DRAFT EIA REPORT FOR THE PROPOSED MACKENZIE PARK X 3 RESIDENTIAL DEVELOPMENT ON PART OF THE REMAINING EXTENT OF THE FARM BENONI 77 IR.

This process was managed by:

ENVIRONMENTAL CONSULTANTS – Galago Environmental

Vanessa Marais: BL Landscape Architecture (Principal EAP)

Vanessa Marais has a BL Degree in Landscape Architecture with more than 12 years relevant experience (see Appendix F and G) in reviewing and conducting EIAs at DEAT, Africon and Galago Environmental.

Vanessa Marais has specialized in the development of management processes and guidelines for the review of environmental impact assessments. She has been extensively involved in policy decisions relating to environmental impact management within the ambit of the national context. Her field of expertise is environmental impact management, evaluation and review with analysis of processes used for environmental impact management as well as the mitigation of these impacts within the environmental management plan context.

While working at a big engineering firm, her experience in the field of Environmental Impact Assessments (EIAs) has enabled her to develop mechanisms for determining impacts associated with developments as well as mitigating measures for Environmental Management Plans (EMP). She gained valuable experience in project management while contributing to various projects in the environmental field. She has used the vast experience in EIAs and EMPs to externally audit environmental conditions at various construction projects, notably the Kruger Mpumalanga International Airport, the Development Bank of Southern Africa, Rabali Weir (Limpopo) and wind measuring masts in Port Nolloth.

She has compiled more than 20 Basic Assessment, Scoping or EIA reports in the last 10 years as part of a team, team leader and single Environmental Assessment Practitioner while also working on EMF's, Policies and other IEM related projects.

This report was prepared by:

Marli Burger: MSc Aquatic Health

Marli Burger is an Aquatic Resource Consultant with 12 years of environmental legal compliance experience. She has a Master's degree in Science from the University of Johannesburg and specialises in Aquatic Health and Project Management. She has been involved in a variety of different types of Environmental Impact Assessments and Water Use License (WUL) Applications including applications for water supply projects, dams, transmission lines, roads, mining, agricultural activities, residential developments and a constructed wetland in South Africa. Marli has also been involved in the use of Geographic Information Systems, environmental status quo and audit reports, water quality assessments, legal compliance and open space planning. Relevant training includes, amongst others, the Environmental Management Inspector (EMI) training course during her employment at GDARD, the Department of Water and Sanitation (DWS) Instream Use training course and WUL Audit course.

Management information of specialist studies for the EIA and WULA processes have included amongst others, vegetation, fauna, social, geotechnical, heritage assessments, as well as hydrology, hydrogeology, geomorphology, hydropedology, water quality analyses, aquatic delineation and rehabilitation studies and risk assessments. The findings of the specialist studies are incorporated into the application and presented to the relevant commenting departments and competent authority as required for each application.

Marli has extensive experience in auditing EMPr conditions on construction sites while doing weekly or monthly ECO monitoring, including environmental training with contractors and finding ways to mitigate the impacts of development on the environment. She has also conducted several WUL audits, which includes providing practical measures towards full compliance.

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EXECUTIVE SUMMARY

Ekurhuleni Metropolitan Municipality (EMM) has appointed **Galago Environmental CC**: Environmental Consultants and Specialists as the independent environmental consultants to identify and assess the potential environmental impacts associated with the proposed establishment of the **Mackenzie Park x 3 Residential Development** through an **Environmental Impact Assessment (EIA) process**.

This Draft EIA Report is for the proposed residential development and associated infrastructure situated on part of the Remaining Extent of the Farm Benoni 77 I.R. The site is ± 220 ha in extent and situated between the suburbs of Rynsoord and New Modder in the east and Mackenzie Park in the west. The study area has a total area consists largely of old vacant mining land which has been partially rehabilitated.

The aim of the project is to fast-track formal housing delivery in order to relieve Ekurhuleni's current housing backlog that is estimated to be in the region of 200 000 units and is still growing.

Proposed development:
The proposed development is an integrated residential precinct, consisting of medium and high-density neighbourhoods interspersed with a range of community facilities, including three schools and three business areas. The proposed development will entail a residential township in order to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks.

Project process:
A pre-application meeting was held with GDARD on 26 January 2018 to establish the process under the 2014 EIA regulations, as amended and to establish whether there are any issues identified by GDARD that will need special attention.

A public participation process was followed to inform Interested and/or Affected parties (I&APs) about the proposed development and to gather issues and concerns to be investigated during the EIA process. This process will be discussed further in section 5.

The draft Scoping Report was made available to registered I&APs, State Departments and the EMM for comment on 16 May 2018. All issues and concerns were addressed and included in the Final Scoping Report. The application form was submitted to GDARD on 15 May 2018.

On approval of the Scoping Report in April 2019, the EIA process was started.

During the Environmental Impact Assessment phase the different design and technology alternatives for a residential development on the site were compared in terms of the potential environmental impacts associated with the residential development. Specialist studies were

undertaken during the EIA phase in order to determine the potential impacts on the social and biophysical environment and the EIA report was compiled.

Specialist studies:
Specialist studies were undertaken during the EIA phase in order to determine the potential impacts on the social and biophysical environment:

- Biophysical
  - Flora assessment;
  - Fauna study including Mammals, Avifauna and Herpetofauna;
  - Flood line study
  - Aquatic ecosystem delineation
  - Geotechnical Assessment
  - Air Quality Impact Assessment
  - Radon Study
- Social
  - Cultural Heritage Assessment
  - Civil Services Report
  - Traffic impact study
  - Township application report
  - Stormwater Management report

Biophysical:
Mucina & Rutherford (2006) classified the area as Soweto Highveld Grassland, a gently to moderately undulating landscape on the Highveld plateau supporting short to medium high, dense, tufted grassland dominated almost entirely by *Themeda triandra*, and accompanied by a variety of other grasses. It is in places undisturbed, with scattered small wetlands, narrow stream alluvia and pans. Occasional ridges or rocky outcrops interrupt the continuous grassland cover. This vegetation unit comprises shale, sandstone or mudstone, or the intrusive Karoo Suite dolerites which feature prominently. The soil is deep and red on the flat plains. This vegetation unit is considered endangered.

The **flora study** found that the Eragrostis – Tristachya grassland is disturbed natural grassland and is not deemed sensitive. The Cortaderia – Cynodon vegetation study unit, the Eragrostis – Cynodon grassland study unit and the Mixed alien and indigenous vegetation study unit are not considered sensitive. The Wetland vegetation study unit is deemed sensitive. The alien invasive species should be removed. No Red List or Orange List species occur on the study site.

The **mammal** study found that the proposed development will progressively displace the mammals recorded during this survey, although it is anticipated that the wetland will retained its *status quo* (which will be a conservation asset for hawking bats, although over time terrestrial wetland-reliant small mammals will also perish as result of isolation). However, it is submitted that displacement of terrestrial wetland-reliant small mammals is of little consequence since all mammal species are widespread and common, even the *Crocidura* species.

The habitat is predominantly terrestrial in character and the secondary grassland is, as mammal habitat, in fact fairly good. The historical mammal assemblage has been compromised by the displacement of medium and larger species, whereas the habitats have not been impacted significantly.

From an extant mammal perspective the site is deemed to have a low sensitivity.

The **avifaunal** study found that the study area does not offer suitable habitat for the Red Data avifaunal species recorded for the 2628AB q.b.g.c. These Red Data avifaunal species are habitat specific and unable to adapt to areas changed by man. In general the reporting rate of all Red Data avifaunal species recorded for the q.d.g.c. is very low at 1% and less and if they should occur, they are only likely to move through the area on rare occasions and are unlikely to make use of these habitat systems on a permanent basis. The entire study area including the wetland areas can be regarded as low sensitive in terms of habitat availability for sensitive avifaunal habitat.

Aquatic ecosystems:
It must be clearly noted that any development on the study site will have an impact on the aquatic ecosystems and must be authorised in terms of section 21 of the National Water Act, 1998 (Act No. 36 of 1998).

In terms of GN 1199 of the National Water Act, 1998 any development within 500 meters of a wetland should follow a water use license application process for the release of stormwater from the site. A Water Use Licence Application (WULA) will therefore be submitted to the Department of Water and Sanitation (DWS) for approval.

The **wetland study** found one wetland that is within the study footprint, and it is classified as seepage. The wetland on site is largely unmodified and has a moderate importance and sensitivity to changes in flow regime and lacked sensitive biota. It was recommended that a 30m buffer is set to protect wetland functionality.

All impacts can be mitigated and appropriate mitigation measures should be put into place and carefully monitored to ensure potential impacts are mitigated. During construction a suitable qualified ECO should be appointed to ensure activities are within the recommendation of the specialist as well as conditions in the license

The **air quality study** assigned significance rating of ‘medium’ to potential inhalation health impacts and dustfall effects. With mitigation measures in place on TSF 5, such as vegetation or rock cladding, the significance should reduce to ‘low’. The radon study indicated that radioactivity content of the soil is generally low with localised elevated levels of Th believed to be of natural origin. Radon intrusion into future houses on the site is expected to be insignificant, and the contribution of thoron from the elevated Th content will not be a factor.

Social and Economic:
The social environment refers to the environment developed by humans as contrasted with the natural environment.

There is a huge need for housing provision in the area and both positive and negative impact will be experienced due to this development. The negative social impacts associated with the proposed development can, in most cases, be mitigated successfully.

Conclusion:
There is a tremendous need for housing, better services and jobs within the Ekurhuleni Metropolitan Municipality area as well as the surrounding communities. The project team has worked with the different stakeholders, authorities and the local community to ensure that the proposed project address both the social concerns as well as the environmental concerns.

The proposed development will have a low negative and a high positive impact on the environment should all the mitigation measures proposed above be implemented. It is essential that the Environmental Management Programme be implemented during the construction and operational phases of the proposed development.

It is therefore requested that the **preferred option be authorised by the Department of Agriculture and Rural Development**, in terms of the conditions and requirements of this report and that the township be managed in terms of the recommendations as given in this report.

The site is situated within an urban edge, surrounded by development and the vegetation of the site is transformed. In terms of GN 509 of the National Water Act, 1998 any development within 500 meters of a wetland should follow a water use license application process for the release of stormwater from the site. A Water Use Licence Application (WULA) will therefore be submitted to the Department of Water and Sanitation (DWS) for approval.

There is a huge need for housing provision in the area and the negative social impacts associated with the proposed development can, in most cases, be mitigated successfully.

The proposed residential development is anticipated to have the following **positive social** impacts:

- The creation of employment (even limited) in an area where job opportunities are scarce and where the unemployment rates are growing, as well as the possible economic spin-offs is an important positive impact.
- The possibility of skills development for temporary and permanent employees exists.
- The provision of houses and mixed use development will reduce the housing need in the area and will provide essential services and socioeconomic opportunities.
- The upgrading of roads and services as well as the removal of waste from a formal township will reduce the environmental impacts in the area.

The proposed residential development could have the following **negative social** impacts:

- An influx of job seekers to the area cannot be excluded, with subsequent negative social impacts.
- A possible inflow of temporary workers to the area during the construction phase, as well as the intrusion impacts associated with the construction activities such as increased construction vehicle activity.

- Should the outfall sewer not be upgraded to accommodate increasing demands in the area, then there is a large risk of environmental pollution to the aquatic systems in the area as well as a health risk to neighbouring communities.

The study has shown that the proposed development has no fatal flaws in terms of the institutional, bio-physical or socio-economic environment. There would be no significant impact on the environment, which could not be mitigated by proper mitigation measures. The ensuing Environmental Management Programme (EMPr) as provided in Appendix F could mitigate most of these impacts.

Recommendations:

It is recommended that the **preferred option** of a **Residential Development** be approved with the following conditions:

- All the requirements and mitigation measures as described in the Environmental Management Programme (EMPr) appended in Appendix F must be adhered to.
- All the recommendations and mitigation measures as per the specialist reports must be adhered to.
- The Water Use Licence (WUL) must be approved by the DWS before construction can commence near the wetland and aquatic systems.
- It is recommended that an independent Environmental Control Officer (ECO) be appointed to ensure that the ROD and the requirements of the Environmental Management Programme are adhered to.
- The use of local labour should be maximised to ensure that the locals stand to benefit from the proposed project, but also to limit most of the anticipated social impacts associated with the construction phase of the project (e.g. conflict between locals and outsiders about employment).
- The outfall sewer and other essential bulk services as well as the roads or intersections must be upgraded before the construction phase of the proposed development commence.

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Appendix F: Draft EMPr

Appendix G: Details of EAP and experience

ABBREVIATIONS:

CCC	Customer Care Centre
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
GDARD	Gauteng Department of Agriculture and Rural Development
EBOSS	Ekurhuleni Biodiversity and Open Space Strategy
EIA	Environmental Impact Assessment
EMM	Ekurhuleni Metropolitan Municipality
EMP	Environmental Management Plan
EMSDF	Ekurhuleni Metropolitan Spatial Development Framework
F.A.R.	Floor Area Ratio
GPDA	Gauteng Planning and Development Act, 2003
GSDF	Gauteng Spatial Develop Framework
IDP	Integrated Development Plan
MAP	Mean Annual Precipitation
NEMA	National Environmental Management Act, 1998
NEM:WA	National Environmental Management: Waste Act, 2008
NFEPA	National Freshwater Ecosystem Priority Areas
NHBRC	National Home Builders Registration Council
PET	Potential Evapotranspiration
PRASA	Passenger Rail Agency of South Africa
SAHRA	South African Heritage Resources Act, 1999
WULA	Water Use Licence Application
WWTW	Waste Water Treatment Works

DEFINITIONS:

Affected environment: Those parts of the socio-economic and biophysical environment impacted on by the development.

Affected public: Groups, organizations, and/or individuals who believe that an action might affect them.

Alternative proposal: A possible course of action, in place of another, that would meet the same purpose and need. Alternative proposals can refer to any of the following but are not necessarily limited thereto:

- alternative sites for development
- alternative projects for a particular site
- alternative site layouts
- alternative designs
- alternative processes
- alternative materials

Anthropogenic: Change induced by human intervention.

Authorities: The national, provincial or local authorities, which have a decision-making role or interest in the proposal or activity. The term includes the lead authority as well as other authorities.

Baseline: Conditions that currently exist. Also called “existing conditions”.

Baseline information: Information derived from data which:

- Records the existing elements and trends in the environment; and
- Records the characteristics of a given project proposal

Best practical environmental option: The option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

Contaminated: The presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely.

Cumulative impact: In relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts from similar or diverse activities or undertakings in the area.

Development footprint: In respect of land means any evidence of physical alteration as a result of the undertaking of any activity.

Disposal: Means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into or onto any land.

Decision-maker: The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal.

Decision-making: The sequence of steps, actions or procedures that result in decisions, at any stage of a proposal.

Ecology: The study of the inter relationships between organisms and their environments.

Environment: All physical, chemical and biological factors and conditions that influence an object and/or organism. The surroundings within which humans exist and that are made up of –

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;

iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, cultural, historical, and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Assessment (EA): The generic term for all forms of environmental assessment for projects, plans, programmes or policies. This includes methods/tools such as EIA, strategic environmental assessment, sustainability assessment and risk assessment.

Environmental consultant / Assessment Practitioner: Individuals or firms who act in an independent and unbiased manner to provide information for decision-making.

Environmental Impact Assessment (EIA): A public process, which is used to identify, predict and assess the potential environmental impacts of a proposed project on the environment. The EIA is used to inform decision-making.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

Environmentally sound management: The taking of all practicable steps to ensure that waste is managed in a manner that will protect health and the environment.

Fatal flaw: Any problem, issue or conflict (real or perceived) that could result in proposals being rejected or stopped.

General waste: Waste that does not pose an immediate hazard or threat to health or to the environment, and includes domestic waste, building and demolition waste, business waste and inert waste.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may owing to inherent physical, chemical or toxilogical characteristics of that waste have a detrimental impact on health or the environment.

Independent: In relation to an EAP or a person compiling a specialist report or undertaking a specialised process or appointed as a member of an appeal panel, means – That such EAP or person has no business, financial, personal or other interest in the activity, application or appeal in respect of which that EAP or person is appointed in terms of these Regulations other than fair remuneration work performed in connection with that activity, application or appeal; or that there are no circumstances that may compromise the objectivity of that EAP or person in performing such work.

Impact: The positive or negative effects on human well-being and/or on the environment.

Interested and affected parties (I&APs): Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business associations, trade unions, customers, consumers and environmental interest groups. The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Lead authority: The environmental authority at the national, provincial or local level entrusted in terms of legislation, with the responsibility for granting approval to a proposal or

allocating resources and for directing or coordinating the assessment of a proposal that affects a number of authorities.

Mitigate: The implementation of practical measures to reduce adverse impacts.

Proponent: Any individual, government department, authority, industry or association proposing an activity (e.g. project, programme or policy).

Plan of study for environmental impact assessment: A document, which forms part of a scoping report and sets out how an environmental impact assessment must be conducted.

Role-players: The stakeholders who play a role in the environmental decision-making process. This role is determined by the level of engagement and the objectives set at the outset of the process.

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Stakeholders: A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Stakeholder engagement: The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision making process. The term is considered to be more appropriate than the term “public participation”.

Study area: Refers to the entire study area encompassing the total area as indicated on the study area map.

Sustainability: An attempt to provide the best social, environmental and economic outcomes for the human and natural environments both now and into the indefinite future.

Visual impact: Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the viewshed experienced by visual receptors and intrusion of foreign elements into the viewshed of landscape features thereby detracting from the visual amenity of the area.

Waste: Any substance, whether or not that substance can be reduced, re-used, recycled and recovered: -

(a) That is surplus, unwanted, rejected, discarded, abandoned or disposed of;
(b) Which the generator has no further use of for the purpose production;
(c) That must be treated or disposed of;

(d) That is identified as a waste by the Minister by notice in a Gazette and includes waste generated by the mining, medical or other sector, but-
(e) A by-product in not considered waste; and
(f) Any portion of waste, once reused, recycled and recovered, ceases to be waste.

Waste disposal facility: Any site or premises used for the accumulation of waste with the purpose of disposing of that waste at that site or on that premise.

Waste management activity: Any activity listed in Schedule 1 or published by notice in the Gazette under section 19 of NEM:WA, and includes –

(g) The importation and exportation of waste;
(h) The generation of waste, including the undertaking of any activity or process that is likely to result in the generation of waste;
(i) The accumulation and storage of waste;
(j) The collection and handling of waste;
(k) The reduction, re-use, recycling and recovery of waste;
(l) The trading of waste;
(m) The transportation of waste;
(n) The transfer of waste; and
(o) The disposal of waste.

Waste management license: A license issued in terms of section 49 of NEM:WA.

Waste minimisation programme: A programme that is intended to promote the reduced generation and disposal of waste.

1. INTRODUCTION

Ekurhuleni Metropolitan Municipality (EMM) has appointed **Galago Environmental CC**: Environmental Consultants and Specialists as the independent environmental consultants to identify and assess the potential environmental impacts associated with the proposed establishment of the **Mackenzie Park x 3 Residential Development** through an **Environmental Impact Assessment (EIA) process**.

The EIA process is prescribed by Chapter 5 of the Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the 2014 Environmental Regulations, as amended published as GN No. R. 982-984. A Scoping Assessment Process must be undertaken for activities as listed in Regulation No. R. 984 that may have a significant impact on the environment. A full public participation process forms part of the EIA and is discussed in further detail in the report.

This Draft EIA Report is for the proposed residential development and associated infrastructure situated on part of the Remaining Extent of the Farm Benoni 77 I.R. The site is ± 220 ha in extent and situated between the suburbs of Rynsoord and New Modder in the east and Mackenzie Park in the west. The study area has a total area consists largely of old vacant mining land which has been partially rehabilitated.

The aim of the project is to fast-track formal housing delivery in order to relieve Ekurhuleni's current housing backlog that is estimated to be in the region of 200 000 units and is still growing.

1.1 Project location

The study site is situated in the south-central part of Ekurhuleni within the Brakpan Customer Care Area. The study area consists of only a part of the property, between Mackenzie Park, Rynsoord and New Modder in the Benoni Customer Care Area. The site extends from Snake Road (R23) eastwards and southeastwards between the Kleinfontein spruit/wetland on the north and the Apex/Dersley railway line reserve on the south, up to Rynsoord and New Modder on the east. The study area consists largely of old vacant mining land which has been partially rehabilitated (Figure 1).

As far as its sub-regional context is concerned, the site is relatively close to the Carnival Mall node which is one of the fastest growing nodes in Ekurhuleni, and it is also close to a number of regional arterial routes and the N17 freeway which will provide connections to the wider surrounding area.

A number of major arterial routes provide access to the western (Snake Road/Range View Road) and central portions (Main Reef Road (R29/Modder Road) of the site. The roads are all surfaced municipal roads. Access within the site is very limited because of vegetation, heaps of waste and a number of embankments and drainage ditches surrounding large portions of the site.

Kleinfonteinspruit (also known as the Benoni Canal) runs along the northern boundary; and the R23 Snake Road runs along the western boundary of the site.

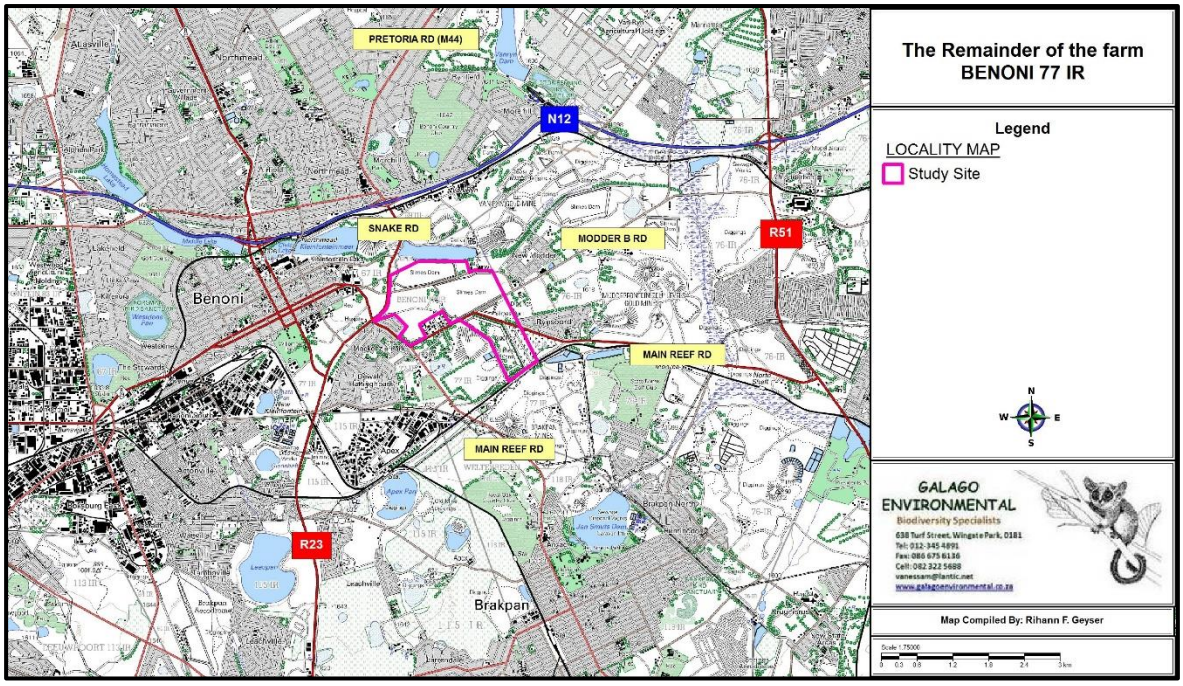

Figure 1: Locality map of the study area

The 1:50 000 map indicating the study site together with all the requirements for a map is included as Appendix A.

1.2 Project description

The proposed development will entail a residential township in order to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks.

High density residential stands are proposed along the major roads and in the areas abutting the open space system. Two to four storey walk-up units will be built on these erven at densities of between 100 to 120 units per ha. Rental units, affordable walk-up units, GAP units and Government subsidized walk-up units can be built on these stands.

A total of 14 erven with an area of 50.46 ha are proposed. It is proposed that these erven be zoned for “Residential 4” purposes.

Medium density residential erven, 699 in total, approximately 180 m² in size, are proposed in the northern and north-western parts of the site, for the FLISP and bonded sectors of the market. A total of 1820 residential erven, approximately 130m² in size, are proposed for subsidy-linked free-standing and semi-detached units, which will be mostly located in the northern part of the site, between New Modder Road and Provincial Road K106. The total of 2519 is recommended to be zoned for "Residential 2" purposes

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A total of 714 row housing erven with a ruling size of 80m² are proposed in the southeastern part of the site abutting the cemetery.

A total of seven erven with a total area of 21.77 ha is proposed for "Business 2 zoning".
Three **combined schools** and two **Primary school** sites are provided in the development and a total of four erven for local community facilities such as crèches and churches are proposed.

A total of ten **"Public Open Space"** erven are proposed throughout the township, including local play parks, stormwater detention dams, shaft buffer zones and the wetlands and their buffers. Also included is the 100m air quality buffer on the south-western boundary of the site, that could be set out for residential erven later when the tailings on the neighbouring property is removed and rehabilitated.

Access and Street system: The existing alignments of New Modder Road and Modder B Road through the site had to be amended in order to link onto the proposed K106 as planned by Gautrans. Both these roads will be deviated southwards to link with K106 and parts of them will have to be deproclaimed. Modder B Road will ultimately intersect with Main Reef Road (K163) south of its current intersection, the existing section of this road west of K106 will eventually become an internal road in the area. No direct erf access will be allowed, except along the stretch close to the K106 intersection.

1.2.1 Civil and electrical Infrastructure

A Civil services report is included in Appendix D: Annexure C5 of this report.

1.2.2 Water

The proposed development will require approximately 6.32Ml/day. A peak demand of 293 l/s is required to service Mackenzie Park x 3, excluding fire requirements.

Sufficient spare capacity is currently available in all affected existing bulk water pipes. One pipe within the Benoni Central distribution zone has a velocity in excess of the recommended 2m/s, but the pressure from the Rand Water system is sufficient to ensure that most of the supply zone experiences peak flow residual pressures in excess of the minimum requirement of 24m. No upgrading to any network water infrastructure is required.

The site does not fall within any of the existing Ekurhuleni water distribution zones and no provision was made for the proposed development in the Benoni water master plan. It would be most economical for the development to be incorporated into the RW Benoni Central Direct distribution zone and partly into the RW0052/RW5596 Direct distribution zone.

1.2.3 Sewer

The proposed development will produce approximately 5.1Ml/day with a peak flow of 269l/s. The sewage network analysis found that:

- A portion of the development site should be incorporated into each of: o The JP Marais/Welgedacht diversion drainage area, which drains towards a diversion structure which controls a split of the flow towards the JP Marais waste water treatment works (WWTW) and the Welgedacht WWTW; and
- Temporarily into the Rynsoord pump station drainage area until the planned Welgedacht Outfall Sewer is constructed, after which this area will be able to drain to the Welgedacht WWTP drainage area.

1.2.4 Stormwater

There are currently three main catchments within the site, one draining north and east towards the Kleinfonteinspruit, one draining south towards Brakpan Mines and one catchment mainly outside the site draining towards a pan near the western side of the site. The pan is therefore likely to spill very rarely if ever.

