities, thus the land could be at risk of invasion from informal settlers as a result of the increasing shortage of housing stock,
especially close to economic opportunities. It can therefore be concluded, that it would be a matter of urgency and prove desirable that the land be densified for development.

The RSDF further determines a more accurate and better defined urban edge so as to exclude as much land as possible. A tighter urban edge increases development pressure on land within the edge, such as that of the subject site. Thus resulting in speeding the process of infill development and optimal utilisation of resources. This would have positive spin-offs relating to increasing the chances of achieving a viable, sustainable public transport system.
5 ARCHITECTURAL

5.1 INTRODUCTION AND BACKGROUND

The architectural design section is based on findings of the GGDA Springs PGM SEZ Market Assessment and Feasibility Report (dated 11 May 2017, prepared by Kaizer EDP, Moore Stephens & Zimmermann urban design & Town Planning) and Town Planning Report (dated March 2018, prepared Urban Dynamics) for the proposed Fuel Cells Plant situated on Portion 133 of the Farm Geduld 123 IR at Impala in Springs. The proposed Fuel Cells plant forms a part of the Gauteng Growth and Development Agency’s strategy to establish a Platinum Group Metals (PGM) Special Economic Zone (SEZ) in Springs.

The proposed Fuel Cells Plant concept will be an exploration of a mixed industrial development which would include PGM value add and other related manufacturing activities such as: power systems, transport, mining equipment and assembly/customisation etc. As illustrated on figure 3 below, the aim of the Fuel Cells will be to have sectors and products that will be a part of a value chain from the beginning (i.e.: catalysts), the later end (i.e.: assembly or customisation of product) and potentially also move into the middle aspects of the value chain (i.e.: power systems).

![Figure 2: PGM SEZ – Value Chain Industries (tenants) and Development Timeline](image)
5.2 OBJECTIVES

- The establishment of a Fuel Cells Plant industrial park for the Springs SEZ, that responds to the enhancement of the PGM value chain and beneficiation.
- Incorporating a modular site design, that allows for incremental development roll-out, which allows for flexibility in response to market fluctuations and allows for a diversity of developments (ranging from industrial, to light manufacturing and commercial warehousing).
- Environmental sustainability, resulting in an environmentally practical layout that is compliant and includes green building systems.
- Takes cognisance to the site conditions and is sensitive to the physical characteristics of the site.
- To creatively incorporate a multi-faceted solution, which will maximize the potential physical and land/legal constraints of the immediate surroundings.
- To design an Industrial Park scheme that will best respond to the market opportunities and to the business demands of the area based on the market analysis.
- The Industrial Park should maximize economic activity and create places of employment that are integrated and accessible to the local community.

5.3 SCOPE

- To develop an architectural concept that will be guided by the outcomes and recommendations of the town planning study, urban design study and environmental study.
- To design a site development plan that will be a viable spatial representation of the individual sites considering access, services and other site limitations. The site development plan will include buildings that are designed according to the applicable zoning, bulk, coverage and height restrictions as recommended by the statutory limitations and following a precinct plan/urban design framework prepared by the town planner and urban designers.
- To compile an architectural scheme that will inform the design of all the engineering infrastructure within the site as well as the basis for cost estimates of the buildings.
5.4 IDENTIFIED INDUSTRIES AND PHASING

Figure 3: Phasing & Industries

Figure 4: Description of Industries
5.5 METHODOLOGY

This industrial development forms part of a bigger plan within the Ekurhuleni Industrial District. The approach to design needs to incorporate the macro and micro considerations of the surroundings and immediate site. The method for design will therefore be a multi-faceted approach, layering a notion of function, market responses and an integration of work and production. The major influence for design is sustainable design, function and space (at the micro level). Furthermore, the different phasing has allowed for industrial clustering (refer to figure 5), which gives opportunity for an integrated systems (whether it be through resources or sustainable environmental systems) for the different industries. At the macro level it’s a combination of functional needs (as per the different industries) and site constraints (the systems that dictate the need of the space for the different industries and their machinery requirements).

Below we will be running through the Key design Principles and later looking at the process used to unpack the layers that have informed our approach and their outcomes.

5.5.1 KEY DESIGN PRINCIPLES

Sustainable (green) design

Increased energy efficiency through facility design or rehabilitation and renewable energy technologies. Cogeneration or collecting and using otherwise wasted heat from the electrical generation process. Energy cascading, which involves using residual heat from a primary process to provide heating or cooling to a later process. Flexible building design for multiple uses. Water cascading

Entrance to the Industrial Park

An industrial Park must have a prominently visible and inviting entrance with easy access to main corridors and intersections.

Mixed use

To accommodate different size firms and industries to the industrial park.

Public transport access into the industrial park

To transport labour efficiently between the surrounding settlements and places of work. A rail transport system can also improve the transportation of products in and out of the Industrial Park.

Resource recovery, pollution prevention and cleaner production

Elimination of wasted energy, water and materials for cost savings within and among firms

Integration into natural ecosystems

Define the carrying capacity of the site and design within those limits. Maintain the natural areas and indigenous vegetation as much as possible. Retain natural drainage systems and use constructed or natural wetlands to purify industrial or storm-water run-off. Increase the
density of development. Design energy-efficient sites and buildings. Location of companies to achieve easier servicing and industrial symbiosis.

**Industrial clustering**

Networks of manufacturers developing cooperative relationships to optimize resources by clustering businesses along a whole value chain.

**Environmental management systems**

Providing environmental area services, such as water and sewage management, hazardous waste treatment and disposal and environmental health and safety training for employees.

**Greening (replanting indigenous species as much as possible)**

Enhance the appearance of an area and help create a sense of enclosure, e.g. trees and bushes along roads and around public space. Provide shelter from noise, sun, wind and rain. Help in filtering pollution: trees with a bushy canopy and broad leaves are able to trap dust and other pollutants and act as air purifiers. Reduce runoff: vegetation acts as a sponge to absorb water, which improves on-site drainage. Reducing erosion and sand storms, vegetation can reduce erosion by up to 50%.

**5.5.2 HIGH-LEVEL DESIGN GUIDELINES**

Based on the above mentioned key design principles the proposed site layout encompasses the following:

- A total of 12 sites with a 20m boulevard as a spine through the development with an entrance at each end. A traffic circle at the change of direction to allow for ease of traffic flow into multiple site access points. There would be street lighting, walkways to allow for pedestrian access as well as public transport facilities. The boulevard will also serve as services spine into all the sites.
- The site sizes are based on an industrial module of site sizes between 0.7780 ha and 1.2266 ha. The buildings will be typical industrial type, with a coverage of 70% on each site. However, to allow for parking, as per the scheme, we have made allowances for yards logistics (heavy duty articulated vehicle with trailer) as well as landscaping. Attached to the warehouses will be offices (these will be double-storey buildings).
- The development includes a small park with a central service facility to accommodate the on-site SEZ/property developer offices and associated facilities (if required), such as possible cafeteria and others (if warranted).
- The proposed layout will be developed from the identified phase 1 (on the east of the site) starting with the main Fuel Cell industry enablers (i.e. Various types of Fuel Cells manufacturing, Fuel Cell inputs or catalysts/MEA, Autocatalysts) towards the west and then south with other PGM value chain industries (i.e. Jewellery, Chemical processing, Dental & Medical Devices, Mining Inputs, Chemical Processing, Investment Coins).
- The industrial park development may also consider the construction of a mega fuel cell power generation plant as a way of activating a big PGM consumer whilst self-generating and supplying its own power.
5.5.3 **PROPOSED MODULAR FACTORY DESIGN CONCEPT**

<table>
<thead>
<tr>
<th>Module</th>
<th>Office Size</th>
<th>Warehouse Size</th>
<th>Parking Requirement</th>
<th>Total Building Size</th>
</tr>
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<tr>
<td>Module 1</td>
<td>400 SQM</td>
<td>1500 SQM</td>
<td>18 BAYS</td>
<td>1900 SQM</td>
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<td>Module 1A</td>
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<td>1000 SQM</td>
<td>17 BAYS</td>
<td>1400 SQM</td>
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<td>Module 2</td>
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<td>20 BAYS</td>
<td>2900 SQM</td>
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<tr>
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<td>2000 SQM</td>
<td>19 BAYS</td>
<td>2400 SQM</td>
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<tr>
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<td>21 BAYS</td>
<td>3900 SQM</td>
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<tr>
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<td>3000 SQM</td>
<td>20 BAYS</td>
<td>3400 SQM</td>
</tr>
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</tr>
<tr>
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<td>4000 SQM</td>
<td>22 BAYS</td>
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<tr>
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<tr>
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<td>2000 SQM</td>
<td>5000 SQM</td>
<td>24 BAYS</td>
<td>5400 SQM</td>
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*Figure 5: Modular concept*
5.5.4 PROPOSED SITE DEVELOPMENT CONCEPT

Figure 6: Site Development Concept – access and massing
Figure 7: Site Development Concept – roads, paving and landscaping
Figure 8: Site Development Concept – 3D Modelling
## 5.5.5 ACCOMMODATION SCHEDULE

Table 5: Accommodation schedule

<table>
<thead>
<tr>
<th>Erf</th>
<th>Area of Site</th>
<th>Area of Factory &amp; Office</th>
<th>Parking</th>
<th>F.A.R</th>
<th>Coverage</th>
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<tbody>
<tr>
<td>Erf 1</td>
<td>1.0745 ha</td>
<td>3900 m²</td>
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<td>0.40</td>
<td>36%</td>
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<td>Erf 2</td>
<td>0.7780 ha</td>
<td>3400 m²</td>
<td>21</td>
<td>0.48</td>
<td>43.7%</td>
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<tr>
<td>Erf 3</td>
<td>0.7794 ha</td>
<td>3400 m²</td>
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<td>43.7%</td>
</tr>
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<td>Erf 4</td>
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<td>3400 m²</td>
<td>21</td>
<td>0.36</td>
<td>32.5%</td>
</tr>
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<td>Erf 5</td>
<td>0.9417 ha</td>
<td>3900 m²</td>
<td>21</td>
<td>0.45</td>
<td>41.41%</td>
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<tr>
<td>Erf 6</td>
<td>1.2249 ha</td>
<td>4400 m²</td>
<td>23</td>
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<td>Erf 7</td>
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<td>Erf 8</td>
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<td>Erf 12</td>
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<td>21</td>
<td>0.30</td>
<td>27.72%</td>
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6 ENGINEERING

6.1 CIVIL

This section considers the feasibility of the development from a civil infrastructure point of view. The following matters will be considered and advised upon:

- Site Investigation
- Existing Bulk Infrastructure around the Site
- Infrastructure Capacity Requirements
- Design Standards
- Geotechnical Investigation
- Information Required
- Recommended Upgrades
- Costing

6.1.1 SITE INVESTIGATION AND ANALYSIS

A site investigation of the proposed site of the development was conducted in June 2018. The purpose of the investigation was to establish the following as briefly discussed hereinafter:

- General Site Conditions
- Site boundary and access
- Existing Structures
- Existing Infrastructure (on site and adjacent to the site)
- Constraints and Concerns

The site visit involved consultation with Impala Platinum and Ekurhuleni Springs Customer Care, where some of the positions of engineering services, sizes and conditions were confirmed.

A further, more detailed assessment will have to be conducted during the Preliminary Design stage, which will focus on confirmation of the rest of the existing buried services.