Without attenuation, development is expected to significantly increase peak runoff in the catchments draining towards Kleinfonteinspruit (from 7.3m3/s to 15.4m3/s) and Brakpan mines (from 2.3m3/s to 6m3/s). Stormwater conveyance measures and detention ponds and other stormwater control measures are recommended in each of these catchments. The northern catchment draining towards Kleinfonteinspruit will have limited space for detention ponds, and it is proposed to provide part of the attenuation in swales. A filter strip is also proposed along the river to prevent pollution from distributed runoff.

Stormwater conveyance infrastructure, detention ponds and vegetated filter strips are recommended in each of these catchments. Three detention ponds are proposed in the northern catchment draining towards Benoni Canal. An extensive pipe network will lead water towards the detention ponds. In one area, a filter strip is also proposed along the river to prevent pollution from distributed runoff.

The effect of the proposed development on the pan catchment is predicted to be very small, and the only bulk stormwater infrastructure recommended is a short pipe to convey stormwater from the proposed Lapwing Street towards the pan.

A single detention pond is proposed in the catchment draining south towards Brakpan Mines. A discharge canal along the proposed K110 road is also proposed downstream of the pond outlet. The mine dams to the west of the site will spill towards the site and thus form a considerable part of the total catchment. An open channel is proposed along the western boundary to divert this flow away from the site. This channel can be routed to the proposed detention pond. Stormwater from uNdunde Street and the adjacent Residential 4 area will be discharged to the currently vacant area to the east of the site. A separate development is also planned in this area, and this small flow which will need to be accommodated by the streets and stormwater network of adjacent development once this development is built.

The total proposed stormwater network includes 9.8km of stormwater pipes, 3.2km of open channels, two filter strips of total length 0.5km and four stormwater detention ponds. A Stormwater Management Plan is included (see Appendix D: Annexure D7).

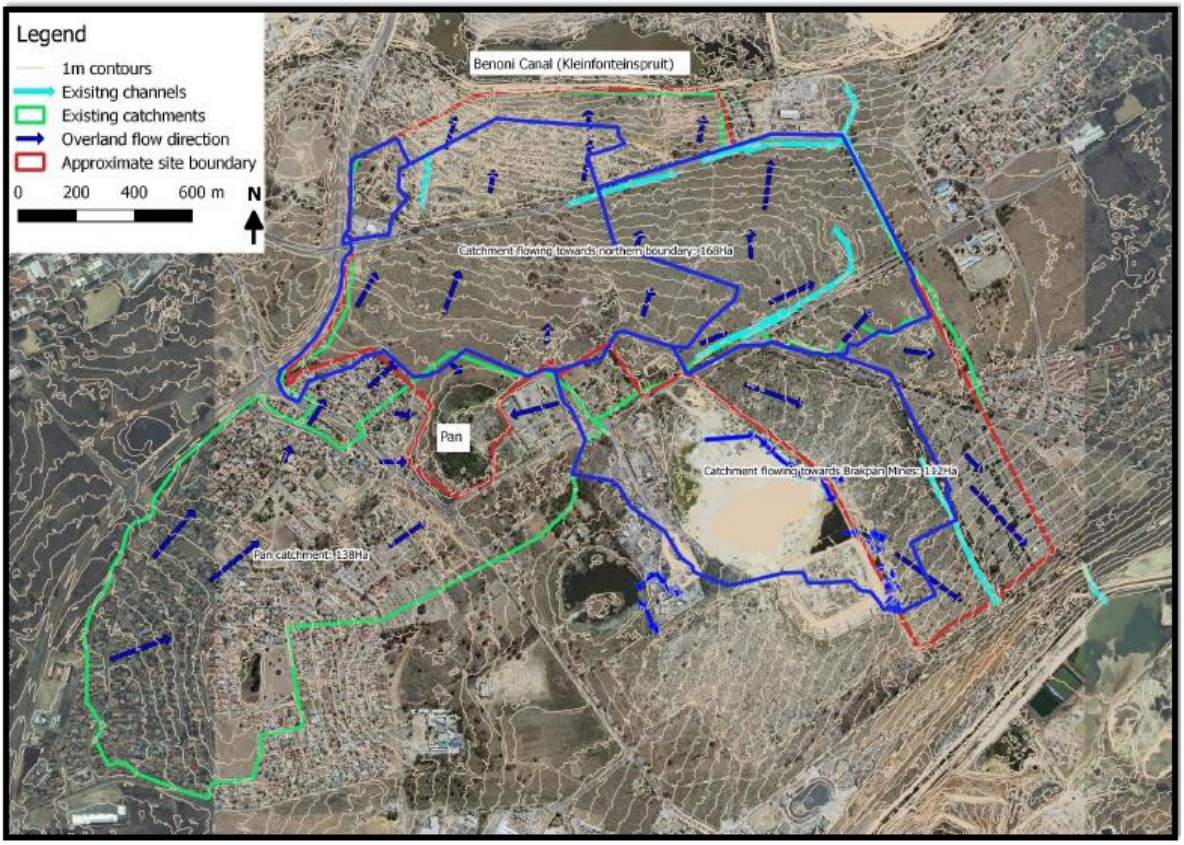

Figure 2: Stormwater catchment areas as provided by Shuma Africa, 2017 (Appendix D7)

1.2.5 Electricity

The proposed development may be supplied with electricity from the Van Eck substation approximately 2 km to the east. The existing maximum demand at Van Eck already exceeds safe capacity. Additional space capacity will have to be installed. Alternatively the site may be supplied from the planned Helderwyk/Leeuwpoort 88kV POD.

1.2.6 Solid Waste

The Ekurhuleni Metropolitan Municipality uses on-site storage on all households in a form of 240 litres mobile bins. The refuse removal is the responsibility of the Municipality. For a school 11m³ bulk containers may be used. The waste will be collected by 85 litre bin liners and into the bulk containers.

1.2.7 Access and Street System

The site is very accessible, the R23 abuts it on the west, providing access to the N12 to the north and to the N17 and the N3 to the south, while a number of local arterial routes (New Modder Road, Modder B Road and Main Reef Road) run through it, linking it to surrounding centres.

The site is surrounded by four local arterial roads which are:

- **Snake/Range View Road (R23),** which forms the northwestern boundary of the site,
- **Main Reef Road (R29),** which branches off the R23 at Mackenzie Park, linking it to Rynsoord and Kingway Avenue (R51) to the east;
- **Main Reef Road (M45),** which branches off the R29, linking the site with Brakpan CBD to the south;
- **New Modder Road,** running through the northern part of the site, linking Benoni CBD to the west of it with New Modder township the east of it; and
- **Modder B Road,** linking the central part of the site with Kingsway Avenue towards the northeast.

Access to the site will be taken from these roads (local arterials) that traverse the site. Taxi drop-off zones and Bus stops will be provided at the access points around all the major arterials roads.

1.2.8 Heritage Resources

Sections of the study site were used for mining in the past, but large parts of it have been rehabilitated during the last two decades and now lie vacant. One of these land parcels, east of Snake Road up to New Modder and Rynsoord Townships, is ideally suited for infill development, in line with Ekurhuleni's stated intent to prioritize vacant land in the Mining Belt for development.

1.3 Statutory and Institutional procedure

1.3.1 National context

The following legislature is closely linked to the Environment in the National context and will be discussed in more detail in the following table (Table 1).

1.3.2 Constitution of Southern Africa Act, 1996 (Act No. 108 of 1996)

The Constitution of South Africa provides the legal foundation for the republic and sets out the rights and duties of its citizens and defines the structure of the government. In terms of Section 24 of the Constitution every person has the right to an environment that is not harmful to their health or wellbeing and to have the environment protected through reasonable legislative measures.

1.3.3 National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2014

NEMA aims to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for matters connected therewith.
Other legislative procedures that have been considered or need to be taken into account for the proposed project are the following:

- The National Water Act, 1998 (Act No. 36 of 1998);
- The National Water Act, 1998 (Act No. 36 of 1998) General Notice 509 - development within 500 meters of a wetland;

- National Environmental Management: Biodiversity Act, (Act No. 10 of 2004);
- Gauteng Planning and Development Act , 2003 (Act No. 3 of 2003) (GPDA);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- The Gauteng Draft Red Data Policy;
- The Gauteng Ridges Policy, 2019;
- GDARD Conservation Plan, Version 3.3;
- GDARD Requirements for Biodiversity Assessments (Version 3, 2014);
- Gauteng Agricultural Hubs Policy;
- Gauteng Transport Infrastructure Act 2001, (Act 8 of 2001) Section 7;
- Ekurhuleni Metropolitan Municipality Spatial Development Framework (MSDF) and Integrated Development Plan (IDP);
- EMM Biodiversity and Open Space Strategy (EBOSS), May 2014;
- Section 108 of the Town Planning and Townships Ordinance, 1986 (Ord. 15 of 1986);
- The South African Heritage Resources Act (SAHRA), 1999 (Act No. 25 of 1999);
- The Municipal Systems Act, 2000 (Act No. 32 of 2000) and the Integrated Development Plans (IDP) regulates the planning processes of the local Municipality. The current zoning for the site is “Mining”, however the site is earmarked for residential development in the Ekurhuleni Metropolitan Spatial Development Framework (SDF) and for urban development in the draft Ekurhuleni Region BSDF. The site is situated within the demarcated Ekurhuleni Urban Edge;
- National Environment Management Protected Areas Act, 2003 (Act No. 57 of 2003);
- National Environment Management Waste Act, 2008 (Act No. 59 of 2008);
- National Veld and Forest Fire Act, 1998 (Act No.101 of 1998);
- World Heritage Convention Act, 1999 (Act No. 49 of 1999);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- Land Use Planning Ordinance 15 of 1985 and the planning ordinances depending on the province in South Africa where construction will take place

Table 1: National legislation and responses to this legislature in terms of the proposed development

LEGISLATURE	RESPONSE
National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations	
NEMA aims to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for matters connected therewith. The Act recognises that many inhabitants of South Africa live in an environment that is harmful to their health and well-being and focuses on the following:	NEMA principles are to be adhered to, with specific reference to development that promotes integrated environmental management, while being socially, environmentally and economically sustainable. The proposed development layout must reflect NEMA principles, such as protection of the environment for present and future generations by preventing pollution and ecological degradation, promoting conservation and securing ecologically sustainable development and utilisation of natural resources.
Everyone has the right to an environment that is not harmful to his or her health or well-being	Please refer to the **EMPr** (**Appendix F**) which discusses health and safety issues during the construction phase.
The State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously	This proposed development will provide housing as well as employment opportunities (construction and operational phase) for previously disadvantaged

LEGISLATURE	RESPONSE
disadvantaged communities	communities.
Inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices;	The proposed development will result in additional employment opportunities for the local community. The increased tax base will benefit the Ekurhuleni Metropolitan Municipality, in turn enabling EMM to provide infrastructure in areas that need it.
Sustainable development requires the integration of social, economic and environmental factors in the planning. implementation and evaluation of decisions to ensure that development serves present and future generations	Social and environmental aspects are taken into consideration during the environmental impact assessment process, along with appropriate market feasibility research, to ensure that the project is viable and sustainable. The site abuts existing residential areas to the west and east. The entire site is proposed as residential development including a variety of housing typologies at different densities. School sites linked to main transportation routes an open space systems were incorporated into the proposed development. The site is earmarked for residential development in the Ekurhuleni Metropolitan Spatial Development Framework (SDF) and for urban development in the draft Ekurhuleni Region BSDF. The site is situated within the demarcated Ekurhuleni Urban Edge.
Everyone has the right to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that: • *prevent pollution and ecological degradation* • *promote conservation* • *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*	The proposed development plan ensures that areas of cultural and ecological value are maintained. Also, please refer to the **EMPr (Appendix F**) which thoroughly discusses aspects that are related to ecological preservation, conservation and sustainable development.
The environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must co-operate with, consult and support one another	Applicable national, provincial and municipal legislation is taken into account and aligned during the environmental impact assessment process
Furthermore, this act develops a framework for integrating good environmental management into all development activities, while establishing principles guiding the exercise of functions affecting the environment. Integrated Environmental Management (IEM) is designed to ensure that the environmental consequences of development proposals are understood and adequately considered in the planning, implementation and management of all developments. It is intended to guide, rather than impede the development process by providing an approach to gathering and analysing information, and ensuring that it can be easily understood by all interested and affected parties in the development. The purpose of IEM is to resolve or lessen any negative environmental	A thorough impact assessment process has been undertaken – derived from: • *Public Participation* • *Specialist studies* • *Map assessments* • *Institutional and legal assessment* This process allows for adequate planning and mitigation.

LEGISLATURE	RESPONSE
impacts and to enhance positive aspects of development proposals.	
The National Water Act, 1998 (Act No. 36 of 1998)	
The National Water Act: • *Recognizes that water is a scarce and unevenly distributed national resource which occurs in many different forms which are all part of a unitary, inter-dependent cycle* • *Recognizes that while water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources* • *Acknowledges the National Government's overall responsibility for and authority over the nation's water resources and their use, including the equitable allocation of water for beneficial use, the redistribution of water, and international water matters* • *Recognizes that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users* • *Recognizes that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users* • *Recognizes the need for the integrated management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate*	A Water Use Licence Application will be lodged with the Department of Water and Sanitation (DWS) to ensure that the stormwater released from the site will not impact on the wetlands on site. The Act requires that (where applicable) the 1:100 year flood line be indicated on all the development drawings that are being submitted for approval (Appendix D: Annexure D8). Please also refer to the **Stormwater Management plan** in **Appendix D: Annexure D7.**
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	
The National Environmental Management: Biodiversity Act aims to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act1, 1998; including the – • *Protection of species and ecosystems that warrant national protection* • *The sustainable use of indigenous biological resources* • *The fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources* • *The establishment and functioning of a South African National Biodiversity Institute; and for matters connected therewith*	An ecological specialist team was appointed to undertake the flora and vascular fauna biodiversity assessment, with specific attention to Red Listed plant and animal species, habitats and biodiversity. The specialist studies (**Appendix D: Annexure D2**) are aligned to the requirements of this Act as well as the requirements for Biodiversity Assessments compiled by GDARD. The proposed development aligns to the purpose of this Act and the above-mentioned specialist reports, conserving areas of high sensitivity for red listed species, endemic species and sensitive habitats. Mucina & Rutherford (2006) classified the area as *Soweto Highveld Grassland*. This vegetation unit is considered endangered. The flora study found that the *Eragrostis – Tristachya* grassland is disturbed natural grassland and is not deemed sensitive. The *Cortaderia – Cynodon* vegetation study unit, the *Eragrostis – Cynodon* grassland study unit and the Mixed alien and indigenous vegetation study unit are not considered sensitive. The Wetland vegetation study unit is deemed sensitive. No Red List or Orange List species occur on

LEGISLATURE	RESPONSE
	the study site. It was determined through all the biodiversity specialist studies that with the exception of the wetlands in the western and northern sections of the site that are regarded as sensitive, the site is mostly transformed with alien vegetation and is therefore not deemed sensitive. Please refer to Appendix D: Annexure D2 – Biodiversity specialist studies for additional information.
Invasive species are controlled by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. One of the objectives of the act as indicated is the control of weeds and invaders plants. The weeds and invader plants have been categorised: • *Category 1a: Invasive species which must be combatted and eradicated. Any form of trade or planting is strictly prohibited.* • *Category 1b: Invasive species which must be controlled and wherever possible, removed and destroyed. Any form of trade or planting is strictly prohibited.* • *Category 2: Invasive species, or species deemed to be potentially invasive, in that a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees. Plants in riparian areas are Category 1b.* • *Category 3: Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade, is however prohibited. Plants in riparian areas are Category 1b.*	A Flora specialist study was commissioned for the study site and list all category 1, 2 and 3 weeds and alien invasive plants. Mitigation measures for the management of these species are included in this report. Please refer to **Appendix D: Annexure D2 – Biodiversity specialist studies** for additional information.
The South African Heritage Resources Act, 1999 (Act No. 25 of 1999) (SAHRA)	
The SAHRA focuses on the following, that have reference to the development of land: • *To introduce an integrated and interactive system for the management of the national heritage resources* • *To promote good government at all levels, and empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations* • *To lay down general principles for governing heritage resources management throughout the Republic* • *To introduce an integrated system for the identification, assessment and management of the heritage resources of South Africa* • *To establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources at national level* • *To set norms and maintain essential national*	The proposed development should respond to the requirements of the National Heritage Resources Act as well as that of the South African Heritage Resources Agency. Section 38 of the SAHRA makes provision for application by developers for permits before any heritage resources may be damaged or destroyed. A specialist in the field was appointed to conduct a Cultural Heritage Resources Impact Assessment. SAHRA's comments on this study are also attached in **Appendix D: Annexure D6**. An old mine shaft and the overburden dump with associated infrastructure were observed within the study area. Due to the importance of mining in the evolution of the East Rand urban landscape these structures have significant historic value. For this reason, it is important that the site undergoes a second

LEGISLATURE	RESPONSE
standards for the management of heritage resources in the Republic and to protect heritage resources of national significance • *To provide for the protection and management of conservation-worthy places and areas by local authorities; and to provide for matters connected therewith*	phase of investigation to determine its architectural and historic significance before any structures are demolished. It is recommended that obscured, subterranean sites be managed, if they are encountered. The Rynsoord Cemetery is situated in the southeastern corner of the site, between Main Reef Road and the Railway Line. It is recommended that the cemetery be fenced off from the rest of the development. In the event that artefacts / graves / areas of cultural significance are discovered during the construction phase, all work should be halted and a cultural heritage practitioner should be appointed to examine the site and make appropriate recommendations. Please refer to **Appendix D: Annexure D6 – Cultural/Historical specialist study** for additional information.
This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations. It recognises that our heritage is unique and precious and it cannot be renewed as it – • *Helps us to define our cultural identity and therefore lies at the heart of our spiritual well-being and has the power to build our nation* • *Has the potential to affirm our diverse cultures, and in so doing shape our national character* • *Celebrates our achievements and contributes to redressing past inequities* • *Educates and deepens our understanding of society and encourages us to empathise with the experience of others* • *Facilitates healing and material and symbolic restitution and it promotes new and previously neglected research into our rich oral traditions and customs*	The importance of cultural heritage and its related preservation is discussed within the Cultural/Historical specialist study (**Annexure D6**) and EMPr (**Appendix F**). The EMPr (**Appendix F**) places focus on the education of people regarding places of heritage value and artefacts, should they come across them during their work activities.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	
The Conservation of Agricultural Resources Act (Act 43 of 1983) – (CARA) is an act which provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation.	The site falls outside any of the agricultural hubs (GAPA V.4).

1.3.4 Provincial context

The following legislature/policies are closely linked to the Environment in the Provincial context and will be discussed in more detail in the following table (Table 2):

Table 2: Provincial context and responses to this legislature in terms of the proposed development

DOCUMENT	RESPONSE
Gauteng Planning and Development Act, 2003 (Act No. 3 of 2003) (GPDA)	
The GPDA states that Policy, administrative practice and law in the Province shall promote development and land use which:	
Promotes the more compact development of urban areas and the limitation of urban sprawl and the protection of agricultural resources;	The principle of compacting the city structure, by the optimised use of scarce infrastructure (engineering services, roads, etc.) forms an important part of the principles in the Development Facilitation Act, 1995. Since the site is surrounded by residential areas and roads, and qualifies as infill development, this development can therefore also be seen as compacting.
Supports the correction of historically distorted spatial patterns of settlement in Gauteng;	To be addressed as far as possible with regard to the provision of job opportunities and housing.
Promotes integrated land development in rural and urban areas in support of each other;	This proposal forms part of a greater planning framework for the area and integration is ensured via appropriate service and infrastructure provision, the provision of linking transport corridors and the continuity of ecological corridors.
Results in the use and development of land that optimises the use of existing resources such as engineering services and social facilities; and	Existing bulk services are to be utilised as far as possible with appropriate upgrades where necessary.
Owns positive development qualities, particularly with regard to public environments.	The urban design framework and planning methodologies cater for inclusive design at a pedestrian scale, incorporating public open spaces and positive streetscapes.
Policy, administrative practice and law in the Province shall with due regard to the principles of the National Environmental Management Act, 1998 (Act 107 of 1998) promote sustainable development that: • *Is within the fiscal, institutional and administrative means of the Province* • *Meets the basic needs of all citizens in an affordable way* • *Establishes viable communities with convenient access to economic opportunities, infrastructure and social services* • *Optimises the balanced use of existing resources, including resources relating to agriculture, land, water, minerals, services infrastructure, transportation and social facilities* • *Balances environmental considerations of preserving natural resources for future generations with economic development practices and processes* • *Ensures the safe utilisation of land by taking into consideration its biophysical factors such as geology and undermined or hazardous areas*	Sustainable principles are to be incorporated as far as possible within the planning, design, construction and operational phases therefore ensuring an appropriate balance between social, economic and environmental contexts. The environmental impact assessment process ensures that sound land development practices are implemented, creating a balance between environmental, social and economic requirements.

DOCUMENT	RESPONSE
The Gauteng Draft Red Data Policy	
The primary purpose of the Draft Red Data Policy is to protect red data plant species in Gauteng Province. The Red Data plant policy is based on the following basic principles: • *Species endemic to the province of Gauteng must be afforded the utmost protection, as they occur nowhere else in the world. As the relevant provincial agency, this Department's responsibility towards Gauteng endemics is absolute;* • *Conservation of only one population essentially ignores the lowest level of biodiversity that is genetic diversity. It is therefore imperative that all populations of Red Data plant species are protected;* • *In situ conservation is preferable to ex situ conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species;* • *In order to ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist;* • *In order to ensure the persistence of a plant population, it is vital that pollinators are conserved. To conserve pollinators, the habitat must be managed to provide appropriate nest sites for pollinators and a seasonal succession of suitable forage and host plants. Pollinators must be protected from herbicide and pesticide application and soil disturbance must be prevented;* • *Translocation of Red Data species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects;* • *Rural parts of the province should be protected from insensitive developments and urban sprawl/encroachment should be discouraged. Policy guiding developments should therefore be less lenient in rural areas;* • *Red Data plant species historically recorded on a site, but not located during searches within species flowering seasons may be dormant (as a seed bank or subterranean structures such as bulbs/tubers/etc.) due to unfavourable environmental conditions;* • *Suitable habitat adjacent to known populations of Red Data plant species has a high probability of being colonized;* • *In order to protect a plant population that occurs in a fragmented landscape from edge effects, it is necessary to protect it with a buffer zone that extends from the edge of the population; and* • *The transformation of natural vegetation to crops is considered as permanent as urbanization and may*	Biodiversity specialists were appointed to assess the proposed development site in terms of fauna and flora biodiversity, with specific attention to Red Listed species. The flora study found that the the *Eragrostis – Tristachya* grassland is disturbed natural grassland and is not deemed sensitive. The *Cortaderia – Cynodon* vegetation study unit, the *Eragrostis – Cynodon* grassland study unit and the Mixed alien and indigenous vegetation study unit are not considered sensitive. The Wetland vegetation study unit is deemed sensitive. No Red List or Orange List species occur on the study site. It was determined through all the biodiversity specialist studies that with the exception of the wetlands in the western and northern sections of the site that are regarded as sensitive, the site is mostly transformed with alien vegetation and is therefore not deemed sensitive. Please refer to **Appendix D: Annexures D2.**

DOCUMENT	RESPONSE
cause the extinction of Red Data plant populations and their pollinators.	
The Gauteng Draft Ridges Policy	
The quartzite ridges of Gauteng are one of the most important natural assets in the northern provinces of South Africa. This is because these ridges, and the area immediately surrounding the ridges, provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world. The ridges also fulfil functions that are necessary for the sustainability of ecosystems such as the recharging of groundwater, wetlands and rivers, wildlife dispersal and providing essential habitat for pollinators. Ridges also have a socio-cultural role in that they provide aesthetically pleasing environments that are valued by residents, tourists and recreational users. Human activities such as urbanization, mining and the planting of alien vegetation may undermine the contribution that ridges make to the environment. The conservation of ridges falls within the ambit of the environmental right and this policy comprises one of the measures that GDARD has taken to give effect to the environmental right in respect of ridges, therefore ensuring that: • *The use of ridges is sustainable;* • *Members of the public are able to make informed decisions regarding proposals for development on ridges and the use of ridges;* • *Officials make consistent decisions in respect of planning and environmental applications that involve negative impacts on ridges; and* • *The Department's responsibility in respect of the protection of the environment is carried out in an efficient and considered manner.*	The study site is relatively flat with no ridge present on the site or surroundings.
GDARD Conservation Plan, Version 3.3	
A comprehensive Provincial Conservation Plan (C-Plan) was launched as a decision support tool in September 2005 to protect the province's ecosystems and associated biodiversity and to act as an information tool for the conservation of sensitive areas. The C-Plan was an outcome of the Gauteng Biodiversity Gap Analysis Project (BGAP). The C-Plan system maps important biodiversity areas in Gauteng and provides information to protect important and sensitive areas within the province. This information is used by government as a decision-making tool with regard to EIA approvals. The second version (C-Plan version 2) indicated that 25 percent of Gauteng needs to be conserved to meet the Province's biodiversity targets. The C-Plan includes protected areas, irreplaceable and important sites due to the presence of Red Data species, endemic species and potential habitat for these species to occur.	According to the Gauteng Conservation Plan (C-Plan 3.3) the western third of the site is situated within a Critical Biodiversity Area with a narrow Ecological Support Area in the centre of the site (see **Error! Reference source not found.**). However it was confirmed during the specialist Biodiversity studies that the vegetation of the site is either severely disturbed or in places even transformed. The site is considered not to be sensitive, except for the wetland areas. Please refer to **Annexure D2 – Vegetation Assessment**

DOCUMENT	RESPONSE
At this stage the current version of C-plan is version 3.3	
Gauteng Agricultural Hubs Policy	
The Department view land with a high agricultural potential as a scarce, non-renewable resource and accordingly applies a risk averse and cautious approach when development of such land for purposes other than agricultural production is proposed. This risk averse and cautious approach should be the basis of decision-making on the transformation of high potential agricultural land and land deemed as irreplaceable in terms of meeting Agri-BBBEE and national food security targets and thus legally protected from transformation. Each of the hubs will be developed to align with its agricultural potential and preferred land use and will be supported by current economic indicators. As such, the land that has been identified as having a high agricultural potential, but also including the moderate and low agricultural potential land within a demarcated Agricultural Hub will be evaluated and reviewed should a change of land use (other than agriculture) be proposed within the hub. This is to ensure that land use within a demarcated Agricultural hub is compatible with the strategic objectives of the specific hub. Therefore, should a change of land use be proposed within an identified and classified Agricultural hub a complete agricultural potential specialist study must be undertaken for the site.	**Note: The Gauteng Agricultural Hubs Policy is a draft document which has not been proclaimed.** According to this policy the site is not situated within any agricultural hub (GAPA V.4). The agricultural potential of the property is low, and the site falls outside all the agricultural hubs.
Protection of Agricultural Land in Gauteng Revised Policy (June 2006)	
The purpose of this policy is to protect land that has been identified as high agricultural potential from development, for the exclusive use of agricultural production to: • *Feed the nation;* • *Provide upcoming farmers with access to productive land; and* • *Meet national targets set in this regard.* Land with high agricultural potential is a scarce non-renewable resource and the need to protect it is a high priority for GDARD. GDARD applies a risk averse and cautious approach when development of such land for purposes other than agricultural production is proposed. The risk averse and cautious approach should be the basis of decision-making on the transformation of high potential agricultural land and land deemed as irreplaceable in terms of meeting Agri-BBBEE and national food security targets and thus legally protected from transformation. GDARD is not in support of development on high potential agricultural land that resides outside the urban edge. Seven agricultural hubs have been identified in the Gauteng Province. All the hubs are located outside the urban edge. The hubs are regarded as areas with	The proposed development site, according to the Gauteng Agricultural Potential Atlas (GAPA Version 3), is situated within a region that is not categorised as an Agricultural hub.