General Site Conditions

The site is currently an open land covered with vegetation comprising wild grasses, minor bush and a few trees (refer to figure 10 below).
Site Boundary and Access

There is no boundary fence demarcating the site and it can be accessed directly from East Geduld Road (refer to figure 11 below).

Figure 10: Access onto the Site from East Geduld Road

Existing structures

There is an air monitoring station on site which is well kept and maintained. The station is barricaded by a concrete palisade fence with an access gate. The station is contained in a prefabricated housing structure (refer to figure 12 below).

Figure 11: Air Monitoring Station
There is also an old water tank that is not in use anymore, it is however still fitted with pipe fittings and steel pipe (refer to figure 13 below).

![Figure 12: Unused old water tank](image)

Several monitoring boreholes are situated within the boundaries of the proposed site. These boreholes are used by Impala Platinum to monitor the ground water quality and level of the water table. The possibility to decommission or relocate these boreholes needs to be confirmed with Impala Platinum (refer to figure 14 below).

![Figure 13: Water Quality Monitoring Borehole on Site](image)
6.1.2 Existing Infrastructure

Roads

A high-level traffic study was conducted on the suitability of the site location to serve as a light industrial park, within the context of the current traffic patterns. It was found the area is sufficiently serviced with roads for this type of development, and that the proposed development ties in with the over-arching direction of industrial development for the area.

Services

There are a number of existing services located on the site of the proposed development and in the road reserves parallel to the site.

Water

There is no municipal water infrastructure in close proximity of the site. The shortest connection routes are about 2 km in length to existing 200 mm diameter water mains in the area. The viability of connections to these existing water mains needs to be confirmed during the Preliminary Design Stage.

A Rand Water pipeline is located along the western boundary of the site and runs parallel to the East Geduld Road, within the road reserve. A request for information was submitted to Rand Water to confirm the position and extend of the pipeline, including servitudes, as well as the possibility to get a water connection for the proposed development.

Sewer

The proposed site is currently not serviced with bulk sewer outfall lines, however, quite a few bulk lines pass by the site to the south, the north and the east. The north and south lines are about 1 km away from the lowest point of the site, whereas the eastern line is about 2.5 km away.

Two sewer manholes are located close to the treatment pond which is believed to be part of the infrastructure conveying sewer from the change rooms of the soccer pitch.

A pump station located between the proposed site and the golf driving range boundaries. The pump station is collecting sewer from the medical facility, but it is unclear where the sewer is discharging to.

Stormwater

The lower lying Cowles Dam is located 2 km to the north-east of the site. To the north-west of the site is the Alexander Dam, which overflows by means of a weir onto an open channel which feeds the Cowles Dam. This channel passes 100 metres to the north of the lowest lying point on site.
There is a stormwater earth channel which is located along the site boundary. It starts at the corner of East Geduld Road and Cowles Street and runs all the way up to the railway tracks, where it discharges into a pipe passing underneath the railway tracks (refer to figure 15 below).

![Figure 14: Stormwater channel inlet under railway track](image)

At the Northern boundary of the site there is a short stormwater earth channel, as well as two 750mm diameter stormwater inlets and outlets with headwalls (refer to figure 16 below).

![Figure 15: Stormwater earth channel inlets/outlets on site](image)

A section of a newly built stormwater pipeline from the Impala Platinum refineries to the treatment pond is located on a portion of the proposed site and relocation may be required.

**OTHER SERVICES**

There are two gas pipe-lines which crosses the site.

**Hydrogen Pipelines**

There is a hydrogen pipeline/s located on the proposed site, parallel to East Geduld Road. It is also located on the Northern end of the proposed site, parallel to the railway tracks. An
enquiry and wayleave application was made to Air Products South Africa and it was found that the proposed Fuel Cells Plant might affect the hydrogen pipeline/s.

**Sasol Gas Pipeline**

A Sasol Gas pipeline is located parallel to East Geduld Road but does not appear to reach the proposed site as it crosses over to the other side of the road close to the Impala Platinum’s office entrance.

### 6.1.3 Infrastructure Capacity for Proposed Development

**ROADS**

The site requires two road entrances which can accommodate heavy vehicles. The proposed site layout positions these entrances to the south and the east of the site boundary, of which both positions are already serviced with hard surfaced access roads.

**WATER**

It is estimated that the water use demand for the site can effectively be served with a 200 mm diameter water main.

The available capacity of the existing water infrastructure is unknown. Ekurhuleni’s standard procedure for all new developments requires that a water capacity investigation be done for the development. The consulting company GLS is responsible for performing this investigation at a fee.

**SEWER**

For sewer and waste-water discharge, a 450 mm diameter concrete sewer bulk line is proposed to provide some redundancy for unknown operations on the site, and to more easily deal with the flat terrain surrounding this site, as well as possible contaminants which may end up in the system.

The available capacity of the existing sewer infrastructure is unknown. Ekurhuleni’s standard procedure for all new developments requires that a sewer capacity investigation be done for the development. The consulting company GLS is responsible for performing this investigation at a fee.

**STORMWATER**

Although EMM’s philosophy is to neutralise the excess run-off from the site development with on-site retention strategies, it is anticipated to provide external site storm water discharge infrastructure as additional mitigation measures.

### 6.1.4 Design Standards

The following design standards/criteria are proposed:

- The Ekurhuleni Metropolitan Municipality’s Development Guide, Section C11:
Developer’s Guidelines to Installing Water and Sewer Services in Ekurhuleni (dated October 2010).

- Guidelines for Human Settlement Planning and Design (Volume 2) compiled under the patronage of the Department of Housing by CSIR Building and Construction Technology.
- The Department of Public Works Manual “P344 Appropriate Development of Infrastructure on Dolomite: Manual for Consultants”.

### 6.1.5 Geotechnical Investigation

A geotechnical investigation was conducted and a report was submitted in March 2018 by Prana Consulting. According to the report the following findings were made:

- The site investigations indicated that the site is underlain mainly by colluvial, alluvial and residual soils characterised by a low to medium active conditions with localised highly expansive conditions.
- The upper horizons are underlain by dolomite.
- The report also recommended that imported material will be required during construction.

Prana also prepared a dolomite risk assessment report (April 2018) based on the Jones & Wagener drilling programme, the report was submitted and discussed with the Council of Geoscience. Prana therefore found that out of the 11 boreholes that were drilled, three indicated very poor conditions with 8 boreholes indicating more favourable conditions. The report therefore recommended that footprint drilling of the site should be conducted prior to development of the site.

### 6.1.6 Information Required

The following key information is required in order to proceed to the next project stage:

#### Topographic Survey

A topographic survey was conducted by Sublimor42 cc Cadastral and Engineering Surveyors in January 2018. A review of the survey data subsequent to the site investigations revealed that not all the existing services were identified and surveyed. The outstanding services include the Rand Water pipeline, Sasol Gas pipeline, Hydrogen pipeline, stormwater infrastructure, etc. All servitude information also needs to be incorporated into the survey.

#### Water and Sewer Investigations

Ekurhuleni’s standard procedure for all new developments requires that water and sewer capacity investigations be done for the development. The consulting company GLS is responsible for performing these investigations, which will include the following:

- Indicate the optimal connection points to the existing water and sewer system.
- Evaluate the existing water and sewer network systems in the vicinity of the proposed development in terms of available spare capacity to accommodate the new development
• Evaluate the availability and capacity of bulk services (main pipelines, pump stations, water and waste water treatment works, etc).
• Evaluate the effect of the incorporation of the proposed new development on the rest of the water system in terms of minimum residual pressures and maximum flow capacity.
• Evaluate the effect of the incorporation of the proposed new development on the rest of the sewer system in terms of the maximum flow capacity.
• Identify the required upgrading, if at all required, to the existing water and sewer systems to accommodate the proposed new development.

GEOTECHNICAL INVESTIGATION

Based on the geotechnical investigation report (March 2018) and dolomite risk assessment report (April 2018 footprint drilling of the site should be conducted prior to development of the site.

6.1.7 RECOMMENDATIONS

STORMWATER

In addition to an on-site storm water retention strategy, it is recommended to provide a storm water outlet route from the low point of the site to the existing storm-water channel to the north of the site. The north-eastern corner of the property is straddled by a rail-way line running east-west which crosses over a local access road running north-south, which puts the low-lying north-eastern corner of the site at risk of flooding.

WATER

It is recommended to supply a bulk water feeder line of 200 mm diameter to the site along the northern boundary of Rowhill settlement. This is the shortest route with the least construction impact to existing services.

SEWER

It is recommended to route a 450mm diameter sewer bulk line from the low-lying north-eastern corner of the site to the east-west sewer line running 1 km north of the site. Due to the flat gradient, it is advised to consider a large diameter outfall line size, and to choose a large diameter line to tie into.

ROADS

It is recommended to use the existing road network as proposed by the current site layout. It was shown that the existing road network can sufficiently serve the demands of the site. It is therefore not foreseen to make any upgrades to road infrastructure around the site, except for a bell-mouth tie in on the east to the existing regional road.
Figure 16: Proposed services connections to site (water, stormwater, sewer)
6.1.8 **Costing**

It should be noted that there is a fairly high probability that the site falls within a dolomite risk area. This implies and additional cost factor to the installation of bulk services in order to comply with dolomitic services specifications.

**6.2 Structural**

**6.2.1 Design Criteria**

The main structural theme of the development will be industrial, mostly in the form of portal type industrial steel structures.

Such structures would typically comprise of a large structural span to provide large under roof open areas for production or storage purposes.

Such structures may also be required to house over-head travelling cranes and / or special shaping of floor features to accommodate the end user’s specific needs.

Apart from possibly overhead travelling crane loads, the most crucial structural considerations are the following:

**Earthworks**

The site is in a dolomitic area of which the intensity grading must still be investigated and confirmed. Depending on the dolomitic severity level, expensive supporting earth platforms or engineered soil mattresses may need to be constructed.

Another common mitigation measure in dolomite areas are dynamic compaction in order to collapse any existing cavities underground and to compact the in-situ material. On large building areas this may become a costly exercise.

**Sub-structure or Floor**

Due to the high probability of dolomite geotechnical conditions, the floor design will need careful consideration to serve the user’s activities load requirements, as well as provide effective bridging of possible sink-hole formations below the covered area.

Such dolomitic resistant floor design may escalate costs depending on the severity level of the possible dolomitic activities.

**Super-structure or Roof**

The roof design will have to resist local wind conditions, especially in the light of cladding requirements and internal ventilation strategies. It may be assumed that costs will be in-line with typical industrial structures costs.

Special equipment requirements, such as overhead travelling cranes, can have a super-structure cost implication. However, such costs and systems are well known in the industry and should not exceed typical costs for such super-structure systems.
6.3 ELECTRICAL

6.3.1 AVAILABILITY OF ELECTRICAL BULK SERVICES

There is an existing overhead Medium Voltage line next to the site on the other side of Geduld road (refer to figure 18 below). The coordinates of the poles are, Latitude -26.216801 degrees and Longitude 28.442598 degrees. Also, there is a new 132/6.6kV capacity electrical substations located in Krugersus (refer to figure 19 below), which according to the City of Ekurhuleni Energy Projects & Master Planning Division, Fuel Cells Plant will supplied with the needed capacity in future once the substation is energized.
6.3.2 ESTIMATED ELECTRICAL LOAD

The estimation of the energy requirements for the proposed design is based on general guidelines to determine the average energy requirements. The load estimation is based on the proposed site development, which consist of warehouses and offices. The assumption is derived from maximum energy demand per building (VA/ m²).