DOCUMENT	RESPONSE
a large amount of high agricultural potential land that should be preserved for agricultural use and will accordingly be planned and managed as a holistic agricultural unit. Each of the hubs will be developed to align with its agricultural potential and preferred land use and will be supported by current economic indicators.	
Gauteng Spatial Development Framework (GSDF)	
The GSDF seeks sound provincial development. The development framework is focussed on achieving development by implementing spatial planning principles and improving urban form.	
The GSDF based the Province's future development on five critical factors, which are resource based economic development, contained urban growth, re-direction of urban growth, rural development beyond the urban edge and mobility and accessibility. The critical factors include: • *Resource-based economic development* • *Contained urban growth: Sprawl and unnecessary urban expansion are widely discouraged, owing to direct and indirect costs to government and distortion of the urban form. To contain unwanted growth, a provincial urban edge has been delineated, which aims to compact the city, improve the utilization of resources, preserve the rural environment and give structure and form to the city.* • *Re-direction of urban growth* • *Rural development beyond the edge: Rural development is to be protected by the urban edge, thereby creating distinctive urban and rural areas. Mobility and accessibility: The GSDF indicates that people in Gauteng will always be reliant on a high level of mobility and accessibility because of the presently dispersed settlement pattern and a culture of private transport. Mobility must be enhanced to improve the movement of people, goods and services, both for public and private transport.*	• The proposed residential development as indicated would fall within the urban edge for EMM. • A Traffic Impact Assessment (TIA) was conducted for the proposed development to determine the impact of the development of on the local network and made recommendations on the need to upgrade or improve public transport routes or major access routes to the site. The development plan would also take cognizance of public transport and transportation nodes planned for the area and honour such servitudes to enhance mobility and accessibility to the area for potential residents (**See Annexure D10 for the Traffic impact assessment report**).
Gauteng Environmental Management Framework (GEMF)	
The EMF is one of a range of tools provided for in the Biodiversity Act that can be used to facilitate biodiversity conservation in priority areas outside the protected area network. The purpose of a EMF is to inform land-use planning, environmental assessments and impacts of decisions on biodiversity. The objectives of the EMF are to support integrated development planning and sustainable development by identifying an efficient set of Critical Biodiversity Areas that are required to meet biodiversity objectives. The EMF, in terms of the Environmental Impact Assessment Regulations, 2010, must be taken into account in the consideration of applications for	According to the Gauteng Environmental Management Framework (GEMF) from GDARD most of the study site falls in **Zone 1 and the southern part in Zone 5**, except for the wetlands on site that fall in **Zone 2 (High control zone)**. • The intention with Zone 1 is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development within the urban development zones as defined in the Gauteng Spatial Development Framework (GSDF), in order to establish a more effective and efficient city region that will minimise urban sprawl into rural

DOCUMENT	RESPONSE
environmental authorisation. Five environmental constraint zones were identified within the GEMF. The environmental constraint factors would be taken into consideration and assessed in the EIA study. These constraint zones include: • *Zone 1: Urban Development zone;* • *Zone 2: High control zone (inside the urban development zone);* • *Zone 3: High control zone (outside the urban development zone);* • *Zone 4: Normal control zone; and* • *Zone 5: Industrial and Commercial Focus Zone.*	areas. • The intention with Zone 2 is to conserve sensitive areas within the urban development zone and where linear development (roads etc.) cannot avoid these areas, a proper assessment and implementation of alternatives must be undertaken. • The intention with Zone 5 is to streamline non-polluting industrial and large scale commercial activities in areas that are already used for such purposes and areas that are severely degraded but in close proximity to required infrastructure (such as old and even current mining areas).

1.3.5 Local context: Planning frameworks / Strategies / Guidelines

The following legislature/policies are closely linked to the Environment in the Local context and will be discussed in more detail in the following table (Table 3):

Table 3: Local context and responses to this legislature in terms of the proposed development

DOCUMENT	RESPONSE
EMM Environmental Management Framework	
The EMF, in terms of the Environmental Impact Assessment Regulations, 2010, must be taken into account in the consideration of applications for environmental authorisation. Five environmental constraint zones were identified within the EMM. The environmental constraint factors would be taken into consideration and assessed in the EIA study. These constraints include: • *Low to no constraint zone;* • *Agricultural constraint zone;* • *Geotechnical constraint zone;* • *Hydrological constraint zone; and* • *Ecological constraint zone*	*According to the Environmental Parameters for Development as set out in the EMF the site is located in an area with **Ecological, Hydrological and Geological Development Constraint Zones**.* The majority of the site falls in GEMF Zone 1 Urban Development Zone and section of the site falls in Zone 6 Industrial and Commercial Focus zone. A small sliver of Zone 2 is situated on the northern border of the site. Geographical Areas: C-Plan 3 wetlands to the west and north of the site. Environmental Sensitivity: Low except for the wetlands to the west and north of the site.
EMM Biodiversity and Open Space Strategy (EBOSS), 2014	
The objectives of EBOSS are to: • *Meet the open space needs of the population of Ekurhuleni in a way that will ensure adequate access to a variety of types of open spaces in Ekurhuleni that will fulfil the physical and psychological needs of the community;* • *meet the national biodiversity targets for vegetation types in the area in an appropriate manner that focuses on attainable priorities;* • *consider and integrate the conservation plan needs of the province in a practical way;* • *consider and take land needed for development into account in an objective and equitable manner;* • *contribute as an integrated element in the proper*	A total of 10 “Public Open Space” erven are proposed throughout the township, including local play parks, stormwater detention dams, and the buffer area and 1:100 year flood line of the wetland. It is proposed that these erven be zoned for “Public open Spaces” purposes as per the Ekurhuleni Town Planning Scheme, 2014, subject to the standard development restrictions.

DOCUMENT	RESPONSE
functioning of Ekurhuleni as a city; • *set implementation targets in a manner that is realistic, affordable and achievable; and* • *provide objective implementation performance measures that will accurately indicate performance and ensure accountability of officials.* The purpose of the policy is to: • *Ensure that the biodiversity conservation priorities of EMM and GDARD are aligned to protect and conserve biodiversity;* • *promote biodiversity;* • *recognise biodiversity as an essential natural resource;* • *increase the area under formal protection; and* • *ensure the substantial management of this resource.*	
In Ekurhuleni, because of its topographical nature, extent and position on the continental divide, the hydrological system provides a strong and distinct natural backbone to open space. Due to the importance of the hydrological systems in terms of both biological and hydrological functioning of the area, it must remain intact and no further development (with the exception of linear infrastructure that has to cross these areas) will be allowed in these areas. The natural open space system represented in this strategy includes highly stressed and sensitive natural environments such as wetlands, rivers/streams and remnant patches of representative indigenous fauna and flora that are necessary to maintain bio-diversity and forms the primary open space network in Ekurhuleni and must be considered as "no go" areas for development.	The study area has been transformed to a large degree, and is zoned for "Agriculture" in the Ekurhuleni Town Planning Scheme, 2014. The southern portion of the site, south of Main Reef Road, is zoned for "Public Services" (the cemetery) and "Mining". The site is earmarked for residential development in the Ekurhuleni Metropolitan Spatial Development Framework (SDF) and for urban development in the draft Ekurhuleni Region BSDF. The site is situated within the demarcated Ekurhuleni Urban Edge.
EMM Bioregional Plan, 2011	
The Bioregional plan is one of a range of tools provided for in the Biodiversity Act that can be used to facilitate biodiversity conservation in priority areas outside the protected area network. The purpose of a Bioregional plan is to inform land-use planning, environmental assessments and impacts of decisions on biodiversity. The objectives of the Bioregional plan are to support integrated development planning and sustainable development by identifying an efficient set of Critical Biodiversity Areas that are required to meet biodiversity objectives.	According to the EMM Bioregional plan the western part of the study site falls within "Critical Biodiversity Area 1 & 2, Ecological Support Areas 1 & 2 (ESA) and the remaining sections within "No natural habitat remaining" and "Other natural areas" categories. "Critical Biodiversity Areas1" Category are natural, near natural terrestrial or aquatic areas required to meet biodiversity pattern and/or process thresholds. "Critical Biodiversity Areas 2" Category, are cultivated landscapes which retain importance for supporting threatened species. "Ecological Support Areas 1" Category are natural, near natural and degraded areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas.

DOCUMENT	RESPONSE
	"Ecological Support Areas 2" Category are areas with no natural habitat which retain potential importance for supporting ecological processes. "No Natural Habitat Remaining" Category are areas which are transformed or degraded, having no remaining intact habitat and not required as Ecological Support Areas. "Other Natural Areas" Category are areas that still contain natural habitat but that area not required to meet biodiversity thresholds.

1.4 Project process

A pre-application meeting was held with GDARD on 26 January 2018 to establish the process under the amended 2014 EIA regulations and to establish whether there are any issues identified by GDARD that will need special attention.

A public participation process was followed to inform Interested and/or Affected parties (I&APs) about the proposed development and to gather issues and concerns to be investigated during the EIA process. This process will be discussed further in Section 8.

The draft Scoping Report was made available to registered I&APs, State Departments and the EMM for comment on 5 May 2018. All issues and concerns were addressed and included in the Final Scoping Report. The application form was submitted to GDARD on 15 May 2018.

On approval of the Scoping Report on 10 July 2018 the EIA process was started and specialist studies commissioned that took some time and the process was on hold for a short while. GDARD has however confirmed on 8 April 2019 that since the Final Scoping Report was authorised within 2 years, that the EIA process may continue without re-submitting the Scoping Report, but that the Application form must be resubmitted **(See Appendix E: Annexure E4).**

During the Environmental Impact Assessment phase the different design and technology alternatives for the residential development on the site were compared in terms of the potential environmental impacts associated with the proposed development. Specialist studies were undertaken during the EIA phase in order to determine the potential impacts on the social and biophysical environment and the EIA report was compiled.

Specialist studies:
Specialist studies were undertaken during the EIA phase in order to determine the potential impacts on the social and biophysical environment:

- Biophysical
  - Flora assessment;
  - Fauna study including Mammals and Avifauna
  - Floodline study
  - Wetland delineation
  - Geotechnical Assessment
  - Air Quality Impact Assessment

- Radon Study
- Social
  - Cultural Heritage Assessment
  - Civil Services Report
  - Traffic impact study
  - Townplanning report
  - Stormwater Management report

1.5 Project need and desirability

The table below provides a summary of the need and desirability considerations for this project (Table 4).

Table 4: Need and desirability considerations

NEED (TIMING)		
QUESTION A1: Is the land use (associated with the activity being applied for considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority.		
Yes X	~~No~~	The site is situated inside the Urban Development Boundary and falls within the "Urban Development" zone according to the Ekurhuleni Region D RSDF. The project is aligned with the objectives of the municipal Spatial Development Framework (SDF) and Integrated Development Plan (IDP) and will not compromise the integrity of these respective forward planning documents. Specific reference is made to the Provincial Strategic Priorities identified for Gauteng and the West Rand District Municipality: • Job Creation • Investment Creation • Rural/Urban Development • Infrastructure Development • Combating Crime • Skills Development • Combating the impact of HIV/AIDS • Poverty Alleviation The housing development and associated operational activities and impacts are aligned with these provincial priorities and will contribute in achieving the strategic priorities set for the province.
QUESTION A2: Should the development concerned, in terms of the land use (associated with the activity being applied for) occur here at this point in time?		
Yes X	~~No~~	The current zoning for the site is "Agriculture" in the Ekurhuleni Town Planning Scheme, 2014. The southern portion of the site, south of Main Reef Road, is zoned for "Public Services" (the cemetery) and "Mining". The prescribed land uses for the site, according to the Ekurhuleni Metropolitan Spatial Development Framework (SDF) is "Open Space" in the northern part of the site, north of New Modder Road; "urban development" in the central part of the site and "Cemetery" and "Mining" in the southeastern part of the site, south of Main Reef Road. The site is situated within the demarcated Ekurhuleni Urban Edge.

		Ekurhuleni's current housing backlog is estimated to be in the region of 200 000 units and is still growing. The obvious need and huge demand for formal housing is an indisputable fact. Fast-tracking housing delivery is one of the top priorities of central, provincial and local government. Providing industrial/commercial development in the area will further contribute to the integrated development of the region, in combination with the integrated open spaces and public amenities, including schools. An integrated, sustainable township will be developed, offering a range of housing typologies and tenure options as well as various community facilities and urban amenities. Functional urbanism and the creation of a sense of place/community are some of the main principles of the township design.
QUESTION A3: Does the community/area need the activity and the associated land use concerned (is it a societal priority)?		
Yes X	~~No~~	Unemployment is a major problem within the Ekurhuleni Metropolitan Municipality and is as high as 28.8% (Source: Census 2011 Municipal Fact Sheet, published by Statistics South Africa). The proposed mixed use development will employ a large amount of people during construction, which will have a significant positive impact on the baseline socio-economic conditions of the local communities involved. The development will contribute towards the socio-economic development of the region as a whole through social upliftment and job creation as primary agents. The future incomes earned by these employees will translate into spending power, benefiting businesses and entrepreneurs not only in the area surrounding the operation where the employees spend their working week, but also in those economies further away. Besides the positive impact the development will have on the livelihoods of the households of its future employees in the neighbouring and labour sending communities, the development will contribute to the upliftment of the beneficiaries receiving houses in this development. In addition to a contribution to the economy, the development will also pay significant amounts in annual taxes, which will be used by the Government for social upliftment. The construction sector will also benefit from a large residential development such as this.
QUESTION A4: Are the necessary services with the adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?		
~~Yes~~	No X	Electricity, sewage system and water are not currently available on site. Additional capacity is required at Van Eck substation or alternatively the site may be supplied from the planned Helderwyk/Leeuwpoort 88kV POD. Internal roads and stormwater systems will have to be built as part of the proposed development. Upgrading of the Welgedacht Outfall Sewer and is required. Sufficient capacity is available from the Benoni Central distribution zone for adequate water supply.

		The site is very accessible, the R23 abuts it on the west, providing access to the N12 to the north and to the N17 and the N3 to the south, while a number of local arterial routes (New Modder Road, Modder B Road and Main Reef Road) run through it, linking it to surrounding centres.
QUESTION A5: Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?		
Yes X	~~No~~	The proposed development will require approximately 6.32Ml/day. A peak demand of 293 l/s is required to service Mackenzie Park x 3. No upgrading to any network water infrastructure is required. The site does not fall within any of the existing Ekurhuleni water distribution zones and that no provision was made for the proposed development in the Benoni water master plan. It would be most economical for the development to be incorporated into the RW Benoni Central Direct distribution zone and partly into the RW0052/RW5596 Direct distribution zone. The proposed development will produce approximately 5.1Ml/day with a peak flow of 269l/s. The sewage network analysis found that: • A portion of the development site should be incorporated into the JP Marais/Welgedacht diversion drainage area, which drains towards a diversion structure which controls a split of the flow towards the JP Marais waste water treatment works (WWTW) and the Welgedacht WWTW; and • Temporarily into the Rynsoord pump station drainage area until the planned Welgedacht Outfall Sewer is constructed, after which this area will be able to drain to the Welgedacht WWTP drainage area. There is no stormwater infrastructure on the site. Stormwater run-off from the site must be controlled in terms of the EMM requirements. A number of stormwater attenuation ponds will thus have to be constructed. The proposed development may be supplied with electricity from the Van Eck substation approximately 2 km to the east. The existing maximum demand at Van Eck already exceeds safe capacity. Additional space capacity will have to be installed. Alternatively, the site may be supplied from the planned Helderwyk/Leeuwpoort 88kV POD.
QUESTION A6: Is this project part of a national programme to address an issue of national concern or importance?		
Yes X	~~No~~	Ekurhuleni's current housing backlog is estimated to be in the region of 200 000 units and is still growing. The obvious need and huge demand for formal housing is an indisputable fact. Fast-tracking housing delivery is one of the top priorities of central, provincial and local government.

B) DESIRABILITY (PLACING)		
QUESTION B1: Is the development the best practicable environmental option for this land/site?		
Yes X	~~No~~	The study area has been transformed to a large degree, and is zoned for "Agriculture" in the Ekurhuleni Town Planning Scheme, 2014. The southern portion of the site, south of Main Reef Road, is zoned for "Public Services" (the cemetery) and "Mining". The prescribed land uses for the site, according to the Ekurhuleni Metropolitan Spatial Development Framework (SDF) is "Open Space" in the northern part of the site, north of New Modder Road; "urban development" in the central part of the site and "Cemetery" and "Mining" in the southeastern part of the site, south of Main Reef Road. The site is situated within the demarcated Ekurhuleni Urban Edge. Alternatives for the site include grazing and farming activities, but the agricultural potential is low. Ekurhuleni's current housing backlog is estimated to be in the region of 200 000 units and is still growing. The obvious need and huge demand for formal housing is an indisputable fact. Fast-tracking housing delivery is one of the top priorities of central, provincial and local government. An integrated, sustainable township will be developed, offering a range of housing typologies and tenure options as well as various community facilities and urban amenities. Functional urbanism and the creation of a sense of place/community lie at the heart of the township design.
QUESTION B2: Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?		
~~Yes~~	No X	The project is aligned with the objectives of the municipal Spatial Development Framework (SDF) and Integrated Development Plan (IDP) and will not compromise the integrity of these respective forward planning documents. The study area has been transformed to a large degree, and is zoned for "Agriculture" in the Ekurhuleni Town Planning Scheme, 2014. The southern portion of the site, south of Main Reef Road, is zoned for "Public Services" (the cemetery) and "Mining". The prescribed land uses for the site, according to the Ekurhuleni Metropolitan Spatial Development Framework (SDF) is "Open Space" in the northern part of the site, north of New Modder Road; "urban development" in the central part of the site and "Cemetery" and "Mining" in the southeastern part of the site, south of Main Reef Road. The site is situated within the demarcated Ekurhuleni Urban Edge.

QUESTION B3: Would the approval of this application compromise the integrity of the existing environmental management priorities of the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?		
~~Yes~~	No X	The project is aligned with the Zoning 1 and Zoning 5 of the Gauteng EMF, which calls for infill development in urban control zones.
QUESTION B4: Do location factors favour this land use (associated with the activity applied for) at this place, etc.)?		
Yes X	~~No~~	The site is situated within the demarcated Ekurhuleni Urban Edge. The site is very accessible, the R23 abuts it on the west, providing access to the N12 to the north and to the N17 and the N3 to the south, while a number of local arterial routes (New Modder Road, Modder B Road and Main Reef Road) run through it, linking it to surrounding centres.
QUESTION B5: Will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?		
~~Yes~~	No X	It was determined through all the biodiversity specialist studies that with the exception of the wetlands in the western and northern sections of the site that are regarded as sensitive, the site is mostly transformed with alien vegetation and is therefore not deemed sensitive. An old mine shaft and the overburden dump with associated infrastructure were observed within the study area. Due to the importance of mining in the evolution of the East Rand urban landscape these structures have significant historic value. For this reason, it is important that the site undergoes a second phase of investigation to determine its architectural and historic significance before any structures are demolished. It is recommended that obscured, subterranean sites be managed, if they are encountered. The Rynsoord Cemetery is situated in the southeastern corner of the site, between Main Reef Road and the Railway Line. It is recommended that the cemetery be fenced off from the rest of the development. Failing this the graves should be relocated to another official municipal cemetery. In the event that artefacts / graves / areas of cultural significance are discovered during the construction phase, all work should be halted and a cultural heritage practitioner should be appointed to examine the site and make appropriate recommendations.
QUESTION B6: Will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?		
Yes X	~~No~~	Noise, dust and visual impacts will increase during the construction phase, but with the proper mitigation measures and good practice environmental management measures, it will result in minimal impacts and it is not expected to reach beyond the property boundary. Once the development is completed it is expected that there will be a large improvement in comparison to the current situation.

		The tailings dam to the south west of the site will not have a significant impact on the proposed development in terms of air quality and radiation.
QUESTION B7: Will the proposed land use result in unacceptable cumulative impacts?		
~~Yes~~	No X	As already mentioned, through the implementation of good practice environmental management measures as well as mitigation measures, all direct and cumulative impacts which may result from the proposed development will be addressed and ensure that the environment is affected to the minimum.

2. NEMA REQUIREMENTS AND LISTED ACTIVITIES TO BE APPLIED FOR AND DETAILS OF EAP

2.1 NEMA requirements

In accordance with the Regulations in terms of Chapter 5 of the NEMA, 1998, Appendix 3, of the 2014 regulations states that an Environmental Impact Assessment Reports require the following:

3. An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-

(a) details of-
    (i) the EAP who prepared the report; and
    (ii) the expertise of the EAP, including a curriculum vitae;
(b) the location of the activity, including:
    (i) the 21 digit Surveyor General code of each cadastral land parcel;
    (ii) where available, the physical address and farm name; and
    (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-
    (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;
    (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;
(d) a description of the scope of the proposed activity, including-
    (i) all listed and specified activities triggered and being applied for; and
    (ii) a description of the associated structures and infrastructure related to the development;
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;
(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;
(g) a motivation for the preferred development footprint within the approved site;

(h) a full description of the process followed to reach the proposed development footprint within the approved site, including:
    (i) details of the development footprint alternatives considered;
    (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;
    (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;
    (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
    (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-
        (aa) can be reversed;
        (bb) may cause irreplaceable loss of resources; and
        (cc) can be avoided, managed or mitigated;
    (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;
    (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
    (viii) the possible mitigation measures that could be applied and level of residual risk;
    (ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and
    (x) a concluding statement indicating the preferred alternative development location within the approved site;
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-
    (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and
    (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;
(j) an assessment of each identified potentially significant impact and risk, including-
    (i) cumulative impacts;
    (ii) the nature, significance and consequences of the impact and risk;
    (iii) the extent and duration of the impact and risk;
    (iv) the probability of the impact and risk occurring;
    (v) the degree to which the impact and risk can be reversed;
    (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and
    (vii) the degree to which the impact and risk can be mitigated;
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;

(l) an environmental impact statement which contains-
    (i) a summary of the key findings of the environmental impact assessment:
    (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and
    (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMP as well as for inclusion as conditions of authorisation;
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;
(s) an undertaking under oath or affirmation by the EAP in relation to:
    (i) the correctness of the information provided in the reports;
    (ii) the inclusion of comments and inputs from stakeholders and I&APs;
    (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and
    (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;
(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-
    (i) any deviation from the methodology used in determining the significance of potential
    (i) environmental impacts and risks; and
    (ii) a motivation for the deviation;
(v) any specific information that may be required by the competent authority; and
(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.

2.2 Listed activities applied for

NEMA aims to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for matters connected therewith.

In April 2006 the Minister of Environmental Affairs and Tourism passed Environmental Impact Assessment Regulations in terms of Chapter 5 of the National Environmental Management Act, 1998 (NEMA). The regulations replaced the Environmental Impact Assessment (EIA) regulations which were promulgated in terms of the Environment Conservation Act, 1989 in 1997. These regulations were again replaced on 18 June 2010 and on 4 December 2014. Therefore, all new applications must be made in terms of the New NEMA regulations of Notice R.982 of 2014. The purpose of this process is to determine the possible negative and positive impacts of the proposed development on the surrounding environment and to provide measures for the mitigation of negative impacts and to maximise positive impacts.

Notice No. R 326 and R 984 of the New Regulations list activities that indicate the process to be followed. Notice No. 985 list activities that required a Basic Assessment process in terms of Critical Biodiversity Areas and Ecological Support areas in the Gauteng Province. The Activities listed in Notice No. R 983 requires that a Basic Assessment process be followed and the Activities listed in Notice No. R 984 requires that the Scoping and EIA process be followed. However, the guidelines document supplied by DEA states that if any activity being applied for is made up of more than one listed activity and the scoping and EIA process is required for one or more of these activities, the full EIA process must be followed for the whole application.

The proposed development includes a number of listed activities and therefore it will be necessary to follow a full EIA process (as an independent process) in terms of NEMA (See Table 5).

Table 5: The activity is covered by the following sections of the 2014 Environmental Regulations, as amended

Regulation No:	Activity No:	Description of the activity
983, 4 December 2014	9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.
983, 4 December 2014	10	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes - (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more;
983, 4 December 2014	24	The development of – (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.
983, 4 December 2014	26	Residential, retail, recreational, tourism, commercial or institutional developments of 1000 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

Regulation No:	Activity No:	Description of the activity
		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.
984, 4 December 2014	15	The clearance of an area of 20 hectares or more of indigenous vegetation.
985, 4 December 2014	4	The development of a road wider than 4 metres with a reserve less than 13,5 metres on - iv) Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.
985, 4 December 2014	12	The clearance of an area of 300 square metres or more of indigenous vegetation ii) Within critical biodiversity areas.

This description encompasses all relevant infrastructures, which will be associated with the construction of the proposed development and related supporting infrastructure. The legislation requires that the Environmental Impact Assessment (EIA) procedure for the proposed development has to be followed. This procedure entails a permitting process meeting various environmental reporting requirements.

2.3 Environmental assessment practitioner (EAP)

The Environmental Assessment Practitioner is Vanessa Marais who is a registered member of ILASA (Institute of Landscape Architects South Africa) and IAIA (International Association for Impact Assessments) and has 15+ years of relevant experience in the field of environmental impact assessments. Please see expertise on the first page of this document and CV in Appendix G.

3. ENVIRONMENTAL BASELINE DESCRIPTIONS

The following section provides a description of the baseline, or status quo assessment of the environmental and socio-economic parameters of the site. From this assessment the specific and pertinent issues to be addressed by the assessment were identified, together with issues identified by interested and affected parties and the authorities.

3.1 Biophysical descriptions

The study site has no red or orange data species or rocky outcrops/ ridges. Wetlands were delineated north and west of the site. The study site drains partly to the Blesbokspruit. Vegetation is mostly re-introduced grass including papyrus within the reclaimed tailings dams. Almost the entire site consists of reclaimed tailings dams. Abundant exotic trees ranging from immature to mature *Eucalyptus* sp. are found throughout the site.

No structural development is evident on the site except for the south-eastern portion that forms part of an existing cemetery. The presence of small brick structures associated with previous mining activities is also present north of New Modder Road. The site is divided by a watershed which runs east-west through it roughly along Modder B Road.

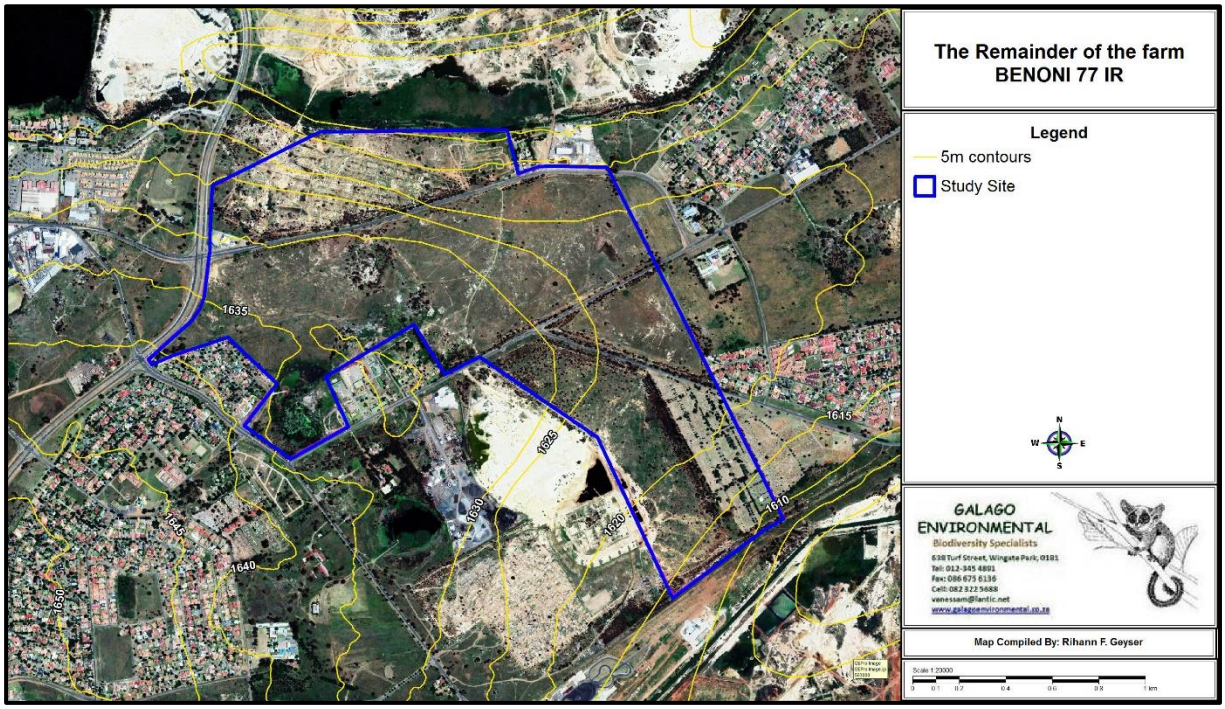

Figure 3: Topographical map showing the contours on the site

3.1.1 Climate and rainfall

The climate of the site is typical of the Highveld region. Precipitation is usually in the form of thundershowers, often accompanied by hail in the summer months followed by dry winters. The mean annual precipitation for the area is between 600 and 700 mm, with the dominant precipitation received during the months of October to March.

The area generally receives little rainfall during the months from April to September. The highest monthly temperature of 35.3°C is recorded in January and the lowest monthly

temperature of -3.3°C is recorded in July. The area is significantly colder than Pretoria itself, with winter temperatures easily dropping to 4 degrees below freezing point with extensive frost during winter months (Mucina and Rutherford, 2006).

Benoni normally receives about 579mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (0mm) in July and the highest (110mm) in January. The average midday temperatures for Benoni range from 16.4°C in June to 26°C in January. The region is the coldest during July when the mercury drops to 0.4°C on average during the night. The Weinert Climatic N-number for the area (Weinert, 1980) which is <5 indicating that the climate is semi-humid and chemical weathering processes are dominant.

3.1.2 Geology

According to the 1:250 000 Geological Map, Sheet No 2628 East Rand, the site is underlain by Karoo-age sediments comprising diamictite of the Dwyka Formation and younger overlying mud rock and sandstone of the Vryheid Formation of the Ecca Group. The Witwatersrand-age quartzite occurs along the northern end of the site. The bedrock is overlain by transported soils.

This was confirmed by the presence of sandstone, diamictite and quartzite bedrock in the majority of test pits excavated at the site.

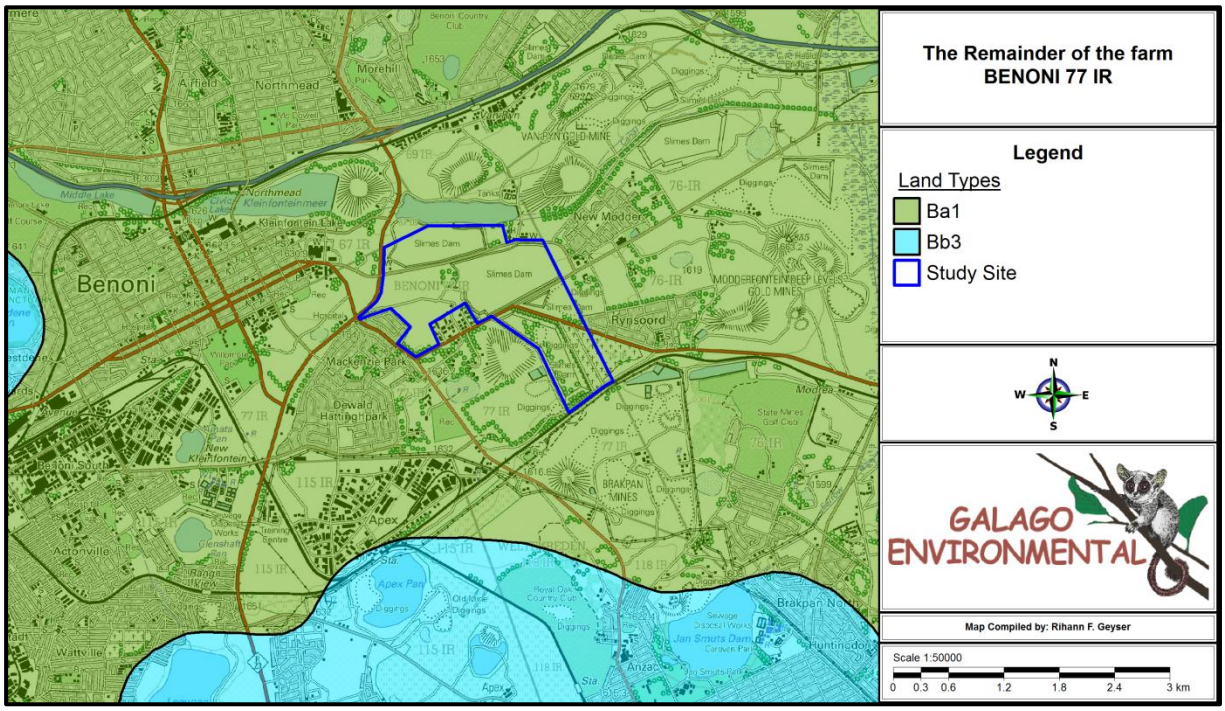

Figure 4: Land types of the study area

According to the soil conductivity guideline values the following were taken from the Geotechnical report (Shuma, 2017)

- The topsoil is not generally corrosive.
- The colluvium is extremely corrosive.
- The pedogenic layer is very corrosive.
- The quartzite is very corrosive to extremely corrosive.

- The diamictite is not generally corrosive due to its pH which is >6.
- The mine tailings are very corrosive to extremely corrosive.

Corrosion of buried metallic elements is therefore likely on colluvium, pedogenic layer, quartzite and mine tailings. No adverse conditions prohibiting the construction of structures for residential development were encountered at the site.

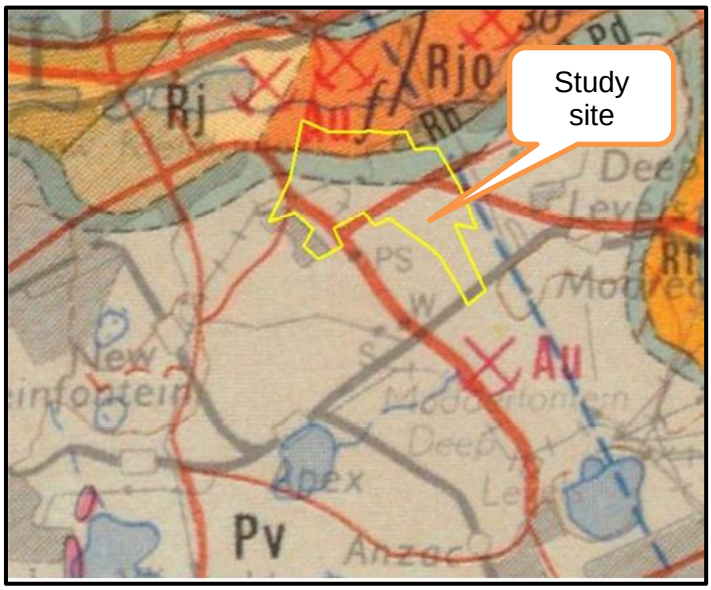

Figure 5: Geotechnical map

Jd	Dolerite (Post-Karoo intrusive)
Pv	Mudrock and sandstone (Vryheid Formation – Karoo Supergroup
C-PD	Diamictite (Tillite) (Dwyka Formation – Karoo Supergroup)
Vbr	Quartzite (Black Reef Formation – Transvaal Supergroup)
Rt	Quartzite (Turffontein Subgroup – Witwatersrand Supergroup)

3.1.2.1 Geotechnical information

The colluvial layer covering the site is generally described as predominantly sandy material (clayey silty sand, etc). These horizons were generally moist and although they have a loose consistency it is expected that the materials will soften when inundated. The collapse potential laboratory results also revealed that the colluvium is potentially collapsible.

Ground water seepage was encountered in most of the test pits excavated at the site fluctuated between 0.40m and 2.40m. This perched water table was encountered mainly due to the fact that the investigation was carried out a day after heavy rainfall. Ferruginization, which indicates that a changing water regime can be expected, was also noted in the majority of test pits. Problems due to ground water seepage are therefore expected in places, especially during and after a very wet rainy season.

No evidence of expansive soil behaviour was noted in the soil profiles. Furthermore, the laboratory results reveal that the materials are low in potential for being expansive.

The surface at the site is covered by the sandy fill material thus possibly prone to erodibility due to the sandy nature of the covering material on site; however it must be noted that no significant erosion channels were encountered during the investigation. Also, the proposed site is covered with grass and, and there is therefore a reduced risk of erodibility problems. Limited erosion problems are expected.

The excavation characteristics of the strata have been estimated from the performance of the TLB used for the investigation. Refusal was encountered in some test pits on hardpan ferricrete, sandstone, diamictite and quartzite. “Intermediate excavation” in terms of SABS 1200D can be expected where the TLB refused. Machine excavatability for the installation of services is therefore expected to be problematic with a backhoe in certain places. Allowance should be made for the use of power tools when excavating at depths below TLB refusal. No dolomite, undermining, steep slopes or unstable natural slopes. No geotechnical conditions preventing township establishment are encountered on this site.

The site is situated on old proclaimed mining land. The Mining Rights Holder is Gold One / Goliath – prospecting rights were granted to Gold One. The site is underlain by the Main Reef which is mined out at a depth in excess of 240m under the majority of the site – only a very small portion on the extreme northwest of the site is undermined at a depth between 120m and 240m.

According to the Safety Assessment by Parc Scientific, radioactivity content of soil on the Benoni 77 R site is generally low. Localised elevated levels of Th occur, which is anomalous for reefs in the East Rand mining complex. Evidence of mine tailings was visible at only one of the sampled locations, and it is concluded that the Th levels may be of natural origin (Appendix D: Annexure D5 – Radon study).

Radon intrusion into future houses on the site is expected to be insignificant, and the contribution of thoron from the elevated Th content will not be a factor. External dose, after background correction, is the major contributor the expected total annual dose. Dose exceeds 0.25 mSv.a-1 at the location of the 90th percentile of the distribution of gamma dose measured on the site. The distribution of dose across the site is, however, sufficiently homogeneous to represent the site with the average dose value of 0.090 mSv.a-1. It is concluded that no remedial actions or site clearance will be required.

3.1.2.2 Soils

The most significant rock is the basaltic lava of the Klipriversberg Group (Ventersdorp Supergroup), together with the sedimentary rocks of the Madzaringwe Formation of the Karoo Supergroup. Soils typical of Ba and Bb land types.

3.1.3 Agricultural potential

The study site falls outside all the GDARD agricultural hubs (GAPA V.4) and have been disturbed by mining activities in the past.

3.1.4 Hydrology

The study area falls in the Upper Vaal Water Management area (WMA no 9), and is located in quaternary catchment C21D. There is only one wetland within the development footprint classified as a seep with a Present Ecological State of B, “largely natural with few modifications” and Ecological Importance and Sensitivity of 1.6 or “moderate” category. A 30m buffer around the seep wetland is recommended.

Ground water seepage was encountered in most of the test pits excavated at the site fluctuated between 0.40m and 2.40m. This perched water table was encountered mainly due to the fact that the investigation was carried out a day after heavy rainfall. Ferruginization, which indicates that a changing water regime can be expected, was also noted in the majority of test pits. Problems due to ground water seepage are therefore expected in places, especially during and after a very wet rainy season (See Appendix D: Annexure D1-Geotechnical report).

It must be clearly noted that any development on the study site will have an impact on the aquatic ecosystems and must be authorised in terms of section 21 of the National Water Act, 1998 (Act No. 36 of 1998).

3.1.4.1 Wetlands

A total of five wetlands are located within 500m of the study area. The wetland within the footprint of the site can be classified as a seep. The present ecological status of this status falls in category B, “Largely natural with few modifications”. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. The ecological Importance status is 1.6, which is moderate, “wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers”. The score allocated to this wetland is 1.

Figure 6: Wetlands in and around the site (Shuma, 2017)

The level of impact to the wetland is likely to deteriorate in the next 5 years as a result of anthropogenic activities. Potential impacts of the proposed construction of housing units includes:

- Loss and disturbance of wetland habitat and fringe vegetation.
- Introduction and spread of alien invasive vegetation.
- Changes in the amount of sediment entering the system.
- Changes in water quality due to toxic contaminants and increased nutrient levels entering the system.
- Changes in water flow regime due to the alteration of surface characteristics.

3.1.5 Air quality

Airshed Planning Professionals (Airshed) was appointed by Galago Environmental to do an air quality impact assessment for a proposed residential development. Tailings storage facilities (TSFs) surrounding the proposed development could possibly impact on the proposed development. Since it is assumed that naturally occurring radionuclides are associated with these TSFs, one of the parameters considered as part of the air quality study was the exhalation of radon gas.

Airshed approached AquiSim Consulting (Pty) Ltd (AquiSim) to facilitate the update of the radon exhalation rates of the 5 TSFs. AquiSim further proposed to assess the potential radon inhalation dose because of the TSFs and to provide guidance on public radiation protection principles to consider (**See appendix D: Annexures D4 and D5**).

The air quality impact assessment included a study of the receiving environment and the quantification and assessment of the impact of the TSFs on human health and the environment. The receiving environment was described in terms of local atmospheric dispersion potential, the location of potential AQSRs in relation to proposed activities as well as existing ambient pollutant levels and dustfall rates.

An atmospheric emissions inventory was compiled for the TSFs. Pollutants quantified included particulate matter (TSP, PM_{10}, and $PM_{2.5}$). PM_{10} is defined as particulate matter with an aerodynamic diameter of less than 10 µm and is also referred to as thoracic particulates. Respirable particulate matter, $PM_{2.5}$, is defined as particulate matter with an aerodynamic diameter of less than 2.5 µm. Whereas PM_{10} and $PM_{2.5}$ fractions are taken into account to determine the potential for human health risks, total suspended particulate matter (TSP) is included to assess nuisance dust effects.

All PM emissions were quantified using the Airshed in-house model ADDAS. This model is based on the dust emission scheme of Marticorena and Bergametti (1995) and Shao *et al*. (2011).

The main findings of the assessment are summarised below:

- The receiving environment:
  - In the absence of on-site surface meteorological data, hourly meteorological data from the Weather Research and Forecasting model (WRF) data set used for the City of Johannesburg (CoJ) air quality management plan (AQMP) was extracted for the site

for 2014 and was utilised for the study. Validation statistics for this data can be seen in the CoJ AQMP Status Quo report (CSIR Climate Studies, 2016).

- The proposed development area is dominated by winds from the north-westerly sector. An average wind speed of 2.9 m/s was extracted for the site.
- Ambient air pollutant levels in the proposed development area are currently affected by the following sources of atmospheric emissions; mining; industries, vehicle tailpipe emissions; agriculture; domestic fuel combustion and open areas exposed to wind erosion.
- Limited ambient air quality data is available for the proposed development site. However, surrounding areas where data is available from the Ekurhuleni Metropolitan Municipality (EMM) show elevated PM_{10} concentrations.
- AQSRs around the proposed development site include residential settlement, townships, schools, mosques and churches.

- Impact of the TSFs:
  - Sources of emissions quantified included windblown dust from the TSFs.
  - PM emissions ($PM_{2.5}$, PM_{10} and TSP) were quantified and utilized in dispersion simulations.
  - For wind erosion to occur, the wind speed needs to exceed a certain threshold, called the friction velocity. The threshold wind speed for this study is ~ 6 m/s.
  - A summary of compliance with the relevant legislation can be seen in the table below:

Impact Description	Compliance
$PM_{2.5}$ daily	X
$PM_{2.5}$ annual	√
PM_{10} daily	X
PM_{10} annual	√
Nuisance effects due to dustfall deposition	X

  - Maximum simulated annual average $PM_{2.5}$ and PM_{10} concentrations, as a result of the TSFs, are low and below the respective standards.
  - The area of non-compliance (on a daily basis) is for a small portion of the proposed development only near TSF number 5.
  - A significance rating of 'medium' was assigned to potential inhalation health impacts and dustfall effects. With mitigation measures in place on TSF 5, such as vegetation or rock cladding, the significance should reduce to 'low'.

In conclusion, it is the specialist opinion that the proposed development may be authorised, however it is recommended that the development area is adjusted to exclude the section directly adjacent to TSF number 5 unless TSF number 5 can be mitigated (vegetation would significantly reduce the impacts). See the recommended buffer zone in the figure below (Figure 7).

It is recommended that a short term ambient monitoring campaign be carried out to verify the ambient levels at the site.

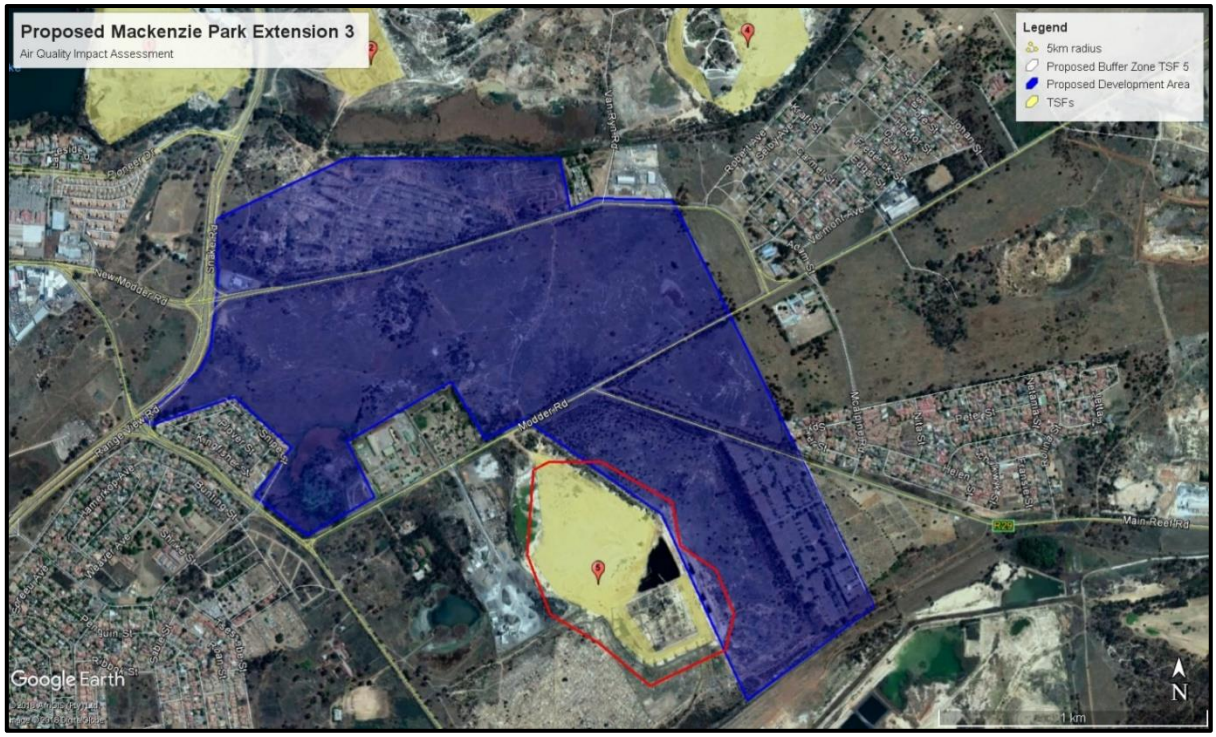

Figure 7: Proposed air quality buffer zone (Airshed, 2018)

The mandate of the National Nuclear Regulator (NNR), amongst others, is to ensure that members of the public are protected against exposure to ionizing radiation. This means that, in terms of issuing a ROD, they must be convinced that the proposed development will not result in members of the public being exposed to radiation above the criteria specified in the national safety standards.

The **Radon study** in Annexure D5 found that it is unlikely that members of the public that will reside in the proposed Mackenzie Park Ext. 3 residential development area will be exposed to ionizing radiation, *as a contribution from the nearby TSFs*, above the regulatory compliance criteria. From the results, it can be concluded that the radon inhalation dose contributed by the nearby TSF will be less than 10 µSv.year^{-1}, and collectively from all TSFs less than 30 µSv.year^{-1} using the higher dose conversion factor.

This conclusion is based on the assumption and understanding that the Mackenzie Park Ext. 3 site currently does not require remedial action or site clearance as recommended in Parc Scientific (2017a). With this as justification and from a radiation protection perspective, it can be recommended that the proposed development continues.

3.2 Biological environment

3.2.1 Regional Vegetation

The study site lies in the quarter degree square 2628AB (Benoni). Mucina & Rutherford (2006) classified the area as Soweto Highveld Grassland, a gently to moderately undulating landscape on the Highveld plateau supporting short to medium high, dense, tufted grassland dominated almost entirely by *Themeda triandra*, and accompanied by a variety of other grasses. It is in places undisturbed, with scattered small wetlands, narrow stream alluvia and pans. Occasional ridges or rocky outcrops interrupt the continuous grassland cover. This

vegetation unit comprises shale, sandstone or mudstone, or the intrusive Karoo Suite dolerites which feature prominently. The soil is deep and red on the flat plains (Figure 6).

It has summer rainfall and cool-temperate climate with high extremes between maximum summer and minimum winter temperatures, frequent frosts and large thermic diurnal differences, especially in autumn and spring.

This vegetation unit is considered endangered. Its conservation target is 24%. Only few patches are conserved in statutory reserves and a few private nature reserves. Almost 50% of the unit is already transformed by cultivation, urbanization, mining and road infrastructure and some areas have been flooded by dams.

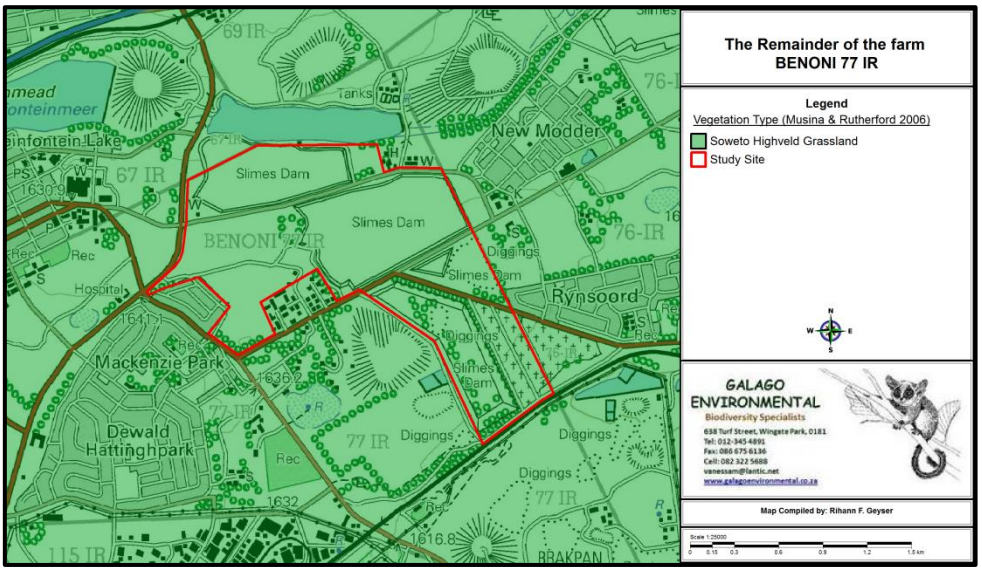

Figure 8: Vegetation study units according to Mucina and Rutherford, 2006

According to the GDARD C-Plan 3.3 the western third of the site is situated within a Critical Biodiversity Area with a narrow Ecological Support Area in the centre of the site (Figure 7).

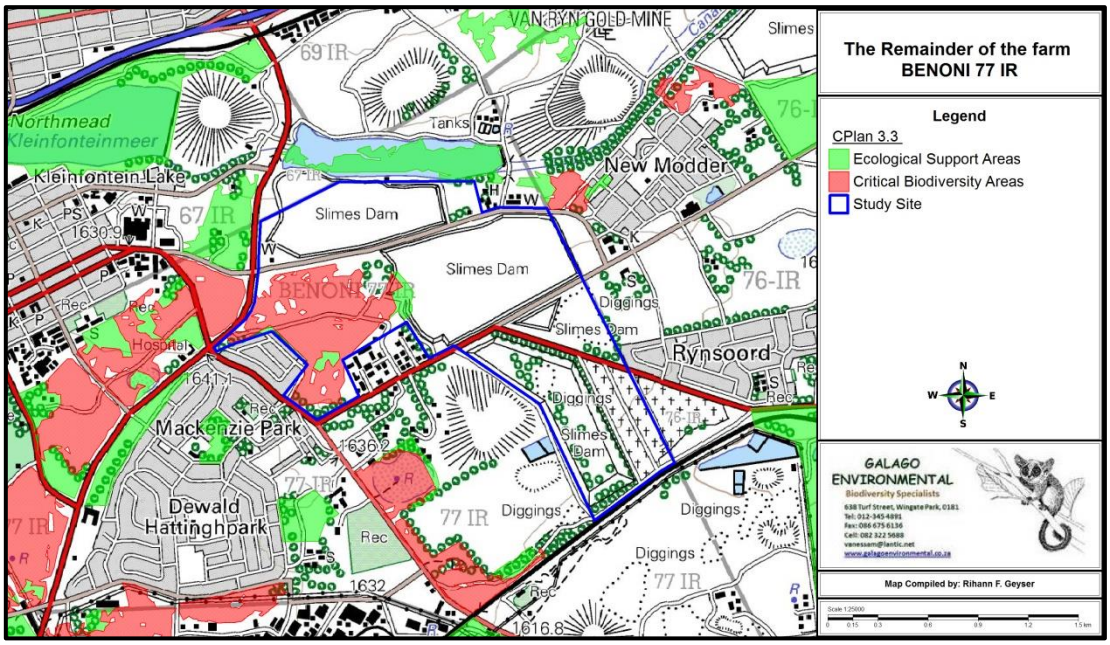

Figure 9: Critical Biodiversity Area and Ecological Support Area.