The estimated electrical load is outlined as follows:

The estimated electrical load for all the warehouses and offices is 90VA/m² (refer to table 4 below). The Total Gross Area of the buildings is 45700 m². This means that the total estimated demand for the buildings is 4.2MVA.

Table 6: Estimated electrical load

<table>
<thead>
<tr>
<th>Area</th>
<th>Power Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC for air conditioned general areas, reception offices, meeting rooms etc.</td>
<td>30VA/m²</td>
</tr>
<tr>
<td>Electrical for warehouses, general areas, reception offices, meeting rooms etc.</td>
<td>60VA/m²</td>
</tr>
<tr>
<td>Total Demand</td>
<td>90VA/m²</td>
</tr>
</tbody>
</table>
6.3.3 RENEWABLE ENERGY

We propose Solar power which is the conversion of energy from sunlight into electricity, either directly using photovoltaics, indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam.

City of Ekurhuleni will be advised to use On or Off-Grid Systems depending on their requirements and available budget.

6.4 MECHANICAL

6.4.1 WET SERVICES BULK AVAILABILITY

The investigations still need to be done with the municipality to find out or identify the availability of the bulk wet services.

6.4.2 HVAC ANALYSIS

We will consider Space heating and cooling and it shall employ a high efficiency system called Variable Refrigerant Volume (VRV) for the main offices and other activity rooms.

The VRV process has vast advantages in that a single load condenser (outdoor) unit can be used to power multiple evaporator (indoor) units.

6.4.3 WATER FOR HEATING AND COOLING

Depending on the building needs we will assess and recommend bulk water heating, steam/water cooling methods and storage thereof utilising bulk storage tanks etc.

Water heating might be via a 300L geyser per building. We will investigate the use of a solar heating panels with a geyser to comply with latest Standard Building Regulations. This is designed and manufactured according to SANS 1307.

The geyser shall have a standby electric heating element for use where water heating is to happen especially at night times in the absence of solar power. Expectation however is that 75% of the annual hot heating shall come from direct solar power.

6.4.4 RENEWABLE ENERGY

In this sub section we will look at the renewable energy that can be used in the development. We will identify if there are any gas pipelines close to the development which can be utilised to provide a mixed energy use development.

We will consider the use of a solar heating panels with a geyser to comply with latest Standard Building Regulations. This is designed and manufactured according to SANS 1307. Moreover, the use of Variable Refrigerant Volume (VRV) technology assist in conserving energy in that some heat extracted from one room may be re-directed for efficient use in another room that
might be requiring heating at the same time. Opposite is true for vice versa. As such the co-efficient of performance of the VRV system will be very high as compared to conventional designs and that will result in huge electrical power savings.
7 SPECIALIST STUDIES

7.1 ENVIRONMENTAL

7.1.1 ENVIRONMENTAL CONSIDERATIONS

The baseline survey revealed the following:

- The site is mapped by the GDARD C-Plan as a “Threatened Ecosystem”.
- According to Ekurhuleni records the site currently has a dual zoning, namely industrial and mining.
- The site is part of the Highveld Air Quality Priority Area. The Air Quality Priority Area means that ambient air quality standards are being or maybe be exceeded in the area.

The environmental considerations relate to the changing use of the site and proposed new activities, vegetation and fauna (there may be “Threatened Ecosystems” according to C-Plan), proximity to environmentally sensitive water bodies, and existing mining rights.

The NEMA Regulations require a Basic Assessment on mining land according to Activity 26 of Listing Notice 1:

“Residential, retail, recreational, tourism, commercial or institutional developments of 1 000 square metres or more, on land previously used for mining or heavy industrial purposes; — excluding —

(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or

(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or

(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land”

A site visit shows that the land has been disturbed. Impala Platinum confirmed that they have been storing top-soil on the site from excavations and work being undertaken elsewhere on their plant. A biodiversity assessment will be required to confirm the exact situation, and confirm whether the GDARD’s C-Plan (Threatened Ecosystems) is applicable.

The NEMA Regulations require a Basic Assessment on clearing of indigenous vegetation according to Activity 27 of Listing Notice 1:

“The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—

(i) the undertaking of a linear activity; or

(ii) maintenance purposes undertaken in accordance with a maintenance management plan.”
A further issue that must be highlighted is that the site stormwater run-off drains northwards into the Cowles Dam and river system, which are classified as “wetlands” as well as sensitive ecological areas by GDARD’s C-Plan. Any stormwater run-off from the development on the site will require to be treated to a level that its discharge does not negatively impact on the adjoining natural environmental systems. A stormwater management plan will be required. Discharge into the river system (wetland) triggers a water use license application.

Due to the site being located in an air quality priority area, there may be restrictions in terms of pollutants that may be released from site. A detailed and fixed project scope is needed in order to evaluate the impacts of the fuel cell development being located in an air quality priority area and vice versa.

7.1.2 ENVIRONMENTAL CONCLUSION AND RECOMMENDATIONS

It should be stated that there are environmental uncertainties which still need more clarity. A full description of the project is needed in order to clarify which environmental process(es) need to be conducted for the project. The final environmental process(es) to be followed and the specialist studies required will be confirmed with the authorities once the final project scope has been fixed.

The specialist studies may include:

- **Biodiversity assessment.**
  - This is a baseline assessment of fauna and flora, a description of vegetation on site. As the site is considered a “Threatened Ecosystem” in the GDARD C-Plan, this study will give an indication of the presence or likely occurrence of Red Data species on site. An Ecological Management Plan will be compiled, and this plan will be incorporated into the Environmental Management Plan.

- **Heritage assessment**
  - This is an identification of any possible heritage/archaeological resources on site. A desktop assessment will be the initial part, and this will compile regarding the known heritage resources on site. The study will also assess the significance of identified heritage/archaeological resources and the impact the fuel cells development may have on them. The assessment will be conducted in accordance with the requirements of the National Heritage Resources Act (Act 25 of 1999).