3.2.2 Flora

A specialist flora assessment was undertaken to determine the detailed vegetation communities, sensitive areas and impacts on red listed plant species on site **(Appendix D: Annexure D2).**

Five vegetation study units were identified on the study site (Figure 8):

- Cortaderia – Cynodon vegetation;
- Eragrostis – Cynodon grassland;
- Mixed alien and indigenous vegetation;
- Wetland vegetation; and
- Eragrostis – Tristachya grassland

The flora study found that the *Eragrostis – Tristachya* grassland is disturbed natural grassland and is not deemed sensitive. The *Cortaderia – Cynodon* vegetation study unit, the *Eragrostis – Cynodon* grassland study unit and the Mixed alien and indigenous vegetation study unit are not considered sensitive. The Wetland vegetation study unit is deemed sensitive. The alien invasive species should be removed. No Red List or Orange List species occur on the study site.

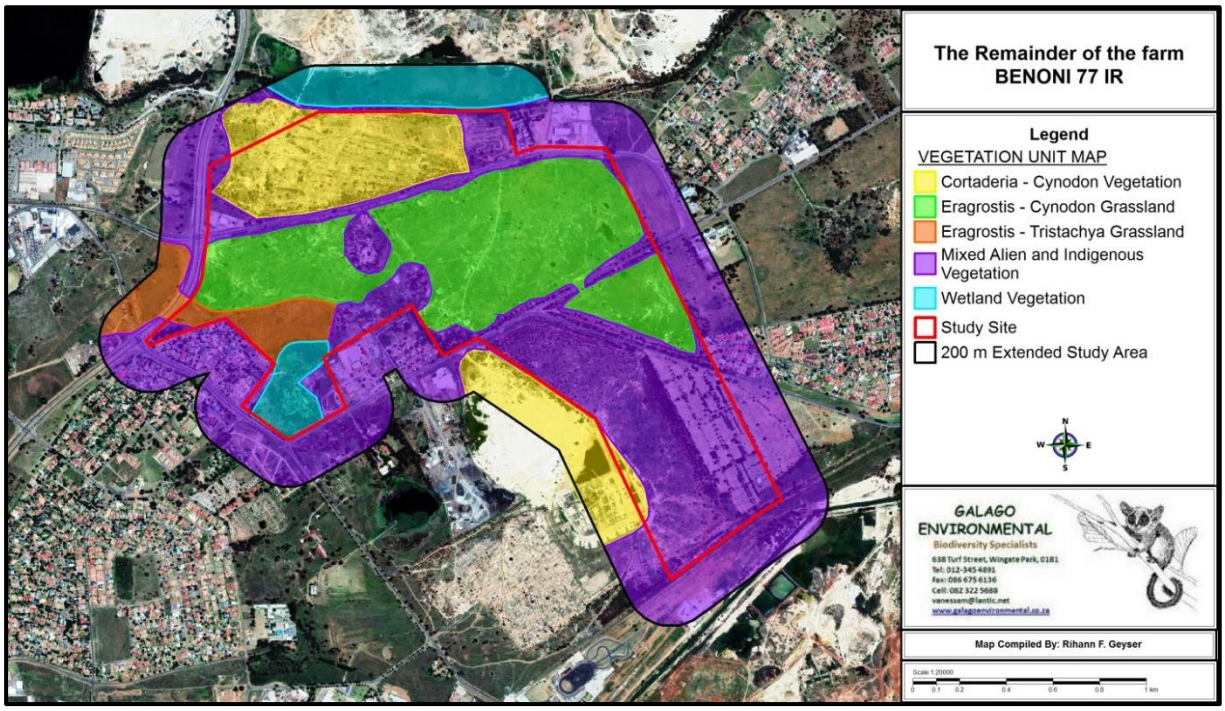

Figure 10: Vegetation study units identified on the study site

3.2.2.1 Species of conservation concern, Red data species, NEMBA species, protected trees

Six Red List plant species are known to occur in the 2628AB quarter degree square, one of them within 5 km of the site. The study site has suitable habitat for another Red List species, but it was not found during the survey. Annexure A indicates the Red List species previously found with 5 km of the site.

GDARD requires biodiversity studies for *Habenaria bicolor*, but the study site does not have suitable habitat for this species. No Red List species or protected species were recorded on the study site.

No Protected trees, listed in terms of the National Forests Act, 1998 (Act No. 84 0f 1998) or plants listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) are known to occur in the 2628AB quarter degree square.

NEMBA species are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). No NEMBA species were found on the site.
Protected trees are identified in accordance with the list of nationally protected trees published in Government Notice No. 29062 3 (2006) of the National Forests Act, 1998 (Act No. 84 0f 1998), as Amended (Department of Water Affairs Notice No 897, 2006).

3.2.2.2 Medicinal Plants

South Africa has a wide diversity of plant species and a rich cultural heritage. A large number of species are still used in traditional medicine and several species were also investigated for medicinal development. Indigenous vegetation is mostly used, but a few alien species are also used for medicinal purposes.
Of the 84 plant species recorded on the site, nine species with medicinal properties were found and are included in Annexure D2. None of these species are of conservation importance or is considered to be rare.

3.2.2.3 Alien Plants

A list of alien and invasive species has been published in the Government Gazette of 1 August 2014 in the Alien and Invasive Species Regulations (AIS) under the National Environmental Management Biodiversity Act (Act No. 10 of 2004). Invasive species are divided into the following four categories:

- “Category 1a: Invasive species which must be combatted and eradicated. Any form of trade or planting is strictly prohibited.
- Category 1b: Invasive species which must be controlled and wherever possible, removed and destroyed. Any form of trade or planting is strictly prohibited.
- Category 2: Invasive species, or species deemed to be potentially invasive, in that a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees. Plants in riparian areas are Category 1b.
- Category 3: Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade, is however prohibited. Plants in riparian areas are Category 1b.”

Thirty-four alien plant species, of which 13 species are Category 1b invasive species, four are Category 2 invasive species and one is a Category 3 invasive species, were recorded on the site.

3.2.3 Fauna

3.2.3.1 Mammals

The mammal study found that the proposed development will progressively displace the mammals recorded during this survey, although it is anticipated that the wetland will retained its *status quo* (which will be a conservation asset for hawking bats, although over time terrestrial wetland-reliant small mammals will also perish as result of isolation). However, it is submitted that displacement of terrestrial wetland-reliant small mammals is of little consequence since all mammal species are widespread and common, even the *Crocidura* species.

The habitat is predominantly terrestrial in character and the secondary grassland is, as mammal habitat, in fact fairly good. The historical mammal assemblage has been compromised by the displacement of medium and larger species, whereas the habitats have not been impacted significantly.

From an extant mammal perspective, the site is deemed to have a low sensitivity.

3.2.3.2 Avifauna

The avifaunal study found that the study area does not offer suitable habitat for the Red Data avifaunal species recorded for the 2628AB q.b.g.c. These Red Data avifaunal species are habitat specific and unable to adapt to areas changed by man. In general the reporting rate of all Red Data avifaunal species recorded for the q.d.g.c. is very low at 1% and less and if they should occur, they are only likely to move through the area on rare occasions and are unlikely to make use of these habitat systems on a permanent basis. The entire study area including the wetland areas can be regarded as low sensitive in terms of habitat availability for sensitive avifaunal habitat.

Three major avifaunal habitat systems were identified within the study area. These habitat systems are as follows:

- Wetland Areas
- Disturbed Grassland
- Disturbed and Transformed Areas

Wetland Areas:
A total of ±6% of the total surface area of the study area consists of mainly artificially created wetland areas (Figure 4) probably created by storm water runoff from the surrounding developed and mining areas.
Only the more common avifaunal species associated with aquatic and semi-aquatic vegetation are likely to make use of this habitat system and this habitat does not offer suitable habitat for Red Data avifaunal species and should be regarded as medium sensitive.

Disturbed grassland:
A total of ±22% of the total surface area of the study area consists of disturbed grassland areas. The presence and abundance of bird species in this habitat will vary from season to season - lush and green in summer after summer rains and dry, brown, frosted or burnt during winter. The habitat favours ground-living bird species, such as lapwings, francolins, pipits,

longclaws, larks and chats. These birds hunt for insects and/or breed on the ground, in burrows in the ground, or between the grasses. Weavers and widowbirds make use of such habitat for feeding on ripe seeds during late summer and early winter when the grass is not burnt, and widowbirds and cisticolas will also breed in the tall grass during summer. Species such as weavers and bishops that breed in the wetland habitat during summer will also make use of the open grassland habitat for feeding during winter after the grasses have seeded. Aerial feeding birds such as martins, swifts and swallows will also hunt for insects over the grasslands.

Disturbed and Transformed Areas:
The rest of the study area, ±72%, is disturbed and has been transformed by past and present human activities. These areas include built-up areas interspaced with garden vegetation, graded areas, roads, areas with severe dumping, mining areas and areas overgrown by alien and invasive trees and vegetation.

Only the more common avifaunal species that are able to adapt to areas changed by man will make use of this habitat system. None of the species that occur within this habitat system are threatened.

3.2.4 Biophysical sensitivity map

According to the GDARD C-Plan 3.3 the western third of the site is situated within a Critical Biodiversity Area with a narrow Ecological Support Area in the centre of the site (Figure 7).

The biodiversity and wetland studies have however shown that the site is very disturbed and transformed as a result of past mining activities that took place on the site and except for the wetland areas and their buffers, the site has a low sensitivity (Figure 9 and Appendix B1).

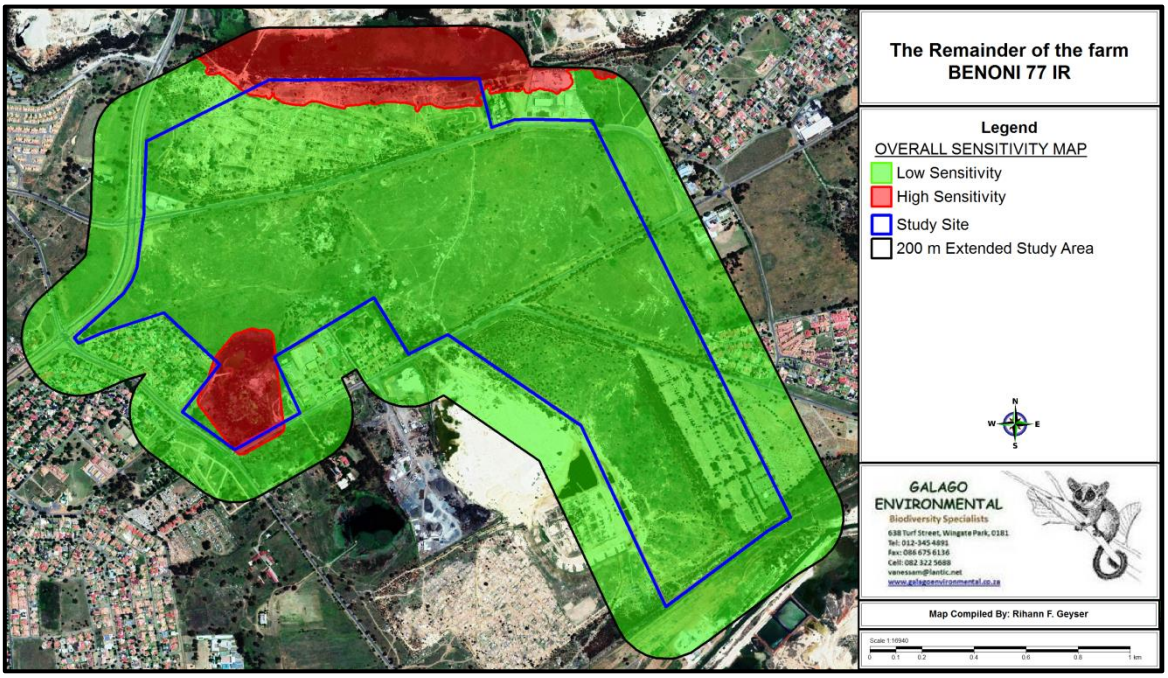

Figure 11: The overall biodiversity map of the study site

3.3 Social Environment

3.3.1 Historical and current land use of the property

Google Earth's Timeline function was used as reference imagery (Accessed April 2019). Google Earth imagery from 2002 (Figure 12) to early 2019 (Figure 13) is available and was used to determine the historical land use and whether the site was extensively altered in the past or to detect large changes in the land use of the catchment.

From these images, it is clear to see the site has not altered much over the past 17 years.

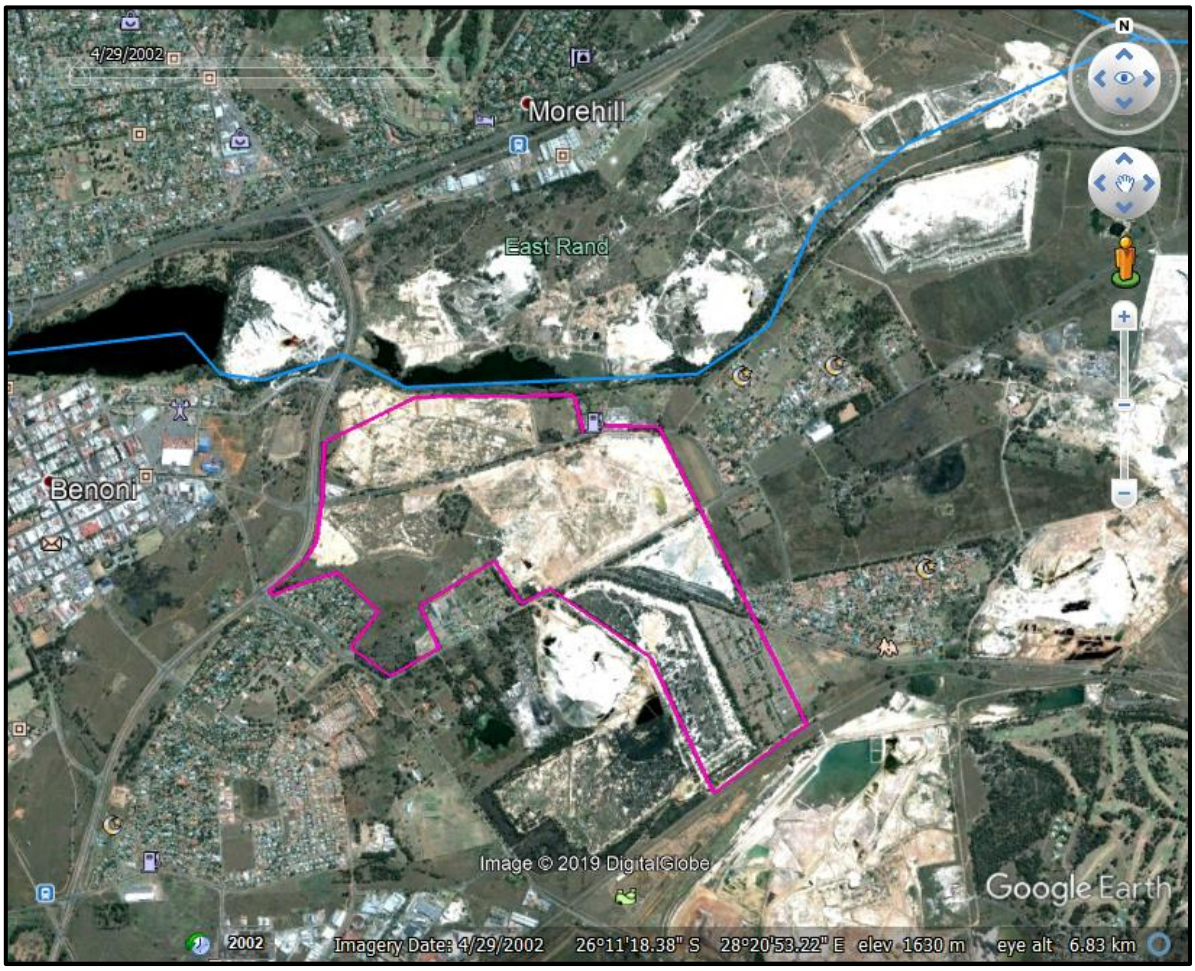

Figure 12: The oldest usable Google Earth image of the site from 2002

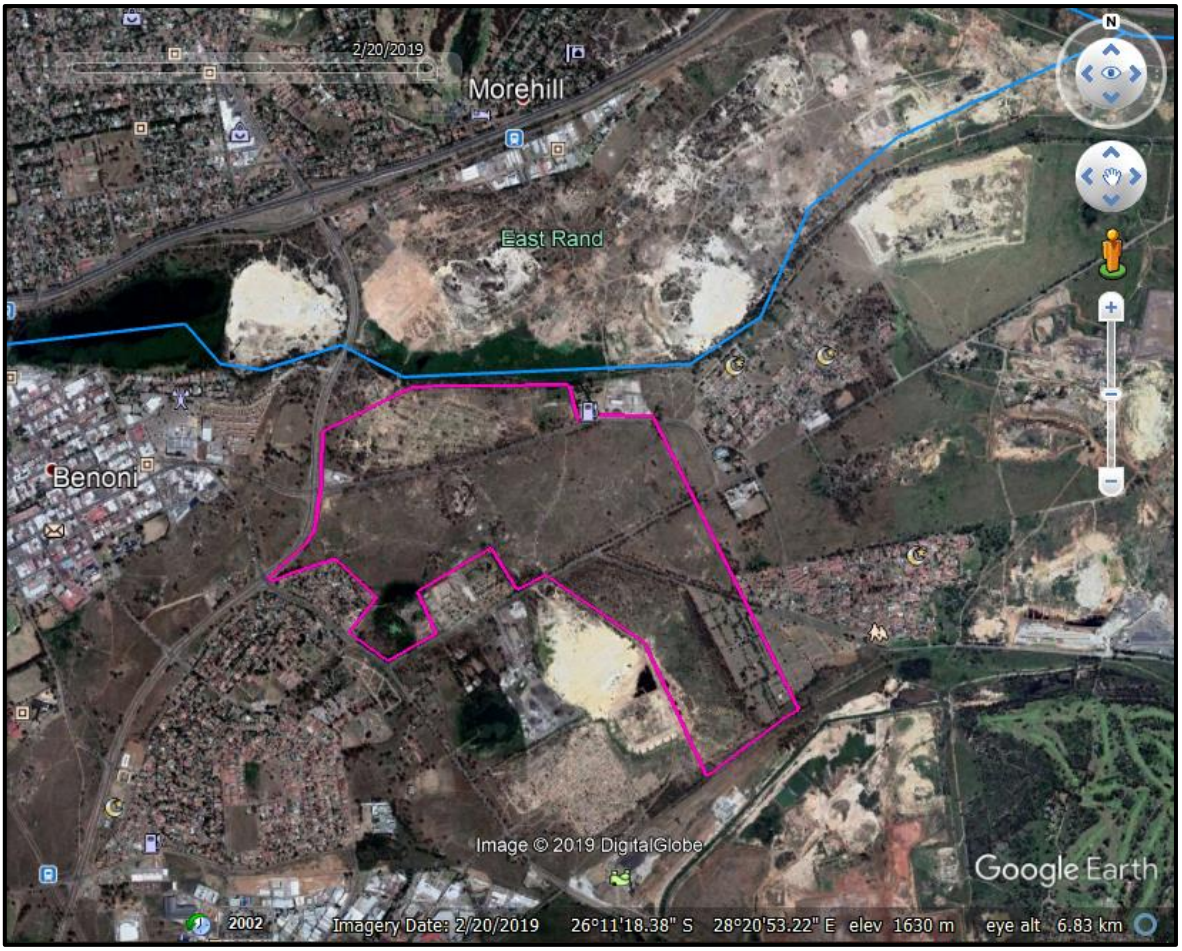

Figure 13: Google Earth Image from 2019

3.3.2 Socio-economic profile

The study site falls within the Ekurhuleni Metropolitan Municipality. The following demographic information is available, according to the Census 2011 Municipal Fact Sheet, published by Statistics South Africa (Table 6).

Table 6: Demographic information for Ekurhuleni metropolitan Municipality, 2011

Population	3 178 470
Age Structure	
Population under 15	24.30%
Population 15 to 64	71.70%
Population over 65	4.00%
Dependency Ratio	
Per 100 (15-64)	39.40
Sex Ratio	
Males per 100 females	105.00
Population Growth	
Per annum	2.47%

Labour Market	
Unemployment rate (official)	28.80%
Youth unemployment rate (official) 15-34	36.90%
Education (aged 20 +)	
No schooling	3.60%
Higher education	14.60%
Matric	35.40%
Household Dynamics	
Households	1 015 465
Average household size	2.90
Female headed households	31.30%
Formal dwellings	77.40%
Housing owned	44.00%
Household Services	
Flush toilet connected to sewerage	85.00%
Weekly refuse removal	88.40%
Piped water inside dwelling	57.20%
Electricity for lighting	82.20%

As far as its sub-regional context is concerned, the site is relatively close to the Carnival Mall node which is one of the fastest growing nodes in Ekurhuleni, and it is also close to a number of regional arterial routes and the N17 freeway which will provide connections to the wider surrounding area.

A number of major arterial routes provide access to the western (Snake Road/Range View Road) and central portions (Main Reef Road (R29}/Modder Road) of the site. The roads are all surfaced municipal roads. Access within the site is very limited because of vegetation, heaps of waste and a number of embankments and drainage ditches surrounding large portions of the site.

The economic targets for the EMM are the following and will be taken into consideration when the proposed development is designed and implemented:

- Economic diversification
- Job creation
- Skills development
- Tourism promotion
- Investment promotion; and Economic transformation.

3.3.3 Cultural / Historical Heritage

A cultural heritage study was undertaken during the EIA phase (see Appendix D: Annexure D6).

An old mine shaft and the overburden dump with associated infrastructure were observed within the study area. Due to the importance of mining in the evolution of the East Rand urban landscape these structures have significant historic value. For this reason, it is important that the site undergoes a second phase of investigation to determine its architectural and historic significance before any structures are demolished. It is recommended that obscured, subterranean sites be managed, if they are encountered.

The Rynsoord Cemetery is situated in the southeastern corner of the site, between Main Reef Road and the Railway Line. It is recommended that the cemetery be fenced off from the rest of the development. Failing this the graves should be relocated to another official municipal cemetery.

In the event that artefacts / graves / areas of cultural significance are discovered during the construction phase, all work should be halted and a cultural heritage practitioner should be appointed to examine the site and make appropriate recommendations

3.3.4 Land use

The site is very accessible, the R23 abuts it on the west, providing access to the N12 to the north and to the N17 and the N3 to the south, while a number of local arterial routes (New Modder Road, Modder B Road and Main Reef Road) run through it, linking it to surrounding centres.

The site is surrounded by four local arterial roads which are:

- **Snake/Range View Road (R23),** which forms the north-western boundary of the site,
- **Main Reef Road (R29),** which branches off the R23 at Mackenzie Park, linking it to Rynsoord and Kingsway Avenue (R51) to the east;
- **Main Reef Road (M45),** which branches off the R29, linking the site with Brakpan CBD to the south;
- **New Modder Road,** running through the northern part of the site, linking Benoni CBD to the west of it with New Modder township the east of it; and
- **Modder B Road,** linking the central part of the site with Kingsway Avenue towards the northeast.

The study area has been transformed to a large degree, and is zoned for “Agriculture” in the Ekurhuleni Town Planning Scheme, 2014. The southern portion of the site, south of Main Reef Road, is zoned for “Public Services” (the cemetery) and “Mining”. The prescribed land uses for the site, according to the Ekurhuleni Metropolitan Spatial Development Framework (SDF) is “Open Space” in the northern part of the site, north of New Modder Road; “urban development” in the central part of the site and “Cemetery” and “Mining” in the southeastern part of the site, south of Main Reef Road. The site is situated within the demarcated Ekurhuleni Urban Edge.

According to the Gauteng Environmental Management Framework (GEMF) from GDARD the study site falls mostly within Zone 1– urban development zone, a section in Zone 6 –industrial development zone, and a sliver at the northern border of Zone 2 – high urban control zone (Figure 12). According to the GEMF Standard, 2018 there are certain guidelines for development that pertains to these zones.

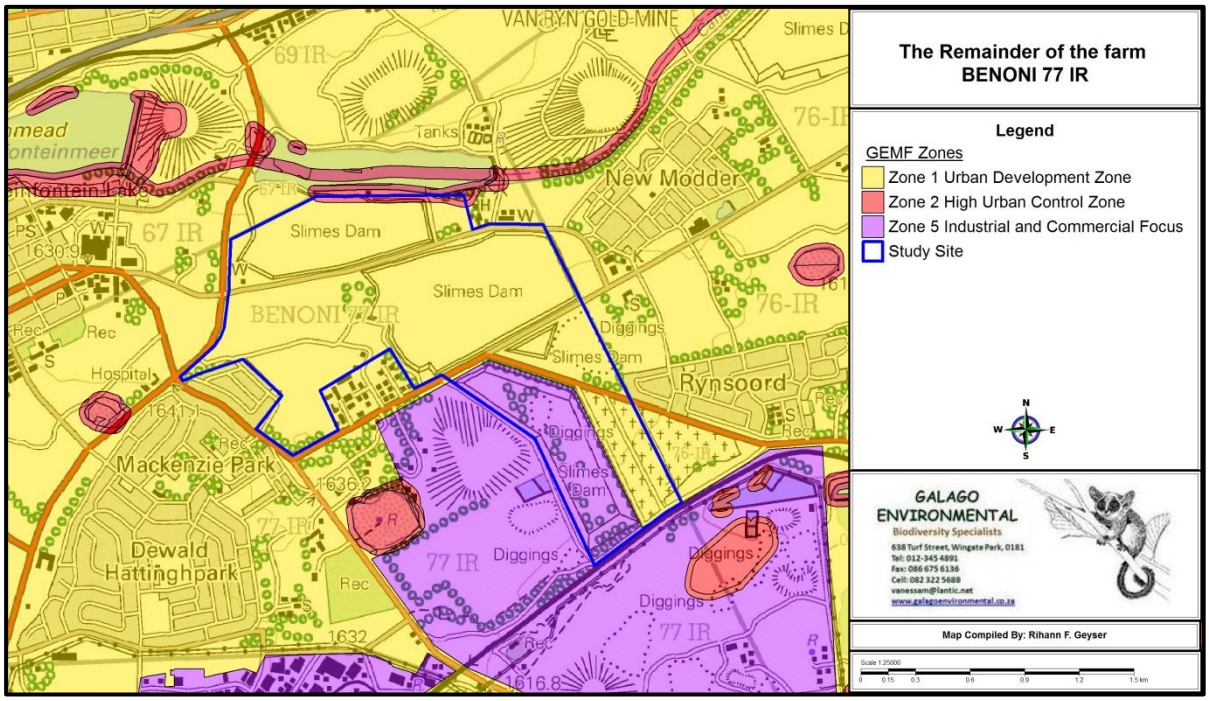

Figure 14: Map of the GEMF Zones on the study site

3.3.5 Visual character

Most of the site area is degraded with a low ecological sensitivity. The visual status of the area is influenced by a cemetery, alien vegetation establishment and expansion; road crossings; dumping and litter; mining (mine tailings) and frequency of fire events (see Figure 15 – 17).

Figure 15: The cemetery in the south east of the study site.

Figure 16: Bluegum trees disturbing the view of the site

Figure 17: Disturbed grassland on the study site with neighbouring tailings in the background

4. TECHNICAL INFORMATION ON THE PROPOSED RESIDENTIAL DEVELOPMENT

The proposed development will entail a residential township in order to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks (See Appendix C for the layout map).

The proposed development will entail a residential township in order to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks.

High density residential stands are proposed along the major roads and in the areas abutting the open space system. Two to four storey walk-up units will be built on these erven at densities of between 100 to 120 units per ha. Rental units, affordable walk-up units, GAP units and Government subsidized walk-up units can be built on these stands.

A total of 14 erven with an area of 50.46 ha are proposed. It is proposed that these erven be zoned for “Residential 4” purposes.

Medium density residential erven, 699 in total, approximately 180 m² in size, are proposed in the northern and north-western parts of the site, for the FLISP and bonded sectors of the market. A total of 1820 residential erven, approximately 130m² in size, are proposed for subsidy-linked free-standing and semi-detached units, which will be mostly located in the northern part of the site, between New Modder Road and Provincial Road K106. The total of 2519 is recommended to be zoned for “Residential 2” purposes

.

A total of 714 row housing erven with a ruling size of 80m² are proposed in the southeastern part of the site abutting the cemetery.

A total of seven erven with a total area of 21.77 ha is proposed for “Business 2 zoning”.
Three **combined schools** and two **Primary school** sites are provided in the development and a total of four erven for local community facilities such as crèches and churches are proposed.

A total of ten **“Public Open Space”** erven are proposed throughout the township, including local play parks, stormwater detention dams, shaft buffer zones and the wetlands and their buffers. Also included is the 100m air quality buffer on the south-western boundary of the site, that could be set out for residential erven later when the tailings on the neighbouring property is removed and rehabilitated.

Access and Street system: The existing alignments of New Modder Road and Modder B Road through the site had to be amended in order to link onto the proposed K106 as planned by Gautrans. Both these roads will be deviated southwards to link with K106 and parts of them

will have to be deproclaimed. Modder B Road will ultimately intersect with Main Reef Road (K163) south of its current intersection, the existing section of this road west of K106 will eventually become an internal road in the area. No direct erf access will be allowed, except along the stretch close to the K106 intersection.

5. ROADS AND SERVICES

5.1 Roads

5.1.1 Existing major road networks

The site is very accessible, the R23 abuts it on the west, providing access to the N12 to the north and to the N17 and the N3 to the south, while a number of local arterial routes (New Modder Road, Modder B Road and Main Reef Road) run through it, linking it to surrounding centres.

5.1.2 Proposed access routes

The site is surrounded by four local arterial roads which are:

- **Snake/Range View Road (R23),** which forms the north-western boundary of the site,
- **Main Reef Road (R29),** which branches off the R23 at Mackenzie Park, linking it to Rynsoord and Kingsway Avenue (R51) to the east;
- **Main Reef Road (M45),** which branches off the R29, linking the site with Brakpan CBD to the south;
- **New Modder Road,** running through the northern part of the site, linking Benoni CBD to the west of it with New Modder township the east of it; and
- **Modder B Road,** linking the central part of the site with Kingsway Avenue towards the northeast.

5.1.3 Traffic impact study

- Snake Road is planned as K109 and Main Reef Road (R29) is planned as K163. The planned K110 forms the southern township boundary running just north of the railway line. K106 is planned to run through the township linking K109 with K110.
- A new link (a Class 3 road) joining New Modder with Snake Road at the Pioneer Drive intersection is proposed. Ostrich Street will need to be widened to at least 25m road reserve, with a 32m road reserve for the first 100m off Snake Road proposed. This is required to improve access to the proposed township.
- The N12, running north of the study area, forms a barrier restricting north-south linkage in the area. Creating more links is essential to create capacity for future developments. Improving the connectivity between the area north and the area south of the N12 will take traffic off the N12 and will relief capacity problems at the two interchanges.
- The repair/reinstatement of the link to Putfontein Road (K161) is required. The re-alignment of the section west of Putfontein Road to align it with Modder Road on the eastern side is important to improve the intersection spacing along K161 (600m minimum Gautrans standard) and to provide continuity (eliminate unnecessary turning movements).
- Linking the east-west link with Modder Road and Main Reef Road will assist to open capacity on Snake Road and should be considered in future. The proposed link is located between Rynoord Township and the planned PWV 17.

- Another option that should be considered to improve mobility (create capacity) along Snake Road is the closure of Golden Drive at Snake Road. Access to the land between this link and the N12 can be reinstated via a new link (Van Ryn Road), with the implementation of the new proposed east-west link at Pioneer Drive.
- A few changes are proposed to the proposed township layout to improve the internal road network and to protect mobility along certain routes.
- The proposed development will generate 8 441 morning peak hour trips and 7 919 afternoon peak hour trips. The expected peak hour trip generation for Saturday is substantially less than for the weekday peak hour. The Saturday peak hour traffic counts are also substantially less than the weekday peak hours. The weekday peak hours represent the worse-case traffic scenarios and were evaluated in this report.
- Additional bus/taxi lay-byes should be provided as indicated in Figure 18. Two circles are also indicated both with a radius of 500m.
- It should be considered that if a shopping centre exceeds 5 000m2 a taxi/bus rank should be provided on-site.

5.2 Rail

5.2.1 Existing rail network

No rail line crosses the site, however a railway line is situated north of the site.

5.3 Water

The proposed development will require approximately 6.32Ml/day. A peak demand of 293l/s is required to service Mackenzie Park x 3, excluding fire requirements.

5.3.1 Existing services

5.3.1.1 Water distribution zone

Sufficient spare capacity is currently available in all affected existing bulk water pipes. One pipe within the Benoni Central distribution zone has a velocity in excess of the recommended 2m/s, but the pressure from the Rand Water system is sufficient to ensure that most of the supply zone experiences peak flow residual pressures in excess of the minimum requirement of 24m. No upgrading to any network water infrastructure is required.

The site does not fall within any of the existing Ekurhuleni water distribution zones and no provision was made for the proposed development in the Benoni water master plan. It would be most economical for the development to be incorporated into the RW Benoni Central Direct distribution zone and partly into the RW0052/RW5596 Direct distribution zone (see the Civil Services report in Appendix D: Annexure D7).

5.3.1.2 Reservoir capacities

As the development will be incorporated into distribution zones directly supplied from the Rand Water bulk system, no municipal reservoirs, water towers or pump stations will be affected. An 18ML reservoir is to be constructed and is currently in detail design phase (see the Civil Services report in Appendix D: Annexure D7).

5.3.1.3 Main Feeder Pipes

One pipe within the Benoni Central distribution zone has a velocity in excess of the recommended 2m/s, but the pressure from the Rand Water system is sufficient to ensure that the majority of the supply zone experiences peak flow residual pressures in excess of the minimum requirement of 24m. No upgrading to any network water infrastructure is required (see the Civil Services report in Appendix D: Annexure D7).

5.3.1.4 Internal Water Reticulation

The materials for the proposed water reticulation will comply with the requirements of Ekurhuleni Metropolitan Municipality. The water pipelines will be constructed with class 12 (SABS 1283), uPVC material with cast iron fittings as required (see the Civil Services report in Appendix D: Annexure D7).

5.3.2 Future Provision

The site does not fall within any of the existing Ekurhuleni water distribution zones and no provision was made for the proposed development in the Benoni water master plan. It would be most economical for the development to be incorporated into the RW Benoni Central Direct distribution zone and partly into the RW0052/RW5596 Direct distribution zone.

The network analysis suggests that:

- Sufficient spare capacity is currently available in all affected existing bulk water pipes.
- One pipe within the Benoni Central distribution zone has a velocity in excess of the recommended 2m/s, but the pressure from the Rand Water system is sufficient to ensure that most of the supply zone experiences peak flow residual pressures in excess of the minimum requirement of 24m.
- No upgrading to any network water infrastructure is required.

5.4 Sewage

The site is split up into three drainage zones, namely the south-eastern zone, south-western zone and the northern zone. The south eastern zones drain toward the eastern corner of the site at an average slope of 4.4 %. The south-western zones drain toward the western corner of the site at an average slope of 2.5 %. The northern zone drains toward the northern corner of the site at an average slope of 2.5 %.

Currently the entire development drains toward the Brakpan-Vlakplaats drainage system with a spare capacity of 97.94 l/s. The internal sewage network was analysed, and it was found that the system does have spare capacity for the proposed development.

5.4.1 Sewage Pump Stations

No pump station will be affected.

5.4.2 Main Outfall Sewers

The proposed development will produce approximately 5.1Ml/day with a peak flow of 269l/s.
The sewage network analysis found that:

- A portion of the development site should be incorporated the JP Marais/Welgedacht diversion drainage area, which drains towards a diversion structure which controls a split of the flow towards the JP Marais waste water treatment works (WWTW) and the Welgedacht WWTW; and
- Temporarily into the Rynsoord pump station drainage area until the planned Welgedacht Outfall Sewer is constructed, after which this area will be able to drain to the Welgedacht WWTP drainage area.
- The Rynsoord pump station will be affected, but has sufficient capacity to temporarily incorporate the additional sewage flow from the proposed development.
- The most critical main outfall sewer in terms of spare capacity is the 1050Ø Boksburg/Benoni outfall sewer that drains in an eastern direction along the N12 freeway. Although this pipeline is currently flowing close to its full capacity, the additional flow from the proposed development will have an insignificant effect on the spare capacity of the pipe.
- The flow capacity of JP Marias WWTW is already exceeded during wet weather, while the capacity of Welgedacht WWTW has recently been upgraded. Therefore it is recommended that the flow diversion structure be set to limit the portion draining to the JP Marais WWTP to 3 ML/day.

5.4.3 Future Provision

The capacity of the existing outfall sewer is insufficient to accommodate the proposed development and the Welgedacht sewer outfall will have to be upgraded.

5.5 Domestic waste

During the construction phase solid building rubble would be generated daily. The construction waste would need to be disposed of at a municipal waste disposal site by the contractors.

The proposed development will produce approximately 2457.72 m^3 of solid waste per week. Waste will be removed by Ekurhuleni Metropolitan municipality on a weekly basis.

5.6 Stormwater runoff and drainage

5.6.1 Existing conditions

There are currently three main catchments within the site. Stormwater from the catchment flowing towards the northern boundary will enter the Benoni Canal directly. Part of this runoff can be collected and detained.

The runoff across the railway reserve towards Brakpan Mines will continue to flow in the same direction. The flow should not be concentrated, except where already concentrated at the edge of the cemetery and the western corner of the site.

Runoff from the pan catchment will be retained in the pan. The pan catchment is primarily in the existing suburbs of Mackenzie Park and Dewald Hattingh Park, and only approximately 11% of the catchment is within the site. A flood line analysis was undertaken as a separate task as part of the planning. This has indicated that the pan will spill towards the site very rarely during extended periods of extreme rainfall.

5.6.2 New stormwater system

The site is split up into three drainage zones, discussed below.

Pan catchment:
The proposed development covers only approximately 11% of the area of the pan catchment, most of which is the pan itself, which will be maintained as an open area. The proposed development therefore has a very limited impact on the pan catchment. The only new built-up area which will drain towards the pan is the row of houses along Lapwing Street. A pipe is proposed from the low point along Lapwing Street to cross through the row of houses and discharge overland towards the pan. The additional runoff due to the hard surfacing of this row of houses is compensated by the fact that a small part of the natural catchment will now be diverted away from the pan along Sandpiper Street into the northern catchment.
Occasional spill from the pan during extended periods of extreme rainfall will be captured in a grass-lined open channel running across the current spillway. This channel will lead towards Sandpiper Street, where it will enter the piped stormwater network (See Appendix D: Annexure 7: Stormwater management plan).

Northern catchment:
An extensive piped stormwater network is proposed within the northern catchment, leading towards two main detention ponds. Both of these ponds are within the proposed combined schools. It is envisaged that the interior of the ponds could be used as sports facilities or playgrounds. The design therefore incorporates low-flow bypass pipes so that the facilities are not flooded too frequently. Both detention ponds will discharge via pipes to outside the northern boundary, where they will flow towards the Benoni Canal.

The stormwater pipe along Imvunduna Street cannot be captured in any of the detention ponds, and will discharge overland towards the Benoni Canal. Similarly, an outlet at the low point along Ostrich Street will also discharge overland towards the river.

A third, far smaller detention pond is proposed in the public open space in the north-western corner of the site. This pond will capture local runoff via a stormwater canal and will also discharge towards the Benoni Canal. Again, a low flow bypass channel so that the pond will not be flooded too frequently should additional parallel uses be considered.

The Residential 4 area in the north-western corner adjacent to pond 3 will discharge directly towards the river without being captured in the bulk stormwater network. A filter strip is proposed along the river boundary to help prevent pollution of the river from this runoff. This is “a vegetated area ordinarily situated on gently sloping ground designed to filter out insoluble pollutants in runoff,” Armitage et al. (2013).

Catchment draining towards Brakpan Mines:
A single detention pond is proposed in this catchment. The proposed stormwater network will allow this pond to collect stormwater runoff from almost the entire site area within this catchment, with the exception of the cemetery, where no development is proposed. Once again, low flow bypass pipes and channels through the pond are included.

The proposed bulk stormwater network within the site includes both pipes and open channels. Pipes predominate, with open channels where distributed flows are expected and streets are not crossed. The main line will be along Cormorant Street.

Discharge from the detention pond and adjacent areas in the extreme south of the site will need to flow to the south-east. Immediately to the south of the site lies the railway reserve and Brakpan Mines, which have not been rehabilitated. While there are some old process water and pollution control dams on this site, these are unlikely to be suitable to receive stormwater. It is therefore proposed to construct a new canal along the proposed K110 Road (i.e. the existing railway reserve) to an existing wetland southeast of the site. This wetland is connected through existing canals to the Benoni Canal further to the east.

The mine dams to the west of the site will spill towards the site and thus form a considerable part of the total catchment. An open channel is proposed along the western boundary to divert this flow away from the site. This channel can be routed to the proposed detention pond. This will compensate for areas of the proposed development which cannot be routed to the detention pond. The channel is shown meandering through the open land and angling down the northern slope of the pond. This should be considered as an option.
An existing berm along the western edge of the cemetery keeps flow from the development away from the cemetery. With the proposed development, this flow will in any case be diverted by the Konde Street, which runs along the edge of the cemetery. The existing channel west of Konde Street will be replaced by public open space, crossed by several streets. A pipe with kerb inlets at the street crossings is proposed.

Stormwater from uNdunde Street and the adjacent Residential 4 area cannot be led towards the detention pond. This will be discharged to the currently vacant area to the east of the site. A separate development is also planned in this area, and the discharge point is along a street proposed for this adjacent development. This is a small flow which will need to be accommodated by the streets and stormwater network of adjacent development once this development is built.

The area immediately to the south of the detention pond will drain directly towards the south. A filter strip is proposed along the southern boundary in this area to prevent downstream pollution.

5.6.2.1 Detention Ponds

The catchment area and runoff from the proposed township was calculated for 5 year and 25 year storms (see the Stormwater management plan in Annexure D7).

On site attenuation will be utilized as well as using all public open spaces. All areas above the environmental buffer zones will also be used for attenuation.

5.6.2.2 Outlet from Detention Facilities

Three detention ponds are proposed in the northern catchment draining towards Benoni Canal. An extensive pipe network will lead water towards the detention ponds. In one area, a filter strip is also proposed along the river to prevent pollution from distributed runoff.

The effect of the proposed development on the pan catchment is predicted to be very small, and the only bulk stormwater infrastructure recommended is a short pipe to convey stormwater from the proposed Lapwing Street towards the pan.

5.6.2.3 Materials

The materials for the proposed stormwater reticulation will comply with the requirements of Ekurhuleni Metropolitan Municipality and SANS 1200.

The following precautions need to be taken by Ekurhuleni Metropolitan Municipality:

5.6.3 Stormwater

Stormwater will accumulate at low points during construction. This water will carry silts that can damage wetland areas when it concentrates in these areas.

5.6.4 Management of stormwater during construction

Stormwater will accumulate at low points during construction. This water will carry silts that can damage wetland areas when it concentrates on these areas. It is therefore essential to apply the following precautionary measures during the construction phase:

- All existing water courses must be protected from pollutants, and transported soils.
- No materials, fluids or substances should be allowed to enter the stormwater system that could have a detrimental effect on the flora, fauna and aquatic life in downstream water courses, wetlands and dams.
- No stormwater, wash water, or waste water may be directed towards any permanent water body or wetland without the installation of a suitable filtration system to prevent pollution, including silt, from entering such water body.
- The site must be managed to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants.
- Temporary cut off drains and berms may be required to capture stormwater and promote infiltration.
- Hazardous substances must be stored at least 20m away from the buffer area surrounding waterbodies and water courses to avoid pollution.
- The installation of the stormwater system must take place as soon as possible after commencement of the construction activities, to attenuate stormwater from the construction site.
- Vegetation clearing and topsoil stripping should be phased to prevent too large an area being prone to erosion at one time.
- Re-vegetation to disturbed surfaces should commence as soon as possible after construction activities are complete.
- Growing seasons and the need to seed timeously should be taken into account in the construction programme.

- Suitable erosion control measures shall be implemented by the contractor at stormwater discharge points, exposed areas and steep embankments.
- Topsoil stockpiles must not be placed close to natural water path ways and wetlands.

5.7 Electricity supply

The proposed development may be supplied with electricity from the Van Eck substation approximately 2 km to the east. The existing maximum demand at Van Eck already exceeds safe capacity. Additional space capacity will have to be installed. Alternatively the site may be supplied from the planned Helderwyk/Leeuwpoort 88kV POD.

6. DESCRIPTION OF ALTERNATIVES

The National Department of Environmental Affairs stresses that the no-go option be considered as a base case against which to measure the relative performance of the other alternatives. The impacts of other alternatives are expressed as changes to the base case or status quo. If considered viable the decision not to act may be considered in the evaluation and assessment process against the other alternatives. The following table (Table 7) describes the different alternatives that were investigated in more detail during the EIA phase and comments on potential implementation.

Table 7: The different alternatives that were investigated in more detail during the EIA phase and comments on potential implementation

Alternatives	Description	Comments on project implementation
Activity alternatives	Alternatives to considering other activities to address the same ends	Activity alternatives were investigated by the EMM during the feasibility phase of the project and the activity of providing housing with associated services and community facilities was prioritised. The EMM RSDF has earmarked the area within which a large part of the site falls for “urban development” and the area is considered ideally suited for infill development, in line with Ekurhuleni’s stated intent to prioritize vacant land in the Mining Belt for development. The proposed development will address a measure of the socioeconomic goals including housing, job creation and service upgrades.
Location or site alternatives	The property on which the proposal is intended and possible location for certain activities within the property. This can also include other	Site alternatives were investigated by the EMM during the feasibility phase of the project. Sites with significant environmental sensitivities were excluded from further investigations.

Alternatives	Description	Comments on project implementation
	sites to commission the project.	The remaining sites are now going through EIA processes to consider the environmental impacts.
Layout / Design alternatives	Placement of land uses and infrastructure within the area available for development to optimise the site and also provide environmental safeguard to sensitive features identified. Design alternatives could also include different architectural designs of housing units, engineering designs of infrastructure services and roads.	These alternatives were investigated during the EIA phase after the finalization of all the specialist studies. The layout attempted to avoid environmentally sensitive areas, such as wetland areas. It was determined through all the biodiversity specialist studies that with the exception of the wetlands in the western and northern sections of the site that are regarded as sensitive, the site is mostly transformed with alien vegetation and is therefore not deemed sensitive. A total of 10 “Public Open Space” erven are proposed throughout the township, including local play parks, stormwater detention dams, and the buffer area and 1:100 year flood line of the wetland (Appendix C – alternative layouts).
Scale alternatives	Refers to actual size of the development proposed and social housing components.	Scale alternatives were investigated during the EIA phase after the finalization of all the specialist studies. A variety of residential densities are provided to cater for a variety of financial groups. The maximization of property potential did not compromise the goals of functional urbanism that will provide an integrated sustainable township.
Technology alternatives	The use of solar instead of electricity to diminish the demand on the municipal electricity provision must be considered.	Technology alternatives were investigated during the EIA phase after the finalization of all the specialist studies. Section 0 gives a summary of potential alternative technologies that could be used.

Alternatives	Description	Comments on project implementation
Land use alternatives	Consideration of alternative land uses on the development site aside from housing.	A short comparable analysis of land use alternatives follow in section 6.1
No-go option	The status quo remains and no development takes place.	The no-go option will be investigated in section 6.3

6.1 Land use/activity alternatives

Activity alternatives were investigated during the feasibility phase of the project and site alternatives will not be further investigated since the applicant is the landowner and has no other land available for residential development in the area (Table 8).

Table 8: A comparable summary of the activity alternatives

Activity	DISQUALIFYING CONSIDERATIONS
Industrial / Commercial development	The current demand in Ekurhuleni Municipality is for mixed use residential developments that include some land for commercial use. The preferred alternative includes 12ha for business use.
Agriculture	The site has been earmarked for housing and does not have a high agricultural potential due to historical mining use in the area.
Residential Development	There is a tremendous need for housing in the area. The site is located next to existing developments and the expansion of the infrastructure can be easily incorporated. There is already a road network for easy access to the surrounding areas. People have different lifestyles and a choice of unit types and tenure options will be provided to fit individual preferences and a range of income groups.

6.2 Alternative energy sources

Appropriate structural designs, energy effective building construction and orientation, have not been considered to date. The following recommendations regarding structural designs are however made by the EAP:

- Use of building materials that requires excessive amounts of energy to manufacture should be minimized.
- Use of building materials originating from sensitive or scarce environmental resources should be minimized. E.g. no tropical hardwood may be used.
- Building materials should be legally obtained by the supplier, e.g. wood must have been legally harvested, and sand should be obtained only from legal borrow pits and from commercial sources.
- Building materials that can be recycled / reused should be used rather than building material that cannot.
- Use highly durable building material for parts of the building that is unlikely to be changed during the life of the building (unlikely to change due to e.g. renovation, fashion, changes in family life cycle) is highly recommended.
- Local building materials instead of imported building materials should be used as much as possible (this will reduce transportation impacts and enhance local job creation).

Passive Thermal Design is based on the principle of energy efficient techniques in housing, that involve the application of energy flow principles and climatic characteristics of a region in the design, construction and management of houses so as to achieve thermal comfort with minimal conventional energy input.

The basic principles of passive thermal design incorporate the following:

i. Orientation of the house
ii. Optimizing natural sunlight through day lighting and
iii. Utilizing thermally efficient building materials.

These principles are a low cost intervention, and are applicable to all climatic regions of South Africa.

Orientation: Passive solar design by orientating the houses towards geographic north can reduce heating expenditure by up to 48%. Houses which are north orientated and have most windows facing north, would have the least heat gain in summer and the least heat loss in winter. “Daylighting” refers to optimizing natural sunlight through glazed areas during daylight hours in such a way that heat gain is minimized in summer and heat loss is minimized in winter. Solar radiation transmitted through glass converts to heat. This is applicable for instance with concrete floors. Hence, at least 20% of the total floor area should be glazed – preferably on the northern side of a house.

Building Materials: Passive thermal design also entails using appropriate building materials, such as materials with a high thermal capacity, which are able to store heat during the day and release this heat slowly at night. Materials of high reflectance should be used to reflect solar heat.

Walls: There are various methods available to insulate a wall. Building a cavity wall is seen as the most effective method of insulation, but it is also the most expensive method. The use of hollow cement blocks for walls and concrete surface beds for flooring have reasonable thermal capacities. Alternative materials such as earth bricks have higher thermal capacities. Another means of insulating walls is plastering. A plastered wall is better resistant to moisture and prevents the mortar of a wall from cracking. Subsequently, plastering reduces maintenance costs and energy usage costs. Construction boards can also function as insulation. They are made of polystyrene or fibre-cement, and when placed outside of the cement blocks wall, place the thermal mass of the wall on the inside of the house.

Ceilings: Installing the correct ceiling is critical in order to achieve a thermally efficient low cost house. Ceilings ensure a reduction of heat flow into and out of the house. As a result, with the use of the correct ceiling material, the house is warmer in winter and cooler in summer. Building products containing asbestos must be avoided wherever possible. Metal sheeting is an alternative to asbestos for roofing, but the heat loss and gain of metal sheeting is too extreme. Ceiling insulation is a moderate to high cost intervention, but should be seen as an absolute necessity.

These principles shall be included as far as possible in the designs, within the budget framework, for the proposed development.

6.3 No-go alternative

The situation where the environment is left in the present condition and no interference is attempted; therefore the status quo is maintained. Most of the site area is degraded a low ecological sensitivity, except for the wetlands that are considered to be of medium sensitivity.

Should this site not be developed then the housing shortage in the area would increase the demand for resources in the area. Illegal hunting and harvesting of medicinal plants on the site could then further reduce the biodiversity on site. The housing shortage also place increasing demand on infrastructure and the social environment of surrounding areas. The surrounding schools and health facilities are not designed to deal with the influx of people.

At present there is uncontrolled access to the site, causing increased dumping on the site and a great possibility of a squatter camp establishing on the site. This situation has an increasing security risk for the surrounding properties.

6.4 Alternative 1

This option is almost the same as the preferred option, to develop the site into a residential development with a mixture of high and medium density residential erven together with community facilities and parks to facilitate a proper working township catering for the housing need in the area without compromising on the community sense of place. The air quality buffer areas from the neighbouring tailings dam to the west of the site have however not been considered in this option (See Appendix C for the alternative layout plan).

6.5 Preferred option

The preferred option is to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks.

High density residential stands are proposed along the major roads and in the areas abutting the open space system. Two to four storey walk-up units will be built on these erven at densities of between 100 to 120 units per ha. Rental units, affordable walk-up units, GAP units and Government subsidized walk-up units can be built on these stands.

A total of 14 erven with an area of 50.46 ha are proposed. It is proposed that these erven be zoned for “Residential 4” purposes.

Medium density residential erven, 699 in total, approximately 180 m² in size, are proposed in the northern and north-western parts of the site, for the FLISP and bonded sectors of the market. A total of 1820 residential erven, approximately 130m² in size, are proposed for subsidy-linked free-standing and semi-detached units, which will be mostly located in the northern part of the site, between New Modder Road and Provincial Road K106. The total of 2519 is recommended to be zoned for “Residential 2” purposes

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A total of 714 row housing erven with a ruling size of 80m² are proposed in the southeastern part of the site abutting the cemetery.

A total of seven erven with a total area of 21.77 ha is proposed for “Business 2 zoning”.
Three **combined schools** and two **Primary school** sites are provided in the development and a total of four erven for local community facilities such as crèches and churches are proposed.

A total of ten **“Public Open Space”** erven are proposed throughout the township, including local play parks, stormwater detention dams, shaft buffer zones and the wetlands and their buffers. Also included is the 100m air quality buffer on the south-western boundary of the site, that could be set out for residential erven later when the tailings on the neighbouring property is removed and rehabilitated.

Access and Street system: The existing alignments of New Modder Road and Modder B Road through the site had to be amended in order to link onto the proposed K106 as planned by Gautrans. Both these roads will be deviated southwards to link with K106 and parts of them will have to be deproclaimed. Modder B Road will ultimately intersect with Main Reef Road (K163) south of its current intersection, the existing section of this road west of K106 will eventually become an internal road in the area. No direct erf access will be allowed, except along the stretch close to the K106 intersection.

6.6 Conclusion

See Table 9 below for a summary of the feasible alternatives identified for the study site.