- **Air Quality assessment**
  - The main purpose of this investigation will be to quantify and assess the potential impact that the proposed fuel cell development will have on the receiving environment and vice versa.

- **Major Hazard Installation Risk Assessment**
  - A major hazard assessment is undertaken to determine the exact nature of the activities on the site and their potential impact. This will also determine mitigation requirements and management actions to allow for the activity to take place. It will also identify the industrial activities that may trigger a full environmental assessment.

- **Impact on neighbouring areas in terms of:**
  - Noise – evaluation of the potential noise impact associated with the fuel cells. This will also include the identification of the components of the project that could generate significant noise levels. Sensitive noise receptors in the vicinity of the site
The study should identify management and mitigation actions to enhance positive impacts and avoid/reduce negative impacts respectively. This study should also provide guidelines to be incorporated into the design of the facility to attenuate the noise impacts.

- Visual – defining the visual resources and the impact of the fuel cells. This study will also identify and screen potential visual concerns. Management and mitigation actions will be developed to enhance positive impacts and avoid/reduce negative impacts respectively.

The exact environmental process(es) (whether a BA or a full EIA, water use license application, air quality license application etc) and specialist studies to be conducted will be determined after the project scope is fixed. These process(es) will be confirmed with the authorities (GDARD, DWS etc) at the authority consultation meetings.

7.2 GEOTECHNICAL

7.2.1 Desk Study

Available information assimilated during the desk study included:

- Topographic maps of the Director of Surveys at a scale of 1: 50 000: Sheet 2628AB Benoni.
- Impala Preliminary Geotechnical and Dolomite stability investigation for Ambatovy Refinery, Springs – FINAL Report No.: JW209/05/A326, September 2005 prepared by Jones & Wagener (Pty) Ltd.

The geological map indicated that the investigated area is located on colluvial soils of the Quaternary stage, which overlie dolomite and chert of the Malmani Subgroup of the Chuniespoort Group, Transvaal Sequence. The existing geotechnical report indicated that a drilling programme had been conducted for a proposed Ambatovy Refinery development which is located within the same vicinity as the proposed Fuel Cells Plant development.

7.2.2 Preliminary Geotechnical Investigation

The site was investigated by excavating five (5) test pits on 30 January 2018 employing a CAT 428D 4X4 TLB (tractor loader backhoe) to a depth of at least 3.0 m or until refusal was encountered. The test pits were spread evenly and excavated over the entire site to cover the extent of the site earmarked for the township establishment and sited in relation to the test pits and boreholes excavated in the 2005 drilling programme.

The findings from the fieldwork, laboratory testing and interpretation of the results classified the site into soil sub-area namely 2/H-H2(H3)/C(C1)/S(S2). The site was therefore characterised as developable with areas that may need precautionary or certain remedial measures. However, the site is underlain by dolomite and interpretation of the borehole
profiles from the 2005 drilling programme, the fieldwork, geological and hydrogeological data gathered during the site investigation of the area, the site was further subdivided into three Inherent Risk Classification, namely: Inherent Risk Class 3/6, Inherent Risk Class 3/7 and Inherent Risk Class 6/7. Part of the site is characterised as developable with areas that may need precautionary or certain remedial measures.

The drilling programme conducted in 2005 did not include a dolomite risk assessment, it was therefore deemed necessary for a risk assessment to be conducted based on the existing borehole logs. This resulted in a dolomite stability report being prepared in accordance with the SAIEG guidelines, GFSH-2 guidelines and the SANS 10400-B guidelines.

The site was classified according to three broad dolomite risk characterisations, namely Inherent Risk Class 3/6, Inherent Risk Class 3/7 and 6/7. The SAICE dolomite designation for the Inherent Risk Class (IRC) 3 classification is D3 and for the Inherent Risk Class 7 is D4. According to the SANS requirements, the risk classification indicates that part of the site is suitable for the proposed development of an industrial centre.

Site classification IRC3/6 commercial development with 3 storeys and higher can be considered. The investigated site is characterised by variable subsurface conditions. The site exhibits poor subsurface conditions that are consistent with industrial development potential.

The coordinates of the boreholes from the 2005 drilling programme were slightly offset from the site, hence the site zonations could not be verified and accurately delineated.

The dolomite stability report was submitted to Council for Geoscience for review. The council was in agreement with the Inherent Risk Classification and site zonation as per the report, namely: Inherent Risk Class 3/6, Inherent Risk Class 3/7 and 6/7. CGS was also in agreement with the recommendation that part of the site is characterised as developable with areas that may require precautionary or certain remedial measures.

The council indicated that if the site is deemed suitable for development after further investigations, footprint drilling will be required prior to developing the site. Further drilling was therefore recommended.

### 7.2.3 REPORTING

Three comprehensive reports are submitted as Annexure H namely:

7.3 TRAFFIC IMPACT STUDIES

A Traffic Impact Assessment (TIA) was undertaken by Paruk Consulting for a proposed 45 700m² mixed development (i.e.: industrial park) on Portion 133 of the Farm Geduld 123 IR at Impala in Springs, in accordance with TMH 16: South African Traffic Impact and Site Traffic Assessment Manual. The TIA considered the traffic impact on the immediate surrounding road network arising from the proposed new industrial park development (refer to annexure F for a detailed report).