Table 9: Summary of the feasible alternatives identified

ALTERNATIVE	EVALUATION
No-go option	**Positive:** o Uncontrolled open space function of site will prevail and continue. o Biodiversity on the site will continue, but will probably decrease with illegal dumping on site. o Visual character of area will remain intact. **Negative:** o Infrastructure services in the area will not be upgraded to accommodate the current demand in the area. o Congested roads in the area will not be upgraded in the foreseeable future. o Uncontrolled dumping and continued degradation of land. o There is a potential for informal settlement to occur on site which poses associated health impacts. o The continued harvesting of the flora and fauna on the site will reduce biodiversity over the long run. o Visual character of area will remain intact with increasing signs of dumping. o Social impacts on neighbouring properties due to uncontrolled access to the site will continue and/or increase. o A huge capital investment will be needed in the future for rehabilitation of the site due to increased deterioration through dumping of domestic and construction rubble. o Security risk of vagrants.
Alternative 1: Mixed use residential development of the area with conservation of wetland areas and their buffers	**Positive:** o Local Authority receives taxes and income from service provision. o Shortage in housing demand will be reduced. o Infrastructure services in the area will be upgraded to accommodate the demand for the new residential development. o Upgrade of living conditions of the people living in informal townships in surrounding areas. o Installation of infrastructure (especially sewage lines) will improve the quality of living and reduce the impact to the environment. o The visual character or "sense of place" of the area will be improved through proper planning and development. **Negative:** o Potential health issues may occur with residents in the proposed development adjacent to the tailings dam if the 100m buffer is not incorporated into the layout as open space area. o Increasing pressure may be placed on resources such as clinics and schools until these increased demands are accommodated into new facilities in the future, however the development will provide for some of these facilities. o Traffic impacts may increase as a result of increased amount of residents using already congested roads if not upgraded before the proposed development is built. o Potential for increased crime during the construction phase of the proposed development. o Increasing pressure on infrastructure in an area that is already under pressure with sewage and other services that have not been upgraded in

	recent years, should infrastructure not be upgraded before the proposed development is constructed.
Preferred alternative: Mixed use residential development of the area with conservation of the wetland areas and their buffers as well as the air quality buffer	**Positive:** o Open space areas that will be conserved will include sensitive wetland areas and their buffers. o Potential health impacts associated with the tailings dam on the neighbouring property could be mitigated with the 100m buffer. o Local Authority receives taxes and income from service provision. o Shortage in housing demand will be reduced. o Infrastructure services in the area will be upgraded to accommodate the demand for the new residential development. o Upgrade of living conditions of the people living in informal townships in surrounding areas o Installation of infrastructure (especially sewage lines) will improve the quality of living and reduce the impact to the environment. o The visual character or "sense of place" of the area will be improved. **Negative:** o Increasing pressure may be placed on resources such as clinics and schools until these increased demands are accommodated into new facilities in the future, however the development will provide for some of these facilities. o Traffic impacts may as a result of increased amount of residents using already congested roads if not upgraded before the proposed development is built. o Potential for increased crime during the construction phase of the proposed development. o Increasing pressure on infrastructure in an area that is already under pressure with sewage and other services that have not been upgraded in recent years, should infrastructure not be upgraded before the proposed development is constructed.

This study therefore recommends that the preferred alternative be instituted, as negative impacts could be mitigated with proper planning and infrastructure upgrades. This assessment is not strictly conducted on the conventional impact assessment process, but integrates strengths of environmental planning from the inception phase to ensure that sensitive environmental features are excluded from development, and that environmental opportunities and constraints are integrated into the planning and design of the scheme.

It is important to remember that there are also other types of alternatives that were investigated throughout the process as described in the tables 8-10 under Section 6.

7. METHODOLOGY AND APPROACH

An impact can be defined as any change in the physical-chemical, biological, cultural, and/or socio-economic environmental system that can be attributed to human activities relative to alternatives under study for meeting a project need.

There are numerous assessment methodologies and approaches within the international sphere of assessing the potential impact of development activities on the environment.

When a particular method for environmental impact analysis is selected or used certain general principles must be kept in mind to avoid the mystique and pseudo-science, which

cloud many planning procedures. In general terms an environmental assessment evaluation comprises four main tasks:-

a. Collection of data;
b. Analysis and interpretation of this data;
c. Identification of significant environmental impacts;
d. Communication of the findings.

Further to the above the proposed mitigation and management options for the identified impacts must be provided. The selected impact evaluation method must enable these four tasks. Impact methodologies provide an organised approach for predicting and assessing these impacts. Any one methodology and approach will have opportunities and constraints, as well as resource and skill demands, and no one method is appropriate for all circumstances. The selected methodologies proposed by this document are appropriate for most situations, taking the above criteria into account.

Impact assessment methodology should comply with the following set of criteria:

a. *Be comprehensive:* The environment consists of intricate systems of biotic and abiotic factors, bound together by complex relationships. The methodology must consider the impact on these factors.
b. *Be flexible:* Flexibility must be contained in the methodology, as projects of different size and scale result in different types of impacts.
c. *Detect true impact:* The actual impact that institutes environmental change, as opposed to natural existing conditional changes. Long-term and short-term changes should be quantified.
d. *Be objective:* The methodology must be objective and unbiased, without interference from external decision-making.
e. *Ensure input of required expertise:* Sound, professional judgement must be assured by a methodology.
f. *Utilize the state of the art:* Draw upon the best available analytical techniques.
g. *Employ explicitly defined criteria:* Evaluation criteria used to assess the magnitude of environmental impacts should not be arbitrarily assigned. The methodology should provide explicitly defined criteria and explicitly stated procedures regarding the use of these criteria, including the documented rational.
h. *Assess actual magnitude of impacts:* A method must be provided for an assessment based on specific levels of impact for each environmental concern.
i. *Provide for overall assessment of total impact:* Aggregation of multiple individual impacts is necessary to provide an evaluation of overall total environmental impacts.
j. *Pinpoint critical impacts:* The methodology must identify and emphasize particularly hazardous impacts.

Methods for identification of environmental impacts (Table 10) can assist in specifying the range of impacts that may occur, including their spatial dimensions and time period.

Identification methods answer questions concerning the components of the project and what elements of the environment may be affected by these components.

Table 10: Methods for identification of environmental impacts

Function	Methodology
Identification	Description of the existing environmental system Determination of the components of the project Definition of the environment modified by the project
Prediction	Identification of environmental modifications that may be significant Forecasting of the quantity and/or spatial dimensions of change in the identified environment Estimation of the probability that the impact (environmental change) will occur (time period)
Evaluation	Determination of the incidence of costs and benefits to user groups and populations affected by the project Specification and comparison of the trade-offs (costs or effects being balanced) between various alternatives

7.1 Evaluation methods in environmental assessment

Defined as a formal procedure for establishing an order of preference among alternatives. The use of multiple evaluation methods may seem excessively demanding. However, it is usually obtaining the inputs to evaluation methods that are demanding. Once these inputs are available, application of the methods themselves is often relatively straightforward. A particular evaluation obviously should not be seen as equivalent to a decision. Evaluation methods are designed as decision *aids* for decision makers. They do not replace the need for decisions to be made, particularly where issues such as fairness and distribution of costs and benefits are involved. Ultimately evaluation methods should serve as convenient means of connecting assumptions to consequences so that decision-makers can explore and more fully appreciate different alternatives and value sets and ultimately they can make better decisions.

7.1.1 Formal Procedure

An evaluation method is a formal, explicit, and thorough way of organising and describing choices. The amount and complexity of data characteristic of evaluations for projects, including small ones, means that the iterative Environmental Assessment process requires a method too comprehensive to be applied casually or intuitively. Methods are intended to be applied repeatedly, each time with deliberate changes in assumptions or data that produce changes in preferences. This evaluation process gradually shows how differences in environmental preferences result in different ratings among alternatives.

Where affected interests conflict, evaluation methods are used to assist in reconciling differences as far as possible and reach compromises.

7.1.2 Methodology Types

The following lists the most frequently used categories of assessment methodologies. From this schedule those most appropriate and frequently used will be selected for the specific assessment requirements. More than 50 impact analysis methodologies have been

developed. Of those considered we have selected the two primary methods and variations on them, being checklists and matrices.

Checklists can be divided into simple, descriptive, scaling, and scaling-weighting checklists. Matrices are subdivided into simple and stepped matrices.

The key point with regard to all environmental impact analysis methodologies is that they are useful tools for examining relative environmental impacts of alternatives. They represent a tool that must be applied with professional judgement, and their results must also be interpreted using professional judgement.

7.2 Implementation methodology used for the impact identification

1. Establish checklists for a.) Environmental characteristics and b.) Human development activities. These lists should be comprehensive and feature all the necessary items on which to base an informed decision.
2. The checklists are further categorised by single assessment sheets for each individual activity impacting on specific environmental parameters.
3. These are evaluated in terms of the following (see Table 11 -16):

7.2.1 Criteria for rating the extent or spatial scale of impacts

Table 11: Criteria for rating the extent or spatial scale of impacts

Extent Rating	
High	Widespread Far beyond site boundary Regional/national/international scale
Medium	Beyond site boundary Local area
Low	Within site boundary

7.2.2 Criteria for rating the intensity or severity of impacts

Table 12: Criteria for intensity rating

Intensity Rating	
High	Disturbance of pristine areas that have important conservation value. Destruction of rare or endangered species.
Medium	Disturbance of areas that have potential conservation value or are of use as resources. Complete change in species occurrence or variety.
Low	Disturbance of degraded areas, which have little conservation value. Minor change in species occurrence or variety.

7.2.3 Criteria for rating the duration of impacts

Table 13: Criteria for duration rating

Duration Rating	
High (Long term)	Permanent.

	Beyond decommissioning. Long term (More than 15 years).
Medium (Medium term)	Reversible over time. Lifespan of the project. Medium term (5 – 15 years).
Low (Short term)	Quickly reversible. Less than the project lifespan. Short term (0 – 5 years).

7.2.4 Categories for Probability (likelihood) of the occurrence of an impact

Some of the potential impacts are associated with risk or conjecture (based on other scenarios developing during the period of impact) rather than the actual impact. It is important to establish the probability of the impact actually materialising.

Table 14: Probability categories

Category	Definition
Probable - High likelihood	Greater than 50:50 chance of occurrence
Improbable – Low likelihood	Less than equal to 50:50 chance, but at least a 1:20 chance of occurrence
Negligible	Less than 1:20 chance of occurrence

7.2.5 Categories for the rating of impact magnitude and significance

Table 15: Impact Magnitude and significance rating

Impact Magnitude and Significance Rating	
High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur.
Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.

Impact Magnitude and Significance Rating	
No impact	Zero impact.

4. Together with the above, integrated in the evaluation checklist sheet provision is made for the:
   - Description of the impact
     Nature, what causes the effect and how is it affected.
   - Intervention specifications
     Design, precautionary, management, rehabilitation and documentation.
5. Once the above assessment has been completed an objective evaluation of the potential impact of the activity can be assured. The activity impact is then offset against the list of environmental characteristics in the cause-effect interaction matrix, which will be the evaluated significance.
6. Affected environmental components will be categorised as primary effect and secondary or peripheral effect.

7.3 Conclusion

A combination of the above methodologies was used in section 9 to determine the significance of the potential impacts associated with the proposed development. The following section would describe how the potential impacts were identified and what actions should be taken to ensure that the potential environmental impacts of the proposed development are reduced to the minimum.

8. ADVERTISING AND PUBLIC INVOLVEMENT PROCESS

8.1 Press advertising and site notices

The Public Participation Process forms the corner stone for detailing the Scoping and EIA reports. The process identifies potential interested and affected parties on the project and solicits inputs and comments pertaining to the matter/activity proposed from such parties. Public Participation allows the public to contribute to the project and provides for better decision making by collective inputs from stakeholders, organs of state and specialists. In terms of the EIA Regulations, 2014, Section 21 and Appendix 2 and Appendix 3, a Scoping and EIA report must contain details of the public participation process undertaken for the project.

The public participation process is conducted in accordance to Chapter 6, Regulation 39 to 44 of Government Notice R982 of the NEMA Regulations 2014 (as amended by 2017 Regulations GN 326). The process provides the public access to necessary information on the project throughout the scoping and EIA phase of the study. The public participation process for the Mackenzie Park x 3 Development kicked off on 16 March 2018.

8.2 Newspaper advertisement

The project was advertised in the local press as per the GDARD requirements. The proposed activity was advertised on 16 March 2018 in the *Benoni City times* (regional paper) in English. Refer to Annexure E3 for a proof of the newspaper advertisement within Appendix E: Public participation process.

8.3 Site notices

Five A2 - sized on-site notices were placed, one on the southwestern boundary of the site on the corner of Main Reef Road and Snipe Street, a second notice on the corner of Modder and Main Reef Roads, a third notice next to the cemetery on Main Reef Road, a fourth notice on the north eastern side of the site on New Modder Road and a fifth notice on the northwestern boundary of the site on New Modder Road. Refer to Annexure E1 for a proof of the notice within Appendix E: Public participation process.

8.4 Background information documents and notices/flyers

As part of the identification of landowners and tenants on the project site, Galago Environmental provided Background Information Documents on 16 March 2018 through hand delivery to residents within the neighbouring area as well as to landowners of the neighbouring agricultural holdings. BIDs were also handed to pedestrians encountered on the site. The proposed project was also discussed and explained to the residents who received the background information documents. Refer to Annexure 3 for the BID within Appendix E: Public participation process.

The BID provides an Interested and/or Affected Party (I&AP), with background information on the proposed project, as well as information regarding the Environmental Impact Assessment process that will be undertaken. It further indicates how you can become actively involved in the project, receive information and raise issues that may concern and/or interest you. The sharing of information forms an important component of the public participation process and provides the opportunity to become actively involved in the process from the onset. I&APs were given a 30 calendar day period to raise any issues or concerns regarding the project. Background Information documents (BID) were emailed, posted and delivered in English to stakeholders and organs of state.

8.5 I&AP correspondence

All comments received from interested and affected parties were acknowledged and recorded in an Issues and Response Register and were addressed in the final Scoping Report accordingly. (Please refer to Annexure E4 and E5 for the Issues and Concerns Register within Appendix E: Public participation process).

8.5.1 Issues raised and potential impacts identified during the Public participation process

The Scoping Report aimed to scope, identify and list the environmental issues and potential impacts that are relevant to the project and determines where further information is required in the form of specialist studies and or investigations. The identification of such issues and potential impacts are solicited from stakeholders, interested and affected parties through a public consultation process as well and desktop investigations undertaken by the environmental consultant paired with initial site investigations.

The key identified issues and potential impacts pertaining to the proposed establishment of a mixed use development outlined the focus areas for the Impact Assessment phase and Specialist studies which were undertaken.

The following issues, determined through the public participation process with authorities and I&APs, were investigated in further detail during the EIA phase and informed the final layout plan (Appendix C) for the Mackenzie Park x 3 development.

8.5.2 Biophysical environment

The biophysical environment is the relation between the physical environment and the biological life forms within the environment.

- Impacts on biodiversity (fauna and flora).
- Impacts on aquatic ecosystems (wetlands).
- Impacts on soils and geology.
- Impacts on air quality, including radiation assessment

8.5.3 Social environment

The social environment refers to the environment developed by humans as contrasted with the natural environment.

- Impact on cultural and heritage resources.
- Impacts on land use and also surrounding land uses.
- Impact on existing services supply (municipal capability).
- Impact on traffic (local road network).
- Socio-economic impacts (positive and negative).
- Storm water management.
- Provision of water, sewage and electricity (infrastructure) to the residents of the residential area.
- The poor and insufficient municipal infrastructure in the area that will be exacerbated by the proposed development.
- Capacity of public amenities such as schools and clinics in the area.
- Mitigation measures and management procedures to reduce the potential impact of construction activities on the environment.

8.6 Comments on the draft scoping report

During the correspondence with I&APs, stakeholders were advised that the Draft Scoping Report would be prepared and made available for public review. Electronic copies as well as hard copies of the Draft Scoping Report was made available to registered interested and affected parties and organs of state on the project database on 5 May 2018. One hard copy of the Draft Scoping Report was provided to the Ward Councillor for comment for a period of thirty (30) days, from 5 May 2018 to 5 June 2018 in the study area to allow for review and commenting.

Stakeholders were informed about the comment period for the Draft Scoping Report through emails and faxed letters and copies of the Draft Scoping Report emailed as requested from I&APs or provided with a link on the internet. State Departments will also receive the draft Scoping Report for their comments.

The concerns raised during the public participation process and the Draft Scoping Report comments period were included in the final Scoping Report and were investigated in terms of the potential impacts associated with the proposed development in the Environmental Impact Assessment phase.

8.7 Public Consultation during Environmental Impact Phase

Interested and Affected Parties would be notified of the commencement of the EIA Phase once all specialist investigations have been undertaken. I&APs would be given the opportunity to review the findings of the EIA which is presented in a Draft EIR and EMPr. The draft EIR would indicate the potential positive and negative impacts and measures to enhance positive impacts and reduce negative impacts.

As part of the assessment, an EMPr is compiled. The EMPr is a requirement as per the EIA Regulations. The EMPr recommends how to operate and implement the project. I &Aps would receive a notification letter announcing the availability of the Draft EIR. The report would be distributed for public review and comment for a period of 30 calendar days.

All comments and issues received during the public review period of the Draft EIR and EMPr would be captured in a Final EIR and submitted to GDARD for review and ultimately approval. I &APs would receive notification of the submission and would as per the scoping phase have the opportunity to request copies of the final report.

8.8 Public Consultation during Decision making phase

During this phase GDARD will review the Final EIR and consult with any other key organs of state e.g. the Department of Water and Sanitation (DWS) before granting or refusing an environmental authorisation.

The environmental authorisation will be made available for public review for a period of 20 consecutive calendar days. This provides I&AP's with an opportunity to verify that the decision taken have considered their comments and concerns raised. I&AP's are also then informed of the appeal procedure, should they have a reason to appeal.

8.9 Conclusion

During the Environmental Impact Assessment phase the different design and technology alternatives were compared in terms of the potential environmental impacts associated with the preferred alternative of residential development. Specialist studies were undertaken during the EIA phase in order to determine the potential impacts on the social and biophysical environment.

9. IMPACT ASSESSMENT

9.1 Introduction

The following section categorises and identifies the single environmental aspects, which have informed the list of ***pertinent*** issues, which have been identified by specialist research, I&AP's and authority representation and the assessment evaluation. These listed issues have been determined through the environmental impact assessment, the scoping and EIA processes and the site visits with authorities, specialists and engineers.

9.2 Issues identified through public / authorities involvement

The Scoping Report aimed to scope, identify and list the environmental issues and potential impacts that were relevant to the project and determined where further information is required in the form of specialist studies and or investigations. The identification of such issues and potential impacts were solicited from stakeholders, interested and affected parties through a public consultation process as well as desktop investigations undertaken by the environmental consultant in combination with initial site investigations.

The key identified issues and potential impacts pertaining to the proposed establishment of a mixed use development outlined the focus areas for the Impact Assessment phase and Specialist studies which were then undertaken.

The following issues, determined through the public participation process with authorities and I&APs, were investigated in detail during the EIA process and were informed by the final draft layout plan for the Mackenzie Park x 3 Housing development (See Appendix E: Annexure E5 for the Issues and Concerns register).

9.2.1 Biophysical environment

The biophysical environment is the relation between the physical environment and the biological life forms within the environment.

- Impacts on Biodiversity (flora and fauna)
- Impacts on Aquatic Ecosystems (wetlands)
- Impacts on Soils and Geology (dolomite)
- Impacts on Air Quality

9.2.2 Social environment

The social environment refers to the environment developed by humans as contrasted with the natural environment.

- Impact on cultural and heritage resources.
- Impacts on land use and also surrounding land uses.
- Impact on existing services supply (municipal capability).
- Impact on traffic (local road network).
- Impacts on health of residents associated with the tailings facility.
- Socio-economic impacts (positive and negative)
- Provision of water, sewage and electricity (infrastructure).
- The poor and insufficient municipal infrastructure in the area that will be exacerbated by the proposed development.
- Capacity of public amenities such as schools and clinics in the area.
- Mitigation measures and management procedures to reduce the potential impact of construction activities on the environment.
- Storm water management.

9.3 Issues identified through the assessment process

The following list of issues has been determined through the assessment process based on the environmental baseline descriptions in section 3.

Environmental Features	Construction Activity	Description of potential impact
Air quality	o Clearing and excavating o Construction vehicle movement	o Dust generation o Noise o Safety of road users o Health impacts o Radon levels from old mining activities and neighbouring tailings
Water o Water quality (run-off) o Water quantity o Stormwater run-off	o Material storage o Mixing of concrete o Maintenance o Construction camp and vehicles o Dust suppression	o Pollution and siltation of water bodies/wetlands o Erosion gulley formation o Water from reliable sources o Damage to wetlands and stream
Geology and soils	o Trenching o Construction material storage o Vehicular movement o Rehabilitation	o Compaction of soils o Contamination of soil o Erosion o Dust

Environmental Features	Construction Activity	Description of potential impact
Natural vegetation	o Storage of construction materials o Clearing of topsoil and excavating o Vehicular movement and access o Road and platform construction o Trenching o Rehabilitation	o Destruction and loss of natural vegetation cover o Mixing of topsoil and subsoil o Loss of vegetative layer for rehabilitation o Erosion control o Pollution of or damage to wetlands.
Fauna species	o Vehicular movement o Clearing and excavating o Trenching o Construction of roads and platforms o Construction staff activities	o Noise o Safety o Potential displacement of birds and other fauna o Destruction and loss of natural habitat
Cultural / historical	o Trenching o Vehicular movement o Clearing and excavating o Road and platform construction	o Destruction of cultural / archaeological material. o Loss of cultural / historical features
Socio-economic		
Existing neighbouring communities	o Trenching o Vehicular movement o Construction camp	o Noise pollution o Air pollution o Increased traffic o Safety of children and community members o Job creation o Increased flow of construction workers
Infrastructure: o Electricity supply o Water & sewage supply o Removal of domestic waste o Roads o Upgrade of municipal infrastructure in the area	o Clearing and excavating o Construction Vehicle movement o Trenching o Construction camp	o Noise pollution o Air pollution o Supply of services from Ekurhuleni Metropolitan Municipality and Eskom o Disruption of services during upgrades

9.4 Pertinent issues addressed by the impact evaluation

The above issues and comments were disseminated and categorised into issues of similar nature, to consolidate the assessment evaluation process. The assessments are environment focused with descriptions of the activity impacts included within each evaluation type.

9.4.1 Air quality - Dust generation

There will be a disturbance of soil properties with a loss of soil to wind (dust) and water erosion during the construction phase. This will be caused by construction activities such as clearing and excavating, topsoil and vegetation removal, trenching and storage as well as the movement of construction vehicles on site. The dust will influence the air quality in the immediate vicinity of the construction activities. If the air quality exceeds accepted standards, the neighbouring communities as well as construction workers could experience health problems.

Dust from the construction activities could impact on the flora and fauna on neighbouring natural areas if not mitigated (Annexure D2). During the operational phase of the project, dust will be minimal, since the internal roads will be paved, disturbed areas will be rehabilitated and communal areas will be vegetated.

Dust from the adjacent tailings facility will remain an impact throughout the operational phase however mitigation measures such as vegetation and rock cladding can reduce the impacts. According to the Radiological Impact Study the prevailing wind direction, as well as associated PM_{10} concentration and TSP deposition, is towards the southwest, which means that the contribution of this (radon inhalation) pathway in the Mackenzie Park Ext. 3 residential development area would be minimal, since the contribution to the total effective dose is generally less than the radon inhalation pathway.

Table 16: Impact table for dust generation

Dust generation		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact will be restricted to the site as well as the surrounding area.	Medium
Duration	The impact will be of short duration, limited to construction phase.	Short term
Status and intensity	The intensity of the impact will be medium, but it could be mitigated with proper planning and suitable mitigation measures.	Medium
Probability	The impact will be probable and all mitigation and construction requirements are to be instituted in improving and maintaining the status quo of the air quality.	Probable
Significance	The impact if not mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMPr, be implemented.	Medium

Dust generation	
Mitigation Measures	○ The neighbouring tailings facility should be vegetated or taken away and rehabilitated before any development takes place within the 100m buffer area. ○ Wet all construction areas with water from a water truck three times a day during the dry periods of the year to reduce dust and adjust the frequency as necessary for sufficient dust suppression. ○ Disturb as little as possible of the natural vegetation on site and keep construction activities within demarcated areas only. ○ Rehabilitate disturbed areas as soon as construction activities have been completed in that area. ○ Construction workers to follow prescribed precautions when working in dusty conditions. ○ Construction vehicles to reduce speed to 30km/h through the site to reduce dust. ○ Transportation vehicles used for the construction materials to be covered with tarpaulins when travelling off site to reduce dust when travelling.
Level of significance after mitigation	**Low**

9.4.2 Noise

Noise is generated during the construction and operation phase of the project. Excessive noise could have an impact on the neighbouring communities, construction workers as well as the animals in the area.

The following construction activities could potentially generate noise during the construction phase of the project:

- Construction of access roads (excavator / grader / bulldozer and dump trucks).
- Vehicular movement or large delivery trucks on access and internal roads. Construction traffic is expected to be generated during the entire construction period and the volume and type of traffic generated will be dependent on the type of construction activities being conducted. The use of onsite crushing and screening, as well as onsite concrete batching plants could significantly reduce heavy vehicle movement to and from the site.
- The establishment, operation and removal of concrete batching plants or the use of concrete trucks.
- Clearing, excavating and digging of trenches.
- Blasting may be required as part of the civil works to clear obstacles (rocks) to prepare foundations. Blasts will be infrequent occurrences with a loud but instantaneous character. Blasting is highly regulated and the control of blasting to protect human health will ensure that any blasts will use minimum explosives and occur in a controlled manner. The breaking of obstacles by explosives is a very specialised field and when correct techniques are used, it causes less noise than a rock breaker.

Table 17: Impact table for noise

Noise during construction phase

Noise during construction phase		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact will be restricted to the site as well as the surrounding area.	Medium
Duration	The impact will be of short duration, limited to construction phase.	Short term
Status and intensity	The intensity of the impact will be Low.	Low
Probability	The impact will be probable and all mitigation and construction requirements are to be instituted.	Probable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMPr be implemented.	Medium
Mitigation Measures	○ Construction workers to wear earmuffs as prescribed by ISO 18000 standards. ○ Working hours should be restricted to reduce impact on residents, fauna on the neighbouring natural areas at night and weekends. ○ Construction vehicle traffic to be reduced to the minimum taking the limited water on site into account. ○ All machinery and plant to conform to SABS noise reduction standards. ○ The adjacent property owners must be informed of the construction activities and blasting (if needed) schedule.	
Level of significance after mitigation		**Low**

9.4.3 Soil disturbance and instability

The geotechnical report found that the site has potential collapsible colluvium and ground water seepage fluctuated between 0.40m and 2.40m. There is no evidence of expansive soil behaviour in the soil profiles and the laboratory results reveal that the materials are low in potential for being expansive. Limited erosion problems are expected.

Machine excavatability for the installation of services is expected to be problematic with a backhoe in certain places. No dolomite, undermining, steep slopes or unstable natural slopes, except for a very small portion on the extreme northwest of the site that is undermined at a depth between 120m and 240m occur. No geotechnical conditions preventing township establishment are encountered on this site.

Specific mitigation measures have been recommended and it is imperative that they be implemented during the construction phase of the development.

Table 18: Impact table for soil stability

Soil stability		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the site	Within site boundary
Duration	The impact could be reversible over time.	Medium term
Status and intensity	The intensity of the impact could be low if mitigated with proper planning and management.	Low
Probability	The impact will be have a low probability	Probable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendations as stipulated in the EMP, be implemented.	Medium
Mitigation Measures	The following founding solutions are recommended for light structures erected on Class C2 land. Founding alternatives for lightly loaded single and double-storey structures constructed in this zone include the following: **Option 1: Stiffened strip footings, stiffened or cellular raft** o Stiffened strip footings or stiffened or cellular raft with lightly reinforced or articulated masonry. o Bearing pressure not to exceed to 50 kPa. Fabric reinforcement in floor slabs. The site should be properly drained and adequate plumbing and service precautions should be taken to prevent water leaks. **Option 2: Deep strip footings** o Found on competent horizon below the problem layer using normal construction which should also include fabric reinforcement in floor slabs. Adequate drainage precautions should be taken for the site. **Option 3: Piled or pier foundations** o Reinforced concrete ground beams or solid slabs on piled or pier foundations. Ground slabs with fabric reinforcement. The site should be properly drained and adequate plumbing and service precautions should be taken to prevent water leaks.	
General mitigation measures:	o When clearing and excavation or trenching activities takes place, topsoil must first be removed and stored separately from the subsoil for rehabilitation purposes. o Ponds and silt traps to be constructed as soon as possible after construction begins. o Precautions to be taken to limit sediment movement off the site. o Fuel/oil spills on site must be managed so that no runoff contamination occurs. Contaminated soil must be removed to a registered landfill site.	

Soil stability		
Impact Evaluation	**Description**	**Summary**
	○ All Equipment working on the site to be in full working order – no leaks that could cause soil pollution. ○ Daily spraying of exposed soil to minimise dust.	
Level of significance after mitigation		**Low**

9.4.4 Ground and surface water pollution (Stormwater)

There is a seepage wetland on the site and the floodline delineation will be affected by the development. Careful planning of stormwater is needed to reduce impacts on this system. Stormwater will accumulate at low points during construction. This water will carry silts that can damage the riparian areas when it concentrates on these areas.

A stormwater management plan has been developed and was closely linked to the planning of this development. It is generally good practice to avoid any accumulation of surface water near buildings by appropriate surface drainage design. Care must be taken to ensure that stormwater is settled and handled on site so that it does not impact on wetlands and pans on site.

Table 19: Impact table for ground and surface water

Ground and surface water pollution		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the site and surrounding areas	Local
Duration	The impact could be of long duration, not only limited to the construction phase but also during the operational phase with Stormwater draining into the wetlands.	Long term
Status and intensity	The intensity of the impact could be minor if mitigated with proper planning and management.	Medium
Probability	The impact will be probable during the construction phase.	Probable
Significance	The impact **if not** mitigated will have high significance. It is imperative that the mitigation and recommendation as stipulated in the EMP, be implemented.	High
Mitigation Measures	○ Manage stormwater discharges, across the site, with consideration for both water quality and flow rates. ○ Introduce a range of techniques at all levels of the development with this objective	

Ground and surface water pollution		
	○ Reduce both the volumes and rate of runoff from the developments proposed on the site itself. ○ Place excavation material on stream-up side of all trenches that will be excavated. ○ Before stormwater trenches are excavated, the stormwater retention pond areas must first be prepared to accept stormwater during construction. This will then act as a stilling chamber in which any silts and waste will settle before the water can enter the wetland area. ○ Roads can also concentrate stormwater towards the water retention areas. Before road construction, channels that lead to low lying areas can be constructed, the riparian area must be protected by construction of the retention pond areas to settle stormwater during construction. ○ The retention pond areas must be maintained and cleaned during construction and be kept in a working order. After construction the ponds will be cleaned and vegetated. ○ Stormwater and sewerage lines must be constructed from the low point towards the high point to prevent accumulation of stormwater in the trenches. ○ Particular care must be taken to prevent spillage of oils and fuel, especially around the onsite storage of diesel if needed. Preventative measures must be in place if spillages should occur to prevent the spillage to enter trenches or road construction areas. The top layer of soil around the storage tanks must be stabilized with cement to establish an impermeable layer of soil. This must be removed after construction. ○ Adhere to all the recommendations as listed in the Civil Engineering Services report as well as the dolomite report and EMPr.	
Level of significance after mitigation		**Medium**

9.4.5 Flora

Mucina & Rutherford (2006) classified the area as Soweto Highveld Grassland, a gently to moderately undulating landscape on the Highveld plateau supporting short to medium high, dense, tufted grassland dominated almost entirely by *Themeda triandra*, and accompanied by a variety of other grasses. This vegetation unit is considered endangered.

The **flora study** found that the *Eragrostis – Tristachya* grassland is disturbed natural grassland and is not deemed sensitive. The *Cortaderia – Cynodon* vegetation study unit, the *Eragrostis – Cynodon* grassland study unit and the Mixed alien and indigenous vegetation study unit are not considered sensitive. The Wetland vegetation study unit is deemed sensitive. The alien invasive species should be removed. No Red List or Orange List species occur on the study site.

Table 20: Impact table for flora

Flora		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the construction site and surrounding area.	Local
Duration	The impact could be of long duration, not only limited to the construction phase.	Long term
Status and intensity	The intensity of the impact could be medium if mitigated with proper planning and management.	Medium
Probability	The impact will be probable during the construction phase if development takes place.	Probable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMP be implemented.	Medium
Mitigation Measures	○ Only indigenous plant species, preferably species that are indigenous to the natural vegetation of the area, should be used for landscaping in communal areas. As far as possible, plants naturally growing on the development site, but would otherwise be destroyed during clearing for development purposes, should be incorporated into landscaped areas. Forage and host plants required by pollinators should also be planted in landscaped areas. ○ In order to minimize artificially generated surface storm water runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilized for these purposes. ○ An appropriate management authority (e.g. the body corporate) that must be contractually bound to implement the Environmental Management Plan (EMP and Record of Decision (ROD) during the operational phase of the development should be identified and informed of their responsibilities in terms of the EMP and ROD. ○ The open space system should be fenced off prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be excluded from the open space system. Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases. Movement of indigenous fauna should however be allowed (i.e. no solid walls, e.g. through	

Flora		
	the erection of palisade fencing). o Category 1, 2 and 3 Alien Vegetation must be removed from the study site. o Dumping of builders' rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures. These areas must be properly managed throughout the lifespan of the project in terms of fire, eradication of exotics etc. to ensure continuous biodiversity. o Avoid any disturbances within the wetland areas and their buffer zones. o Avoid erosion at all times. Erosion control measures must be implemented, especially at areas with a slope, e.g. near the slimes dam.	
Level of significance after mitigation		**Low**

9.4.6 Fauna

Construction activities will cause disturbance (noise) and displacement of fauna on site, but not on a permanent basis, since the fauna would most probably move away from the area to the natural areas in the surroundings. The study site has a seep wetland which can be considered important topographical features and contains faunal habitat. The species richness is decidedly low, which is ascribed to limited habitats available, restricted site size and adjoining areas and a dismal quality of conservation resulting in species displacement.

The natural fauna of the site has deteriorated in species richness and environmental wellbeing as result of mining and illegal dumping activities. The habitat on and in the study area will not favour any of the Red Data faunal species recorded for the area. Connectivity to other open spaces is moderate.

Table 21: Impact table for fauna

Fauna		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the construction area and surroundings.	Local
Duration	The impact could be of long duration, not only limited to the construction phase.	Long term
Status and intensity	The intensity of the impact could be low if mitigated with proper planning and management.	Low
Probability	The impact will be Probable during the construction phase if managed.	Probable
Significance	The impact **if not** mitigated will have medium to low significance. It is imperative that the mitigation and recommendation as stipulated in the EMP be implemented.	Low
Mitigation Measures	o The contractor must ensure that no fauna on site and in the surroundings is disturbed, trapped, hunted or killed	

Fauna		
	during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance. o It is suggested that where work is to be done close to the wetland and buffer area, these areas be fenced off during construction, to prevent heavy machines and trucks from trampling the plants, compacting the soil and dumping in the system. o During the construction phase, noise must be kept to a minimum to reduce the impact of the development on the fauna residing in the wetland and on the neighbouring sites. o Dumping of builders' rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures. These areas must be properly managed throughout the lifespan of the project in terms of fire, eradication of exotics etc. to ensure continuous biodiversity. o Avoid any disturbances within the wetland areas and their buffer zones. o Avoid erosion at all times. Erosion control measures must be implemented, especially at areas with a slope, e.g. near the slimes dam. o No vehicles should be allowed to move in or across the wet areas or drainage lines and possibly get stuck. This leaves visible scars and destroys habitat, and it is important to conserve these areas. o Alien and invasive plants must be removed	
Level of significance after mitigation		**Low**

9.4.7 Destruction of Archaeological and cultural/historical sites

An old mine shaft and the overburden dump with associated infrastructure were observed within the study area that may have significant historic value. The Rynsoord Cemetery is situated in the southeastern corner of the site, between Main Reef Road and the Railway Line. It is recommended that the cemetery be fenced off from the rest of the development.

From the cultural/historical impact assessment it was determined that a phase 2 study must be done on the mine shaft and surroundings to determine whether these may be demolished. The cemetery will be excluded from the residential development and will not be impacted.

Table 22: Impact table for cultural / historical

Archaeological and cultural/historical sites destruction		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the construction area.	Within site boundary
Duration	The impact could be likely during the construction and operation phase	High
Status and intensity	The intensity of the impact could be medium if mitigated with proper planning and management.	Medium
Probability	The impact could be improbable during the construction phase if managed.	Improbable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMP, be implemented.	Low
Mitigation Measures	The site should undergo a second phase of investigation to determine its architectural and historic significance before any structures are demolished. It is recommended that obscured, subterranean sites be managed, if they are encountered. In the event that artefacts / graves / areas of cultural significance are discovered during the construction phase, the following recommendations are given: All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered. o All construction in the immediate vicinity (50m radius of the site should cease). o The heritage practitioner should be informed as soon as possible. o In the event of obvious human remains the SAPS should be notified. o The area in a 50m radius of the find should be cordoned off with hazard tape. o Public access should be limited. o The area should be placed under guard. o No media statements should be released until such time as the heritage practitioner has had sufficient time to analyse the finds. o If a grave is found, the identified grave should be fenced off or relocated (with the proper measures for relocation) before construction commence.	
Level of significance after mitigation		**Low**

9.4.8 Job creation, capacity building and skills transfer

Jobs are anticipated to be created during the construction phase. Whilst the expected inflow of workers from outside the study area cannot be quantified at this stage, it is anticipated that the number of workers involved in a project of this nature, would have a marked impact on the local population figures.

The construction workforce would be present in the area and social conflict between "outsiders" and the local population could materialise in the form of anger and discontent aimed at outsiders. In worst cases, it could, potentially, lead to violence between the two groups. The possibility of conflict materialising would thus depend on the local communities' perceptions of whether outsiders are favoured to locals for employment opportunities, as well as on the actual number of outsiders that would be employed. A critical mitigation measure in this regard is the employment of locals.

An extensive influx of job seekers to an area could result in negative social impacts such as illegal settlements with associated environmental pollution, social conflict between job seekers and locals over securing employment, conflict among informal vendors for "new" business, a lack of sufficient accommodation and other infrastructure to cater for their needs, and pressure on water- and sanitation-related facilities, etc.

Table 23: Social impact table

Population Change and Inflow of Workers & job seekers		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact will be restricted to the site as well as the surrounding area.	Local
Duration	The impact could be of Medium duration, not only limited to the construction phase.	Medium
Status and intensity	The intensity of the impact could be medium if mitigated with proper planning and management.	Medium
Probability	The impact will be probable during the construction phase.	Probable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMP be implemented.	Medium

Population Change and Inflow of Workers & job seekers		
Mitigation Measures	○ Local labour (women included) should be used as far as possible during the construction phase of the development. ○ Construction workers (especially those in the semi-skilled and unskilled categories) should be employed as much as possible. ○ Care should be taken not to create unrealistic expectations among locals in terms of job creation, as is often the case where high unemployment levels prevail. ○ The recruitment process and the use of contractors should be clearly communicated to the local communities, e.g. through community meetings arranged by the local councillors. ○ Councillors in the adjacent towns should be consulted regarding the sourcing of labour. ○ A designated area must be set out for vendors selling food to construction workers where they will not be a nuisance to the surrounding landowners. Used oil and domestic waste must be disposed of in a proper way. Care must be taken that these vendors do not cause veld fires that could impact on surrounding properties.	
Level of significance after mitigation		**Medium**

9.4.9 The upgrade and provision of Services and Roads

The proposed development is expected to increase the demand for proper services in the area. The Services report (Annexure D7) on civil services proposed that the average annual daily water demand (AADD) for the proposed development is approximately 6.32Ml/day.

Sufficient spare capacity is currently available in all affected existing bulk water pipes. One pipe within the Benoni Central distribution zone has a velocity in excess of the recommended 2m/s, but the pressure from the Rand Water system is sufficient to ensure that most of the supply zone experiences peak flow residual pressures in excess of the minimum requirement of 24m. No upgrading to any network water infrastructure is required.

The capacity of the existing outfall sewer is insufficient to accommodate the proposed development and the sewer will have to be upgraded. It is expected that the development will ultimately be served by the Waterfall WWTP which is currently being upgraded by ERWAT.

Currently the whole development drains toward the Brakpan-Vlakplaats drainage system with a spare capacity of 97.94 l/s . The internal sewage network was analysed, and it was found that the system does have spare capacity for the proposed development.

There is no stormwater infrastructure on the site. Stormwater run-off from the site must be controlled in terms of the EMM requirements. A number of stormwater attenuation ponds will thus have to be constructed, which will overflow into the buffer areas. A stormwater management plan was developed during the EIA phase to properly manage stormwater on the site.

The proposed development may be supplied with electricity from the Van Eck substation on site. The existing maximum demand at Van Eck already exceeds safe capacity. Additional space capacity will have to be installed. Alternatively the site may be supplied from the planned Helderwyk/Leeuwpoort 88kV POD.

A traffic impact study was done (see Annexure D10) and some amendments to the layout plan was recommended. The proposed development will be accommodated by the traffic network with the recommended upgrades.

Domestic waste associated with the proposed development could have an impact on the environment if the waste stream is not properly managed. EMM is however the landowner and applicant and formal waste removal will be implemented in this development.

Table 24: Services impact table

Upgrade and provision of Services and Roads		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact would not be restricted only to the site area.	Regional
Duration	The impact would be of long duration, not limited only to the construction phase.	Long term
Status and intensity	The intensity of the impact could be medium if not mitigated with proper planning and management.	Medium
Probability	The impact will be probable and definite during the construction and operation phase.	Probable
Significance	The impact if not mitigated will have a high impact in terms of the upgrade of the outfall sewer and other infrastructure, accumulation of waste, provision of water.	High
Mitigation Measures	o A formal waste removal strategy for the proposed township must be developed and implemented by EMM to reduce the risk of environmental pollution from waste. o EMM will have to ensure that the sewage system, WWTW, bulk water and stormwater systems are properly upgraded and other services take place before the proposed development is finalised to reduce the risk to the environment. o Upgrade Roads and Services in the area o Provide a business area to decrease the need for communities to go far for shopping of essentials. o Public transport and taxis are to be accommodated by means of additional bus/taxi lay-byes and bus/taxi ranks. o Encourage the Health Department to provide clinics in the area.	
Level of significance after mitigation	**Moderate positive impact**	

9.4.10 The provision of housing development

Ekurhuleni's current housing backlog is estimated to be in the region of 200 000 units and is still growing. The obvious need and huge demand for formal housing is an indisputable fact. Fast-tracking housing delivery is one of the top priorities of central, provincial and local government.

The proposed development will entail a residential township in order to provide housing units to beneficiaries qualifying for the government housing subsidy, as well as rental units for non-qualifying households/people. Approximately 9500 housing units will be built in the township, while provision is also made for a primary school, a local business site, local community facilities and parks.

A total of 10 "Public Open Space" erven are proposed throughout the township, including local play parks, stormwater detention dams, and the buffer area and 1:100 year flood line of the wetland.

The above structuring elements combine to demarcate **distinct residential cells/neighbourhoods** in the proposed development.

Providing housing on this site could reduce the need for informal settlement on site.

Table 25: Provision of housing impact table

Provision of housing		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact would not be restricted only to the site area.	Regional
Duration	The impact would be of long duration, not limited only to the construction phase.	Long term
Status and intensity	The intensity of the impact could be medium positive.	Medium positive
Probability	The impact will be probable and definite during the operation phase.	Probable
Significance	The impact will have a highly positive impact.	High positive
Mitigation Measures	○ Upgrade Roads and Civil Services in the area before construction of the houses commence. ○ Provide a range of housing typologies ○ Provide a business area to decrease the need for communities to go far for shopping of essentials. ○ Encourage the Health Department to provide clinics in the area.	
Level of significance after mitigation	**High positive impact**	

9.4.11 Health and Safety Impacts

During the construction phase, the safety of construction workers as well as the surrounding communities is of concern as is the case with any other construction activities. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction activities, increased risk of accidents due to the increased movement of construction vehicles on the site and on the local roads, as well as the risks associated with the storage of chemicals or other hazardous substances on the site.

Another source of concern is the establishment of a construction camp on the construction site. Construction camps, where labourers are accommodated for the duration of the construction period are usually associated with a possible increase in criminal activities. Other concerns relate to littering, unwanted behaviour of construction workers, transmission of sexually transmitted diseases (STDs), environmental pollution, an increased risk of fires, etc. Although such perceptions cannot be substantiated or changed, they should be dealt with sensitively. The employment of locals would be a key mitigation measure in this regard, as the development of a construction camp would then be unnecessary and outsiders would not come to the area and intrude on the local social networks. If that is not possible then proper mitigation measures must be implemented to reduce the potential impacts associated with construction camps.

Table 26: Health and safety impact table

Health and Safety impacts		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be Regional, not only limited to the site and surrounding neighbourhood.	Medium
Duration	The impact would be of short term, occurring mostly during the construction phase.	Short term
Status and intensity	The intensity of the impact could be medium if mitigated with proper planning and management.	Medium
Probability	The impact will be probable during the construction phase.	Probable
Significance	The impact **if not** mitigated will have medium significance on the neighbouring community	Medium
	○ No construction workers may be housed on the site. ○ Ensure safe and healthy working practices. ○ Chemicals and materials stored at the storage sites on site should be held securely and in accordance with the relevant health and safety regulations. ○ Only qualified personnel should undertake tasks relevant to their duties. ○ Suitable protection (clothing, harnesses, etc.) should be provided for construction workers.	

Health and Safety impacts	
Mitigation Measures	○ Local labourers should be used as far as possible during the construction phase as it would limit the influx of outsiders to the area and avoid a possible increase in criminal activities and eliminate the need for a residential camp. ○ Signage along the local roads should be put up to indicate construction areas and to limit the risk of accidents. ○ Construction and delivery vehicles must be limited to 30km/h. ○ The construction site must be fenced and access controlled by security before construction commence to keep construction workers and vehicles on site and to reduce the chance of children falling in trenches or to get in conflict with construction vehicles.
Level of significance after mitigation	**Low**

9.4.12 Construction camp

The construction camp could have an impact on the environment if the placement or design is poorly situated. Domestic waste as well as construction waste generated at the construction camp could also impact on the fauna and flora in the area as well as the human health of construction workers if it is not removed to a landfill site.

No construction workers may be housed at the construction camp. Only construction materials and offices will be housed at the construction camp. These construction materials could consist of aggregate, cement, water, steel for foundations, electric cables, oils etc. The placement and design of the construction camp will therefore have to take the social constraints of the site into consideration. The site must also be designed to limit any impact that could potentially be caused by spillages.

Table 27: Construction camp impact table

Construction camps		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the construction area and surroundings.	Local
Duration	The impact could be of short duration, only limited to the construction phase.	Short
Status and intensity	The intensity of the impact could be minor if mitigated with proper planning and management.	Minor
Probability	The impact will be probable during the construction phase.	Probable
Significance	The impact **if not** mitigated will have medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMP, be implemented.	Medium
Mitigation Measures	○ The construction camp must be established in an area which is disturbed, the locality discussed with the ECO before establishment.	

	○ The contractor must supply the workers with firewood or preferably gas cooking appliances, to ensure that wood is not taken from the surrounding area. ○ Water for construction activities must be trucked in from formal registered water sources. ○ Domestic waste must be removed separated, recycled and taken to a registered landfill site where needed. ○ Regular clean-up of the construction camp must ensure that no waste is windblown or otherwise distributed onto the surrounding natural areas. ○ Chemical toilets must be provided at the construction camp and at regular intervals on the site. ○ Bins must be provided for domestic waste and regular clean-ups to be done of the entire site. ○ No animals may be killed or hunted for food. ○ The construction camp area must be properly rehabilitated after construction to a natural state, should it fall outside the study area.
Level of significance after mitigation	**Low**

9.4.13 Visual Aspects

The main visual impact associated with the construction phase would be the actual construction site, possible storage of equipment and disruption of the soil and vegetation. These impacts are temporary and should respond to mitigation measures. The study area is degraded and disturbed due to the following impacts on the study site and adjacent areas:

- Alien vegetation establishment and expansion;
- Dumping and litter;
- Mining (mine tailings); and
- Frequency of fire events.

The site is surrounded by existing townships, the tailings facility and roads and should not change the visual characteristics of the area dramatically should the neighbouring characteristics of the neighbourhoods be kept in mind. However the formalisation of the area will stop the dumping in the area which will improve the visual perception of the site.

Table 28: Visual impact table

Visual aspects		
Impact Evaluation	**Description**	**Summary**
Nature and extent	The impact could be restricted to the construction site and surrounding area.	Local
Duration	The impact could be of long duration since the proposed development is of a permanent nature	Long term
Status and intensity	The intensity of the impact could be low if mitigated with proper planning and management.	Low
Probability	The impact would be probable during the operation phase.	Probable
Significance	The impact **if not** mitigated will have a medium significance. It is imperative that the mitigation and recommendation as stipulated in the EMP be implemented.	Medium
Mitigation Measures	○ Disturbed areas outside the proposed development site should be rehabilitated as soon as possible after construction. ○ The construction site should be kept litter free. ○ Planning must take into account the natural surroundings, sense of place and critical views. ○ Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent /surrounding properties including road verges, roads or public places and open spaces during or after the construction period of the proposed developments but disposed of at an approved dumping site as approved by the Council. ○ Dustbins must be provided at strategic places within the construction area. ○ The construction site must be kept in a clean and orderly state at all times. ○ Architectural styles and paint colours should take cognisance of the character, styles and sense of place of the neighbouring community. ○ Maintain buildings and perimeter fencing etc. in order to ensure that they do not deteriorate and result in an aesthetically unpleasing development.	
Level of significance after mitigation		**Low**

9.5 Cumulative impacts

Cumulative impacts result from actions which may not be significant on their own but which are significant when added to the impact of other similar actions. The anticipated impacts resulting from the construction and implementation of the proposed development could potentially result in cumulative negative effects when taking the following into consideration:

- The proposed development will add to existing road users in the area and will have an impact on traffic.
- The proposed development will add additional pressure to services in the area.
- The proposed development will add to shortages in health facilities, schools, retirement centres and churches if the necessary services are not provided/upgraded.
- Construction impacts may further lead to nuisance noise impacts, the transformation of the general ambience and quality of the site and surroundings and visual concerns.
- Construction impacts may increase dust, which could already be a problem with the mining of the slimes dam to the north.

Therefore it is essential that the EMPr for the construction phase be implemented to minimise the impact of construction activities on the environment.

- The construction and subsequent operational activities will be the source of various waste streams which must be managed appropriately.
- Dust should be monitored on site during construction and dust suppression applied on a regular basis.
- Mitigation during the operational phase of the development is:
    - The upgrade of Roads and Services in the area.
    - The upgrade and maintenance of the outfall sewer and WWTP.
    - Maintenance and management of domestic waste and removal of the waste on a regular basis to registered landfill sites by EMM.
    - Provision of health and education facilities by the Health and the Education departments.

10. CONCLUSION

There is a tremendous need for housing, better services and jobs within the Ekurhuleni Metropolitan Municipality area as well as the surrounding communities. The project team has worked with the different stakeholders, authorities and the local community to ensure that the proposed project address both the social concerns as well as the environmental concerns.

The proposed development will have a low negative and a high positive impact on the environment should all the mitigation measures proposed above be implemented. It is essential that the Environmental Management Programme be implemented during the construction and operational phases of the proposed development.

It is therefore requested that the **preferred option be authorised by the Department of Agriculture and Rural Development**, in terms of the conditions and requirements of this report and that the township be managed in terms of the recommendations as given in this report.

The site is situated within an urban edge, surrounded by development and the vegetation of the site is transformed. In terms of GN 509 of the National Water Act, 1998 any development within 500 meters of a wetland should follow a water use license application process for the release of stormwater from the site. A Water Use Licence Application (WULA) will therefore be submitted to the Department of Water and Sanitation (DWS) for approval.

There is a huge need for housing provision in the area and the negative social impacts associated with the proposed development can, in most cases, be mitigated successfully.

The proposed residential development is anticipated to have the following **positive social** impacts:

- The creation of employment (even limited) in an area where job opportunities are scarce and where the unemployment rates are growing, as well as the possible economic spin-offs is an important positive impact.
- The possibility of skills development for temporary and permanent employees exists.
- The provision of houses and mixed use development will reduce the housing need in the area and will provide essential services and socioeconomic opportunities.
- The upgrading of roads and services as well as the removal of waste from a formal township will reduce the environmental impacts in the area.

The proposed residential development could have the following **negative social** impacts:

- An influx of job seekers to the area cannot be excluded, with subsequent negative social impacts.
- A possible inflow of temporary workers to the area during the construction phase, as well as the intrusion impacts associated with the construction activities such as increased construction vehicle activity.
- Should the outfall sewer not be upgraded to accommodate increasing demands in the area, then there is a large risk of environmental pollution to the aquatic systems in the area as well as a health risk to neighbouring communities.

The study has shown that the proposed development has no fatal flaws in terms of the institutional, bio-physical or socio-economic environment. There would be no significant impact on the environment, which could not be mitigated by proper mitigation measures. The ensuing Environmental Management Programme (EMPr) as provided in Appendix F could mitigate most of these impacts.

11. RECOMMENDATIONS

It is recommended that the **preferred option** of a **Residential Development** be approved with the following conditions:

- All the requirements and mitigation measures as described in the Environmental Management Programme (EMPr) appended in Appendix F must be adhered to.
- All the recommendations and mitigation measures as per the specialist reports must be adhered to.

- The Water Use Licence (WUL) must be approved by the DWS before construction can commence near the wetland and aquatic systems.
- It is recommended that an independent Environmental Control Officer (ECO) be appointed to ensure that the ROD and the requirements of the Environmental Management Programme are adhered to.
- The use of local labour should be maximised to ensure that the locals stand to benefit from the proposed project, but also to limit most of the anticipated social impacts associated with the construction phase of the project (e.g. conflict between locals and outsiders about employment).
- The outfall sewer and other essential bulk services as well as the roads or intersections must be upgraded before the construction phase of the proposed development commence.

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