The TIA in question was submitted to and approved by City of Ekurhuleni Roads and Stormwater Department, with the following conditions:

- The proposed Industrial Development will generate a total of 347 vph additional vehicle trips during the Weekday AM and PM peak hour.
- Two accesses are proposed for this development, and they are as follows:
  - **Cowles Street/Existing Access to Impala Platinum Mine**
    This is an access currently used by Impala Platinum Mine. It forms a T-junction intersection with Cowles Street and it will be stop controlled with priority to Cowles Street.
  - **East Geduld Road/Development Access**
    This will be a new access off East Geduld Road on the western side. It will be priority stop controlled with priority to East Geduld Road. This access will have three entry lanes and two exist lanes with a stacking distance of 39m from the intersection to the access controlled gate. Lane widths will be 3.5m, with a horizontal clearance between obstructions of at least 4.5m to accommodate the fire engine and other large vehicles. The vertical height clearance must be at least 4.5m.
- All proposed accesses must be designed and constructed to the requirements and specifications of City of Ekurhuleni Roads and Stormwater Department at the developer’s cost.
- **The following upgrade is proposed:** 4-way stop controlled intersection on East Geduld Road/Impala Platinum access must be converted to a priority stop controlled intersection, with priority given to East Geduld Road, at the developer’s cost.
- No parking will be allowed on the public road reserve, parking should be provided on site and it must comply with the resolution of the City Development Portfolio Committee. Parking relaxation must be approved by City Planning Department.
- The internal road layout must allow for circulation and manoeuvring of the SU-9 design vehicle (the fire engine, refuse vehicle, delivery trucks). These vehicles must be able to turn around inside the site, and to exit the gate in the forward direction (the reversing of large vehicles out of the site into the public road will not be acceptable).
- All development controls such as access arrangement, access geometry, road upgrades, parking and circulation must be shown on the SDP submission for consideration and approval.
• The developer will make provision for the construction of bus/mini-bus laybys along East Geduld, upstream and downstream of its intersection with the proposed new access. The laybys will be designed and constructed to the requirements and specifications of the City of Ekurhuleni at the developer’s cost.

• In order to cater for pedestrians, the developer will be required to pave walkways to at least 1.8m wide on East Geduld Road along the site frontage using the standard pedestrian paving blocks as used by the Springs Maintenance Depot, Dewaal Greyling, and telephone (011) 999-8619.

• It will be necessary to obtain a Way-leave to authorise you to undertake construction work within the public road reserve. In this regard please contact Mr Moses Phofu at telephone number (011) 999-6532.

The comments above are valid for a period of five years from the date of issuing of the TIA approval letter and are based on the rights mentioned in the TIA report, and should these rights not be in-line with full potential rights applied for in the land use application, then these comments can be considered void.

7.4 LAND SURVEY

As mentioned on sub-section 6.1.6 above, a topographic survey was conducted by Sublimor42 cc Cadastral and Engineering Surveyors in January 2018 (refer to annexure G for the layout plan).
## COSTING

### 8.1.1 Initial Outlay and Development Costs (Including Professional Fees)

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<th>Rate/Unit</th>
<th>Cost</th>
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<td>Engineering Works</td>
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<td>Civil (Bulk Services)</td>
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<td>Geotechnical Report</td>
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<td><strong>Insurance (Equipment) @ 3%</strong></td>
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9 PROGRAMMING

Annexure I of this report shows Fuel Cells Plant Programme for the Feasibility Phase of the project. The programme illustrates the importance of finalising the Dolomite Stability Investigation as a matter of urgency, in order to allow for the commencement of the proposed outstanding Environmental and Engineering activities.

10 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this document, it is evident that the proposed Fuel Cells Development is feasible. This is considered in terms of site physical characteristics, its location as part of the Impala Platinum industrial complex, existing development rights, existing infrastructure services and road access, and urban development policy that promotes further industrial development in the area. And the following conclusions and recommendations are drawn:

Town Planning

- Currently there is a single industrial use that is being used on the site; mining offices and the establishment of the proposed fuel cells plant will introduce various other industrial uses. Given that there will be various land uses that will be introduced on the site as part of the industrial development there will be a need for a Township Establishment application to be submitted, where the required development controls (zoning, height, coverage etc.) will be determined.
- Portion 133 Geduld 123 IR has restrictive title conditions as reflected in the Title Deed T67313/1993, mostly related to servitudes (i.e.: historic mining rights, coal mining rights, Eskom Powerline servitude, and water pipeline servitude).
- Central to the township establishment application will be the; Environmental assessment, Geotechnical assessment, Traffic assessment, Outline Scheme Report and a general assessment of the availability of bulk infrastructure.
- The title deed of the property explicitly states that the property is subject to mining rights and therefore the application will have to be circulated to the Department of Mineral Resources for comments.
- The zoning of the site as “Industrial 1” is beneficial because it allows a wide scope of land use rights and an opportunity for consent use of more heavier/noxious industrial activities as well as ancillary uses.
- The proposed mixed industrial development will offer various employment opportunities in close proximity to residential neighbourhoods. It can be interpreted that the proposed development will assist in realising the vision of the National Development Plan by creating a development that is compact and that offers employment opportunities.

Architectural

- The proposed Fuel Cells plant forms a part of the Gauteng Growth and Development Agency’s strategy to establish a Platinum Group Metals (PGM) Special Economic Zone (SEZ) in Springs.
- This industrial development forms part of a bigger plan within the Ekurhuleni Industrial District. The approach to design needs to incorporate the macro and micro considerations of the surroundings and immediate site. The method for design will
therefore be a multi-faceted approach, layering a notion of function, market responses and an integration of work and production.

**Civil Engineering**

- Although it is known that the area around the development is serviced for industrial use, the exact available capacity of the existing water and sewer infrastructure, at this stage, is still unknown. Ekurhuleni’s standard procedure for all new developments requires that a water capacity investigation be done for the development, which will be commenced in the preliminary design phase in consultation with the consulting company, GLS. Despite the exact demand and capacity figure not known at this stage, it is safe to say that a light to medium industrial development in this area is feasible as the existing bulk infrastructure should accommodate the perceived demands.
- The site requires two road entrances which can accommodate heavy vehicles.
- It is anticipated to provide external site storm water discharge infrastructure as additional mitigation measures.
- The geotechnical investigation indicated that the upper horizons are underlain by dolomite. And also, the report also recommended that imported material will be required during construction.
- The dolomite risk assessment report recommended that footprint drilling of the site should be conducted prior to development of the site.
- It is recommended that a Capacity Investigation for existing water and sewer infrastructure in and around the area earmarked for the proposed development be carried-out at preliminary design stage.
- In addition to an on-site storm water retention strategy, it is recommended to provide a storm water outlet route from the low point of the site to the existing storm-water channel to the north of the site.
- It is recommended to supply a bulk water feeder line of 200 mm diameter to the site along the northern boundary of Rowhill settlement. This is the shortest route with the least construction impact to existing services.
- It is recommended to route a 450mm diameter sewer bulk line from the low-lying north-eastern corner of the site to the east-west sewer line running 1 km north of the site. Due to the flat gradient, it is advised to consider a large diameter outfall line size, and to choose a large diameter line to tie into.
- It is recommended to use the existing road network as proposed by the current site layout. It was shown that the existing road network can sufficiently serve the demands of the site. It is therefore not foreseen to make any upgrades to road infrastructure around the site, except for a bell-mouth tie in on the east to the existing regional road.

**Structural Engineering**

- The site is in a dolomitic area of which the intensity grading must still be investigated and confirmed. Depending on the dolomitic severity level, expensive supporting earth platforms or engineered soil mattresses may need to be constructed.
Another common mitigation measure in dolomite areas are dynamic compaction in order to collapse any existing cavities underground and to compact the in-situ material. On large building areas this may become a costly exercise.

Due to the high probability of dolomitic geotechnical conditions, the floor design will need care-full consideration to serve the user’s activities load requirements, as well as provide effective bridging of possible sink-hole formations below the covered area. Such dolomitic resistant floor design may escalate costs depending on the severity level of the possible dolomitic activities.

**Electrical Engineering**

- There is an existing overhead Medium Voltage line on site. And there is a new 132/6.6kV capacity electrical substations located in Krugersus, which according to the City of Ekurhuleni Energy Projects & Master Planning Division, Fuel Cells Plant will supplied with the needed capacity in future once the substation is energized.
- We propose Solar power which is the conversion of energy from sunlight into electricity, either directly using photovoltaics, indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam.

**Mechanical Engineering**

- We will consider Space heating and cooling and it shall employ a high efficiency system called Variable Refrigerant Volume (VRV) for the main offices and other activity rooms. The VRV process has vast advantages in that a single load condenser (outdoor) unit can be used to power multiple evaporator (indoor) units.

**Environmental**

- The proposed project is a listed activity of Regulation 982, 983, 984 and 985 of the EIA Regulations of 4 December 2014, promulgated in terms of Chapter 5 of the National Environmental Management Act (NEMA), Act 107 of 1998, as amended, and therefore requires environmental authorisation before commencement of the activity.
- It should be stated that there are environmental uncertainties which still need more clarity. A full description of the project is needed in order to clarify which environmental process(es) need to be conducted for the project. The final environmental process(es) to be followed and the specialist studies required will be confirmed with the authorities once the final project scope has been fixed.

**Geotechnical**

- The site was characterised as developable with areas that may need precautionary or certain remedial measures. However, the site is underlain by dolomite and interpretation of the borehole profiles from the 2005 drilling programme, the fieldwork, geological and hydrogeological data gathered during the site investigation of the area, the site was further subdivided into three Inherent Risk Classification, namely: Inherent Risk Class 3/6, Inherent Risk Class 3/7 and Inherent Risk Class 6/7. Part of the site is
characterised as developable with areas that may need precautionary or certain remedial measures.

- The drilling programme conducted in 2005 did not include a dolomite risk assessment, it was therefore deemed necessary for a risk assessment to be conducted based on the existing borehole logs. This resulted in a dolomite stability report being prepared in accordance with the SAIEG guidelines, GFSH-2 guidelines and the SANS 10400-B guidelines.

- The site was classified according to three broad dolomite risk characterisations, namely Inherent Risk Class 3/6, Inherent Risk Class 3/7 and 6/7. The SAICE dolomite designation for the Inherent Risk Class (IRC) 3 classification is D3 and for the Inherent Risk Class 7 is D4. According to the SANS requirements, the risk classification indicates that part of the site is suitable for the proposed development of an industrial centre.

- Site classification IRC3/6 commercial development with 3 storeys and higher can be considered. The investigated site is characterised by variable subsurface conditions. The site exhibits poor subsurface conditions that are consistent with industrial development potential.

- The dolomite stability report was submitted to Council for Geoscience for review. The council was in agreement with the Inherent Risk Classification and site zonation as per the report, namely: Inherent Risk Class 3/6, Inherent Risk Class 3/7 and 6/7. CGS was also in agreement with the recommendation that part of the site is characterised as developable with areas that may require precautionary or certain remedial measures.

- The council indicated that if the site is deemed suitable for development after further investigations, footprint drilling will be required prior to developing the site. Further drilling was therefore recommended.

**Traffic Impact Assessment**

- The TIA for the proposed Fuel Cell Plant development was approved by City of Ekurhuleni Roads and Stormwater Department on the 10th December 2018, with the conditions noted on subsection 7.3 above.


IDC Department of Research, February 2013. *Industry analysis: opportunities for downstream value addition in the platinum group metals value chain - Fuel Cells*, s.l.: s.n.


ANNEXURE A: MARKET STUDY
ANNEXURE B: ARCHITECTURAL CONCEPT DESIGN
ANNEXURE C: EXISTING INFRASTRUCTURE REPORTS
ANNEXURE E: ENVIRONMENTAL SCREENING REPORT
ANNEXURE F: TRAFFIC IMPACT ASSESSMENT
ANNEXURE H: GEOTECHNICAL INVESTIGATION
ANNEXURE I: PROGRAMME